PEOPLES GAS SYSTEM

BEFORE THE

FLORIDA PUBLIC SERVICE COMMISSION

Docket No. 080318-GU

In Re: Petition for rate increase by Peoples Gas System

Submitted for Filing: August 11, 2008

DIRECT TESTIMONY AND EXHIBITS OF:

SUSAN C. RICHARDS
On Behalf of Peoples Gas System

Q. PLEASE STATE YOUR NAME AND BUSINESS ADDRESS.

A. My name is Susan C. Richards and my business address is 702 N. Franklin Street, Tampa, Florida 33602.

Q. BY WHOM ARE YOU EMPLOYED AND IN WHAT CAPACITY?

A. I am employed by Peoples Gas System ("Peoples" or the "Company") as Manager - Budget and Finance, and have held that position since August 2006.

Q. PLEASE PROVIDE A BRIEF OUTLINE OF YOUR EDUCATIONAL BACKGROUND AND BUSINESS EXPERIENCE.

A. I hold a degree in accounting from the University of South Florida, and have been employed by Peoples for 16 years. From August 1992 until September 1996, I worked in marketing in the Company's St. Petersburg Division. In 1996, I began working as a financial analyst in the budget department, and became Supervisor, Budget & Finance in 2003, after which I assumed my current position with the Company.

Q. WHAT ARE YOUR CURRENT RESPONSIBILITIES?

A. As Manager, Budget and Finance, I am responsible for Peoples' annual budget and multi-year forecast, analysis of capital expenditures, analytical work on customer consumption of natural gas, trends in that consumption, and weather tracking.

Q. WHAT IS THE PURPOSE OF YOUR TESTIMONY?

A. My testimony presents the numbers and classes of customers in the projected test year, as well as the projected consumption by those customers. I will explain the development of the historical portion of the cost of service study, excluding the costs associated with miscellaneous service charges, and the base revenue budget for the projected test year in this proceeding.

Q. HAVE YOU PREPARED OR CAUSED TO BE PREPARED ANY EXHIBITS TO BE INTRODUCED IN THIS PROCEEDING?

A. Yes. The schedules of the MFRs listed in Exhibit ___(SCR-1) were prepared by me or under my supervision. Each schedule contains a general explanation of what is called for and shown on the schedule. In addition, I prepared or caused to be prepared Exhibits ___(SCR-2) through ___(SCR-6).

Q. HOW DID YOU DEVELOP THE PROJECTED NUMBER OF CUSTOMERS IN THE PROJECTED TEST YEAR?

A. The projected number of customers was derived from analysis of our customers as of the end of the 2007 historic base year plus the forecasted customer additions, minus losses and seasonal activity for 2008. This became the beginning base for projecting the same information for the projected test year.

Q. HOW DO YOU FORECAST CUSTOMER ADDITIONS?

A. Peoples' annual budget for revenue-producing capital expenditures is developed based on the specific capital projects for which the expenditures will be made. Each project is associated with a projected number of customer additions by rate class and by year. For 2008, I included forecasted customer additions by rate class, adjusted these gross additions based on the historical losses of customers and historical seasonal customer data to arrive at the projected number of customers as of the end of 2008.

The process described above was repeated in order to forecast the number of customers for the 2009 projected test year. In addition to any new capital projects, gross additions are included from existing on-going revenue-producing projects and on-main saturation projects.

Q. YOU MENTIONED CUSTOMER LOSSES. DOES PEOPLES ACTUALLY LOSE CUSTOMERS EACH YEAR?

A. Yes. The Company loses customers each year as a result of, among other things, competition from alternative energy sources, single-appliance customers' replacing the gas appliance with an electric appliance when the gas appliance reaches the end of its useful life, inner city renewal projects, demolition and replacement of single family homes, and mortgage foreclosures.

Q. HOW DID YOU PROJECT OR FORECAST THE CUSTOMER LOSSES FOR 2008 AND THE PROJECTED TEST YEAR?

A. I used a historical average of customer losses which was developed for and applied to each customer rate class. This average was adjusted slightly to reflect more recent history resulting from current economic conditions.

Q. WHAT IS THE "SEASONAL ACTIVITY" YOU MENTIONED, AND HOW DID IT AFFECT THE PROJECTED NUMBER OF CUSTOMERS FOR 2008 AND THE PROJECTED TEST YEAR?

A. Peoples has about 3,000 customers who are part time, seasonal customers. They are generally in Florida only for the winter months or a portion of the winter months. I reviewed the historical activity of these customers to adjust monthly the number of customers for both 2008 and the 2009 projected test year.

Q. WHAT ARE THE NUMBERS OF CUSTOMERS YOU HAVE PROJECTED FOR PEOPLES IN THE PROJECTED TEST YEAR?

A. For 2009, the Company projects to have an average of 338,795 customers. The numbers of customers by rate class for the projected test year are shown on Schedules H-2, pages 2 and 3, and G-2, page 8, of the MFRs.

Q. HOW WAS THE CONSUMPTION OF EACH CUSTOMER CLASS DETERMINED FOR THE PROJECTED TEST YEAR? PLEASE BEGIN WITH THE RESIDENTIAL CUSTOMER CLASS.

A. After a lengthy study of historical residential customer consumption over a 10-year period, I identified a continuing trend of declining use per residential customer. Rather than just accept the linear trend of lower usage per customer, a regression model was developed to forecast the future consumption of these customers. The model took into account 10 years of weather history, 10 years of the residential delivered cost of gas, and the 10-year linear trend of declining use per customer I previously mentioned. As shown on my Exhibit ___(SCR-2), although the trend of declining use was still evident, it was not as severe as that shown by the linear model alone after the consumption had been weather normalized.

Q. WHAT IS A REGRESSION MODEL?

A. It is a technique used for modeling numerical data consisting of values of a dependent variable (in this case, customer therm consumption) and one or more independent, or explanatory variables (in this case, weather, gas price, and the historical linear decline in usage). In simpler terms, it uses known past customer information to predict what the future customer information will be in terms of the dependent variable, customer therm consumption. The regression model is developed in Microsoft Excel using its regression analysis tool. The tool performs linear regression analysis by using the "least squares" or "best-fit" method to fit a line through a set of observations. The regression analysis estimates the relationship between variables so that a given result can be predicted with the use of one or more other variables.

Q. DID THE RESULTS DEVELOPED BY THE REGRESSION MODEL CORRELATE WITH ACTUAL RESIDENTIAL CUSTOMER USE?

A. Yes. The model was able to replicate the customer usage with a high degree of correlation for each of the Company's divisions based on 10 years of weather-normalized consumption history. On a consolidated basis the correlation was greater than 98%.

Q. DID YOU USE THE SAME REGRESSION MODEL TO PROJECT THE CONSUMPTION OF THE COMPANY'S COMMERCIAL CUSTOMER CLASSES?

A. Yes, but as explained later in my testimony, I used the same regression model only for the smaller commercial rate classes GS-1 through GS-3. Peoples' commercial classes were expanded from three rate classes to five rate classes as a result of the Company's last base rate proceeding, and this change made tracking commercial trends somewhat more difficult. However, I was able to obtain 10 years of consumption history for existing customers that had been on the Company's system for that period, and assumed they had been on their current rate schedule during that time. I then used this data to simulate the regression model using the same variables used for the residential rate class – the delivered price of gas, weather and a 10-year linear trend. Again, I identified a growing trend of declining use per customer greater than would be caused by weather alone.

Q. DID THE RESULTS DEVELOPED BY THE REGRESSION MODEL CORRELATE WITH ACTUAL CUSTOMER USE FOR THE GS-1 THROUGH GS-3 CUSTOMER CLASSES?

A. The GS-1 through -3 classes fit the model very well and the predictions were within an acceptable error rate of less than plus or minus 5% in the last few years. The models have a high degree of correlation but do vary by rate class and operating location. A summary of the regression statistics is contained in my Exhibit ___(SCR–3), and graphs showing the correlation between the actual therms per bill and projected therms per bill are contained in Exhibit ___(SCR-4).

Q. HOW DID YOU FORECAST PROJECTED TEST YEAR CONSUMPTION FOR THE OTHER RATE CLASSES?

A. The large commercial and industrial classes (GS-4, GS-5, SIS, IS and ISLV) were individually forecasted based on input from the customers as to their plans for the projected year, and this input was used to determine projected test year consumption for these classes of customers.

Consumption of customers in the Small General Service ("SGS") rate class is very volatile, with movement in and out of the class by new customers that are unable to predict what their consumption will be. Due to this volatility, the regression model was not able to produce an estimated average annual therm consumption with a high degree of correlation. To effectively forecast this rate class a five-year linear trend was calculated for the period ending April 2008. I believe using a linear trend not only accounts for the impact of weather but also predicts the declining use per customer.

Q YOU'VE MENTIONED THAT YOU WEATHER-NORMALIZED THE HISTORIC CONSUMPTION. HOW WAS THIS ACCOMPLISHED?

A. Peoples' receives actual degree day data from Accuweather for each operating division. The heating and cooling degree days are weighted over a 60-day billing period to arrive at an average monthly number of degree days. These degree days have been tracked for the past 10 years and used in the regression model described above. The 10-year weighted average was used to project weather for the 2009 test year. Exhibit ___(SCR-5) summarizes the 60-day billing period weighted heating and cooling degree days by location for 10 years ending April 2008.

Q. YOU'VE MENTIONED A TREND OF DECLINING USE PER CUSTOMER. WHAT IS OCCURING?

A. I conducted a thorough study of each of the Company's operating divisions, tracking the consumption of each customer class and analyzing the usage patterns of the class. As appliances are updated and replaced, they are being replaced with electronic ignition appliances such as ranges, furnaces and pool heaters, which no longer have the constant flame and flow of gas associated with older appliances with a standing pilot. Water heaters are much more efficient today than they were even a few years ago. In addition, Peoples has been promoting instantaneous (tankless) water heaters, which reduce gas consumption as they have no pilot light and no need to maintain hot water within the tank. Water heaters are one of the major base load appliances in each household.

Q. IS THIS TREND PECULIAR TO PEOPLES, OR IS IT SOMETHING BEING EXPERIENCED BY OTHER LOCAL DISRIBUTION COMPANIES?

A. Peoples is not alone in experiencing this trend. A declining use per customer is being experienced all over the United States. The American Gas Association ("AGA") conducted a detailed study documenting the efficiencies of appliances and customer trends in different areas of the country. The South Atlantic region has experienced a 12.8% decline over the past six years. Our findings came to the same conclusions that were confirmed by the research provided by AGA. A copy of the Executive Summary from the study is attached to my testimony as Exhibit ___(SCR-6).

Q. HAVE YOU IDENTIFIED ANY CAUSES FOR THE DECLINING-USE-PER-CUSTOMER TREND YOU HAVE IDENTIFIED?

A. Yes. The declining use can be attributed to improved appliance efficiencies, as well as conservation efforts over the past decade. This is driven by the historical forces related to the turnover of old appliances to the more energy-efficient appliances that become available on the market each year. For example, since our last rate proceeding, Peoples' aggressive energy conservation programs have assisted customers in replacing over 17,000 water heaters, furnaces, ranges and dryers with new energy-efficient appliances. In addition, changes in customer usage trends as a result of higher fuel costs than those which existed a few years ago also contribute to the trend. Customer habits changed when natural gas prices increased, and some gas appliances, such as pool heaters and fire logs, are now often used only sparingly.

Q. DID THIS TREND AFFECT YOUR PROJECTIONS OF THE THERM CONSUMPTION BY CUSTOMER CLASS FOR THE PROJECTED TEST YEAR AND, IF SO, HOW?

A. Yes. Each of the Company's divisions was analyzed and the estimated annual therms were calculated using the regression model. With two exceptions, the Southwest Florida and Dade-Broward divisions, estimated annual therms are trending downward. The upward trend for the Dade-Broward division can be attributed to the loss of single appliance (range only) customers and the addition of multi-appliance homes. The Southwest Florida division is relatively new and its usage is trending slightly upward as we continue to add customers and the customer base becomes more stable.

Q. DID YOUR ANALYSES INDICATE WHETHER THIS DECLINING USE TREND COULD BE EXPECTED TO CONTINUE IN THE FUTURE?

A. Yes. The average annual therms per customer are expected to continue to decline beyond the projected test year. I believe past performance is a good indicator of increasing appliance efficiencies, and do not believe we will see gas prices return to the lows of the 1990s.

Q. WHAT IS THE PROJECTED RATE USED FOR THE PURCHASED GAS ADJUSTMENT (PGA)?

A. Residential gas was projected at an average of $1.17955 per therm. Commercial customers pay a slightly lower rate, an average of $1.11710 and the wholesale customers would pay an estimated $1.08584 per therm. As I stated earlier, customer usage will vary depending on the price of gas and the weather. For example, if the price of gas in the regression model is increased by 26% (from $1.18 to $1.48), the residential consumption would drop from 221 estimated annual therms to 213 estimated annual therms. The impact of such a decrease in consumption would result in a reduction in revenue of approximately $1 million. As gas prices fluctuate daily, the impact on projected revenues could have a material impact on earnings.

Q. ARE COMMERCIAL CLASSES ALSO IMPACTED BY THE COST OF GAS?

A. Yes. All customers are affected by the cost of gas. For the smaller commercial classes whose volumes have been predicted using the regression model, the impact of such an increase can be forecasted. Using the same projected increase in gas costs noted above, the impact to Peoples could exceed a $2 million reduction in revenue for the GS-1, GS-2, and GS-3 rate classes.

Q. WHAT WAS THE PROJECTED AVERAGE ANNUAL CONSUMPTION OF A RESIDENTIAL CUSTOMER IN THE 2003 PROJECTED TEST YEAR IN PEOPLES' LAST RATE CASE?

A. The average annual consumption was projected to be 249 therms per year.

Q. WHAT IS THE AVERAGE ANNUAL CONSUMPTION OF A RESIDENTIAL CUSTOMER IN THE 2009 PROJECTED TEST

YEAR IN THIS CASE?

A. The average annual consumption is projected to be 221 therms per year. This represents a decline of greater than 11% since 2003, and is consistent with the AGA study decline of 12.8% noted earlier.

Q. WHAT IS THE PROJECTED THERM CONSUMPTION OF EACH RATE CLASS FOR THE 2009 PROJECTED TEST YEAR?

A. The therm consumption by rate class is shown on MFR Schedules H-2 and G-2, page 8.

Q. WERE YOU RESPONSIBLE FOR THE COST OF SERVICE STUDY INCLUDED IN THE MINIMUM FILING REQUIREMENTS SUBMITTED BY PEOPLES IN THIS CASE?

A. The full cost of service study is covered by both the "E" schedules and the "H" schedules of the MFRs. Certain information developed in the "E" schedules flows into certain of the "H" schedules, and vice versa. I was responsible for the preparation of the "E" schedules listed on Exhibit ___(SCR-1), Richard Wall was responsible for preparation of Schedule E-3, and Daniel Yardley was responsible for preparation of the "H" schedules.

Q. PLEASE EXPLAIN WHAT IS SHOWN ON THE "E" SCHEDULES FOR WHICH YOU WERE RESPONSIBLE.

A. Schedule E-1 details customer bills, therms and revenue by rate class under the current rate structure, under the current rate structure adjusted for therms and bills in the projected test year without any rate increase, and under the proposed rate structure for the projected test year. Schedule E-2 uses information from Schedules E-1 and H-1 to show revenues calculated at present rates, present rates adjusted for growth in bills and therms only, and proposed rates for the projected test year. Again, this information is shown for each customer class.

Schedule E-4 shows, for the historic base year, the system peak month sales by rate class.

Schedule E-5 consists of monthly bill comparisons under present and proposed rates for each rate class. Bill comparisons are shown both with and without fuel.

Schedule E-6 details for each of the five years ending with the historic base year, and for the projected test year, the derivation of the components (rate base, accumulated depreciation, operation and maintenance expense, taxes other than income, required return and income taxes) of the overall cost of service. This cost and the supporting information is used on Schedule H-3 to begin the classification of costs based on whether they are driven by the numbers of customers, the capacity of the Company's system, commodity (system throughput) or revenue. Whether various costs are customer, capacity, commodity or revenue related in terms of cost causation is discussed in more detail by Mr. Yardley.

Q. WHAT IS A COST OF SERVICE STUDY?

A. A cost of service study is a method of determining, based on responsibility for the incurrence of costs, our costs of initiating and maintaining service to each customer class. Once the cost to serve each rate class has been determined, the cost of service study permits rates to be designed for each rate class in a manner that will, to the extent consistent with other considerations in the rate design process, permit recovery of the Company's cost to serve each class.

Q. HOW DID YOU DETERMINE THE BASE RATE REVENUE BUDGET FOR THE PROJECTED TEST YEAR?

A. As described earlier, once I have determined the number of customers by month, rate class, and division, this is multiplied by the estimated annual therms by rate class and division. The numbers of bills are multiplied by the average customer charge and the tariff per therm rate. For off-system sales revenues, I used $500,000, which is an appropriate level as described in more detail in Paul Higgins' testimony. This $500,000 amount was netted against the projected 2009 revenue requirements. For miscellaneous revenues, I have trended the number of transactions or units and multiplied by the Commission-approved charges.

Q. WHAT IS THE TOTAL BASE RATE REVENUE FOR THE PROJECTED TEST YEAR AT THE CURRENTLY AUTHORIZED BASE RATES?

A. As shown on MFR Schedule G-2, page 8, total base rate revenue at the currently authorized rates is $521,577,680, including purchased gas adjustment, or PGA, revenues of $351,671,555.

Q. PLEASE SUMMARIZE YOUR TESTIMONY.

A. As more fully explained in my testimony, Peoples is projected to have an average of 338,795 total customers in the projected test year. Those total customers, by rate class, are detailed on Schedules H-2 and G-2, page 8, of the MFRs. Those MFR schedules also show the therm consumption by rate class, which I developed based on analyses of 10 years of consumption history. Those analyses also confirmed a trend of declining usage per customer, a trend other natural gas local distribution companies in the United States are also experiencing due to increased appliance efficiencies, rising natural gas commodity cost, and customer conservation efforts. The projected average annual consumption per residential customer for the 2003 projected test year in the Company's last base rate proceeding was 249 therms. The average annual consumption of a residential customer in the 2009 projected test year is projected to be 221 therms.

Q. DOES THIS CONCLUDE YOUR TESTIMONY?

A. Yes, it does.

1

MFR SCHEDULES SPONSORED OR CO-SPONSORED BY SUSAN C. RICHARDS

MFR Schedule No. (page)	Title
C-3	Operating Revenues by Month
C-4	Unbilled Revenues
E-1	Cost of Service
E-2	Cost of Service - Revenues Calculated at Present Rates, Adjusted for Growth Only and Final Rates
E-4	Cost of Service - System Peak Month Sales by Rate Class
E-5	Cost of Service - Monthly Bill Comparisons
E-6	Derivation of Overall Cost of Service
G-2 (6a-7)	Historic Base Year + 1 - Revenues and Cost of Gas
G-2 (8a-9)	Projected Test Year - Revenues and Cost of Gas
G-6	Projected Test Year – Major Assumptions

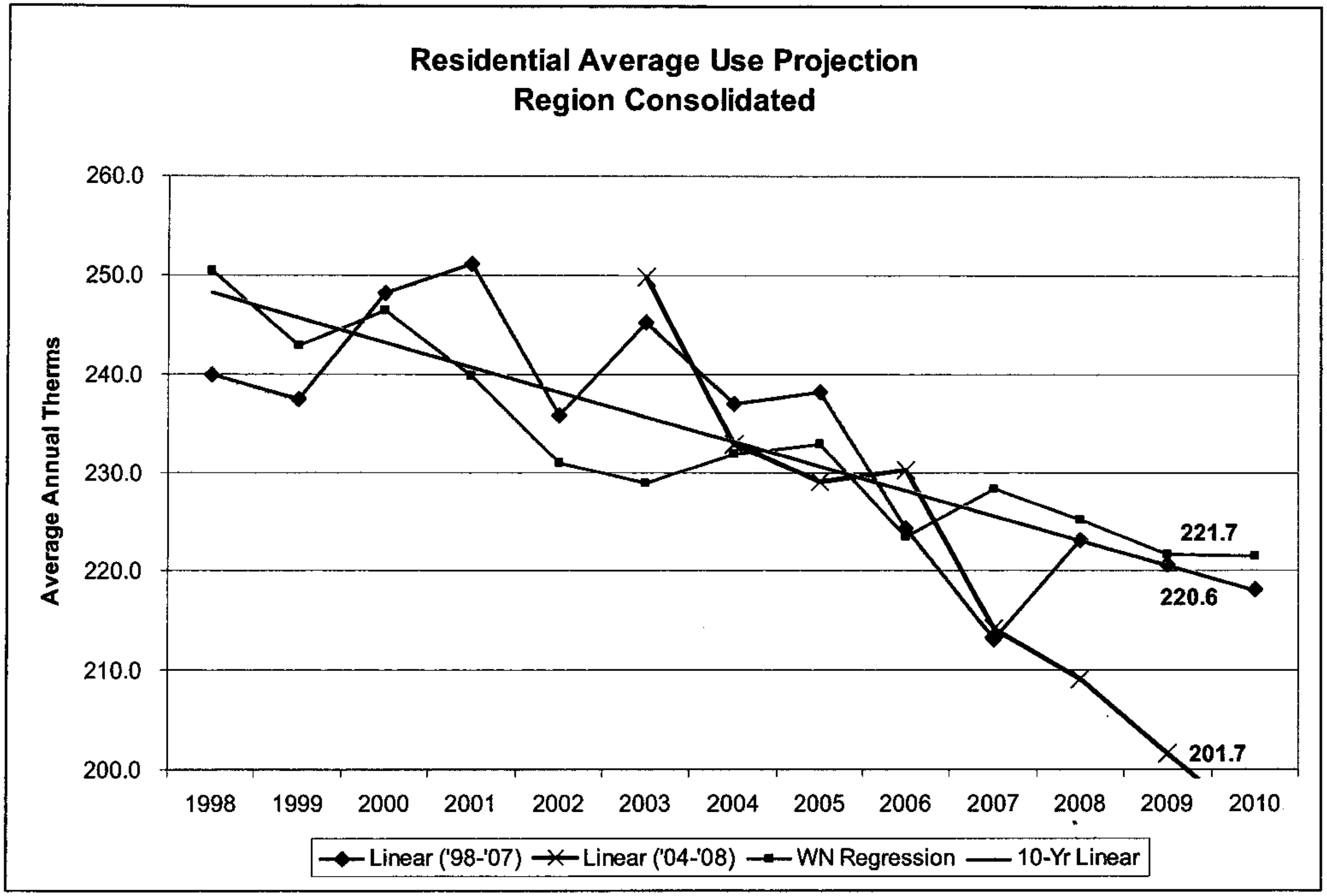


Exhibit No. ______
Docket No. 080318-GU
Peoples Gas System
(SCR-2)
Page 1 of 1

SUMMARY OF REGRESSION STATISTICS

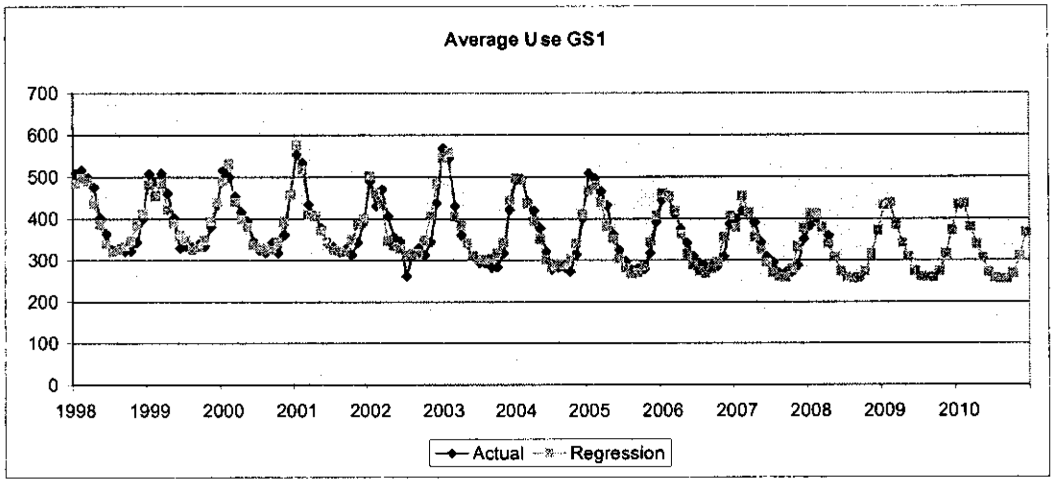
Regression Statistics	GS1	GTS1	GS2	GTS2	GS3	GTS3
Multiple R	0.9529	0.9197	0.9466	0.9433	0.9144	0.8476
R Square	0.9080	0.8459	0.8961	0.8899	0.8361	0.7185
Adjusted R Square	0.9049	0.8407	0.8926	0.8862	0.8306	0.7090
Standard Error	23.5176	40.8462	149.5233	120.0465	566.9726	770.1028
Observations	124	124	124	124	124	124

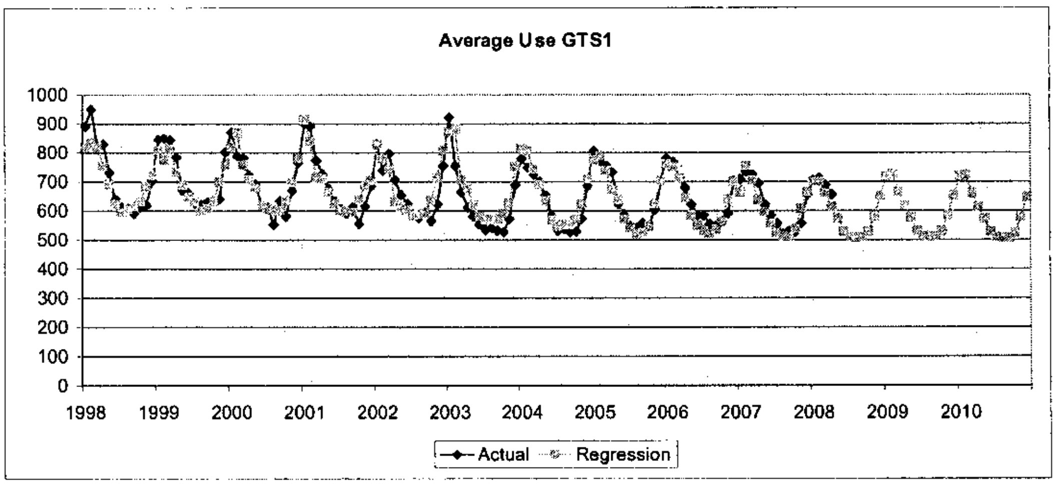
PROJECTED ANNUAL WEATHER NORMAL VOLUMES

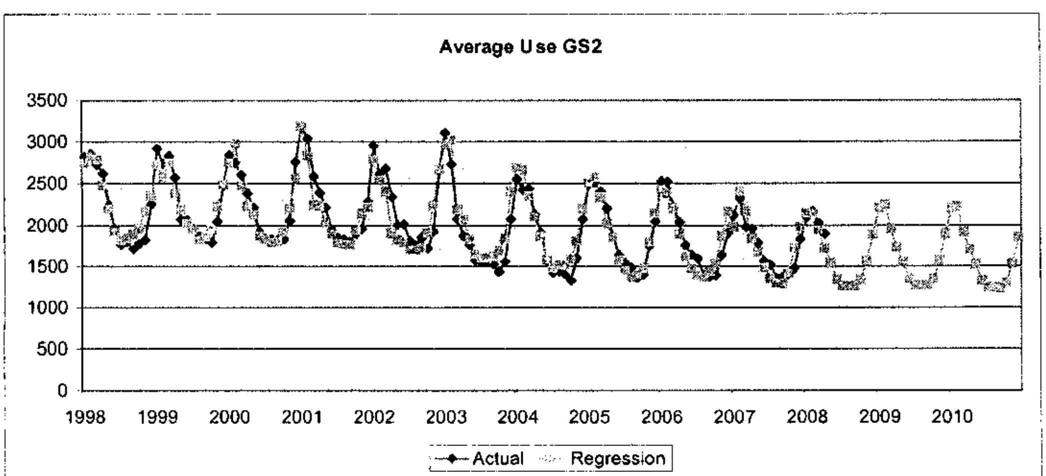
	EAT	Err %	EAT	Err %	EAT	Err %	EAT	Err %	EAT	Err %	EAT	Err %
1998	5,024.7	-1.0%	8,783.5	-2.5%	27,549.2	2.4%	28,625.1	0.8%	81,737.1	0.8%	104,408.9	-1.5%
1999	4,958.3	-1.4%	8,661.4	-2.5%	27,705.9	-0.8%	28,585.7	-0.4%	77,680.4	5.0%	100,695.6	2.4%
2000	4,773.1	0.2%	8,214.3	1.0%	26,913.2	-1.1%	28,232.7	-0.7%	81,691.7	-2.1%	96,444.0	5.6%
2001	4,614.2	1.1%	8,113.0	0.4%	26,607.9	-3.4%	27,796.1	-0.8%	77,243.3	1.6%	96,563.3	3.9%
2002	4,537.8	2.0%	8,028.6	0.9%	26,503.9	-4.3%	27,497.5	-0.5%	84,359.1	-6.9%	119,094.0	-13.4%
2003	4,358.4	2.5%	7,338.0	7.2%	22,474.8	7.0%	26,177.1	2.1%	74,976.3	1.4%	94,870.6	4.3%
2004	4,361.2	0.3%	7,507.4	3.2%	22,251.5	4.8%	26,021.7	1.2%	74,937.2	0.0%	97,403.1	1.3%
2005	4,412.1	-3.4%	7,715.8	-1.6%	22,604.5	-0.8%	26,231.2	-1.3%	74,909.3	-2.0%	100,891.6	-3.6%
2006	4,196.3	-0.2%	7,677.8	-2.4%	22,021.6	-1.1%	25,534.9	0.0%	73,935.0	-1.8%	97,472.0	0.4%
2007	4,131.7	-0.5%	7,529.9	-1.9%	21,249.9	-0.4%	25,099.7	0.4%	71,174.1	1.1%	94,958.3	3.9%
2008	3,968.4	0.0%	7,300.4	0.0%	19,941.5	0.0%	24,481.4	0.0%	68,604.6	0.0%	90,739.3	0.0%
2009	3,947.4	0.0%	7,276.8	0.0%	19,754.5	0.0%	24,322.6	0.0%	69,056.2	0.0%	94,534.6	0.0%
2010	3,903.2	0.0%	7,219.5	0.0%	19,383.8	0.0%	24,088.5	0.0%	69,012.9	0.0%	97,017.1	0.0%
10 Yr Avg	(105.6)	-2.7%	(148.3)	-2.0%	(760.8)	-3.8%	(414.4)	-1.7%	(1,313.3)	-1.9%	(1,367.0)	-1.5%

Exhibit No. ________
Docket No. 080318-GU
Peoples Gas System
(SCR-4)

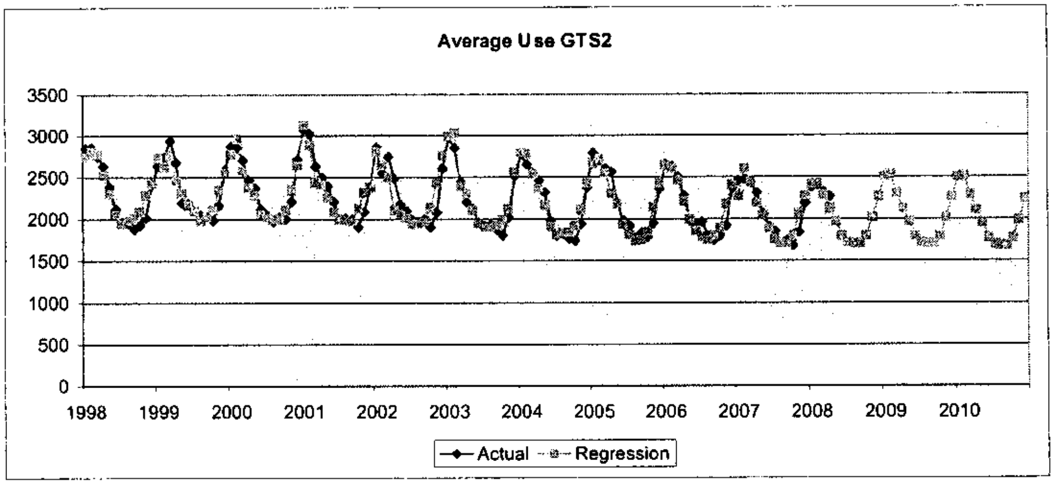
Actual Therm / Bill vs Regression Forecast
Region Consolidated

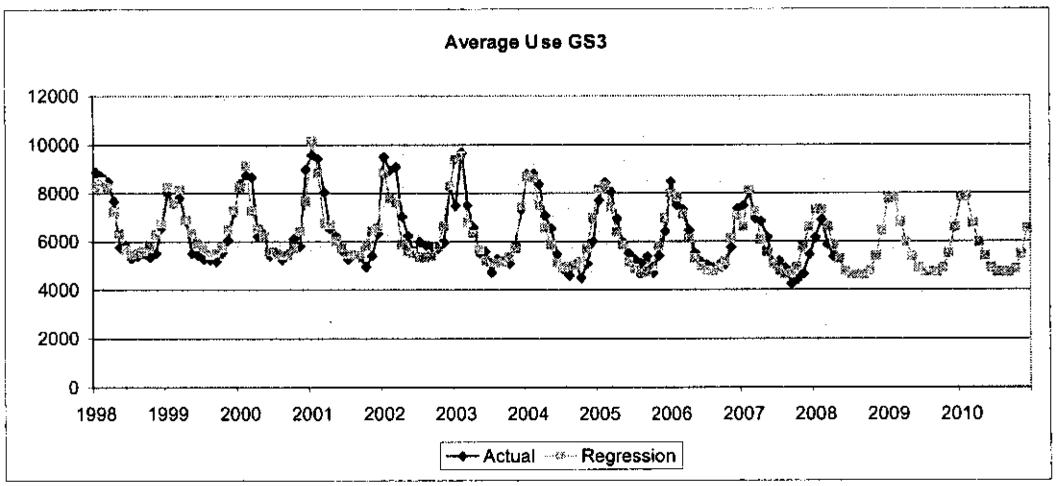


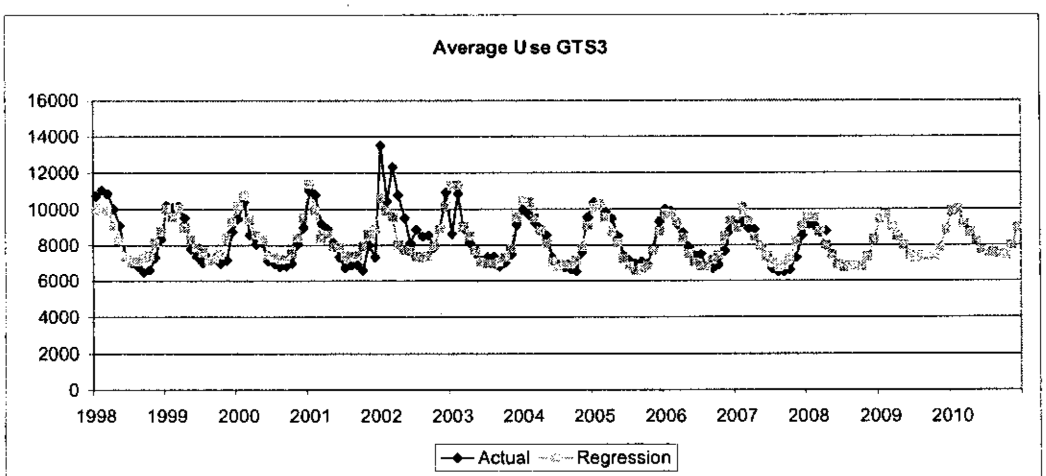




Actual Therm / Bill vs Regression Forecast
Region Consolidated







Weighted 60-Day Billing Period
Average Heating Degree Days

Year	Dade - Broward	Tampa	St. Pete	Orlando	Eustis	Jacksonville	Lakeland	Daytona Beach	Avon Park	Sarasota	Palm Beach	Panama City	Ocala	SW Florida
1998 Jan	22	136	127	153	181	309	134	193	104	78	50	125	47	22
Feb	22	144	144	179	189	322	155	211	81	83	68	467	203	22
Mar	41	125	127	150	172	263	135	196	77	70	68	362	192	41
Apr	11	63	63	71	86	138	70	101	49	34	29	136	98	11
May	0	2	3	6	6	26	3	16	0	0	1	27	14	0
Jun	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Jul	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Aug	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sep	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Oct	0	0	0	0	0	1	0	0	0	0	0	0	0	0
Nov	0	4	3	4	7	35	4	6	1	1	1	46	8	0
Dec	5	16	11	19	23	68	16	24	12	7	7	138	25	5
1999 Jan	38	128	113	131	158	339	133	164	101	70	50	451	178	38
Feb	19	77	77	74	84	206	76	98	54	43	26	336	104	19
Mar	24	117	120	121	140	276	111	170	82	67	49	377	164	24
Apr	2	26	23	31	43	122	29	53	16	11	6	195	48	2
May	0	11	9	15	19	47	14	22	8	10	1	65	15	0
Jun	0	1	1	1	2	4	1	2	0	1	0	4	1	0
Jul	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Aug	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sep	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Oct	0	0	0	0	0	3	0	1	0	0	0	4	1	0
Nov	0	13	0	17	10	95	14	22	2	13	0	114	37	0
Dec	7	47	15	52	61	198	49	74	31	43	11	250	95	7
2000 Jan	32	118	83	149	167	338	137	189	104	110	62	408	190	0
Feb	49	212	183	231	258	443	213	285	149	203	93	473	274	0
Mar	8	49	42	54	67	191	45	89	32	54	17	202	76	0
Apr	0	12	7	14	19	91	11	31	1	11	0	120	35	0
May	0	5	3	7	9	40	6	13	0	5	0	53	22	0
Jun	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Jul	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Aug	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sep	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Oct	0	2	1	3	3	21	2	2	0	1	0	0	6	0
Nov	1	13	10	14	19	73	13	24	1	10	2	53	26	0
Dec	13	87	53	93	123	284	91	138	30	74	20	347	152	0
2001 Jan	117	320	308	323	354	584	320	383	237	282	150	554	365	237
Feb	89	237	226	223	236	409	216	281	181	212	115	424	241	181
Mar	8	50	46	54	60	169	50	82	26	36	15	176	70	26
Apr	4	36	32	38	43	145	34	59	14	25	8	166	61	14
May	0	7	5	7	10	37	8	14	1	5	0	21	21	1
Jun	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Jul	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Aug	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sep	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Oct	0	0	0	0	0	13	0	0	0	0	0	4	8	0
Nov	0	11	9	15	13	102	18	12	5	8	0	55	57	5
Dec	0	5	4	8	9	80	11	9	4	4	0	56	38	3
2002 Jan	54	183	188	221	230	396	198	251	161	175	80	382	344	126
Feb	20	100	113	114	119	255	100	134	59	99	32	259	198	51
Mar	16	118	131	126	125	274	117	152	68	115	28	297	217	60
Apr	0	7	8	7	6	54	7	12	3	6	1	62	24	3
May	0	0	0	0	0	4	0	0	0	0	0	1	1	0
Jun	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Jul	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Aug	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sep	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Oct	0	0	0	0	0	3	0	0	0	0	0	0	2	0
Nov	1	16	12	17	17	71	16	25	9	14	3	57	56	8
Dec	18	146	128	146	152	349	132	190	87	119	34	311	297	66

Weighted 60-Day Billing Period
Average Heating Degree Days

Year	Dade - Broward	Tampa	St. Pete	Orlando	Eustis	Jacksonville	Lakeland	Daytona Beach	Avon Park	Sarasota	Palm Beach	Panama City	Ocala	SW Florida
2003 Jan	88	263	261	280	273	466	272	325	228	246	133	408	420	184
Feb	99	280	280	280	283	509	273	356	261	276	134	426	422	186
Mar	1	45	50	41	47	182	38	81	37	43	7	169	102	13
Apr	10	28	22	35	29	82	34	49	14	22	12	60	69	14
May	1	6	3	8	6	21	8	11	2	4	1	14	17	2
Jun	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Jul	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Aug	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sep	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Oct	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Nov	0	1	1	2	3	22	2	4	0	1	0	15	16	0
Dec	25	103	95	109	123	276	102	125	66	99	40	227	221	66
2004 Jan	46	186	178	193	211	428	182	230	123	178	69	386	327	121
Feb	39	193	176	190	209	409	175	228	118	174	62	387	318	113
Mar	19	93	84	105	124	274	102	153	59	77	30	241	195	44
Apr	1	25	19	37	41	119	29	59	9	18	6	76	89	9
May	1	6	4	10	12	34	7	19	2	6	3	20	22	2
Jun	0	0	0	0	0	1	0	0	0	0	0	1	0	0
Jul	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Aug	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sep	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Oct	0	0	0	0	0	3	0	0	0	0	0	2	3	0
Nov	0	1	0	0	2	40	1	3	0	0	0	13	24	0
Dec	15	62	50	64	82	208	67	91	46	50	23	146	152	28
2005 Jan	43	161	152	163	192	353	163	206	120	139	63	279	283	94
Feb	64	161	138	173	200	372	175	241	129	147	88	269	293	104
Mar	30	103	67	112	140	262	110	168	84	96	50	196	211	60
Apr	6	35	15	38	53	109	34	61	25	29	12	57	85	14
May	0	10	0	10	13	53	8	23	3	5	0	11	38	0
Jun	0	0	0	0	0	0	0	1	0	0	0	0	1	0
Jul	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Aug	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sep	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Oct	1	2	1	2	2	4	2	2	1	1	1	4	4	1
Nov	5	20	7	23	30	79	25	26	11	11	9	63	63	6
Dec	14	87	50	82	98	237	95	114	49	62	28	234	195	38
2006 Jan	48	180	126	167	199	348	179	219	133	143	77	286	314	106
Feb	51	158	112	155	194	315	151	201	133	126	75	242	277	101
Mar	29	90	54	95	115	242	93	153	68	80	40	158	221	58
Apr	8	31	13	25	29	107	26	49	15	28	12	55	76	16
May	0	0	0	0	0	7	0	0	1	1	0	1	1	1
Jun	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Jul	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Aug	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sep	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Oct	0	1	1	2	2	9	1	2	0	1	0	3	4	0
Nov	6	24	23	34	38	117	30	50	17	23	12	72	80	14
Dec	20	65	70	86	97	236	84	110	57	60	36	187	166	42
2007 Jan	5	45	41	56	63	188	57	71	34	41	11	172	118	26
Feb	29	166	134	178	199	381	176	231	118	141	55	359	285	92
Mar	25	110	88	113	129	242	107	155	73	96	44	200	193	63
Apr	0	33	23	31	38	99	30	47	14	20	5	86	70	9
May	0	11	8	11	12	38	10	15	6	6	3	30	25	3
Jun	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Jul	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Aug	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sep	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Oct	0	0	0	0	0	0	0	0	0	0	0	2	0	0
Nov	0	17	14	17	20	67	13	31	5	14	2	84	70	5
Dec	2	37	34	40	43	181	33	60	15	32	8	190	109	15

Weighted 60-Day Billing Period
Average Heating Degree Days

Year	Dade - Broward	Tampa	St. Pete	Orlando	Eustis	Jacksonville	Lakeland	Daytona Beach	Avon Park	Sarasota	Palm Beach	Panama City	Ocala	SW Florida
2008 Jan	30	98	95	103	111	301	101	124	70	84	43	322	190	65
Feb	8	93	90	101	115	332	97	135	55	78	20	361	205	41
Mar	10	68	70	77	88	239	68	109	27	52	19	246	154	24
Apr	2	25	25	32	34	120	25	41	8	19	8	109	62	10

Exhibit No. ________
Docket No. 080318-GU
Peoples Gas System
(SCR-5)
Page 4 of 6

Weighted 60-Day Billing Period
Average Cooling Degree Days

Year	Dade - Broward	Tampa	St. Pete	Orlando	Eustis	Jacksonville	Lakeland	Daytona Beach	Avon Park	Sarasota	Palm Beach	Panama City	Ocala	SW Florida
1998 Jan	238	71	74	72	53	22	82	48	118	136	142	26	29	174
Feb	187	39	33	30	24	14	40	24	67	76	108	16	13	97
Mar	213	49	49	46	35	17	59	33	82	113	126	19	19	144
Apr	315	154	153	136	126	84	154	114	205	222	224	98	69	285
May	430	263	252	230	232	166	262	208	298	320	316	192	128	409
Jun	594	495	474	463	470	429	496	442	493	538	489	497	259	689
Jul	677	599	585	564	578	548	606	546	565	663	570	636	318	849
Aug	670	537	553	515	538	476	531	503	532	628	565	552	296	804
Sep	613	531	545	499	500	441	511	493	522	605	566	511	275	774
Oct	533	465	489	438	431	371	445	440	473	544	515	431	237	696
Nov	418	287	309	260	254	139	282	258	309	367	385	161	139	470
Dec	332	215	230	172	167	68	195	159	223	276	286	78	92	353
1999 Jan	215	88	87	70	57	14	74	59	100	131	174	17	31	167
Feb	210	88	75	75	61	14	86	51	107	155	163	16	33	199
Mar	123	37	29	34	29	7	41	24	53	85	83	8	16	109
Apr	258	149	131	157	147	94	170	131	178	142	225	109	81	182
May	353	280	265	246	248	168	267	224	293	262	321	195	136	335
Jun	433	422	405	348	357	291	367	364	389	395	415	337	196	505
Jul	478	467	456	427	433	385	434	438	430	442	464	447	238	566
Aug	570	563	546	516	548	526	543	530	516	527	553	610	301	674
Sep	532	527	516	489	506	445	512	476	494	497	516	516	278	636
Oct	502	431	429	396	381	295	402	385	429	406	484	342	210	520
Nov	367	228	281	194	182	105	204	191	240	206	342	122	100	264
Dec	246	91	164	69	57	17	77	62	107	70	214	19	31	89
2000 Jan	180	46	63	28	20	4	33	17	62	34	128	4	11	44
Feb	115	19	23	14	11	2	18	7	30	16	56	2	6	20
Mar	234	103	113	67	60	17	87	41	108	70	165	20	33	90
Apr	340	192	207	151	146	44	182	109	192	153	256	51	80	196
May	384	284	296	232	229	120	254	187	270	223	310	140	126	286
Jun	473	493	525	446	456	370	471	403	465	424	463	430	251	543
Jul	517	499	535	453	475	428	476	441	470	469	497	496	261	600
Aug	548	521	514	474	489	463	525	458	491	494	522	537	269	632
Sep	545	523	532	477	482	433	522	461	479	488	530	502	265	624
Oct	492	417	428	381	372	263	420	371	407	407	462	305	204	520
Nov	334	212	220	165	162	66	195	145	213	186	280	76	89	238
Dec	223	81	82	65	66	20	75	46	103	72	176	23	36	92
2001 Jan	99	33	29	27	26	4	28	17	41	27	87	5	14	35
Feb	126	42	46	36	33	7	40	19	65	49	109	8	18	63
Mar	255	127	119	121	116	51	127	82	171	125	231	59	64	160
Apr	279	133	131	139	134	70	140	101	185	140	255	81	73	179
May	330	254	256	211	201	132	219	184	270	231	313	116	114	192
Jun	445	437	416	378	392	334	408	353	435	387	419	394	368	429
Jul	515	492	479	435	447	426	447	432	471	475	489	492	441	466
Aug	529	496	489	450	459	446	472	454	472	479	499	521	427	465
Sep	568	520	506	460	463	423	478	440	485	499	535	503	430	485
Oct	467	373	357	326	326	215	341	314	384	365	440	273	250	385
Nov	348	237	226	181	181	99	194	188	238	222	323	129	137	243
Dec	287	195	162	122	117	50	134	123	171	155	255	66	84	171
2002 Jan	206	98	84	75	70	18	88	53	109	75	172	13	39	112
Feb	183	66	55	65	68	25	71	46	92	58	156	13	41	95
Mar	344	235	220	202	209	127	209	168	272	206	322	108	161	274
Apr	439	413	389	354	355	275	369	337	405	372	418	322	323	406
May	454	441	430	372	369	311	395	366	432	415	450	375	353	433
Jun	462	464	458	396	397	418	417	399	446	442	449	492	395	453
Jul	553	511	510	467	488	449	482	464	501	495	549	538	408	503
Aug	541	498	507	454	481	434	471	472	475	478	536	500	406	481
Sep	532	485	501	449	476	395	462	452	464	469	535	453	397	464
Oct	430	311	330	288	292	167	299	250	318	307	394	195	199	343
Nov	216	60	67	55	54	21	64	47	71	66	164	13	28	96
Dec	100	13	14	12	14	0	14	7	27	19	73	3	1	32

Weighted 60-Day Billing Period
Average Cooling Degree Days

Year	Dade - Broward	Tampa	St. Pete	Orlando	Eustis	Jacksonville	Lakeland	Daytona Beach	Avon Park	Sarasota	Palm Beach	Panama City	Ocala	SW Florida
2003 Jan	112	12	14	14	17	0	16	7	31	19	82	2	1	35
Feb	84	7	7	12	14	1	16	6	20	8	62	1	3	27
Mar	323	136	128	137	136	33	138	83	188	145	305	27	79	227
Apr	315	189	189	177	197	79	193	134	221	180	293	83	121	244
May	388	329	306	312	331	210	337	277	348	297	372	251	258	356
Jun	481	470	454	429	436	363	459	408	471	454	467	426	370	472
Jul	533	496	491	450	456	416	495	435	496	488	530	492	416	496
Aug	563	503	506	453	458	409	485	428	482	490	525	507	402	488
Sep	550	477	481	443	445	409	468	433	477	463	526	484	397	482
Oct	515	419	418	380	367	250	398	362	440	412	489	305	304	446
Nov	442	306	309	272	261	140	292	273	341	300	413	161	184	346
Dec	247	101	102	86	80	35	93	83	131	95	215	39	43	131
2004 Jan	125	28	23	19	17	5	23	11	37	17	96	7	5	38
Feb	129	29	32	26	25	9	32	24	57	29	98	3	16	57
Mar	207	74	76	64	58	32	74	45	117	76	179	13	54	116
Apr	225	104	110	97	91	44	106	66	142	99	199	41	59	142
May	342	260	261	222	225	176	235	189	281	235	329	165	182	281
Jun	499	477	470	425	446	403	446	386	449	434	483	436	398	448
Jul	594	533	551	514	521	467	532	481	517	516	567	553	461	507
Aug	546	514	531	498	508	473	518	484	507	520	510	572	449	508
Sep	562	526	544	504	501	455	506	503	528	519	521	529	467	526
Oct	513	443	469	441	424	357	441	436	459	442	475	410	366	468
Nov	397	273	312	254	227	153	259	220	293	261	329	250	163	310
Dec	258	113	126	114	102	47	119	94	148	104	205	77	49	155
2005 Jan	171	52	50	46	34	20	54	31	60	50	137	19	18	75
Feb	103	24	37	25	22	9	32	16	28	23	80	8	8	46
Mar	141	45	75	54	53	14	65	33	65	50	115	16	17	79
Apr	245	138	192	134	126	43	141	90	168	132	220	66	64	182
May	304	199	268	184	185	91	190	124	236	182	279	148	106	246
Jun	435	415	485	381	394	319	386	335	413	394	431	403	323	416
Jul	518	513	582	495	520	467	491	477	516	500	524	521	447	514
Aug	589	583	653	584	588	533	570	540	577	559	596	531	504	566
Sep	574	575	644	569	572	511	553	535	581	563	579	549	491	570
Oct	525	497	561	464	461	391	453	443	490	491	512	461	400	482
Nov	353	236	300	202	203	103	206	198	272	253	342	164	124	284
Dec	221	99	138	75	66	25	76	66	117	117	199	49	31	152
2006 Jan	124	23	44	27	22	7	27	20	46	40	101	11	18	65
Feb	131	38	56	39	35	10	42	33	53	64	111	13	25	78
Mar	158	58	120	78	68	26	82	51	105	62	139	31	39	108
Apr	282	164	228	178	171	94	196	125	221	150	243	115	107	213
May	406	302	354	308	317	190	341	259	360	291	346	255	221	353
Jun	490	437	484	419	453	347	445	394	458	421	452	424	359	449
Jul	555	500	565	469	487	439	492	455	499	506	514	548	444	490
Aug	580	534	598	513	546	507	544	503	528	544	555	571	481	511
Sep	555	520	529	477	504	474	504	469	504	515	519	521	447	501
Oct	537	446	432	394	403	288	411	360	446	427	484	353	308	456
Nov	389	234	231	192	191	93	203	169	253	221	312	127	123	268
Dec	276	126	107	91	83	35	93	80	139	119	218	36	46	151
2007 Jan	308	157	150	115	107	38	115	108	160	137	258	49	59	173
Feb	202	42	50	37	35	7	37	32	74	42	142	15	14	82
Mar	216	79	89	74	61	19	78	46	107	71	167	13	39	121
Apr	284	180	188	149	146	66	163	113	199	158	250	60	117	208
May	369	284	286	253	245	153	274	197	296	251	337	155	195	307
Jun	457	415	433	363	357	278	371	362	402	401	422	334	331	405
Jul	546	530	534	468	491	438	502	478	509	519	507	480	456	509
Aug	599	564	566	508	545	490	541	528	528	550	547	532	487	533
Sep	626	569	597	531	549	473	546	525	538	558	559	530	507	537
Oct	556	478	505	435	442	358	449	443	486	487	491	394	397	486
Nov	422	274	274	234	237	121	253	238	315	286	352	113	170	315
Dec	318	143	138	104	104	10	124	83	190	132	248	22	45	190

Weighted 60-Day Billing Period
Average Cooling Degree Days

Year	Dade - Broward	Tampa	St. Pete	Orlando	Eustis	Jacksonville	Lakeland	Daytona Beach	Avon Park	Sarasota	Palm Beach	Panama City	Ocala	SW Florida
2008 Jan	82	21	18	12	14	1	16	11	31	18	58	4	5	33
Feb	229	60	56	55	54	8	66	41	105	62	165	7	20	117
Mar	269	92	94	84	78	16	95	67	165	102	202	12	43	170
Apr	311	175	171	144	139	56	159	123	221	162	245	63	101	227

AN ECONOMIC ANALYSIS OF CONSUMER RESPONSE TO NATURAL GAS PRICES

FREDERICK JOUTZ AND ROBERT P. TROST

PREPARED FOR THE AMERICAN GAS ASSOCIATION
MARCH, 2007

AGA American Gas Association

Executive Summary

Introduction and Key Findings

The consumption of natural gas per household has been declining, on a weather-normalized basis, since about 1980. Over time, natural gas consumers have been tightening their homes, purchasing more efficient appliances and turning down their thermostats. Given the significant increase in natural gas prices since 2000, the American Gas Association (AGA) decided to examine whether or not the trend in declining use has changed in this higher-priced environment. The results of this study are based on monthly data submitted by 46 local natural gas distribution companies that serve nearly 30 percent of all residential natural gas customers throughout the U.S. Some companies submitted data as far back as the early 1980's. The key findings of the study are as follows.

- A trend in declining use per residential natural gas customer of 1 percent annually has been documented[2] back to 1980. This decline rate has accelerated since the year 2000.
    - Weather-adjusted use per residential customer fell by 13.1 percent from 2000 through 2006.
    - The annual rate of decline in this 2000 to 2006 timeframe more than doubled relative to the pre-2000 period, increasing to 2.2 percent annually.
    - Further acceleration was witnessed in the 2004 to 2006 period, as evidenced by a 4.9 percent annual rate of decline.
    - The decline in use per customer has accelerated since 2000 in all 9 geographic regions analyzed.
- No appreciable changes in the price elasticity of demand were observed post-2000. Price elasticity of demand refers to the percentage change in demand for a good relative to a percentage change in price. Although the elasticity has not changed over time, it should be noted that natural gas is an essential product that provides heat, hot water and cooking. Despite the essential nature of natural gas, consumers have continued to reduce their consumption at a relatively constant rate with respect to changing prices. Therefore, the large price increases post-2000 have resulted in the large consumption declines noted above.

[2] 2004 AGA Energy Analysis: Patterns in Residential Natural Gas Consumption, 1980-2001.

- This study found a short-run price elasticity of –0.09 and a long-run price elasticity of -0.18. (Long-run elasticity refers to a period of time long enough for consumers to change the capital stock of their energy consuming equipment and the shell efficiency of their homes.)

- These price elasticity estimates are relatively consistent with previous works on this subject.

- The econometric analysis presented in this study predicts a decline of 13.9 percent between 2000 and 2006; the actual decline was 13.1 percent. The decline is attributable to a price effect and the longer-run trend towards tighter homes and more efficient appliances. The price elasticity effect is 7.9 percent - equal to the elasticity estimate of -0.18 times the 44 percent real price increase. The remaining 6.0 percent is explained by the longer-run trend towards tighter homes and more efficient appliances.

- As a general rule of thumb, at the national level we would expect a 10 percent increase in the price of natural gas to result in nearly a 3 percent decline in the average residential use per customer 12 months later – 1 percent attributable to more conservation with existing appliances, 1 percent attributable to the price-induced purchase of more efficient appliances, and 1 percent attributable to the natural turnover of equipment that occurs annually.

<u>Background</u>

Residential natural gas consumption is strongly influenced by three factors: seasonal heating needs; response to price change; and the efficiency changes in appliances and home shells caused by a natural turnover rate to more efficient homes and gas appliances. On a weather-adjusted basis, the price and the long run conservation effects are key determinants of changes in residential natural gas consumption. The price effects can be further decomposed into short-term and long-term effects. Short term effects are decisions made by consumers with the current capital stock. Residential customers "turning down the thermostat" would be considered a short term effect. Long term effects are distinguished from short term effects by the inclusion of the decision to purchase more efficient energy consuming appliances and prematurely retiring less efficient ones. The price elasticity in the long-run is the sum of (1) the short-run demand and (2) the additional changes that occur to quantity demanded one year later because of natural gas price effects on the efficiency of the appliance capital stock and on the shell efficiency of homes[3]. While the separate efficiency and conservation effects due to

[3] It should be noted that if natural gas prices decrease, consumers will not replace recently purchased efficient equipment with less efficient equipment. So there maybe asymmetry with respect to the impact of natural gas prices on appliance and shell efficiency. The efficiency gains in appliance equipment that have occurred in the last several years will not disappear if natural gas prices go down. However, declining prices may lead consumers turning up thermostats to increase comfort levels (in the short-run). In the very long-run, a decline in prices could lead to an increase in burner tips per customer.

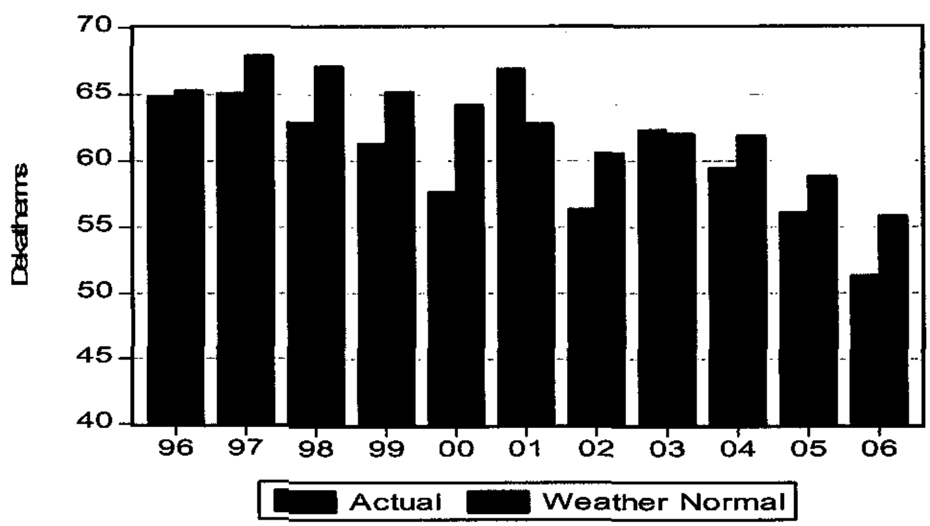
appliance and housing shell turnover are difficult to disentangle in the current sample, they do appear to be discernable from the long term price effects.

To address these issues, AGA commissioned a study to document changes in use per residential customer on a weather normalized basis, particularly since the year 2000, and to identify the reasons for these changes. Other objectives of this study were: to obtain updated elasticity estimates for all nine US Census Regions and for the US; to test for an increase in the price elasticity of demand for natural gas since the year 2000; and to estimate a natural rate of decline in use per customer due to technology-induced gains in appliance and shell efficiency and a change in conservation attitudes that would occur even in an environment of constant real natural gas prices.

Decline in Use per Customer

Demand for natural gas per residential customer has been declining since the 1980's, and in recent years this decline has accelerated. Between 1980 and 2001, weather adjusted natural gas use per consumer in the US declined almost 1 percent on an annual basis. Since 2000, however, the decline for winter only use has accelerated, decreasing 13.1 percent nationally between 2000 and 2006 for the sample of companies analyzed in this report. Figure ES1 below shows the winter season use per customer in actual and weather normal dekatherms from 1996-2006 using the data collected by AGA.[4] It is clear that actual and weather normalized use per customer has been declining since 1997 and this decline has accelerated since 2004.

Figure ES1
US Annual Winter Use per Customer



[4] The data was collected from 46 Local Distribution Companies (LDCs) in 29 states, representing 28 percent of all residential customers. An LDC is a gas utility that serves a specific rate jurisdiction. Some of the companies in this sample have multiple jurisdictions in their corporate structure. The winter season for this report is defined as the sum of the monthly consumption between October and March.

Table ES1 disaggregates the national winter season weather normal use per residential customer across the nine US Census Regions and for the US The decline in weather normal use per customer has occurred across all US Census regions. The decline ranges from 5.7 dekatherms per customer for the West South Central region to 10.9 dekatherms for the East North Central region. The percentage decline in use per customer ranged from 9.2 percent for the Middle Atlantic Region to 14.8 percent for the Pacific Region.

Table ES1
Annual Winter Season Weather Normal
Natural Gas Use per Residential Customer,
By Region and for the U.S.
(Dekatherms per Customer)

Census Region	2000	2001	2002	2003	2004	2005	2006	Percent Change
National	64.3	62.8	60.6	62.0	61.9	58.9	55.9	-13.1%
East North Central	81.1	79.2	80.1	77.8	76.1	73.1	70.2	-13.4%
East South Central	64.9	64.2	61.3	62.2	60.8	58.7	55.9	-13.9%
Middle Atlantic	93.7	95.0	91.2	93.5	92.8	88.3	85.1	-9.2%
Mountain	80.6	77.9	75.8	76.4	71.8	72.0	70.5	-12.5%
New England	80.7	79.8	75.3	82.3	80.3	75.9	72.4	-10.3%
Pacific	43.8	40.9	40.0	41.8	40.6	40.4	37.3	-14.8%
South Atlantic	71.7	69.4	63.8	69.1	62.0	62.5	62.5	-12.8%
West North Central	80.1	79.5	79.8	80.4	78.3	75.9	70.2	-12.4%
West South Central	46.3	46.4	40.2	44.1	54.1	41.7	40.6	-12.3%

<u>Price Elasticity and "Natural" Conservation Estimates</u>

This study found that neither a practical nor statistically significant change in the price elasticity of residential natural gas consumption occurred in the post year 2000 period. The price elasticity of residential natural gas demand appears to have remained relatively constant since the 1990s. This implies the large percentage price increase since 2000 accounted for the decline in natural gas use, rather than an increased sensitivity or greater response by households to a given price change. The study also found that independent of natural gas price increases, the naturally occurring decline due to the technology driven gain in appliance and home thermal shell efficiency, as well as changes in conservation attitudes was 1 percent per year.

Table ES2 illustrates that for the sample of companies in the study, the short run price elasticity of demand averaged -0.09, while the long run estimated averaged -0.18. Therefore, given a 10 percent increase in the price of natural gas, consumption would decline 2.8 percent; 1.8 percent for price response, added to 1.0 percent decline due to the normal turnover of appliances and other "natural" conservation measures. There is very little regional variation in the total impact of a 10 percent increase in real prices on use per customer. The impact in all regions was close to the national estimate of 2.8 percent, with the Mountain region being the lowest at 1.9 percent and the South Atlantic region being the highest at 3.7 percent.

The study also found that the elasticity estimates calculated using the sample data were generally consistent with the elasticity estimates found in the energy economics literature.[5]

Table ES2
Summary of National and Regional
Natural Gas Price Elasticity Estimates*

Region	Short-run elasticity	Long-run elasticity**	Annual Time Trend	Total Response to a 10% Price Increase***
National	-0.09	-0.18	-1.0%	-2.8%
East North Central	-0.08	-0.22	-1.0%	-3.2%
East South Central	-0.01	-0.01	-2.0%	-2.1%
Middle Atlantic	-0.10	-0.20	-1.3%	-3.3%
Mountain	-0.07	-0.10	-0.9%	-1.9%
New England	-0.08	-0.25	-0.4%	-2.9%
Pacific	-0.07	-0.12	-0.8%	-2.0%
South Atlantic	-0.12	-0.29	-0.8%	-3.7%
West North Central	-0.09	-0.15	-1.1 %	-2.6%
West South Central	-0.13	-0.16	-1.6%	-3.2%

* Estimates obtained from the "fixed effects" pooled regression
** Cumulative: includes impacts of short-run elasticities
*** The total response to a 10% price increase is the sum of the long-run elasticity and the annual time trend effect.

Implications

These price elasticity estimates and the natural conservation trends are able to explain the post 2000 winter consumption per household per customer actual experience.

Between 2000 and 2006, real natural gas prices for the sample companies in this study rose 44 percent, which according to our analysis would lead to approximately a 7.9 percent (0.18 x 44 percent) decline in use per customer by the year 2006. In addition to this 7.9 percent price induced decline in weather normal use per household, there would be an additional 6.0 percent (6 x 1.0 percent) decline because of the natural annual rate of turnover of old gas appliances to newer more efficient appliances. Hence, our analysis predicts a decline of 13.9 percent over the six-year period, which is very close to the actual decline of 13.1 percent.

[5] See Appendix C of the main report for a summary of the elasticity estimates found in the energy economics literature.

Overall decline in Winter Gas Use per Customer	=	*Price Effect Elasticity with Price Increase*	+	*Conservation and Turnover to More Efficient Appliances*
13.9%	=	$0.18 \times 44\%$	+	$6 \times 1.0\%$
	=	7.9%	+	6.0%

In the expression above, the left hand term is the overall predicted decline of winter gas use per customer, the first term on the right hand side is the price effect reflecting the elasticity estimate multiplied by the price increase, and the second term the effect from conservation and turnover to more efficient appliances that occurs naturally every year with or without a price increase.

The results from analyzing the AGA sample data lead to a general rule of thumb. This rule does not apply to all companies in all situations, but the general rule with its caveats provides valuable insight to the underlying processes governing consumer behavior. This rule appears to capture consumers' winter price sensitive consumption behavior reasonably well across both the LDCs and Census regions. Twelve months after a 10 percent increase in natural gas prices at the national level, there will be nearly a 3 percent decline in natural gas use per customer on a national level. This 3 percent decline is comprised of about a 1 percent drop in gas use with the current capital stock, about a 1 percent drop in use per customer because households respond to the higher gas prices by replacing still functional appliances with more efficient units, and about a 1 percent drop in gas usage per customer due to the natural turnover of old gas appliances to the more efficient gas appliances that are available in the market each year. This rule of thumb will vary by LDC because they are heterogeneous in terms of weather, housing stocks, and standards of living.

Other factors that impacts residential energy use are the many programs that encourage consumers to save energy. These include:

- The federal government encourages conservation through weatherization programs funded by the Low-Income Household Energy Assistance Program (LIHEAP), tax credits for the purchase of efficient appliances and housing shell improvements, and consumer education on the importance of saving energy.
- State and local governments also encourage efficiency through similar programs.
- Many utilities provide rebates, incentives, and assistance to their customers to conserve energy use. For example, electric and natural gas utilities provided more than $140 million in 2005 to assist low-income customers to weatherize their homes.[6]

From a planning and policy perspective, even if gas prices do not increase in a given year, there will still be approximately a 1 percent fall in gas usage per household in the following year. This is driven by the historical forces related to the natural turnover of old appliances

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[6] Source: http://liheap.ncat.org/tables/FY2005/05stlvtb.htm

to the more efficient appliances that are available on the market each year. The annual time trend impacts will vary somewhat by LDC, because of regional differences in weather, appliance stocks, housing shell efficiency, demographic and economic characteristics.

There is a caveat. We cannot address whether the phenomenon will continue at the same rate for the long-term. Further gains in efficiency in absolute and relative terms may or may not have the same impact as they did previously. This is an issue for more detailed engineering studies on the efficiency of appliances and housing shells and economic research on the change in conservation habits of consumers for energy use and winter season comfort levels. We would note, however, that legislative and regulatory pressure for greater efficiency is likely to increase as climate change becomes a more pronounced national and international priority.

The policy implications of the 13.1 percent decline since 2000 are significant. First, regulators must recognize these trends and allow rate structures to incorporate these variations. Second, the natural turnover of appliances and increases in thermal shell efficiency from new construction will result in continued conservation, impacting utility operations. Third, even if future natural gas prices remain constant or even decrease, the appliance and house shell efficiency gains achieved in prior years will not be reversed.

Future Research

As with any study, there is room for future research. Suggestions for future research are the following:

- Obtain data from natural gas companies that did not participate in the initial study.
- Try different specifications of the model.
- Use the Iterative Bayes Shrinkage Estimation Technique to get individual LDC parameter estimates.
- Consider the impact of competition from the electric utility industry.