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THE CHAOS THAT WAS ENRON: ENRON AND THE TRANSFORMATION OF THE U.S. NATURAL GAS INDUSTRY, 1968-2001

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The Chaos That Was Enron

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Disclaimer

In 1984, Internorth Corp, the parent of Northern Natural Gas Co., asked me to come to their headquarters in Omaha to tell them about the Texas intrastate gas industry. Northern Natural was an interstate pipeline and Internorth wanted to buy a Texas intrastate company. I told them that HNG had the best facilities and the best management in the state. I am sure they heard that from others too, and it wasn't long before they merged with HNG to form Enron. A number of lawsuits and regulatory proceedings surrounded the merger, and I testified on behalf of Enron in many of those. Until its demise in 2001, Enron was one my largest clients.

This paper is in large part based on my experience in the natural gas industry. I never met or worked with Ken Lay, Jeff Skilling or Andy Fastow. My work was mostly with the pipeline and gas marketing part of Enron's business.

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I. Introduction

1. The Enron Debacle

The collapse of Enron in 2001 was due not as much to perfidy as it was to a deeply flawed business plan. Enron and its predecessors had participated in, and to some extent drove, the restructuring of the natural gas industry. For years natural gas production, transportation and consumption had been a stable, highly regulated business. That stability collapsed in the 1970s and a new commodity-based industry emerged. In that process Enron grew rapidly and was very profitable. The deregulation of natural gas prices had a similar impact on the industry as major technological innovations had on other industries. Early movers made a lot of money, but eventually the opportunities diminished as new entrants drove down margins and stability returned. By the final deregulation of gas prices in 1993, the opportunities for entrepreneurial returns had essentially vanished.

The meteoric rise of the Enron Corporation and its equally rapid flameout is often portrayed in terms of the personalities involved. The personal histories of Ken Lay, Jeff Skilling and Andy Fastow are recounted to explain the path Enron took. Hubris, greed, and poor management practices are often seen as the source of the company's failure. Undoubtedly those were present, but most executives have, at least to some extent, the same flaws. And, one might add, at the time business commentators marveled at the acumen of the Enron management who had evidently discovered new ways to make money. Pictures of Enron's leaders often appeared on the covers of business publications with stories inside lauding their management techniques. Few Wall Street analysts found fault with the Enron game plan.

As the company collapsed in 2001, Enron again hit the news with cable stations reporting daily on developments. The public, at least in Houston, became enthralled with the Congressional

investigations and Federal court trials that followed the company's failure. Lay, Skilling, Fastow, and other Enron managers were found guilty or pleaded to charges. Fastow and Skilling were sentenced to prison but Lay died before he could appeal his conviction and therefore was never sentenced.

While popular accounts of Enron have focused on the personalities involved, more serious commentators have asked how the government might prevent another "Enron." Academic analysts discuss issues of corporate governance and regulatory theory. Because of the court cases, the Congressional hearings, the investigations by government agencies, the regulatory filings made by Enron, and the media coverage of the company, a plethora of information exists on what, how and who did what and when. It is an interesting and compelling story that has been told well by others.[1]

The personal stories are certainly titillating and it is tempting to try to draw some broader conclusions about American business practices or government regulation of the economy from the Enron story. But if we want to understand how the company grew so rapidly and why its fall was so sudden, we must focus on the business plan that Ken Lay pursued and how that plan grew out of his experience in the natural gas industry.

Lay's business philosophy can be found in a Rice University press release in the year 2000. According to that press release, "In a separate donation, Enron chairman and chief executive officer Kenneth Lay and his wife, Linda, made a $3 million contribution to initiate Rice's development of a research and teaching center focused on the study of markets in transition. The center—a joint undertaking between the Jones School and the Department of Economics—will examine issues raised by the deregulation, privatization and evolution of markets such as energy

[1] See: (Bryce, 2003); (Eichenwald, 2005); (McLean & Elkind, 2004); (Salter, 2008).

and bandwidth and investigate the economic effects and implications of regulation and new forms of global competition."

2. Enron in the Context of Gas Industry

The natural gas business was on a stable path of growth from the 1930s to the late 1960s. During that time institutions had developed that organized the economic activity of the industry. Governmental regulations and industry customs and practices were in place that guided business decisions. The industry was, in fact, quite boring.

This tranquility came to an abrupt end in 1968. After that date, a series of exogenous shocks severely challenged the existing institutions. The old way of doing business no longer worked. Whether you favored regulation or not, by the mid-1970s it was clear that changes had to be made. The problems were so pervasive that the entire industry was eventually restructured, a painful process that was not complete until 1993. In the end regulations had been eliminated on wholesale gas prices and the market now was the driving force in transactions and investments.[2]

In 1985, at the height of the chaos in the industry, Enron was formed through a merger of Internorth Corp (Internorth) and Houston Natural Gas Company (HNG). Internorth, headquartered in Omaha, was a holding company which owned Northern Natural Gas, a major interstate natural gas pipeline company.[3] Internorth management was concerned about developments in the natural

[2] That the Federal government would deregulate the commercial side of the natural gas business could not have been predicted in 1968. In fact experience showed that governments often extend regulations when existing regulations fail. "We have already seen that the close interdependence of all economic phenomena makes it difficult to stop planning just where we wish and that, once the free working of the market is impeded beyond a certain degree, the planner will be forced to extend his controls until they become all-comprehensive." (Hayek, 2007) p 137. In fact, the deregulation of gas was accompanied by increased regulation. The *Powerplant and Industrial Fuel Use Act*, passed in 1978 along with the Natural Gas Policy Act, severely restricted the use of gas as a boiler fuel. This was almost immediately ignored as it increased oil imports and was repealed in 1987.

[3] Intrastate pipelines are located entirely within one state, whereas interstate pipelines, typically, cross a state border. Interstate pipelines are regulated by Federal authorities. During this time period, the Federal Energy Regulatory Commission (FERC) replaced the Federal Power Commission (FPC) in this function. Intrastate pipelines are regulated by state authorities. In Texas that authority was vested in the Texas Railroad Commission (TRC).

gas industry at the time and considered themselves a takeover target. In order to protect itself it was seeking a strategic relationship with an intrastate pipeline company in Texas.

HNG was an old-line, Texas energy firm with offices in Houston. It owned several Texas intrastate pipelines including, most importantly, Houston Pipe Line Co. (HPL)[4] which serviced the chemical and industrial complex located on the central Texas Gulf Coast from Corpus Christi eastward to the Louisiana border. Intratex, another HNG subsidiary, owned an interest in and operated a pipeline from the Houston area to the Permian Basin in far west Texas.[5] The combination of Internorth and HNG resulted in one of the largest pipeline companies in the United States with facilities that ran from coast to coast and border to border. First labeled "HNG/Internorth," it had, by 1986, become "Enron." The headquarters were eventually moved from Omaha to Houston.

Ken Lay was well-schooled in the energy business and in government regulation. From 1965 through 1968 he worked as an economist in the planning department of Humble Oil in Houston.[6] In 1971, after completing his military service at the Navy Department in Washington, DC, he became the technical assistant to the Vice Chairman of the Federal Power Commission (FPC) and later went to the Energy Department as Deputy Under-Secretary. In 1974 he joined Florida Gas Co., a major interstate pipeline company headquartered in Winter Park, Florida, as vice president of planning. After rapidly rising through the ranks of several interstate pipeline companies, he landed at HNG as CEO in 1984. The natural gas business was dramatically changing, and Lay wanted his company to take advantage of the opportunities that that change was creating. He wanted his company to be a major force in the transformation of the gas industry.

[4] It is a sign of the longevity of the company that they used the old fashioned "Pipe Line" moniker instead of the more modern "Pipeline."
[5] The Permian Basin had one of the largest deposits of oil and gas in the world.
[6] Humble Oil would later become Exxon.

The two key aspects of Lay's background were his experience as an interstate pipeline executive who regularly had to deal with utility regulators and his doctoral degree in Economics. Each of these contributed to his fundamental business strategy which consisted of exploiting the deregulation of gas, on the one hand, and utilizing mark-to-market accounting,[7] on the other. Lay made no secret of his belief in deregulation nor did he hide his belief in mark-to-market accounting. He saw both as necessary correctives to the ills of the gas industry, and to industrial enterprise in general. He was prepared to use Enron and its political influence to push ahead on these fronts.

[7] Mark-to-market accounting is explained below in Section V.2.

II. Stability: 1938-1968

The price of natural gas was essentially flat from 1938 to 1968.[8] Many gas purchase contracts from that time called for a few penny increase every five years. The stability of gas prices and of the gas industry in general was a result of market conditions and institutional factors.

1. Market Conditions

- *Gas Supply Abundance*

Prior to 1968 natural gas was in many cases considered a nuisance byproduct of oil production. It was often just burned off (flared) at the wellhead. State regulatory authorities in Texas, Oklahoma, Louisiana, and New Mexico had to outlaw the flaring of gas at the wellhead in order to prevent the waste of this natural resource[9]. Midwestern and Northeastern energy markets, mainly dependent on coal and oil, used relatively little gas, but there was a desire to substitute gas for these dirtier fuels.[10]

The excess supply in the Southwest and the desire to replace oil and coal in the Northeast and Midwest meant that a significant business opportunity existed for the construction of facilities to move gas to market. Entrepreneurs lined up to meet this challenge and a boom in pipeline construction followed the Second World War.[11] As a result, marketed production increased steadily, rising from 3.19 TCF in 1945 to 12.80 TCF in 1960 and 21.92 TCF in 1970[12]. In spite of this dramatic increase, production capacity outpaced actual production so that the amount of gas

[8] For a graph of gas prices, see Figure 1.
[9] Figure 2 shows the amount of gas vented or flared over time. Gas at the wellhead can only be transported economically by pipeline and for small quantities it is very costly to extend a pipe to each well. Producers preferred just to waste it.
[10] Pittsburgh, Pennsylvania, for example, outlawed the burning of coal in home furnaces.
[11] See (Castaneda & Pratt, 1993) and (Castaneda & Smith, 1996).
[12] Natural gas can be measured in terms of volume or heat content. In the United States, the standard volumetric measurement unit for gas is a thousand cubic feet or MCF. A TCF is a trillion cubic feet. Energy content is based on the British Thermal Unit or Btu. One MCF of gas contains about one MMBtu (million Btus) of energy. Thus *MCF* and *MMBtu* are often used interchangeably. The average consumption by individual residential consumers of gas is approximately one hundred MCF per year.

available for future delivery continued to increase.[13]

- *Oil Prices*

Oil and gas are substitutes for each other in many applications, particularly for use as boiler fuel in the generation of electricity and process steam. There are other applications, such as transportation fuel, for which gas cannot economically be substituted for oil using existing technologies. Although the relationship between oil and gas prices is complicated, they do interact over certain ranges. The fact that oil prices were very stable during this thirty-year period contributed to the stability of gas prices.[14]

2. Institutional Factors

- *Contracting Practices*

Natural gas was purchased and sold by the pipeline transporters under long-term contracts. At the supply end of the pipe, producers dedicated their production to the pipeline, often for as long as any gas was being produced from that field. At the sales end of the pipe, customers agreed to buy gas exclusively from the pipeline, often with a minimum quantity specified. These types of contracts were necessary to obtain financing. Investors did not want to put money into a pipeline built halfway across the country unless they were sure that gas would be flowing through it. Because the marketing of gas was *bundled* with the transportation of gas under long-term contracts, there was very little flexibility in the market.

- *Federal Regulation*

The Natural Gas Act of 1938 (NGA) granted the Federal Power Commission (FPC) broad

[13] Figure 5 shows gas production and total gas reserves. For a detailed discussion of the development of the natural gas industry see (Tussing & Tippee, 1995).

[14] A barrel of oil contains approximately 6.3 MMBtu of energy. To get a roughly comparable MMBtu price for gas divide the price for a barrel of oil by 6.3. Currently (October 2015) gas is trading below $3.00 per MMBtu, while oil is trading at about $7.00 MMBtu. This price differential suggest that gas has displaced all the oil it can and gas prices will stay below oil unless exports are undertaken.

authority to regulate the gas industry. The goal of the NGA was to protect gas consumers from price gouging by utilities which had service monopolies. The FPC's regulations eliminated competition in both the supply and sales markets. Prices were set by regulators, entry and exit was only by regulatory permission, and, if necessary, supplies were allocated by regulations. By 1968 the interstate natural gas industry was one of the most pervasively regulated industries in the United States.

It was not initially clear whether or not the NGA required the FPC to regulate the wellhead price of gas as opposed to the price at which the pipeline could sell gas to its customers. Where an interstate pipeline acted as a producer and owned the gas coming out of the well, the FPC already had applied cost-of-service pricing to determine a wellhead value of gas. For third-party gas suppliers, however, the FPC did not set wellhead prices.[15] In a case brought by the State of Wisconsin, the United States Supreme Court decided in 1954 that wellhead prices for interstate pipeline purchases must be set by the FPC. Many felt at the time that using traditional cost-of-service rate procedures for setting wellhead gas prices was impractical as well as undesirable. Efforts by Congress to amend the NGA in order to exclude wellhead price regulation fell short, and the FPC proceeded to set wellhead prices.[16]

The imposition of wellhead price controls set the stage for the crisis that was to come in the 1970s. Unlike pipeline facilities, natural gas is a commodity. The supply and demand for that commodity is subject to wide fluctuations due to weather, economic activity, the international oil market, and other market variables. A fixed price, based on historical costs, could not adequately

[15] In general the costs of materials and supplies used in setting the rate for interstate pipelines were not regulated. While a regulatory agency might disallow an expense that it thought to be unreasonable, it would not dictate the price that could be paid for that good or service.

[16] Congress considered amending the NGA to exclude wellhead prices but a bribe offered by a lobbyist scuttled the legislation. (Castaneda & Smith, 1996) pp 135-150.

balance supply and demand and the regulatory process was too cumbersome to permit rapid adjustments to the regulated price.

- *State Regulation*

The Texas Railroad Commission (TRC) regulated production in Texas through its well-spacing rules and production "allowables." These rules encouraged excess capacity and made it impossible for producers to gain market share by cutting prices. Just as Federal regulators were primarily interested in protecting Northern gas consumers, Texas regulators were focused on aiding the producers in the state, and the TRC did not want to see the prices for oil and gas decline.[17] The TRC's concern with the "conservation of resources" was considered by some, probably rightly so, to be code words for a policy of limiting production to support prices. If production quotas were set by the TRC, then there would be little incentive to cut prices to sell more oil or gas. The TRC functioned as a cartel manager, like OPEC, only with the force of law behind it.[18] The Connally Hot Oil Act of 1935 and the establishment of The Interstate Oil Compact Commission in 1935 insured that state production regulations would not be subverted by moving oil across state lines.

3. The Outlook in 1968

In 1968, few, if any, observers expected major changes in the industry. After all, since 1938, production and consumption had been on a growth track with stable prices, and there was no reason to think that the future held anything to the contrary. Two business decisions illustrate the view at the time. LoVaca Gathering Co. (LoVaca), a Texas intrastate pipeline, entered into

[17] The economics of oil and gas production are such that it is almost always in the interest of a producer to drain the wells as fast as possible. At one point oil prices collapsed to almost nothing. See (Prindle, 1981), pp 19-32.
[18] Those familiar with the railroad cartels in the late nineteenth century would recognize that the TRC was acting like an *evener* who, in the case of the railroads, evened out shipments among the various railroad companies in the cartel.

long-term contracts to sell gas at a fixed price without having secured the corresponding fixed-price supply. United Gas Pipe Line Co. (UGPL), an interstate pipeline, sold their reserves in South Texas because they weren't needed to meet their customers' needs. Both companies expected that gas would be readily available in the future at low prices.

Those expectations proved to be erroneous as the industry entered an unprecedented period of nearly constant turmoil that lasted for twenty-five years. In 1968, the factors that had been responsible for the long-run stability of the industry began to change dramatically. In response, a new gas industry would emerge, restructured, efficient, and able to balance supply and demand under widely varying market conditions. Enron helped drive that process and profited as a result.

III. Chaos: 1968-1985

1. Supply Failure

The number of gas wells drilled had been flat for years, but new gas reserves continued to be added at a rate faster than production.[19] As a result the proved reserves in the ground, that is, the inventory of gas in the ground for future delivery increased almost every year. This trend came to a dramatic halt in 1968 when reserve additions fell from 20 TCF to 12 TCF. In 1969 they were down to 8 TCF. The collapse in reserves was in part due to downward revisions in existing "proved" reserves as development wells failed to produce the quantities that had been forecast.[20] Reserve additions throughout the 1970s were well below production. It was not until 1981 that the industry would once again replace production with newly discovered reserves.[21]

2. Pipeline Competition

With diminished Gulf Coast and South Texas supply opportunities, intrastate pipelines attacked the interstate supply sources. Since the price for gas purchased by intrastates was not regulated, they could easily outbid the interstate pipelines for new reserves. In addition to blocking the interstate pipelines' access to new reserves along the Gulf Coast, four new intrastate pipelines were quickly built west to the Permian Basin, predominately an interstate gas supply area.[22] The

[19] The number of wells drilled, including both oil and gas wells, had been declining for some time as oil production shifted out of the United States. Figure 4 shows the number of gas wells drilled.

[20] Proved reserves are estimates of the amount of oil or gas underground that can be ultimately recovered at existing prices with existing technology. The estimates are based on geology and economics. Reserves are subject to upward or downward revision as new information becomes available.

[21] See Figure 5 for reserve additions and production.

[22] The Permian Basin supplied gas to interstate pipelines serving California, Colorado, and Midwest markets. A small amount of gas production went to local markets in West Texas and the Texas Panhandle. This changed dramatically with the construction of four major intrastate pipelines. A joint venture of HPL, Tenneco, and Dow built the four hundred mile Oasis Pipeline connecting Waha, a pipeline junction near El Paso, to Katy, a pipeline junction near Houston. LoVaca built its southern line from Waha to the San Antonio area to serve the Central Texas market. LoVaca also entered into a joint venture with Texas Utilities Fuel Co. (TUFCO) to build the North Texas Pipeline (NTP) which ran from Waha to a location south of Dallas where it connected with other TUFCO facilities. Lone Star built its Line X from Waha to its facilities south of Dallas. Line X and the NTP followed essentially the same route but both pipelines were needed to transport the quantity of gas that would flow over this path.

quick action of the intrastate pipelines meant that they were well-positioned to supply the needs of Texas consumers. The interstate pipelines that operated in the eastern part of Texas did not attempt to cross the state. Since intrastate pipelines could not sell gas to the interstate pipelines, these new facilities could not be used to alleviate the problems facing the interstate market.[23]

With the era of plentiful gas supply over, at least for the time being, the competition between interstate pipelines and intrastate pipelines for gas supply sharply increased. Because the FPC could not control the intrastate pipelines, it could not stop the rapid rise in prices in that market. Furthermore, cumbersome Federal regulations put the interstate pipelines at a competitive disadvantage.[24]

3. Arab Oil Embargo of 1973

The Arab Oil Embargo of 1973 marked the beginnings of the loss of control over oil markets that the major oil companies had long exercised.[25] The Embargo involved only oil, but, since natural gas and oil can be substituted in many applications, the prices tend to track each other. When oil prices quickly doubled, anyone who could do so opted for domestic gas over imported oil. In particular, many petrochemicals were traded internationally, and as the price for these commodities increased, domestic chemical companies were willing to pay gas prices more in line with oil prices established in world markets.

The Arab Oil Embargo touched off a bidding war among intrastate pipelines. Competition

[23] Intrastate pipelines could sell gas to interstates but in doing so they would become subject to Federal jurisdiction. The gas purchase contracts of intrastate pipelines typically stated that, if the pipeline did anything to subject the gas to Federal jurisdiction, the contract would be considered null and void as of the day prior to that act. The producers did not want their gas subject to Federal price ceilings.

[24] A glimpse of how things looked at the time can be found in the dissertation of Karl Wedemeyer submitted to the University of California Economics Department in 1972. Wedemeyer concludes, "... interstate prices remained partially constrained since, even though they exceeded the price ceilings in most areas, they did not move up as far as the intrastate levels. Accordingly, substantial volumes of reserves were diverted from the interstate to the intrastate market" (Wedemeyer, 1979) p 163.

[25] The so called "Seven Sisters" controlled most of the oil production outside of the United States at that time. For a discussion of the development of the international oil industry see (Yergin, 1991)

was intense. Pipelines agreed to *redetermine* the contract price annually or more often. The price could have a specified escalator, say three percent per year, or could be set at the highest price being paid by anyone in the area. Sometimes the price was pegged to fuel oil prices. Usually the price was set to the highest option from this menu.

From 1972 to 1976, the price of gas in the intrastate market in Texas increased seven hundred and fifty percent.[26] With the higher prices, consumption of natural gas in Texas declined sharply in 1974 and 1975. In 1975 gas demand in Texas was fourteen percent below the level of 1973. By 1976 the intrastate market had reached a new equilibrium, and real prices were flat from 1976 through 1980, at about $1.20 per MCF in 1972 prices.

The rise in prices impacted the financial health of the intrastate pipeline companies as they sought to align their sales prices with their purchase prices. LoVaca, the company with the fixed-price sales contracts, asked the TRC to set aside their contracts since there was no way they could afford to buy gas given the sales prices they had agreed to. The TRC granted LoVaca temporary relief by allowing them to increase their sales price to cover all of their gas costs. After several years of litigation, the TRC refused to interfere in what they viewed as a private contractual matter and ordered LoVaca to refund all the money it had collected above the contracted sales price. Since that was impossible, LoVaca was reorganized as Valero Transmission Co. with the customers receiving an ownership interest in the company.[27]

While the intrastate pipeline and the TRC had adjusted quickly to the rise in prices, conditions in the interstate market were continuing to deteriorate. The administrative procedures

[26] Figure 1 shows the rapid price increase during this period.

[27] LoVaca, a subsidiary of The Coastal Corporation, was owned by Oscar Wyatt. As part of the LoVaca reorganization, Wyatt received no ownership interest in Valero and agreed to never own another intrastate pipeline in Texas. The LoVaca reorganization was an agreed settlement between the parties approved by the TRC and did not involve a formal bankruptcy proceeding. This was done to protect the existing gas supply contracts of the company which might have been set aside by a bankruptcy court.

of the FPC could not keep up with the rapidly changing prices. Expectations of continued shortages and continued price increases, at least through the end of the century, were driving prices upward. In such an environment, the imposition of any price ceiling meant that there was a huge risk to a producer that his gas would not receive a market price. After all that is exactly what a price ceiling is designed to do, and, if the seller has no alternative markets, he can sell his gas at the ceiling price or not sell it. In this case, however, the producer did not have to accept the interstate price ceiling; he could sell gas from newly developed reserves to the intrastate market. Because of the pipelines constructed to West Texas, there were no major producing areas in Texas that did not provide for an intrastate alternative.

Although the FPC recognized the problem, they were constrained by law and traditional regulatory procedures. The FPC and, subsequently, FERC tried to keep up with rising intrastate prices, but by leaving in place the old, lower price-ceilings for existing reserves, they reinforced producers' fears that once gas was committed to interstate commerce, the price was likely to be below market forever. Not only did interstate prices fail to keep up with the intrastate prices, but the regulatory environment continued to signal risk in interstate sales.

Prices constrained below market levels increased the demand for gas and decreased the supply of gas. The supply market was being lost to intrastate competitors. On the demand side, gas consumers were not willing to voluntarily reduce their consumption of gas when the price they were required to pay was well below the cost of oil, the fuel they would likely have to use in lieu of gas. Market forces had balanced the intrastate market, but the market was not allowed to balance supply and demand in the interstate market.

The interstate pipeline experience during this period was an unmitigated disaster.[28] To deal

[28] The contrast between the intrastate market and the interstate market could not have been more stark. The TRC allowed the individual companies - pipelines, producers, and large consumers - to resolve their problems and refused

with the shortages in the interstate market, interstate pipelines submitted curtailment plans to the FPC describing how they would determine who got gas and who did not.[29] The plans gave top priority to residential consumers. Boiler fuel users, such as electric utilities, were given lowest priority. Users who experienced curtailed deliveries could either shut down their operations or switch to alternate fuels. During the winter heating season of 1977-1978, gas deliveries in New York and New Jersey were curtailed for everyone except residential consumers. Commercial users received only 94.3 percent of requirements, industrial users only 79.2 percent of requirements and electric utilities only 13.5 percent of their requirements.[30] Other regions served by interstate pipelines were similarly impacted.

Since the alternate fuels cost more than interstate gas, customers whose deliveries were curtailed suffered economic losses which they tried to reclaim from their pipeline suppliers. Customers were suing pipelines for amounts that, in some cases, exceeded the company's net worth. In the case of UGPL, the company that had sold reserves on the cusp of the price rise, the claims made by their customers for "failure to deliver" exceeded two billion dollars. Meanwhile, Federal regulatory authorities continued to allocate the limited supplies that were available.

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to intervene in the LoVaca financial mess even though it involved most of the major gas companies in the state. Federal officials, on the other hand, continued to try to "help" the industry that they regulated. Elinor Ostrom made these general observations in her Nobel Prize lecture delivered on December 8, 2000: "When analysts perceive the human beings they model as being trapped inside perverse situations, they then assume that other human beings external to those involved - scholars and public officials - are able to analyze the situation, ascertain why counterproductive outcomes are reached, and posit what changes in the rules-in-use will enable participants to improve outcomes. Then, external officials are expected to impose an optimal set of rules on those individuals involved. It is assumed that momentum for change must come from outside the situation rather than from the self-reflection and creativity of those within a situation to restructure their own patterns of interaction." (Ostrom, 2010) p 648. In 1983, Energy Planning was hired by FERC and the Texas Energy and Natural Resources Advisory Council (TENRAC) to prepare a study of the experience of the gas industry in Texas during the 1970s. (Anderson, 1983). I described in some detail the TRC approach to regulation. The folks at FERC were quite upset by the way I implicitly contrasted the policies of FERC with those of the TRC. They threatened not to pay us but, fortunately, TENRAC had control of the funds and they liked our conclusions.

[29] The only intrastate pipeline to significantly curtail deliveries was LoVaca and that was only for one winter. At a LoVaca customer meeting to determine who would get the limited gas available, the commanding officer of a San Antonio Air Force base pointed out that he was the only one present who had bombers at his disposal.

[30] Electric utilities were able to substitute coal and oil for natural gas so they bore the brunt of the shortages. In some instances electricity had to be allocated if adequate alternate fuels were not available.

Politically this situation could not continue.[31]

4. The Natural Gas Policy Act of 1978

By 1978, the political pressure to clean up the natural gas regulatory mess could not be resisted and Congress stepped in. The interactions among the various interest groups were incredibly complex. Consumer groups from the non-producing states asserted property rights to the old, low-priced interstate gas. Producers saw this as the chance to do away with price controls all together. Coal interests liked the idea of a declining gas supply. The interstate pipelines wanted to ensure that they could actually compete for and buy reserves. The intrastate pipelines and their large industrial and electric utility customers in the producing states feared that they would become subject to Federal regulators.[32]

In the final analysis, the compromise reached in the Natural Gas Policy Act of 1978 (NGPA) took a step toward relinquishing control of prices by extending Federal control of prices. From the standpoint of the NGPA, the natural gas industry appeared to have two problems: 1) prices in the intrastate market were not controlled; 2) prices in the interstate market were controlled. The NGPA solved the first problem immediately, and the second one over an extended

[31] Temin and Galambos make the point that "The deregulation movement gained impetus from the increased international competition American firms have faced." (Temin & Galambos, 1987) p 344. Certainly the Arab Oil Embargo and the Iranian Revolution were key factors in forcing a change in gas regulations.

[32] Regulation is ultimately a political issue: some parties will gain and some will lose. Many of those favoring regulation of economic activity think that the correct path can be determined through analysis. See, for example, the review of Jonathan Alter's The *Promise: President Obama, Year One* (Rich, 2010). When speaking of President Obama, Alter says, he was "in thrall to the idea that with enough analysis, there was a right 'answer' to everything. But a right answer for whom?" One reason it took so long to change the obviously flawed gas regulatory structure was that some people benefited from the flaws. Robert Bartlett, in his review of *The Crisis of the Twelfth Century: Power, Lordship, and the Origins of European Government* by Thomas N. Bisson, notes that "Saint Augustine [wrote] in the fourth century: 'What are robber gangs, except little kingdoms? If their wickedness prospers, so that they set up fixed abodes, occupy cities and subjugate whole populations, they then can take the name of kingdom with impunity.' Augustine's ponderings stem from the worrying doubts that states and kingdoms, indeed all lawfully constituted governments, are just the most successful of the robber gangs." (Bartlett, 2010) p 47.

period.[33]

The NGPA combined the interstate and intrastate markets by extending Federal price controls to the wellhead purchases of intrastate pipelines and by allowing intrastate pipelines to sell gas to interstate pipelines without becoming subject to the jurisdiction of FERC under the Natural Gas Act. The idea was to take away the advantages which intrastate pipelines had enjoyed in the purchase of new reserves and encourage intrastate pipelines to sell any excess gas that they had under contract to the interstate market. These two initiatives were designed to deal quickly with the immediate supply crisis in interstate markets.

The NGPA sought to deal with the long-run goal of letting the market determine gas prices by phasing out wellhead price controls for all gas not already dedicated to interstate commerce as of February 19, 1977.[34] Prior to decontrol, the NGPA set ceiling prices on an escalation path tied to the rate of inflation. The initial prices were pegged at levels near current intrastate prices, a recognition that the market had set a reasonable price there at that time. These ceiling prices were to increase at a rate of three to four percent above inflation. It was hoped that by 1985, when many of the price controls would be eliminated, the ceiling prices would no longer be constraining.

Unfortunately for the drafters of the NGPA, in 1979 the Shah of Iran was overthrown and oil prices once again took off.[35] The hope that escalating ceiling prices in the NGPA would allow gas to reach parity with oil was now unrealistic. Talk turned to a "fly-up" on January 1, 1985 when price ceilings would be removed from much of the new gas. Federal price ceilings, which in 1978

[33] The NGPA was a remarkable political achievement and was, in part, a product of the general disenchantment with regulation at the time. In his discussion of the career of Alfred E. Kahn, Thomas McKraw makes the point that efficiency was a key issue in the late 1970s. (McKraw, 1984) pp 222-299.

[34] One category of intrastate gas was scheduled to remain forever controlled, however this represented a very small amount of gas and had no material impact on the market. Price controls were immediately eliminated on one category of gas, deep gas produced from reservoirs below 15,000 feet. Price controls on most other categories of gas were to be phased out on January 1, 1985. Prices for one category of gas would continue to be regulated until July 1, 1987. Figure 3 shows the various categories of ceiling prices.

[35] The NGPA was passed in November of 1978. The Shah left Iran in January of 1979.

had been more or less in line with the market, were, a few months later, once again too low.

Interstate pipelines and intrastate pipelines were now competing with each other but they could not compete on price except for gas produced from new, deep wells. The deep-well gas was very minor part of production and almost all gas had price controls. In that situation buyers competed in the non-price terms. New contracts committed the pipeline to pay for the gas whether they took it or not. These so called take-or-pay contracts became standard. Also the pipelines agreed to astronomic prices if and when the price controls were removed. When I questioned these practices, one pipeline executive told me, "This will probably end up in court but that is why we have lawyers. Right now we need the gas."

5. The Gas Bubble

High oil prices and rising gas prices continued to fuel the expansion in drilling activity that had begun in response to the earlier Arab Oil Embargo. In 1981, 20,250 gas wells were completed, five times as many as had been completed in 1970. The increased drilling paid off, and in 1981 reserve additions exceeded production for the first time since 1967. The higher prices allowed by the NGPA had elicited the desired response in gas supply.

Rising prices also reduced the demand for gas. In 1982, a weak economy, falling oil prices, and conservation all combined to yield a six percent drop in gas consumption. In the following year consumption declined by an additional seven percent. Although there was some recovery in 1984 and 1985, gas consumption reached a modern low in 1986, some twenty-six percent below the peak experienced in 1972.

The continued increases in gas supply and declining gas demand resulted in a significant oversupply of gas. Although it was not immediately obvious to participants in the industry, by late 1982 and certainly by early 1983 the industry began to switch from a shortage mentality to a

surplus mentality. The phrase "gas bubble" was used to describe the new supply-demand imbalance.[36]

Because of the gas glut many producers found that their gas was shut in. Some estimates suggested that only two-thirds of the gas that could be produced was actually being produced. The producer could take a chance on collecting take-or-pay money from the pipeline or they could recognize the new market conditions and move on.[37] Many of these producers were willing to take a reduced price if they could flow more gas.[38] Although that sounds like a simple enough proposition, in both the interstate and the intrastate markets there were significant contractual and regulatory barriers that had to be overcome.

The industry in the early 1980s was in complete chaos. It had gone from surplus to shortage to surplus in a few, short years. The existing regulatory and commercial practices had dramatically failed and no one had much of an idea where things were headed. Many feared a return to shortages. The industry needed new ways to do business. Regulations at both the State and Federal levels had to be reformulated. No one knew how this was going to work. New procedures and new protocols were developed on the fly.

Perhaps a few examples will provide a picture of the problems the pipelines faced. Certainly the chaos was not unique to Enron or its predecessors. At one pipeline the accounting vice president considered putting on a second shift to handle the increased complexity. At another they couldn't keep up with the billing and payments and spent several million dollars on a

[36] Figure 6 shows the imbalance in the gas market that became known as the "Gas Bubble."
[37] Many gas purchase contracts required pipelines to pay for gas whether taken or not. These clauses were referred to as *take-or-pay*. A lot of the litigation in the 1980s between pipelines and producers revolved around take-or-pay issues. Also FERC had to address how these costs would be treated in pipeline rate cases.
[38] Gas not produced today will not be produced for many years. In other words, you cannot just produce twice as much the next day. As a result, producers will rarely voluntarily shut in wells. They would rather take a reduced price and continue to flow gas. Pipeline bankruptcy was also a possibility, and most producers figured that the pipelines were worth more alive than dead. Figure 7 and Figure 8 show the declining prices in the interstate and intrastate markets.

computer system that in the end did not work.

The pipeline back offices were simply overwhelmed. For instance, GasMark (the company I established) owed El Paso Natural Gas over a million dollars for transporting our gas to California. When we contacted El Paso they thanked us for the information but told us they had "bigger fish to fry" and said they would get back to us. A year and a half later they finally sent us a bill.

Eventually institutions were put into place to once again bring stability to the industry, but, for the moment, it was an exciting and frightening time to be in the gas business.[39] Out of this chaos Enron emerged as a recognized, national leader in the gas business and Ken Lay became the spokesman for the industry. While Enron was not the only company involved in these developments, it was the company which most aggressively embraced the new order.

[39] It is difficult to convey the level of trauma experienced by individuals in these companies. There were shouting matches, tears, and nervous breakdowns. Managers went AWOL. Companies were constantly suing each other and a few employees took advantage of the situation to engage in criminal activity. Kickbacks of one sort or another occurred. A man I had worked with at UGPL evidently took side payments on a sales contract. I thought I knew him well. He had been a Colonel in the Air Force and Commanding Officer of the airbase in Shreveport, Louisiana. He invited me to lunch one day and asked me to adjust one of our published index prices. I refused even though he said it would mean a lot to him. He ended up in prison.

IV. Rationalizing the Industry: 1985-1993

It seemed clear by 1985 that the merchant function, that is, the buying and selling of gas, needed to be separated from the transportation function, that is, the pipelines. This process was known as *unbundling*. Unbundling had already been tried on a limited basis, but it was viewed as a temporary expedient. Now it was seen as the future. Unbundling required dramatic changes in the regulatory structure especially at the Federal level. Those regulatory changes were but the first step. A whole new set of business customs and practices had to be developed to handle what had previously been managed within the individual pipeline companies. Enron, formed in 1985, was a key player in both the regulatory transformations and the development of new business institutions.

1. Regulatory Unbundling

The separation of the merchant and transport functions required regulatory action by the TRC and by FERC. The TRC had required intrastate pipeline purchasers to take an amount of gas from each well on their system according to a formula based on a well's production capacity. This meant that a producer could not gain market share by reducing the price he was asking for his gas. In 1986, the TRC decided that gas sold to a marketing affiliate of the pipeline would not be combined with the pipeline's purchases for purpose of administering the market allocation rules. Thus producers wanting to sell more gas could simply sell to the marketing company and bypass the pipeline as a purchaser.[40] With this decision the floor that had kept prices from declining was effectively removed and prices could move upward, or downward as the market dictated.

[40] The industry in Texas had already moved to this new structure, but some, primarily smaller, producers wanted the TRC to combine the purchases of the pipeline and its affiliated marketing companies for the purpose of applying the market allocation rules. This would have continued to limit competition and would have kept prices from adjusting downward. I testified before the TRC that the result of such a policy would be to move production to New Mexico, Oklahoma and Louisiana with Texas absorbing all of the excess supply. The affiliated marketing companies were known as Special Marketing Programs or SMPs. A bumper sticker widely seen in Houston at the time read, "If SMPs are outlawed, only outlaws will have SMPs." The TRC eventually recognized marketers, including the SMPs, as separate purchasers for purposes of market allocation. Figure 9 shows the shift from sales to transport in the Texas intrastate industry.

The situation with the FERC was more complicated because the relationships between a pipeline and its suppliers and customers were embodied in tariffs that could not be changed without the permission of FERC. To go through each of the thousands of tariffs in existence would have been impossible so FERC started issuing blanket rules that applied to all pipelines. Even the promulgation of these blanket rules required lengthy hearings. Beginning in 1984 with Order 380 and culminating in 1992 with Order 636, FERC methodically unbundled the interstate segment of the industry. [41]

2. Gas Marketers

With unbundling you no longer had to own a pipeline to buy and sell gas. There were marketers associated with pipelines and marketers associated with producers. Some large gas consumers established buying agencies. There were also independent marketers. All it took to open a gas marketing business was a phone and a fax machine. I started GasMark, an independent marketing company, in 1985 with $500,000 in capital and we were quickly trading tens of millions of dollars of gas a month with no credit checks. The idea that someone might not pay for the gas delivered was of less concern than just getting the gas flowing. Very small marketers were known as "barking dog brokers" since when you talked to them on the phone you could hear the screen door slamming shut and the dog barking in the backyard.

Perhaps the most important thing for a marketer was information. Pipelines knew who the producers were and who the customers were on their system, but that information was essentially confined to the pipeline company itself. People wanting to market gas needed to know who the

[41] In 1984, Order 380 eliminated minimum bills in pipeline sales contracts so that the customers of interstate pipelines could shop for gas. In 1985, Order 436 encouraged interstate pipelines to unbundle by giving them a blanket transportation certificate so long as the pipelines did not discriminate among shippers. In 1988, Order 490 allowed the abandonment of producer supply contracts by the interstate pipelines. In 1992, Order 636 required the unbundling of sales and transport on interstate pipelines. Figure 10 shows the shift from sales to transport in the interstate industry.

producers were and who the consumers were. They had to know which pipelines could be used to get from point A to point B. My consulting company, Energy Planning, sold a directory of major natural gas consumers in the United States for $50,000 each. That price was justified because a marketer could easily make up that amount on a single sale. With this level of profit potential, people were pouring into the business.

3. Contracts

Prior to unbundling, gas was bought and sold under long-term gas contracts between the pipeline and its suppliers and customers. Now it was necessary to include the marketers in the loop. Initially these new contracts were month-to-month, meaning either party could opt out at the end of the month. Additionally the deals were done on a *best efforts* basis. That meant that there was no guarantee that the gas would show up. Although *best efforts* was intended to cover the possibility that the gas would be recalled by the pipeline, this provision was often abused. If a higher price were available from another buyer, a marketer might simply shift the gas there. This became known in the industry as *price majeure*[42] and resulted in several lawsuits. Eventually purchase contracts and transport contracts became either *firm* or *interruptible*. Firm contracts carried a higher price but you were guaranteed the gas would be there.

4. Spot Pricing

Pipelines had not typically tried to match the price they bought gas at to the price they sold it at since their sales contracts allowed them to pass through their gas costs to their customers. Marketers had to balance the price they paid to the price they charged. That was a new experience

[42] This is a play on words. Many defendants in gas contract litigation evoked the *force majeure* clause of their contract as a defense. The *force majeure* clause excused what would otherwise have been non-performance under the contract if totally unexpected developments meant that the contract could not be performed as originally anticipated. Examples of a *force majeure* events include hurricanes, ice storms, and explosions. Of course just getting a better offer was not a *force majeure* event.

for everyone. Producers wanted to get the best price possible but they also wanted their gas to be sold. Consumers wanted to buy gas as cheaply as possible. Initially there were no public price reports to establish value, and everyone wondered if they were getting a reasonable deal.

Panhandle Gas, a marketing subsidiary of Enron, was one of the first companies to buy gas using an index. Each month they negotiated a price with their customers. Then Arthur Andersen would calculate a *Weighted Average Sales Price* (WASP) for that month. The producers would be paid a percentage of Panhandle's WASP. Eventually industry newsletters began publishing price indexes which were determined by telephone surveys of the people buying and selling gas. The idea of tying the contract price to an index was a novel concept at the time. As late as 1989, Energy Planning was able to attract over one hundred people to a conference on how to use price indexes in gas purchase contracts.

In addition to the need to have public price information, the industry had to restructure pricing to reflect the way gas was now being traded. As the market developed, the trading window went from monthly to daily. Whereas the first indexes were published once a month, now the price was being set daily and contracts began to reference prices that were gathered from surveys conducted in the afternoon and distributed the next morning before trading began.

Also it was necessary for the market indexes to reflect the regional variations in pricing. Under the NGPA, all gas, no matter where it was located, was given the same ceiling price. Since the market price was greater than the ceiling price prior to 1982, gas in Montana got the same price as gas on the Texas Gulf Coast. Obviously that was not an accurate reflection of the relative market value of gas from these sources. In order to provide a geographical structure to the market, trading hubs were identified where several different pipelines came together. For example, gas indexes

were published for the Houston Ship Channel,[43] California Border, and Chicago City Gate. In order to determine the price for a particular package of gas, you started with the price at the closest hub and either added or subtracted a transportation fee.

5. Operational Innovation

Before the spot market emerged, pipelines pooled their gas supply and sold to their customers out of this common pool. Production from a particular well was not tied to deliveries to a particular consumer. Gas flows were controlled by field operations personnel and at the end of the month the accountants figured out who to pay and who to bill. Now with deals done early each morning, daily flow nominations had to be made to the pipeline transporters. Pipelines were informed one day in advance where gas would come from and where it was to be delivered. Valves had to be opened or closed; compressors turned on or off; meters had to be read. A broker could do a deal in a few minutes but then he had to arrange for the gas to actually flow. In the days before the internet this was done by phone with a fax confirmation.[44]

6. Gas Accounting

In the early 1980s a lot of the accounting for gas was done on paper or with very primitive computer systems. With long-term contracts and monthly pricing, it was possible to do business that way. The speed and complexity of commercial activity in the spot market could not be managed with the existing accounting methods. Computers were required to keep up with the greatly increased flow of information, and, although there had been significant advances in

[43] The Houston Ship Channel (HSC) runs approximately fifty miles from Galveston on the Gulf of Mexico through Galveston Bay to Houston. It is home to some of the largest petroleum refineries and chemical plants in the world, most of which consume copious amounts of natural gas. Given the quantity of gas purchased there each day and the price sensitivity of those consumers, the HSC index was one of the best indicators of the current value of gas.

[44] It took a while for employees to adjust to the new way of doing business. At a deposition I attended in New Mexico, a field operator testified that they ignored the dispatch orders from the central office and just made sure that the total amount of gas was delivered without regard to which wells the gas came from. The attorney for the pipeline was not too happy to hear that.

computer hardware by this time, the software necessary to keep track of the deals simply did not exist. Here again Enron took the lead, outsourcing all of their computing to Electronic Data Systems (EDS), a major supplier of data management services to the Federal government.[45] By the late 1990s, off-the-shelf systems were available which allowed a deal to be entered and would automatically send nominations to the pipeline transporter and confirmations to the counter parties. These programs then linked to the company's gas measurement database, sent invoices, printed checks, and provided data to the accounting system for financial reporting.

7. Natural Gas Futures

With natural gas now trading as a commodity and pipelines no longer acting as merchants, the price risks moved from the pipelines to the producers, marketers and consumers. A producer might buy a group of wells, only to find that a month later gas prices had collapsed. A seasonal user of gas could find prices spiking exactly when he was in the market. Other commodities had long established futures markets which offered a way to hedge against price changes and shift risks to others, usually at a minimal cost. Some fixed-price contracts for gas existed, but the industry needed a full-fledged, publicly-traded futures market.

In April of 1990 futures contracts for gas began trading on the New York Mercantile Exchange (NYMEX).[46] The NYMEX contracts were for one month's deliveries in constant daily volume at the Henry Hub in south Louisiana. Although commodity trading was a well-established business, commodity brokers knew little about the gas business, and gas marketers knew little about trading futures. Many in the gas industry thought the name of the game was speculation. All

[45] EDS was the company founded and owned by Ross Perot. They purchased Enron's computers and hired most of Enron's information technology (IT) employees.

[46] An article on the initiation of gas futures trading in *The Wall Street Journal* (April 2, 1990) quoted me as observing that "Gas is not like soybeans or corn." Twenty-five years later, that comment still seems incredibly insightful.

you had to do to make a fortune was outguess the market. It was an area wrought with peril for the inexperienced. For some it involved placing large bets, often with other people's money.[47]

Even for the more sophisticated gas marketers, the infrastructure to engage in commodity trading had to be built from scratch. Trade rooms and the computer systems necessary to keep track of your positions all had to be developed. To the extent there were off-exchange transactions, new contracts and new ways of communicating with counter parties had to be developed. It was not enough to merely embrace the concept of *natural gas futures*, real innovation was needed and real capital had to be invested.

Enron was a leader in this process and perhaps most aggressively embraced this new world order. Unfortunately for Enron, as the gas futures market matured, larger, more established commodity brokers entered the arena. Banks and investment houses began to trade gas futures and, in some cases, they entered the physical market for gas. For them gas was just another commodity. Traders didn't need to know the painful history of the gas business; they just had to watch the prices on the screen and run their pricing models. The margin on gas trading was continuously under competitive pressure. While it was possible to make money trading futures, it was hardly an area where Enron had a competitive advantage.

[47] I testified in several bankruptcy and breach of contract trials that involved gambling on the future price of gas by taking a fixed-price forward position. Eventually companies required traders to have a balanced book each day by offsetting sales positions with purchase positions. Risk managers could then evaluate the net position of the company each evening. Regulators also misunderstood the concept of futures trading. I had to repeatedly explain to the staff at the TRC that futures trading was not a way to save money but a way to reduce risk for a seasonal purchaser. In New Mexico a pipeline was chastised for not hedging their purchases and ending up paying very high prices one winter. The next year they hedged their purchases and again ended up paying very high prices when the market price declined.

V. The Party Is Over: 1993-2001

Two regulatory initiatives marked the end of the transition to the new, market-driven gas industry. The Natural Gas Wellhead Decontrol Act of 1989 mandated the removal of all wellhead price controls by January 1, 1993. Although the vast majority of natural gas was no longer subject to price ceilings, this act marked a definite end to all price ceilings as of a date certain. Issued in 1992, FERC Order 636, known as *The Restructuring Rule*, ordered interstate pipelines to unbundle their operations into transportation and marketing. Intrastate pipelines had gotten there long ago, and now FERC was telling interstate pipelines that they could no longer combine the merchant and the transport functions.[48] The transition was complete.

Commentary on regulated industries often focuses on the battle over deregulation. Actually, for the natural gas industry, that was the easy part. Pressure from the international energy markets made continued regulation of natural gas prices impossible. The hard part was building new institutions to replace the old ones. Enron played a key role in that process and Ken Lay grew to prominence in the industry during this period. As a result, Enron made a lot of money and enjoyed rapid profit growth. The experience of building a functioning company and an efficient industry out of this chaos shaped Enron's strategy going forward.

With the maturation of the physical gas markets, the opportunities for high margins and continued growth disappeared. Information was readily available from public sources, standard

[48] From FERC Order No. 636: "As discussed above, the Commission has found that the current regulatory structure, and in particular the pipelines' existing bundled, city-gate, firm sales service, is and will continue to be an unreasonable restraint of trade which causes competitive harm to all segments of the natural gas industry because, among other things, it provides the pipelines with an undue advantage and subjects other gas sellers to an undue disadvantage. Therefore, the Commission has found that the pipelines' bundled, city-gate firm sales service violates Sections 4(b) and 5(a) of the Natural Gas Act. Accordingly, the Commission is adopting remedies that must be complied with as soon as possible to remedy the violations of the Natural Gas Act promptly and to eliminate the anticompetitive conditions that currently exist. To that end, the Commission seeks to ensure that all pipelines will be in full compliance with the final rule for the 1993-1994 winter heating season." FERC expected that many of the pipelines could unbundle in time for the 1992-1993 winter heating season, but they gave them an extra year if they needed it. (Federal Energy Regulatory Commission, 1992) p 215.

contracts were published by industry trade associations, and off-the-shelf accounting systems could be purchased at reasonable prices. Many smaller brokers were driven out of business, and the companies that remained had to show adequate credit for the deals they were doing. The gas business could be profitable but the go-go days were over. Enron's growth would have to come from elsewhere.

1. New Horizons

Faced with the end of opportunities for rapid growth in the gas business, Enron had to find other venues to conquer. It should not be surprising that they sought to repeat the industrial transformation that they had witnessed and experienced in the case of natural gas. The game plan was to tear down the old institutions, be those industry custom and practice or government regulation, and then commoditize the target industry. It happened in gas. Why couldn't it happen elsewhere? They knew how to do it, or at least they thought they knew how to do it.

- *Electricity*

Electricity was an energy product and a lot of electricity was generated using gas. It seemed like a good fit for Enron. The company became involved in several co-generation (cogen) projects in the United States and abroad.[49] They successfully built and put into operation a cogen plant in Turkey. In India, they negotiated favorable terms for the sale of electricity from a massive new generation plant at Dabhol. Enron built a power plant at Teesside in England. They bought Portland General, a major electric generator in the Pacific Northwest. Enron, however, encountered many obstacles in their attempts to enter the electric business. The first was that governments were not necessarily ready to go along with Enron's enthusiasm for deregulation.

[49] Cogeneration combines the generation of electricity with an industrial process that utilizes the waste steam from the electric turbines.

At Portland General, Enron began to trade in the newly opened California electric market. Accustomed to operating in the more mature gas markets where trades were "no holds barred," the Enron traders exploited flaws in the regulatory structure that California had designed. California and FERC regulators did not appreciate Enron's gaming of the system. Eventually the Justice Department also weighed in.[50]

At Teesside they entered into what turned out to be a very unfavorable gas purchase contract based on their understanding of the price of electricity to be set by the regulator. When regulators allowed electric prices to decrease, the project quickly became unviable.

In India, even though Enron was able to negotiate a favorable contract with the government, the deal was simply not feasible given the income levels and state of economic development there. While local politics played a role in the demise of the plant, Enron executives could not understand that, though there was a great need for electricity, the people simply could not afford its cost.

Another obstacle facing Enron in the electric markets was the existence of established electric utility companies which were not excited about Enron entering their territory. With reduced regulation of the electric wholesale markets and opening up in some states of the retail market for electricity, these utility companies were eager to take advantage of the new opportunities themselves. Many of them were as big as or bigger than Enron and they were not going to voluntarily let a newcomer into the game.

- *Water, Paper, Broadband, Movies, etc.*

[50] The establishment of new regulations for the California electricity market illustrates the dangers inherent in quickly restructuring an industry. Not only did some companies exploit the flaws in the new rules, but the public authority responsible for purchasing electricity itself gamed the system. One might have hoped that FERC could have moved faster to restructure the gas industry, but by taking the time to carefully consider how things would work and by involving all segments of the industry in their deliberations, FERC had relatively few problems implementing their new rules. On California electric deregulation, see (Rossi, 2005) pp 86-87.

At times it appeared that there were no management filters on the projects that Enron pursued. It was not that individually these concepts were necessarily ridiculous. It was that there was no carefully considered plan as to how to proceed. Ideas need money, personnel, and time to come to fruition. It is never enough to just have a good idea. Management is always bombarded with "good" ideas. Management, especially senior management, has to select which projects to pursue and to establish a business plan for that pursuit.

In the United States, they explored paper, broadband wires, and the electronic distribution of movies.[51] In each case the game plan revolved around restructuring an industry often accompanied by some sort of decontrol and then placing an unrealistic value on the business. At this point it was becoming increasingly obvious that Enron was inflating their valuation of these projects.

2. Mark-to-Market Accounting

Even if one believed in all the various schemes that were circulating through Enron at the time, the reality was that these ventures would take a long time to produce any real income. Enron's profit goals and the maturation of the gas industry meant that it needed ventures that could make immediate, significant contributions to their bottom line. Mark-to-market accounting offered a way to accelerate the booking of profits.

Mark-to-market accounting is not inherently evil. People regularly use it to evaluate their stock investments or home value. If you own a mutual fund, the value can be determined daily by looking at the prices of stocks in that fund's portfolio. Both Fidelity and Vanguard allow an investor to easily mark-to- market his investments each day. If a neighbor sells his house, you get

[51] The movie deal was to be done with Blockbuster, a firm that already offered movie rentals through storefronts. Blockbuster almost immediately disavowed the gigantic value that Enron put on this deal.

some idea of what your house might be worth. In Texas, property taxes are based on an annual mark-to-market evaluation of homes throughout the state using recent sales of comparable homes.

Most businesses, however, typically record the value of their assets at "book value," that is, the value of the asset at the time it was acquired or constructed. For fixed assets, *Generally Accepted Accounting Principles* (GAAP) require that a company must recognize on their books any significant reduction in value but cannot recognize increased value unless certain specific criteria are met. For example, if a company buys a truck and it loses ten percent a year in value, the company reduces the value each year by that amount and records a charge for depreciation on its income statement. We might call this mark-to-market in the downward direction.

For long-lived assets in an inflationary economy, the value might actually increase over time. It is not unusual for companies to be worth more than their book value and in some cases this is due to an appreciation of their assets. Consider an oil company that has wells whose book value is based on the cost of drilling the wells and installing wellhead equipment. If the price of oil increases, the wells might be worth much more than their historic, book value. Yet the company could not increase the value of the asset on the balance sheet even though its stock price might increase as investors themselves *marked* the company's assets to market value.

Ken Lay believed that companies should be able to adjust the balance sheet value of their assets for increases as well as decreases in asset values. Lay was open about his belief and enjoyed lecturing the energy industry and others about how the big oil companies were just coupon clippers. Lay believed that a company made its money when it put a project together: The revenue stream might be spread out over many years, but a successful project immediately added value beyond its cost. Of course, with every project the owner hopes it will be worth more than it cost to build.

Lay's philosophical position was that if Enron developed a cogeneration plant, they should be able to record as income the difference between the cost of the project and its completed value, as opposed to the traditional accounting treatment which would record income from year to year as the project operated. In fact, there was a way under GAAP to accomplish what Lay wanted to do. If you sold part of the project to a third party, even a relatively small part of the project, you could write up the value of the asset on your books. The idea was that if outsiders were willing to invest, a market value could be determined for the asset. In other words, there has to be a market to mark to. With widely traded securities or commodities, the market is set daily at the exchanges. It is harder to determine the value of a fixed asset and thus a legitimate sale has to occur. After that sale, a company could increase the book value of the asset and that increase could be recorded as income thus boosting the reported profits of the firm.

GAAP does not allow a company just to make a forecast of what the future holds and mark up the assets based on that forecast. The future is inherently uncertain. The longer the time horizon, the more uncertain it becomes. Placing your bets on computer modeling is extremely risky business. In the final analysis, prices may go up or go down. As we have seen energy prices have been quite volatile over the past forty years. No one really knows what the future holds. When a company writes up an asset, even if does so legitimately, it increases the probability that it will have to write down the value of the asset in the future. Leaving book value below market value provides some comfort that income will not take a hit when an asset falls in value.

Another problem with using mark-to-market accounting is that writing up assets does not produce any cash. The write-up produces an entry on the income statement and hence increases reported profits, but all of that increase is captured on the balance sheet in the asset itself and not in the checking account. In any business cash is king. Cash allows you to pay employees, to buy

equipment and materials, and to pay debts and taxes. Cash is tangible. It can be counted coming in the door and going out.

Enron management did not pay too much attention to cash flow. Their focus was on the "bottom line" profit. When new accountants were brought in at the very end of the company's life, they were surprised that no one seemed to have a handle on the company's cash position. Because Ken Lay strongly believed in the efficacy of mark-to-market accounting, he apparently had not thought through the implications of this accounting treatment for cash flow. For this reason he viewed Enron's collapse as a "classic run on the bank." A bank run occurs when a bank cannot meet depositors demand for withdrawals even though the assets on its books exceed its liabilities. Believing, or at least claiming to believe, that the assets on the books were real, Lay just saw a cash flow problem. In fact, bankers and other sources of cash began to doubt the value of Enron's assets and cut off their flow of funds. As it turned out, a good part of those assets were worthless.

While mark-to-market accounting is widely used, and is appropriate for some purposes, it was clearly a big part of Enron's surprising collapse. By taking all of the future earnings from a project to the current bottom line, Lay put Enron on a treadmill that had to run increasingly faster. The company had to continuously come up with new projects since it had already booked the earnings of previous ones. Big deals are hard to find and take time to develop. Managers were under constant pressure to "complete" a project so it could be booked. New ideas got increasingly bizarre and unworkable. Water, paper, electricity, broadband, and movies were marginal ideas at best and certainly would take too long to develop to fit Enron's time schedule. Enron booked huge "profits" in these areas even when they were little more than concepts.

Andy Fastow, as Enron's Chief Financial Officer, was responsible for the company's financial arrangements which included borrowing and implementing the asset sales necessary for

mark-to-market accounting.[52] When Enron's bankers balked at accepting some of the assets, he strong-armed them into providing funds by threatening to cut them out of all Enron investment opportunities. Most bankers and investment conduits did not want to lose their Enron business and went along with Fastow for a while. When these tactics were not enough to attract capital, Fastow bribed individuals at the banks to provide money. Eventually, he formed investment partnerships using family and associates to provide minimal funds which were then leveraged through a series of complex maneuvers that hid the actual funding sources.[53]

Many of the descriptions of Enron's collapse focus on Fastow's fraudulent activity, activity that provided the cover that allowed Enron to unrealistically write-up asset values. This misses the true story. Ken Lay's business strategy was flawed. It was simply unrealistic to pursue so many divergent development paths with the amount of capital available to the company. Fraud did not cause Enron to implode. With or without Fastow's fraud, it was just a matter of time until Enron collapsed.

[52] When others within the company questioned what Fastow was doing, he managed to get them moved out of the finance department.
[53] Fastow also benefited financially from some of these partnerships.

VI. Conclusion

The stability of the gas industry over the thirty years following the Natural Gas Act of 1938 had been based on institutional and market factors. The basis for this stability began changing dramatically in 1968. As a result of those changes, the entire natural gas industry had to be restructured. Enron and its predecessors played a key role in that transformational process. Growth opportunities in the gas business greatly diminished in the early 1990s as the gas industry's restructuring came to completion.

There were many indications of the efficiency of the gas market by this time. The average daily price for gas was equal to the average monthly price, indicating the lack of arbitrage opportunities. Average peak-season prices differed from average off-season prices, only by the cost of storage. Marketers were making a one percent margin on arranging deals; a price that reflected the cost of providing that service. Fully implemented natural gas accounting software was available off-the-shelf. Standard contracts were in use throughout the industry. There simply were no large economic rents left in the gas business.

The downfall of Enron came from this maturation of the gas business and from Ken Lay's response to that development. With the opportunities for bold new initiatives in natural gas diminishing, Enron sought to find new industries to conquer. Their formula was to commoditize an industry by setting up trading platforms and reducing government limitations on operations. Enron thought they could be the catalyst that brought change to other moribund industries, but their strategy was flawed from a number of perspectives:

1. The company's success in the gas industry was, in no small part, based on the ownership of major pipelines and a wealth of corporate experience and expertise in that industry. The pipelines provided a solid income base from which the company

could deal with marketing and regulatory issues. They had neither the expertise nor the base business platform in the new ventures.

2. The company was centrally organized because historically it had only been in one business, natural gas. They failed to adequately restructure the organization to reflect the fact that they were attempting to become a conglomerate. The corporate structure was inconsistent with their strategy.[54]
3. They believed that they had been a key factor in the deregulation of the gas industry when in fact most people recognized that gas was a commodity whose price should be set by the market. Enron played an important role in the development of new business practices but they were not the causal factor in deregulation. In their new ventures they failed to win many political battles.
4. It had taken twenty-five years and a gigantic investment of capital to restructure the gas industry. It was unrealistic to think that other industries could be modified any faster. Many of the seasoned managers that might have brought a sense of perspective to decision making had retired or been forced out.
5. Fastow's fraudulent implementation of mark-to-market accounting hid the failure of the new ventures. Even when employees tried to raise the issue, Lay was not willing to listen.

Could things have turned out differently? I have observed the demise and near demise of a few large companies. It is never a pretty sight. Managers always believe that they can save the company. After the fall, investors claim that management should have been more forthcoming

[54] (Chandler, 1969).

about the company's problems. It is a fine line that separates surrender from defeat. Should management have announced earlier that the game was over?

In fact there was an alternative to the path taken by Lay: He could have gone back to the historic basis of the company. He could have gone back to the pipeline business. Energy Transfer and Kinder Morgan are examples of firms that were established in the mid-1990s that have had great success in the pipeline business. According to their website "Energy Transfer is a Texas-based company that began in 1995 as a small intrastate natural gas pipeline operator and is now one of the largest and most diversified investment grade master limited partnerships in the United States. Growing from roughly 200 miles of natural gas pipelines in 2002 to approximately 71,000 miles of natural gas, natural gas liquids (NGLs), refined products, and crude oil pipelines today …"

A similar growth path was taken by Kinder Morgan, a company founded by Rich Kinder after he left Enron in 1997. From their website, "Kinder Morgan is the largest energy infrastructure company in North America. We own an interest in or operate approximately 84,000 miles of pipelines and 165 terminals. Our pipelines transport natural gas, refined petroleum products, crude oil, carbon dioxide (CO_2) and more. We also store or handle a variety of products and materials at our terminals such as gasoline, jet fuel, ethanol, coal, petroleum coke and steel."

Enron could have pursued the strategy similar to that of these two companies, but Ken Lay was not really a "pipeliner," nor was Skilling nor Fastow. Ken Lay devised and implemented his strategy based on his training and experience in the natural gas business. It is unrealistic to think that he could have done much differently. To the end he maintained that things were okay.[55]

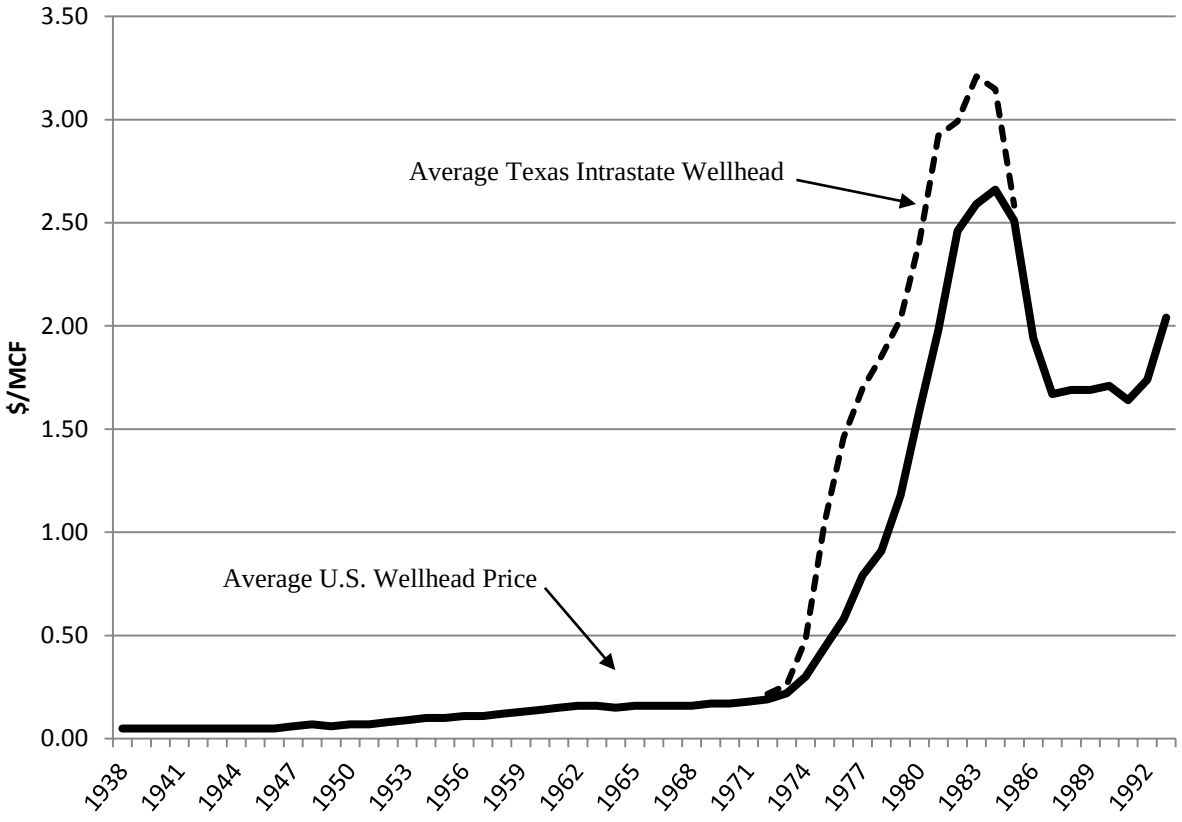
[55] Douglass North has mapped out an elegant explanation of how the path to a decision shapes that decision. In the introduction to his book, *Institutions, Institutional Change and Economic Performance*, North summarizes his understanding of institutional change thusly, "... the nature of incremental institutional change together with the imperfect way by which the actors interpret their environment and make choices accounts for path dependency and

Shortly before his death, Lay said that he should have looked for industries and markets that were already in transition. His mistake, according to him, was to think his company could compel the transition. He thought the problem was tactics not strategy. He believed until the end.

makes history relevant ..." (North, 1990) p 10. He later further elaborates, "The choices made reflect the entrepreneurs' subjective modeling of the environment. Therefore, the degree to which outcomes are consistent with intentions will reflect the degree to which the entrepreneur's models are *true* models. Because the models reflect ideas, ideologies, and beliefs that are, at best, only partially refined and improved by information feedback on the actual consequences of the enacted policies, the consequences of specific policies are not only uncertain but to a substantial degree unpredictable." (North, 1990) p 104.

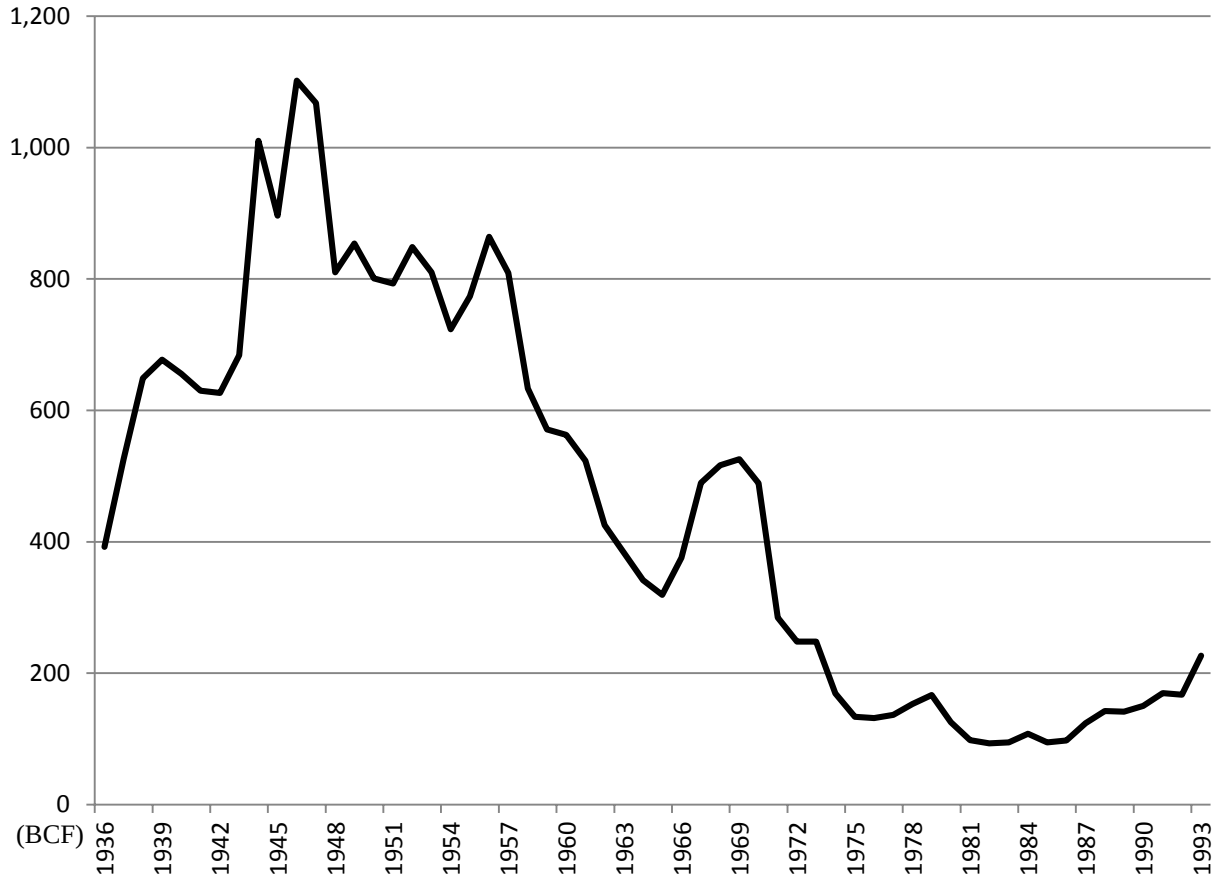
VII. Figures

1. Natural Gas Average Wellhead Prices, 1938-1993



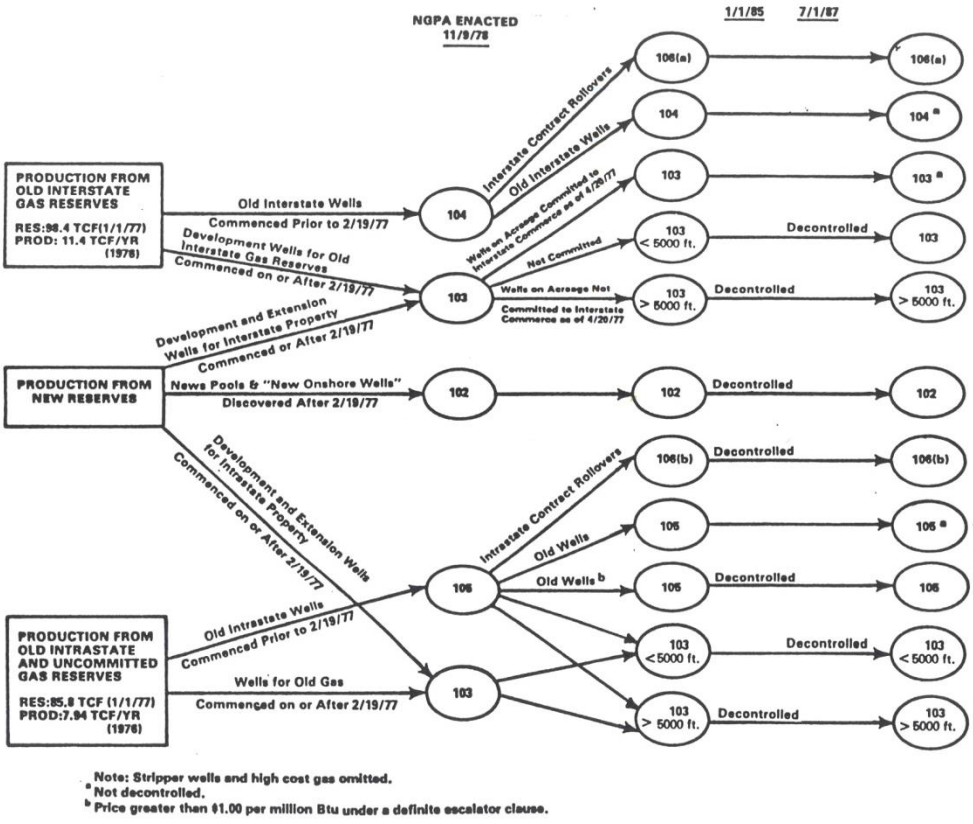
Source:
Average U.S. Wellhead Price: EIA, *http://tonto.eia.gov/dnav/ng/hist/n9190us3a.htm*
Average Texas Intrastate Wellhead Price: Data from the Railroad Commission of Texas and the Texas Comptroller of Public Accounts as compiled by Energy Planning, Inc.

2. U.S. Natural Gas Vented and Flared, 1936-1993



Source: Energy Information Agency, http://www.eia.gov/dnav/ng/hist/n9040us2a.htm

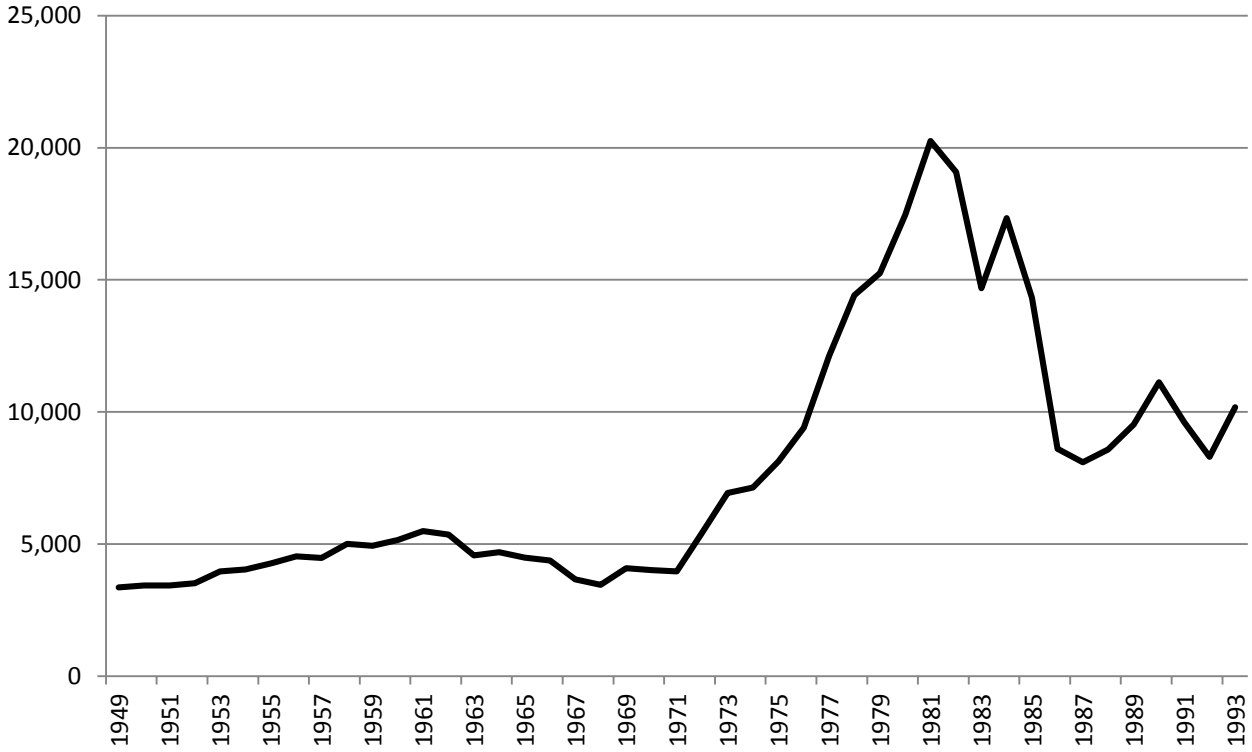
3. NGPA Price Ceilings



a Note: Stripper wells and high cost gas omitted.
a Not decontrolled.
b Price greater than $1.00 per million Btu under a definite escalator clause.

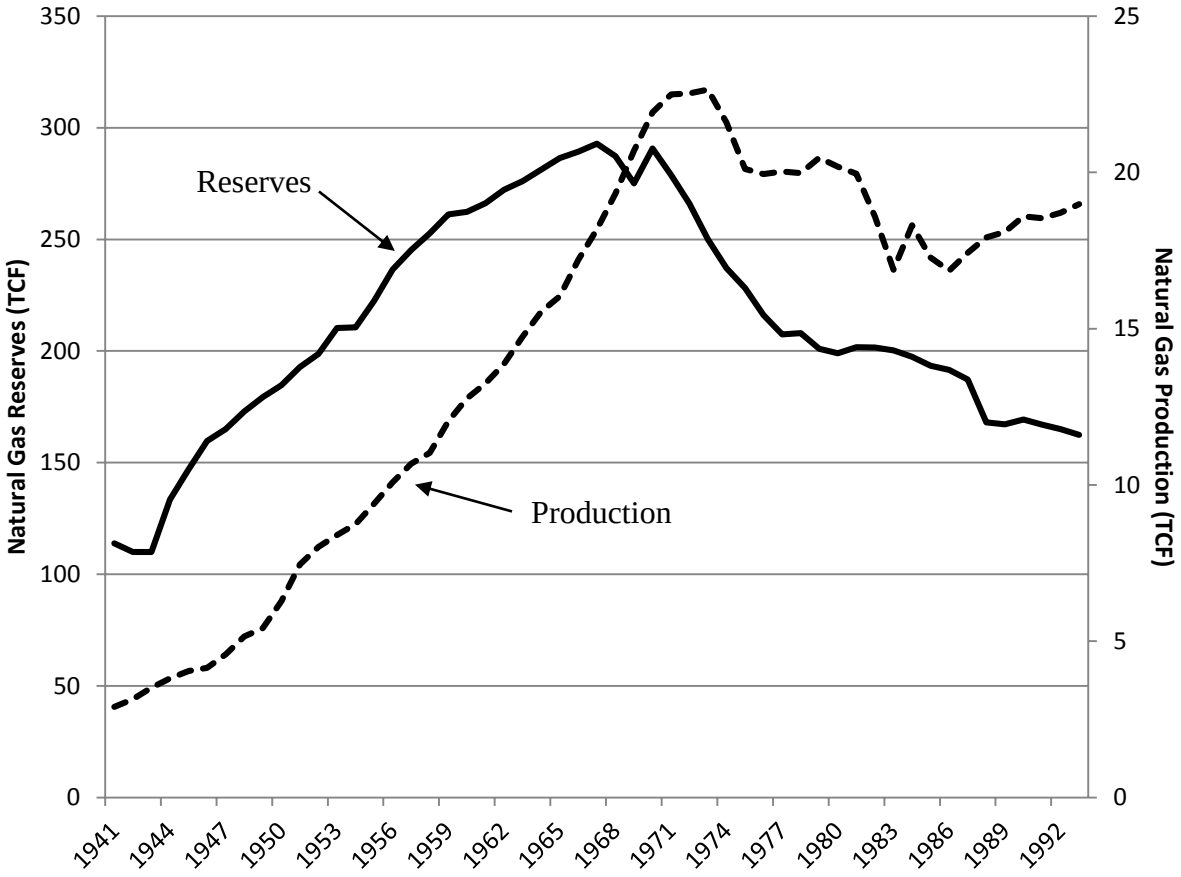
NGPA Title I Maximum Ceiling Price Categories For Onshore Lower-48 Natural Gas Above 15,000 Feet

4. U.S. Natural Gas Exploratory and Development Wells Drilled, 1949-1993



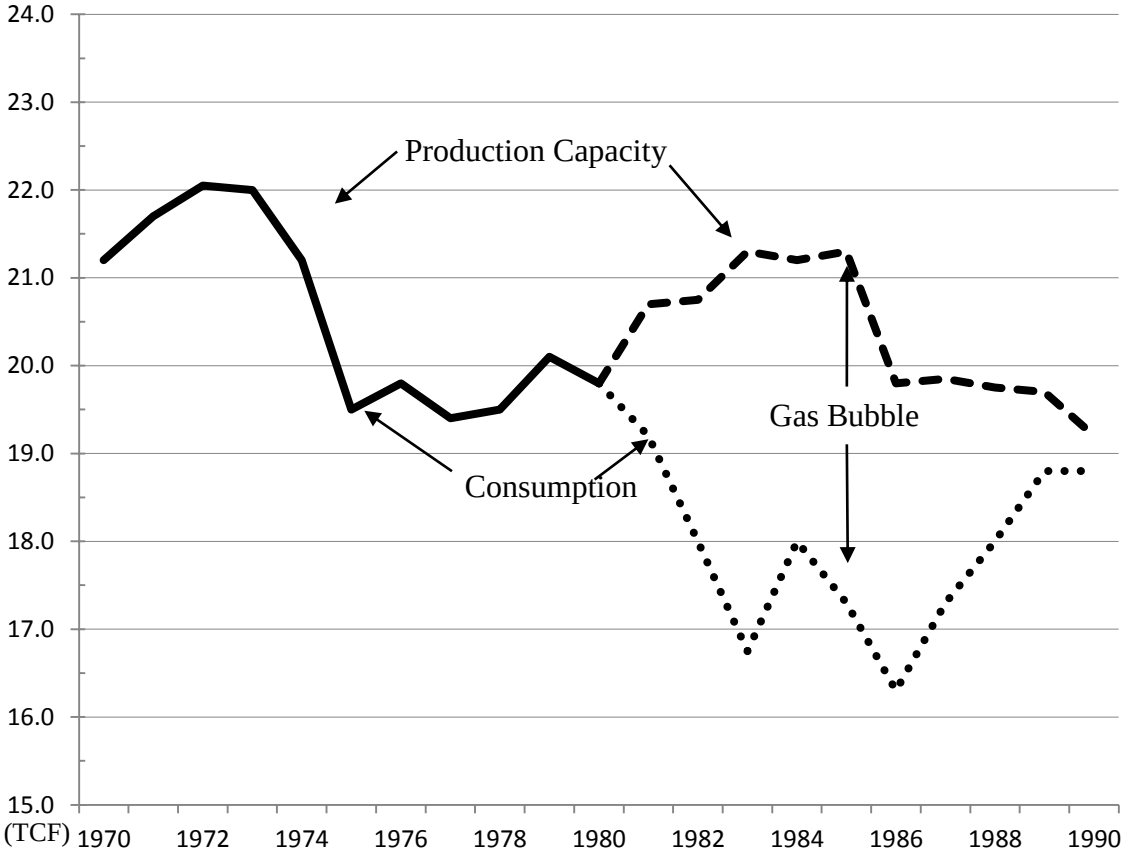
Source: Energy Information Agency, http://www.eia.gov/dnav/ng/ng_enr_wellend_s1_a.htm

5. U.S. Natural Gas Production and Reserves, 1941-1993



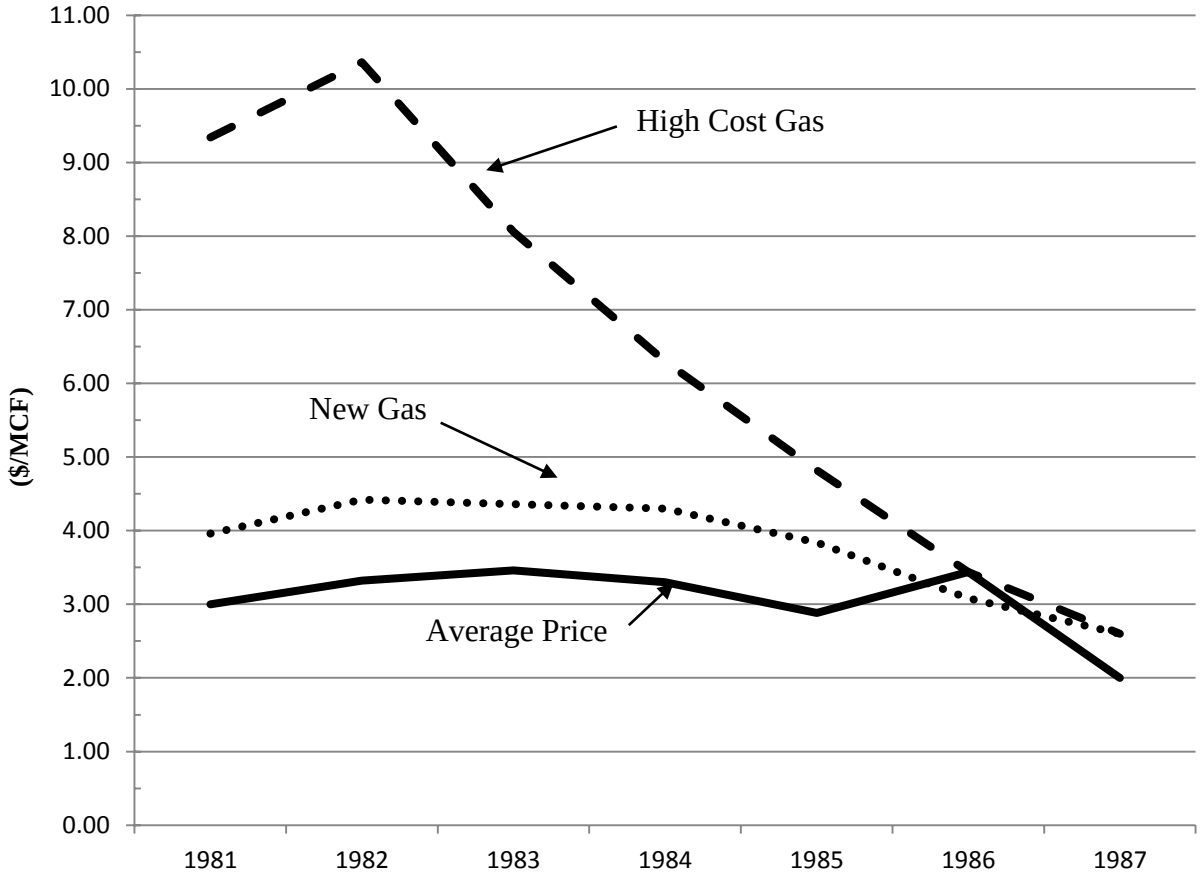
Source:
Reserves: EIA, *http://tonto.eia.gov/dnav/ng/hist/rngr11nus_1a.htm*
Production: EIA, *http://tonto.eia.gov/dnav/ng/hist/n9050us2a.htm*

6. The Gas Bubble



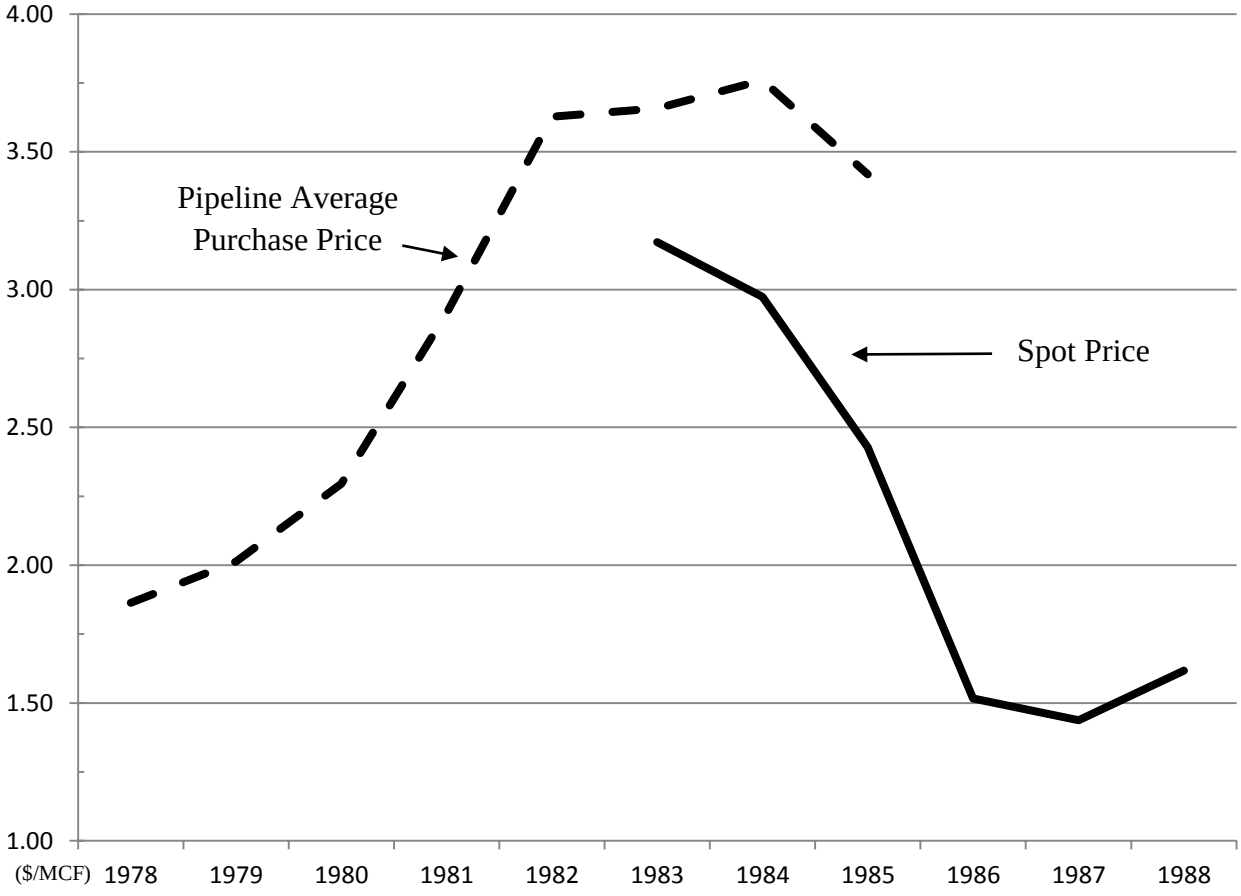
Source:
Consumption: EIA
Production Capacity: American Gas Association

7. Interstate Gas Prices, 1981-1987



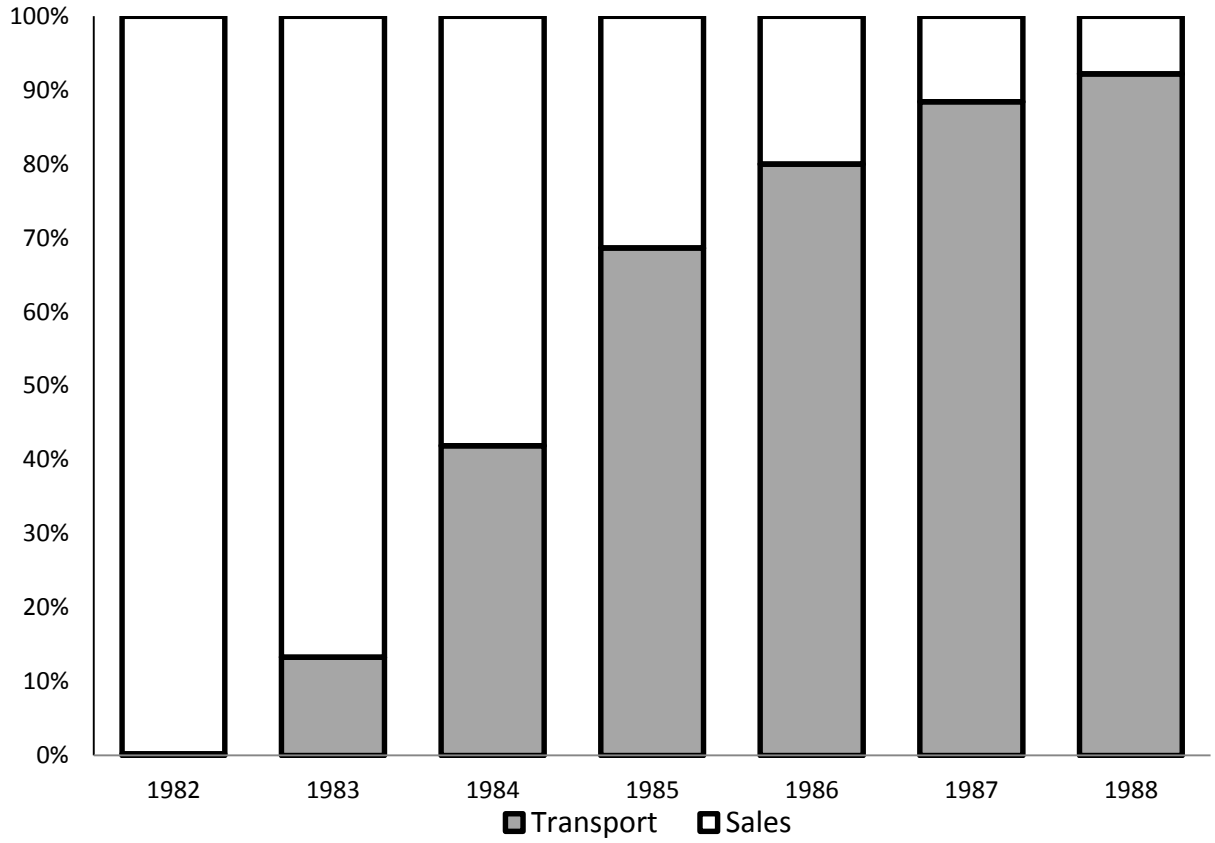
Source: U.S. Department of Energy

8. Average Purchase Price vs. Spot Price, Texas Intrastate Pipelines, 1978-1988



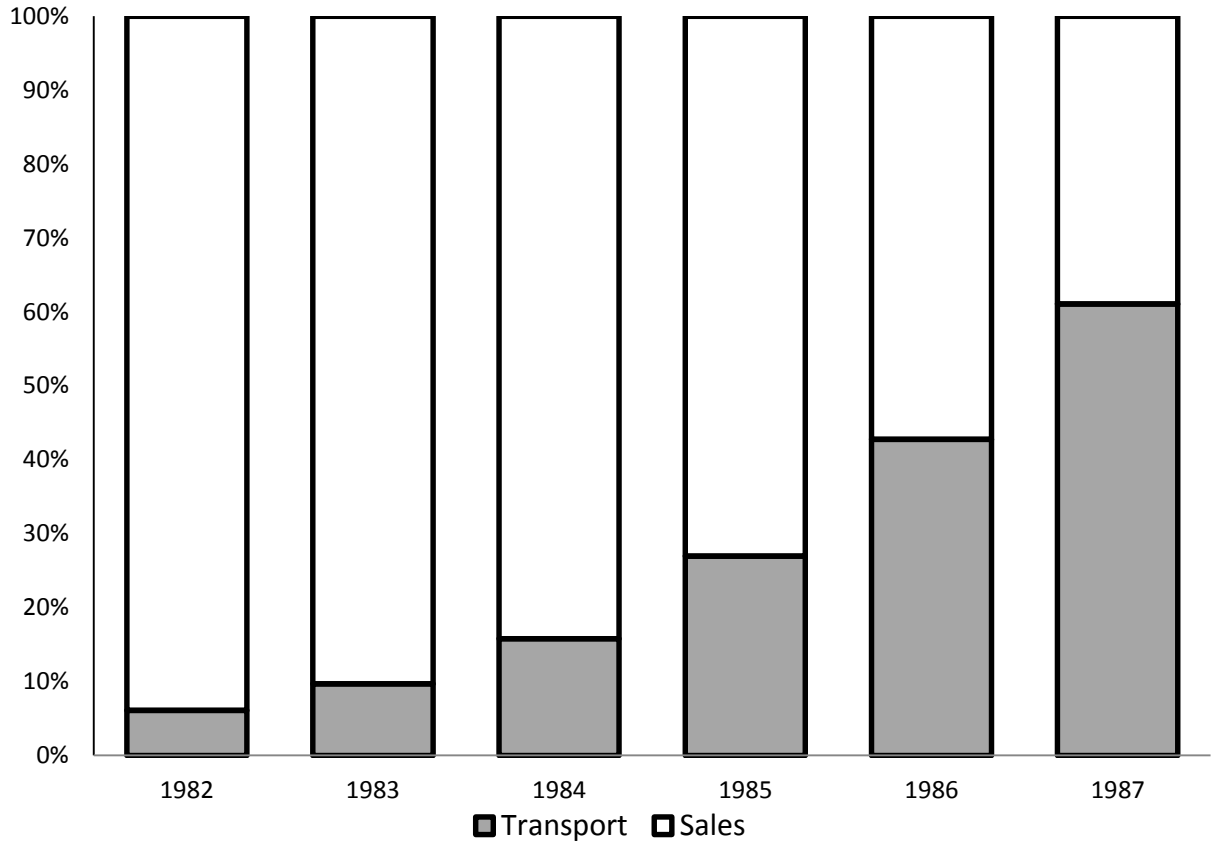
Source: Data from the Railroad Commission of Texas and the Texas Comptroller of Public Accounts as compiled by Energy Planning, Inc.

9. Texas Intrastate Unbundling, 1982-1988



Source: Based on transport for affiliated SMPs by four representative Texas intrastate pipelines as reported in their Annual Reports to the Railroad Commission of Texas as compiled by Energy Planning, Inc.

10. Interstate Unbundling, 1982-1987



Source: U.S. Department of Energy; Based on data reported by twenty major interstate pipelines in their Annual Reports to the Federal Energy Regulatory Commission.

VIII. Appendix: My Involvement in Enron

I left my position as an Associate Professor in the Social Science Department at Carnegie-Mellon University in 1979 to become a staff economist at United Energy Resources (UER) in Houston. UER was the parent of United Gas Pipe Line (UGPL), an interstate pipeline, and United Texas Transmission Co. (UTTCO), an intrastate pipeline. When I arrived for work the first day, I had no idea where these pipelines were located, how they operated, or who regulated them. Nonetheless, after six months, I was put in charge of planning for UGPL and soon after that for the entire corporation. It was a wonderful opportunity to learn the business.

Two and a half years later, along with another academic economist and refugee from UER, I started Energy Planning, a consulting company focusing on the commercial side of the natural gas business. One of our first clients was Houston Pipe Line Co. (HPL), a subsidiary of Houston Natural Gas (HNG).

In 1984, Internorth Corp, the parent of Northern Natural Gas Co., asked me to come to their headquarters in Omaha to tell them about the Texas intrastate gas industry. Northern Natural was an interstate pipeline and Internorth wanted to buy a Texas intrastate company. I told them that HNG had the best facilities and the best management in the state. I am sure they heard that from others too, and it wasn't long before they merged with HNG to form Enron. A number of lawsuits and regulatory proceedings surrounded the merger, and I testified on behalf of Enron in many of those. Until its demise in 2001, Enron was one my largest customers.

I have a detailed and intimate knowledge of Enron's business. Enron, however, was not my only customer. I did consulting work for every major intrastate pipeline in Texas and for many of the interstate pipelines. I also worked for producers, consumers, and royalty owners. I have reviewed thousands of gas purchase contracts and testified before State and Federal regulatory

agencies. Many of the events I describe here I lived through.

The timing of my decision to move back to Texas and go to work in the natural gas industry was auspicious. During the very cold winter of 1978-1979, the country was in a severe energy crisis. At Carnegie-Mellon half of the hall lights were removed to conserve electricity. I could see a small power plant from my office window that had been converted back to burning coal because gas was not available. In November of 1978, Congress passed the Natural Gas Policy Act (NGPA) in an attempt to deal with the gas supply shortage. In January of 1979, the Shah left Iran for exile, and in November of that year the United States Embassy in Tehran was seized and our diplomats taken hostage. It was not clear at the time where things were headed but it was clear that the old way of doing business was ending.

The disruptions in the energy markets that followed the Arab Oil Embargo and the Iranian Revolution created opportunities to make tremendous profits, especially for those who moved quickly. Those opportunities were commercial, rather than technological, in nature. My consulting business provided comprehensive information to the industry on the evolving commercial landscape through a series of publications and databases. I testified in numerous lawsuits as companies dealt with the contractual problems that arose as the industry was restructured. I also served as the president of two gas marketing companies and a small interstate pipeline. More information on my consulting activities can be found at energy-planning.com.

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