

THE IMPACT OF HIGHER NATURAL GAS PRICES ON THE TEXAS ECONOMY

By

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EXECUTIVE SUMMARY

Prices of oil and natural gas have escalated rapidly over the past six months, with varying effects on businesses and consumers. Energy-intensive industries, such as transportation and utilities, have seen their operating costs rise significantly. Gasoline prices have practically doubled, and electric bills—especially for businesses and households served by utilities with gas-fired generators—are also on the rise.

Crude oil and gasoline prices should decline markedly after the peak summer driving season. But because of rising demand, coupled with supply constraints, natural gas prices are likely to remain high for at least the next several years. Some marketers are predicting spot gas prices as high as \$7 per MCF by next winter.

Many factors are contributing to high and rising energy costs. Costly chemical and ethanol additives in reformulated gasoline, along with a major pipeline break in March, are being blamed for \$2.00 plus gasoline prices in the Midwest. Citing soaring industry profits, some politicians point to the recent spate of energy and utility company mergers as the culprit, while the U.S. Department of Energy blames below-normal inventories in the nation's stocks of gasoline, diesel fuel and home-heating oil.

The natural gas picture is more complicated. Strong U.S. economic growth by itself is bolstering demand and affecting prices. For example, industrial consumption of natural gas—about 40 percent of U.S. demand—has grown 4.5 percent over the past year. Also, most additions to electric generating capacity in recent years have been gas-fired turbines, both for the regulated utilities and the growing number of non-utility generators (NUGs).

Problems on the supply side have exacerbated the price spike. Drilling for gas plummeted in 1998 and early 1999 in the face of low prices. Between January 1998 and April 1999, the number of rotary rigs drilling for natural gas fell from 609 to 371. In Texas alone, the rig count dropped from 376 to 180. Reserve additions in 1998 replaced only 83 percent of that year's production and discoveries of new gas fields decreased 60 percent from a year earlier. All told, the amount of new gas discovered in 1998 was equal to just 61 percent of that year's production.

Consequently, producers today have been unable to keep up with rising gas demand. Total consumption of natural gas was 21.4 TCF in 1999 but is expected to approach 22.5 TCF in 2000 and jump another three percent in 2001. According to the American Gas Association, gas storage has been growing by an average of 42 billion cubic feet per week in recent months, down 24 percent from the year-ago average of 55 billion cubic feet.

Because it is environmentally benign and, until recently, abundant in supply, natural gas has become the preferred fuel for industrial processing, home heating, and electric power generation. With the nation's electric utilities turning their backs on nuclear and coal-fired generators, natural gas has provided most of the new capacity. In addition, electric deregulation in many states has encouraged non-utility generators to enter the market, and virtually all of their power plants are gas-fired. According to the Energy Information Agency, almost 50,000 megawatts of new natural gas-fired power generating capacity is expected to come on line by 2007.

About 14 percent of overall U.S. kilowatt usage, and 21 percent of summer electricity, is now generated using natural gas. A series of extremely hot summers has

strained the ability of utilities to provide power for air-conditioners and the like while driving up the spot price for natural gas. At the same time, the construction boom of the late 1990s—with record numbers of new homes, office buildings and retail centers built and sold in 1997, 1998 and 1999—has also boosted demand as most of these buildings are heated and cooled—directly or indirectly—by natural gas.

For Texas, higher gas prices bring both good news and bad news. Because Texas ranks number one among the lower 48 states in on-shore gas production, higher prices generate added jobs, income and severance tax revenues. Each \$1 increase in price, if sustained, boosts the state economy by almost \$3 billion and creates an additional 8,800 jobs paying \$415 million. At the same time, however, higher operating costs for Texas industries using gas as an input will decrease total state output by \$4.29 billion and displace 21,000 jobs paying \$758 million.

Because more than 60 percent of the electric utility capacity in Texas uses natural gas, the cost of power generation has risen rapidly over the past six months. Each \$1 increase per MCF boosts fuel costs to utilities and NUGs by about \$1.46 billion. However, as has been the case for many years, these costs are passed on to households through “fuel adjustment” and affect consumers differently depending on each utility system’s configuration. The resulting loss in discretionary household spending will decrease total economic activity in the state by \$2.1 billion, lower employment by 21,800, and reduce total salaries and wages by \$568 million.

In sum, though rising natural gas prices are a boon to gas drilling, production and distribution industries and their employees, the resulting higher costs to Texas industries and households more than offset any gains. Each \$1 per MCF increase in

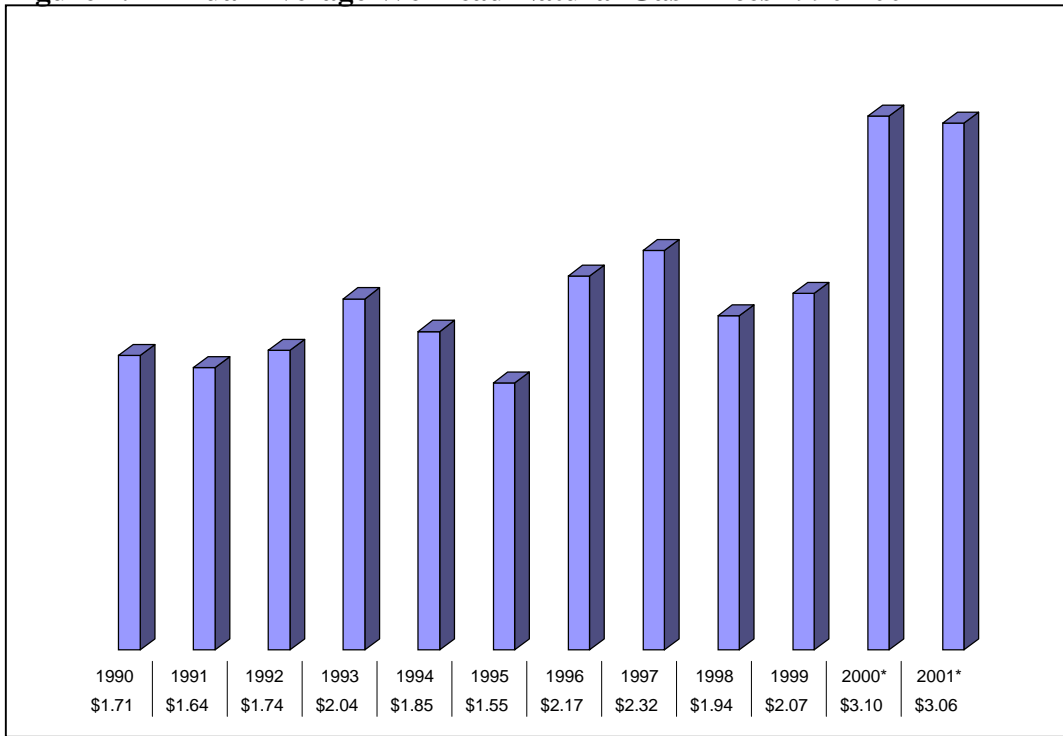
the price of natural gas—if sustained—has the net effect of decreasing state economic activity by a least \$3.4 billion per year, lowering total employment by more than 34,000, and reducing salaries and wages by \$911 million.

THE IMPACT OF HIGHER NATURAL GAS PRICES ON THE TEXAS ECONOMY

Introduction

The last twelve months have witnessed a dramatic run-up in energy prices, most especially oil and natural gas. A year ago, a barrel of West Texas Intermediate crude (WTI) was selling for \$18 and natural gas prices on the spot market averaged \$2.25 per thousand cubic feet (MCF). By mid-2000, WTI was selling for \$32 a barrel and spot gas prices had zoomed to an all-time high of more than \$4.60 per MCF (see Figure 1).

Figure 1. Annual Average Wellhead Natural Gas Prices 1990-2001



Source: Geoinvestor

Higher energy prices have had varying effects on businesses and consumers. A year ago, consumer prices were rising at a rate of less than two percent annually. In the first half of 2000, the CPI was increasing at more than a three percent annual rate, due

mainly to escalating energy costs. For energy-intensive industries such as transportation and utilities, operating expenses have risen significantly. Higher costs, in turn, have been passed forward to consumers in the form of higher prices. Air travel and freight forwarding, as well basic products such as aluminum and steel, are considerably more expensive today than a year ago. Gasoline prices have practically doubled, and electricity prices—especially for businesses and households served by utilities with gas-fired generators—are also on the rise.

Why have energy prices risen so high so fast?

This isn't the first time energy prices have spiked in short order, and it probably won't be the last. Energy prices are determined as much by political factors as market forces, and right now OPEC is sticking to its quotas against the backdrop of a strong and expanding global economy. At the same time, U.S. production of oil and gas has continued its long-term decline, a trend that was exacerbated by falling energy prices during 1998 and 1999, while the demand for gas-guzzling sport utility vehicles, vans and light trucks—all exempt from fuel economy standards—continues its inexorable rise.

Many other factors are contributing to high and rising energy costs. Costly chemical and ethanol additives in reformulated gasoline, along with a major pipeline break in March, are being blamed for \$2.00 plus gasoline prices in the Midwest. Citing soaring industry profits, some politicians are pointing to the recent spate of energy and utility company mergers as the culprit, while the U.S. Department of Energy blames below-normal inventories in the nation's stocks of gasoline, diesel fuel and home-heating oil.

Meanwhile, OPEC ministers blame the new cleaner-burning gasoline rules, which affect about one-third of the nation, and they also contend that American refiners cut back purchases drastically last year to avoid buying oil at prices they considered temporarily high.

The natural gas picture is more complicated. Strong U.S. economic growth by itself is bolstering demand. For example, industrial consumption of natural gas—about 40 percent of U.S. demand—has grown 4.5 percent over the past year. Also, most additions to electric generating capacity in recent years have been gas-fired turbines, both for the regulated utilities and the growing number of non-utility generators (NUGs). About 14 percent of overall U.S. kilowatt usage, and 21 percent of summer electricity, is now generated using natural gas. A series of extremely hot summers has strained the ability of utilities to provide power for air-conditioners and the like while driving up the spot price for natural gas. At the same time, the construction boom of the late 1990s—with record numbers of new homes, office buildings and retail centers built and sold in 1997, 1998 and 1999—has also boosted demand as most of these building are heated and cooled—directly or indirectly—by natural gas.

Problems on the supply side have exacerbated the price spike. As mentioned above, drilling for gas plummeted in 1998 and early 1999 in the face of low prices. Between January 1998 and April 1999, the number of rotary rigs drilling for natural gas fell from 609 to 371. Reserve additions in 1998 replaced only 83 percent of that year's production and discoveries of new gas fields decreased 60 percent from a year earlier. All told, the amount of new gas discovered in 1998 was equal to just 61 percent of that year's production.

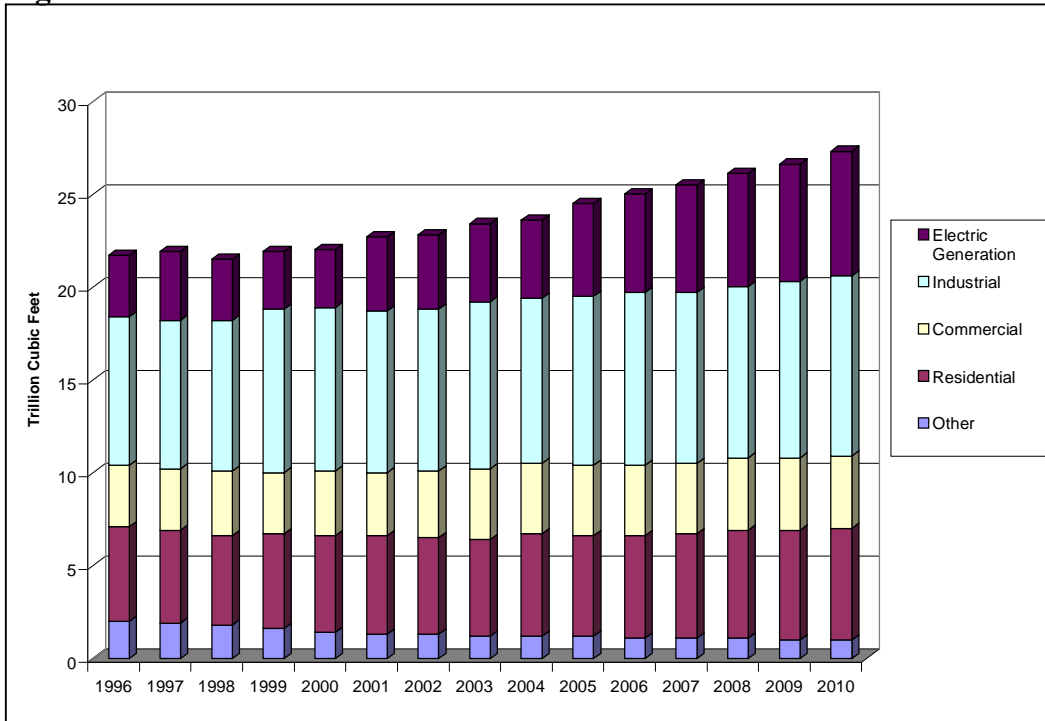
Consequently, producers today have been unable to keep up with rising gas demand. Total consumption of natural gas was 21.4 TCF in 1999 but is expected to approach 22.5 TCF in 2000 and jump another three percent in 2001. According to the American Gas Association, gas storage has been growing by an average of 42 billion cubic feet per week in recent months, down 24 percent from the year-ago average of 55 billion cubic feet.

Is any relief in sight?

Crude oil and gasoline prices will probably decline markedly after the peak summer driving season, though \$12-\$15 a barrel is not a likely scenario. The current consensus is for prices between \$22 and \$25 per barrel by year's end. What's more, OPEC claims the "optimal" price for crude to be around \$25. But, *in contrast to crude oil, gas prices are likely to remain high for at least the next several years.*

Because it is environmentally benign and, until recently, abundant in supply, natural gas has become the preferred fuel for industrial processing, home heating, and electric power generation. With the nation's electric utilities turning their backs on nuclear and coal-fired generators, natural gas has been providing most of the new capacity. In addition, electric deregulation in many states has encouraged non-utility generators to enter the market, and virtually all of their power plants are gas-fired. According to the Energy Information Agency, almost 50,000 megawatts of new natural gas-fired power generating capacity is expected to come on line by 2007. Total U.S. demand for gas is expected to approach 30 TCF by the year 2010, with almost a third allocated to electric power generation (see Figure 2).

Figure 2. U.S. Natural Gas Demand



Source: EIA

Eventually, higher gas prices will bring forth new supply. But this will not occur quickly. Though the rig count has rebounded to 1998 levels, extraction is up only six percent from a year ago. Natural gas exploration is being hampered by a severe shortage of drilling rigs as well as a dearth of trained personnel. Considerable expertise, particularly in exploration and development, was lost as workers looked for greener pastures after the energy bust of the late 1980s; and very few young people today are choosing energy as a career. Shortages of rigs and expertise are compounded by the fact that discoveries of large gas fields in the continental U.S. are increasingly rare. Thus more rigs and workers are need to explore the smaller fields that remain.

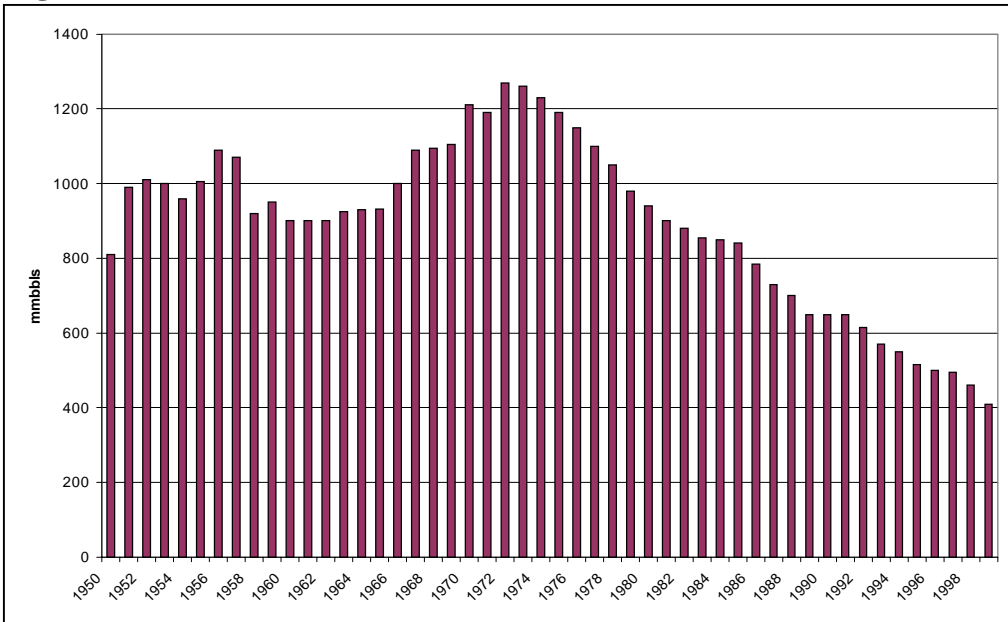
In view of escalating demand on the one hand, and supply constraints on the other, natural gas prices are likely to remain at historic highs for the foreseeable

future. Some marketers are even predicting spot prices as high as \$7 per MCF by next winter.

The energy situation and outlook in Texas

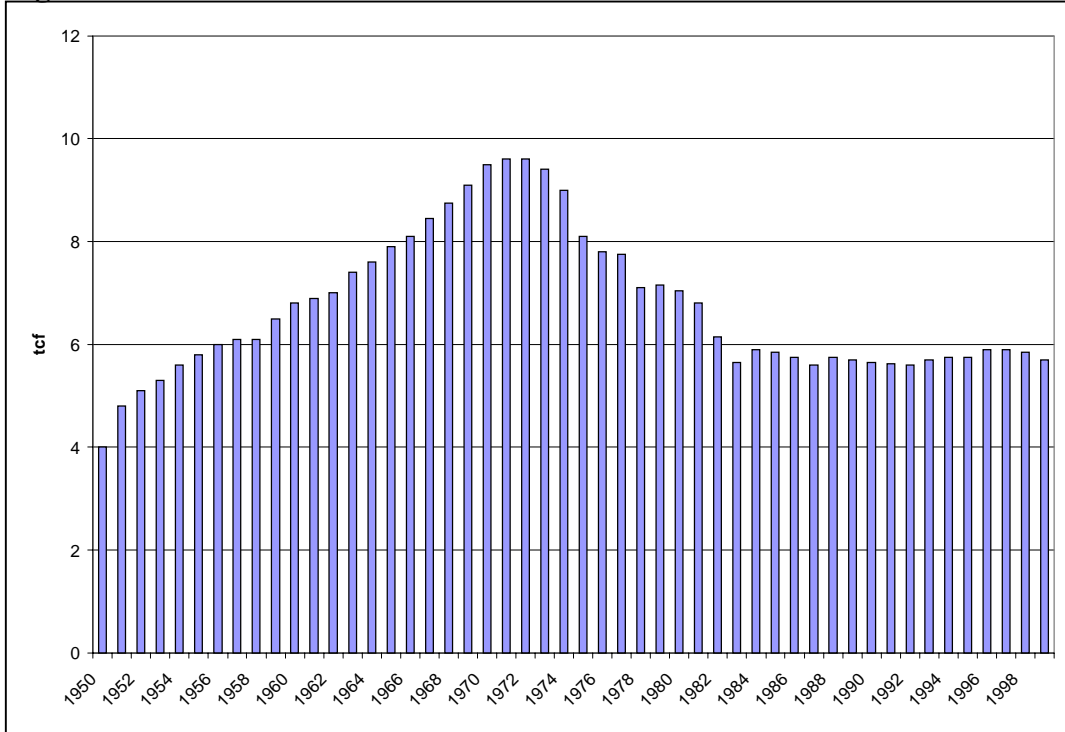
Texas’ production of both crude oil and natural gas has been on a downward slope for decades (see Figures 3 and 4). Since 1972, oil production has declined from more than 1.2 billion barrels annually to about 400 million today. Natural gas production has dropped from nearly 10 TCF to less than six. These declines can be attributed to generally falling prices, higher production costs, and maturation of the state’s major oil and gas fields. For example, in the 1970s, the average oil well produced 19 barrels per day while today production is about eight (see Figure 5). Average daily gas well production fell from 696 to 231 MCF during the same period (see Figure 6). And despite the recent rebound in prices, the Texas oil and gas extraction industry has lost 18,000 jobs and \$885 million in payroll over the past 18 months (see Figure 7).

Figure 3. Texas Oil Annual Production 1950-99



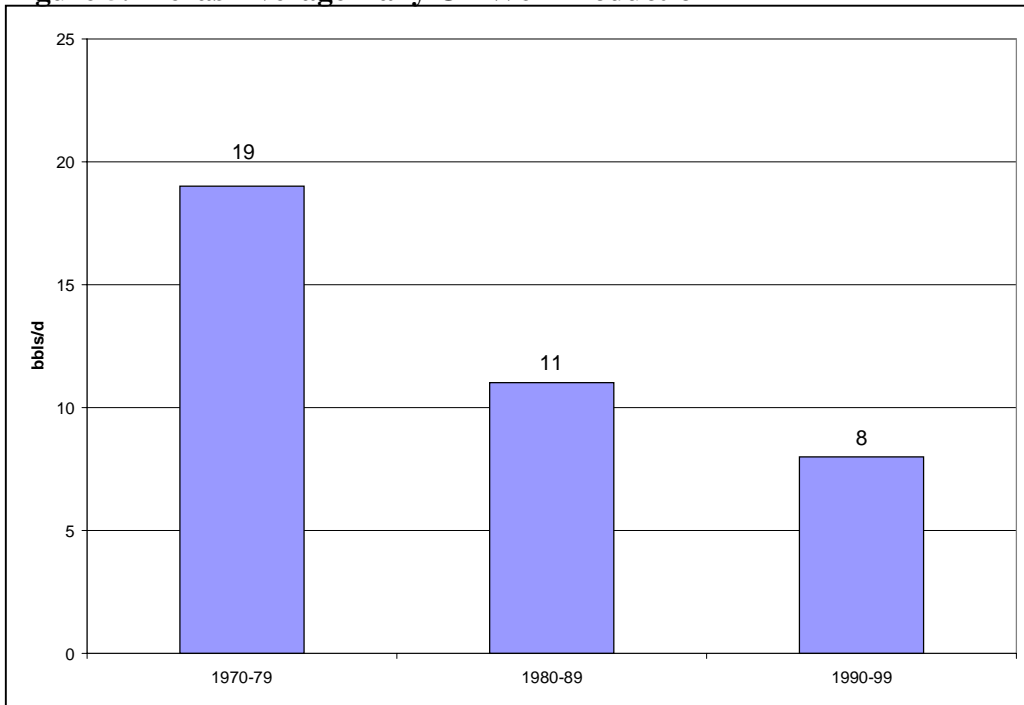
Source: Texas Railroad Commission

Figure 4. Texas Annual Gas Production 1950-99



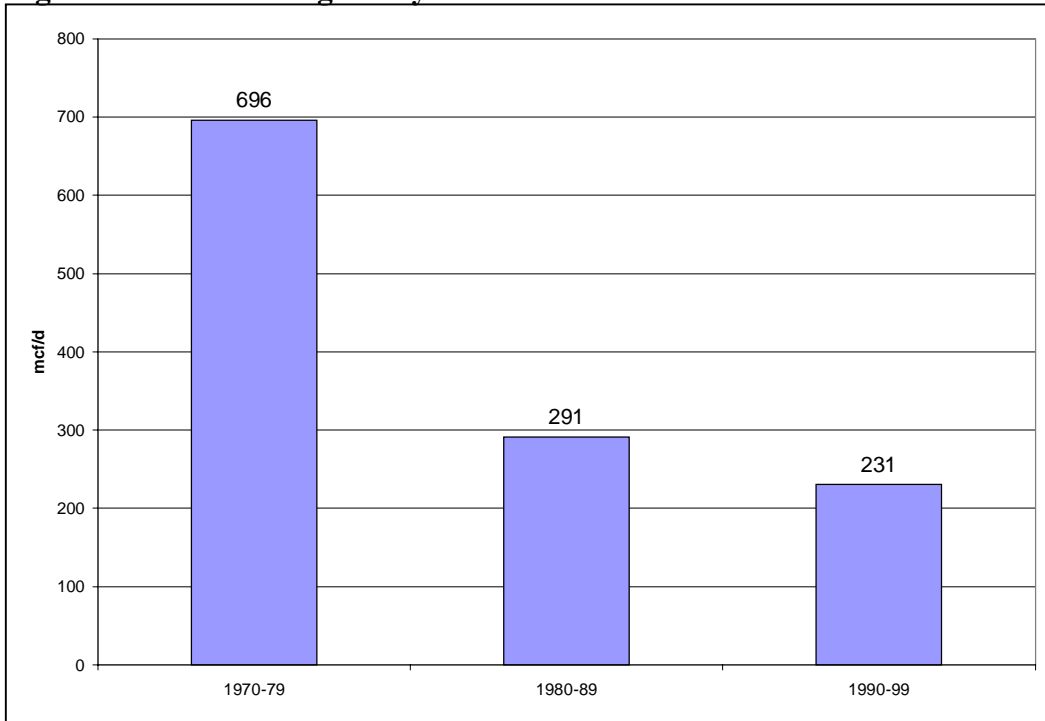
Source: Texas Railroad Commission

Figure 5. Texas Average Daily Oil Well Production



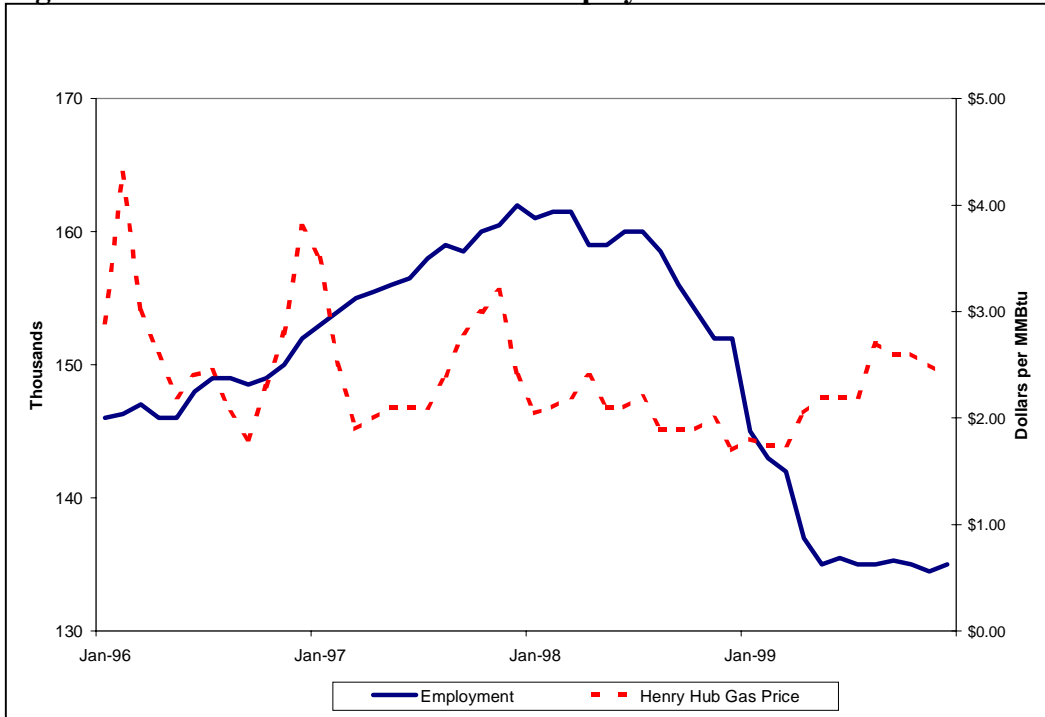
Source: Texas Railroad Commission

Figure 6. Texas Average Daily Gas Well Production



Source: Texas Railroad Commission

Figure 7. Texas Oil & Gas Extraction Employment vs. Natural Gas Prices



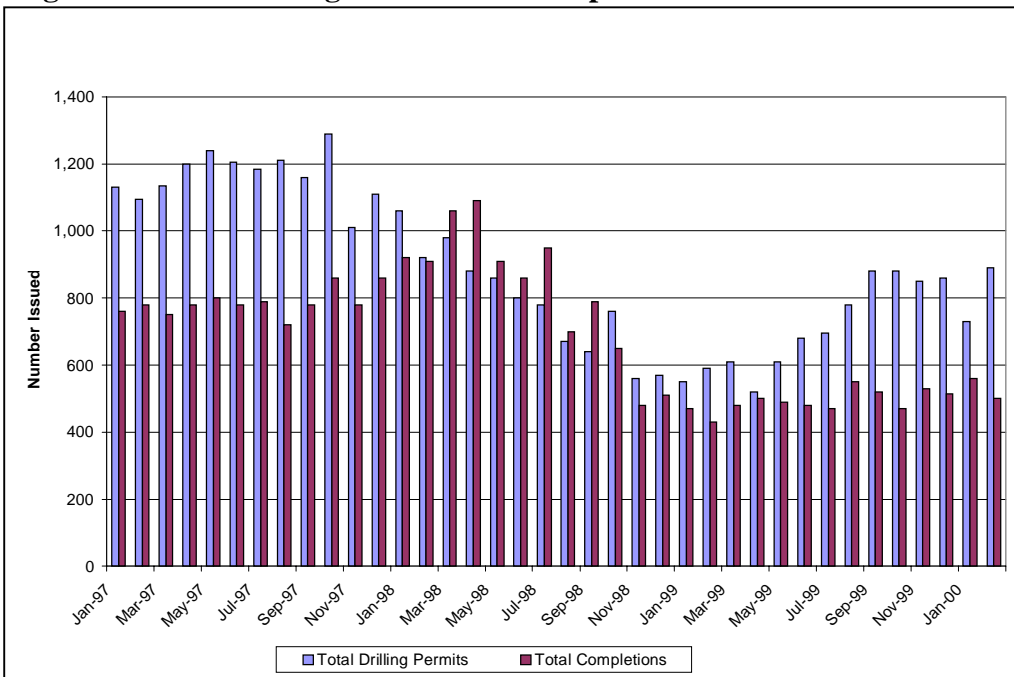
Source: Texas Railroad Commission

Still, among the lower 48 states, Texas ranks number one in on-shore gas production and supplies about a third of all the natural gas in the U.S. Texas' proven reserves are close to 40 TCF, and geologists believe another 325 TCF can be profitably developed.

As oil and gas prices have risen in recent months, the rig count has rebounded somewhat. From a peak of 376 running rigs in November of 1997, the number fell to 180 in April of 1999. By March 2000, however, the Texas rig count was up to 296, with about 80 percent searching for natural gas.

Though the rig count and drilling permits have increased during 2000, completions have not (see Figure 8). Consequently, natural gas supply has remained virtually unchanged. What's more, as with other energy producing states, Texas' oil and gas production infrastructure is severely strained due to a lack of equipment and experienced personnel.

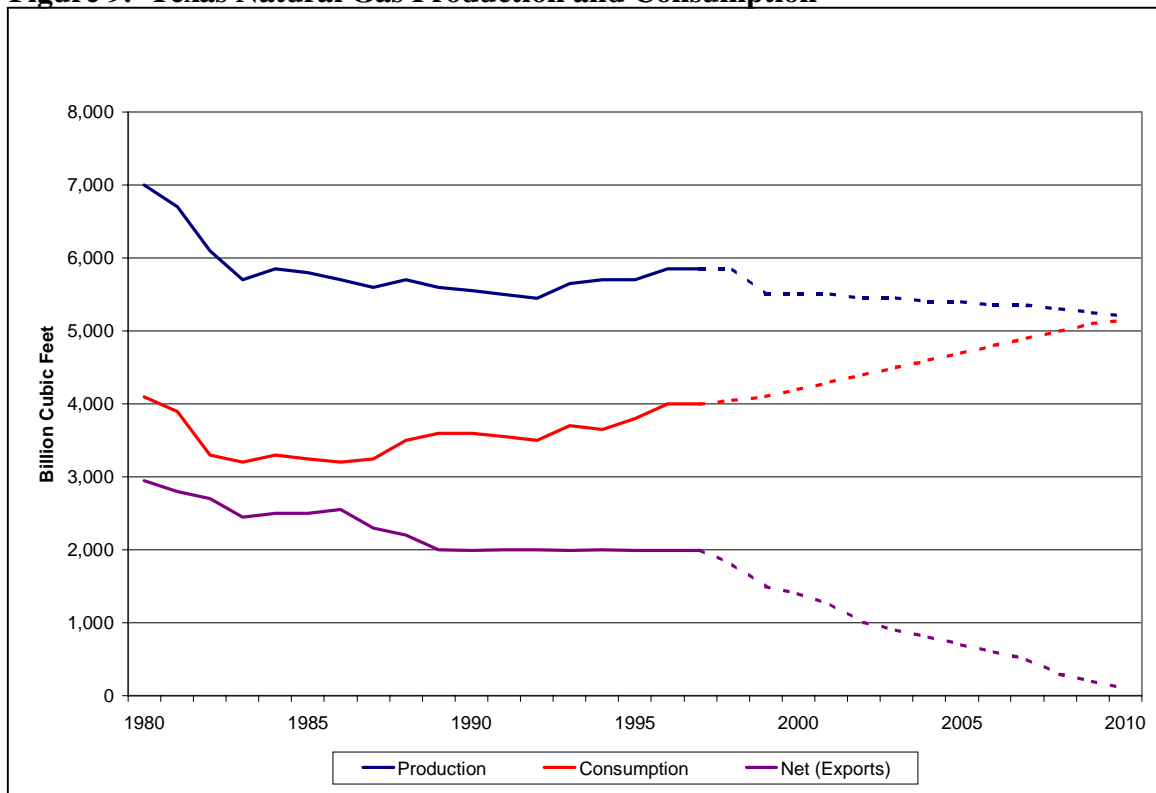
Figure 8. Total Drilling Permits and Completions



Source: Texas Railroad Commission

Until the mid-1980s, Texas “exported” most of its gas production to consumers in other states. But because of increasing gas usage within the state, this is no longer the case. While production has ranged between 5.5 and 5.8 TCF annually over the past decade, Texas’ gas consumption has risen from about 3 TCF to nearly 4.1 TCF. According to projections by the Texas Railroad Commission, Texas natural gas consumption could easily exceed 5.2 TCF by 2010, which would just equal estimated production in that year (see Figure 9).

Figure 9. Texas Natural Gas Production and Consumption



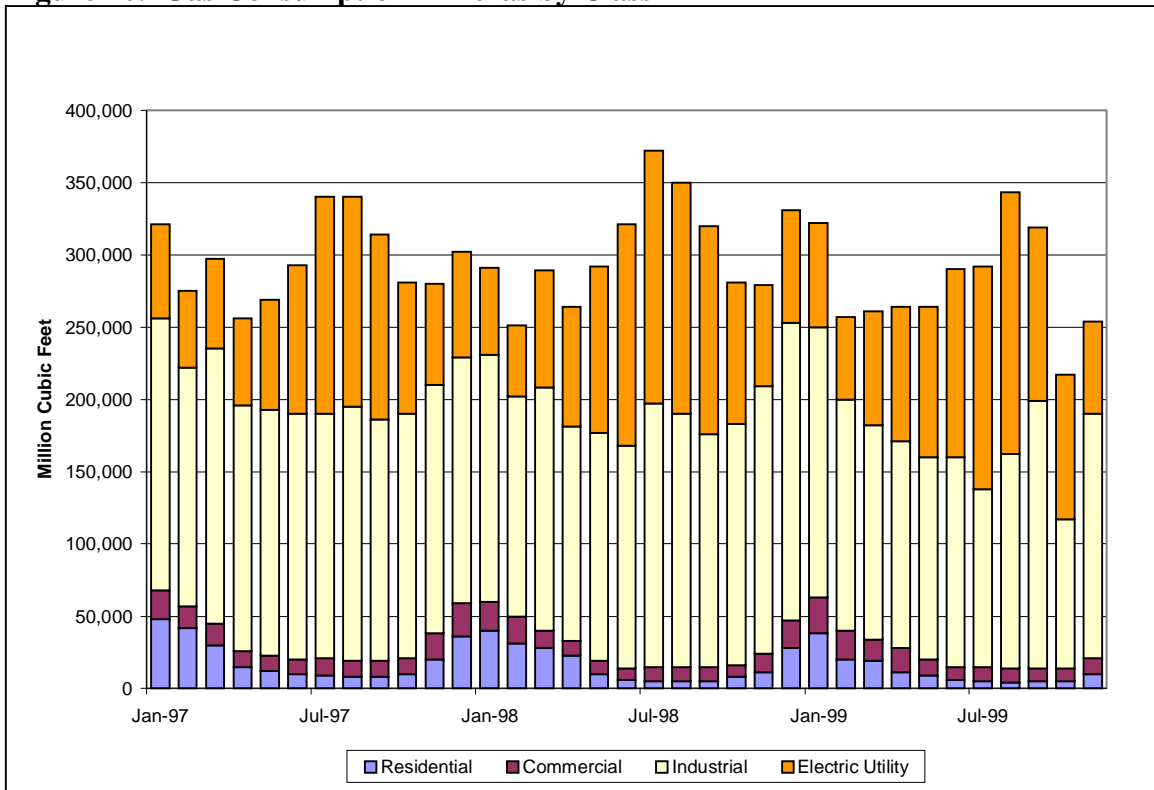
Source: Texas Railroad Commission

Demand for gas in Texas is driven by two major factors. The state has been, and will continue to be, one of the fastest growing areas of the country in terms of population, employment and business investment for the next several decades. New homes,

factories, offices and retail mean greater demands for natural gas. But the second and most important factor driving up natural gas consumption is the almost insatiable demand for electric power. With coal and nuclear plants in disfavor, and no significant hydro resources in Texas, natural gas has become the only viable option for power generation.

Over the past several years, electric utilities' share of natural gas consumption in Texas has grown markedly, accounting for more than half of all gas use during some summer months, and power generation's share of consumption is expected to rise even further in the years ahead (see Figure 10). The Texas Public Utility Commission reports that 35,400 megawatts of new natural gas-fired generating capacity will come on line by 2003 in Texas which, in turn, will require an additional 3.9 BCF of natural gas per day.

Figure 10. Gas Consumption in Texas by Class



Source: Texas Railroad Commission and Texas Public Utility Commission

According to an analysis by the Texas Railroad Commission, 1300 new producing wells will be needed in Texas just to provide enough gas to meet these additional power generation demands. Whether or not Texas' gas producers can meet this target in the face of labor, capital and material shortages remains to be seen.

How higher natural gas prices affect Texas' industries and consumers

In this section, we estimate the economic impacts of rising natural gas prices for the State of Texas. The benefits of rising natural gas prices include higher production with attendant increases in jobs and economic activity in Texas. However, these benefits are offset by increasing production costs for industries that rely on natural gas as an input and higher gas and electric utility bills for households.

To model the economic impact of increasing gas prices we used the IMPLAN input-output model developed by the Minnesota IMPLAN Group. The model is based on 1996 data, the latest year for which such data are available. Our analysis examines the economic impacts for each \$1 increase in the average price of natural gas.

Natural gas production and drilling activities increase modestly with rising prices. Industry estimates suggest that a 10 percent increase in natural gas prices results in a one-half of one percent increase in gas field employment. In 1996, natural gas prices averaged \$2.17 per MCF. For every \$1 per MCF price increase, additional economic activity can be calculated for the drilling industry as well as the natural gas production and distribution industries. We estimate that a sustained \$1 increase in natural gas prices would boost drilling industry output by as much as \$1.5 billion per year. Production and distribution industry activities would increase by \$800 million per year. Combined, this additional drilling and production industry activity would generate almost \$3 billion in

new economic activity in the State of Texas, support more than 8,800 direct and indirect jobs paying in excess of \$415 million in salaries, wages and proprietors' income (see Table 1).

Table 1
Economic Impacts of a \$1 per MCF
Increase in Natural Gas Prices on
Texas Industries and Households

Description	Impact
Impacts of Increased Drilling, Production & Distribution Activities	
Total state economic activity	\$ 2,989,700,000
Total wages, salaries, proprietors' income	\$ 415,359,000
Total jobs	8,830
Impacts on Other Texas Industries	
Increase in total costs	\$ 2,822,900,000
Total state economic activity	(\$ 4,290,000,000)
Total wages, salaries, proprietors' income	(\$ 757,600,000)
Total jobs	(21,330)
Impacts on Texas Households	
Increased utility costs (loss of disposable income)	\$ 1,457,700,000
Total state economic activity	(\$ 2,109,300,000)
Total wages, salaries, proprietors' income	(\$ 568,400,000)
Total jobs	(21,800)
Net Effects of Increased Natural Gas Prices	
Total state economic activity	(\$ 3,409,600,000)
Total wages, salaries, proprietors' income	(\$ 910,641,000)
Total jobs	(34,300)

However, while these gains in economic activity, jobs, and income are impressive, they are offset by the impacts rising natural gas prices have on industries that use gas and electricity as inputs to production. Table 2 lists the twenty industries in Texas that use the most natural gas as a factor of production, excluding inter-industry

flows between natural gas drilling and distribution. In total, Texas industries directly and indirectly consumed \$ 7.4 billion in natural gas in 1996.

Table 2
Top Twenty Industries by Total Demand for Natural Gas
Texas, 1996

Industry #	Description	Demand (\$ Millions)
210	Petroleum refining	2,315.16
190	Cyclic crudes – Intermediate & Indus Organic Chemicals	529.87
512	Other state and local government enterprises	161.62
447	Wholesale trade	121.36
511	State and local electric utilities	120.47
462	Real estate	111.04
443	Electric services	110.92
39	Natural gas liquids	95.72
454	Eating and drinking establishments	85.01
191	Plastics materials and resins manufacturing	61.60
254	Blast furnaces and steel mills	40.43
163	Paperboard mills	40.15
446	Sanitary services and steam supply	39.81
232	Cement – hydraulic, production	38.69
463	Hotels and lodging places	33.91
492	Hospitals	33.86
220	Miscellaneous plastic products manufacturing	31.93
464	Laundry – cleaning and shoe repair	22.86
192	Synthetic rubber manufacturing	22.76
377	Semiconductors and related devices	20.88

However, there are several industries in Texas not in the top-twenty in total natural gas consumption who nonetheless rely heavily on gas and electricity as an inputs to production. Table 3 lists the top twenty industries in Texas ranked by natural gas consumption as a percentage of total industry inputs.

Table 3**Top Twenty Industries by Natural Gas as Percentage of Total Inputs**

Industry #	Description	Gas % of Total Inputs
245	Lime	11.7
232	Cement – hydraulic	8.2
233	Brick and structural clay products	7.4
511	State and local electric utilities	6.5
210	Petroleum Refining	6.0
246	Gypsum Products	5.4
76	Wet Corn Milling	4.5
236	Structural Clay Products	4.4
239	Fine Earthenware Food Utensils	4.3
42	Clay-Ceramics Refractory Minerals	4.3
28	Iron Ores	4.1
89	Animal and Marine Fats and Oils	3.7
81	Sugar	3.7
43	Potash Soda, Borates	3.6
202	Nitrogenous and Phosphates	3.5
300	Other Ordinance and Accessories	3.5
231	Glass Containers	3.2
211	Paving Mixtures	3.2
214	Petroleum and Coal Products	3.1
250	Minerals – ground or treated	3.1

In the short term, an increase in natural gas prices would impact industry profitability with few immediate consequences to production activity or employment. However, if natural gas prices remain at a new higher level, this could reduce total economic activity and employment across the state. We examined the economic impact of increasing natural gas prices by \$1 per MCF on 359 industries in Texas, specifically excluding inter-industry transfers among natural gas drilling and natural gas distribution firms. Under this natural gas increase price scenario, the 359 industries included in the model would see their costs of production rise by \$2.82 billion per year. These cost increases would decrease total economic output in Texas by \$4.29 billion, displace over

21,000 jobs and lower wages, salaries and proprietors' income by almost \$758 million per year (see Table 1).

Texas households are also affected by rising natural gas prices. In 1996, Texas households consumed more than \$2.6 billion in natural gas through direct purchases and via their electric bills. Because more than 60 percent of the electric utility capacity in Texas uses natural gas as the primary fuel, higher gas costs may be quickly passed through to consumers through fuel adjustment clauses (see Table 4). We estimate that each \$1 per MCF increase in the cost of natural gas will decrease household discretionary income by about \$1.46 billion as a result of higher utility bills. The resulting loss of spending by Texas households would decrease total economic activity in the state by \$2.1 billion, lower total employment by 21,800 and reduce total wages, salaries, and proprietors' income \$568 million (see Table 1).

Table 4

Installed Utility Capacity by Resource Type in 1998 (MW)

Utility	Gas	Coal	Lignite	Nuclear	Hydro	Wind	PV	Total
TXU	12,955	-	5,825	2,300	-	-	-	21,080
RHLP	9,335	2,415	1,520	770	-	-	-	14,040
CPS	2,425	1,385	-	700	-	-	-	4,510
CPL	3,116	684	-	630	6	-	-	4,436
SPS (TX)	1,624	1,588	-	-	-	-	-	3,240
EGS (TX)	2,268	269	-	281	-	-	-	2,817
AE	1,450	570	-	400	-	-	0.3	2,420
SWEPSCO (TX)	938	971	443	-	-	-	-	2,352
LCRA	1,040	1,024	-	-	273	-	-	2,337
WTU	1,025	370	-	-	-	1.0	-	1,396
EPE (TX)	607	82	-	466	-	-	-	1,155
BEPC	687	-	-	-	-	-	-	687
TNMP	-	-	301	-	-	-	-	301
Total ERCOT	33,222	7,293	8,037	4,800	435	1.0	0.3	53,788
Total Texas	38,918	10,258	8,597	5,546	662	1.0	0.3	64,011

Source: Public Utility Commission of Texas

State and local government activities are also affected by natural gas price increases. A \$1 rise in natural gas prices increases total costs to state and local governments an estimated \$63 million per year. Moreover, public schools, colleges, and universities could see total costs rise by at least \$105 million per year for their natural gas purchases. These increases would eventually result in higher taxes, which would further erode household purchasing power with additional losses to Texas economic activity.

In sum, though rising natural gas prices are a boon to gas drilling, production and distribution industries and their employees, the resulting higher costs to Texas industries and households more than offset any gains. Based on our models, *each \$1 per MCF increase in the price of natural gas has the net effect of decreasing state economic activity by at least \$3.4 billion per year, lowering total employment by more than 34,000, and reducing salaries, wages and proprietors' income by \$911 million.*