

Restructuring Energy Industries: Lessons from Natural Gas

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For most of this century, firms in some industries, especially public utility industries such as energy, transportation, and communications, have been publicly owned or economically regulated¹ to alleviate public fears that such firms would use market power to raise prices artificially. Many of these industries exhibited some type of scale economies, meaning that over a range of output, the per unit cost of their outputs declined as output increased. This characteristic means that a single firm would have the lowest cost of production and could monopolize the industry. Hence, these industries are treated as natural monopolies and regulated to control entry, prices, and profits.

Over time, however, economic growth and technological improvements have reduced the importance of scale economies, lowered the cost of raising large amounts of capital, and changed perceptions about the potential for economic efficiency. In many cases, these historic changes have led to new products, new delivery systems, or new providers that compete with firms in regulated industries. These economic and technical developments have raised questions about maintaining traditional industry structure and regulation. As a consequence, many industries have restructured² to rely more on competition.³ And, in the course of this restructuring, regulation evolved to accommodate changing economic realities. During the past 25 years, restructuring has occurred in such regulated industries as telecommunications, railroads, airlines, trucking, natural gas, banking, and finance. Most recently, the electric power industry has come under structural pressure.

For the past 20 years, the natural gas industry has been undergoing a restructuring similar to the transition now

confronting the electric power industry. This article presents a summary of some of these gas industry experiences to provide a basis for some insights into energy industry restructuring. The article first discusses some similarities and differences between the natural gas and the electric power industries. Then, with these industry features as background, the discussion turns to issues in restructuring, drawing on experiences in the natural gas industry and suggesting potential parallels in the electric power industry. In conclusion, observations of developments in the natural gas industry are used to suggest some of the difficulties of restructuring, especially when new competitive markets must develop to further the process.

Background

Only a few years ago, doing away with electric power monopoly franchises would have been unthinkable. But large shifts in relative energy prices, starting in the early 1970's with the Arab oil embargo, set off searches for ways to improve energy and economic efficiency. These experiments have produced new perspectives on energy processes and economic organizations. Many of these experiments led to national legislation or policy programs. As time passed, not all these innovations proved successful. Nevertheless, changing government programs often interacted with economic forces to increase the momentum of industry restructuring.

The 1970's energy policy initiatives focused on improving the efficiency of production and consumption.⁴ Many of these programs built on the old command-and-control regulatory system.⁵ New programs included initiatives that discouraged the use of natural gas for electric generation and industrial heat (to conserve on a high-value exhaustible resource), initiatives that tried to rationalize production of natural

¹Economic regulation implies that firms in the industry are subject to entry control and profit limitations.

²Regulatory reform at the Federal and State level is expected to affect the structure and operation of the utilities, either individually or as an industry. These changes are referred to as the restructuring of electric utilities.

³The evolution of regulated into competitive market structures does not necessarily provide equal benefits to all sectors of the economy; therefore, not everyone applauds these changes. Some consumer advocates point to restructuring as causing declines in product quality, reliability, and availability. Similarly, spokespersons for labor or capital interests may identify restructuring with declines in returns to specific factors of production such as wages or profits.

⁴During this same time period, Congress and the courts restructured and in some cases completely deregulated the airline, telecommunication, trucking, and rail industries.

⁵Economic regulation of entry and profit limitations is effected by regulators asserting command and control of the regulated entities; therefore, traditional economic regulation is frequently effected by public bodies exercising command and control over firms engaged in regulated activities.

General Observations on Restructuring

In describing regulated industry restructuring, so much emphasis is placed on legal and regulatory events that it would be easy to imply that restructuring is, at its heart, a regulatory phenomena. In most cases, however, this is an illusion. Restructuring usually is not set in motion by changes in regulation. Rather, economic and technological forces that drive industries to change also, by necessity, cause regulation to adapt. This is because under the traditional command-and-control regulation, public utility industries are molded and shaped to fit a regulatory process. When a regulated industry comes under sufficient pressure from economic growth and technological improvement, it tends to become very inefficient. Growing inefficiencies build forces for change in the industry, but the required changes frequently conflict with the existing regulation. This conflict forces regulation to adapt. Changes in regulated industries are driven by the same basic forces that cause change in the economy as a whole. Because regulation is the platform that shapes these industries, however, changes in regulation are effectively driven by the same forces that pressure the industry itself. In tightly controlled industries, it may not even be possible to assess the true character of the underlying developments until after the regulatory evolution begins to unfold.

Restructuring is often a lengthy process. Indeed, one of the first lessons to be learned from studying other industries in the process of restructuring is just how extended the process is likely to be. For example, the disparity between interstate and intrastate gas prices that signaled the beginning of the need for restructuring in the natural gas industry was first observed more than 25 years ago. But, only now are the outcomes of that restructuring process being translated into direct measures of action for smaller consumers in retail markets. Other restructurings in telecommunications, airlines, and railroads show similar lengthy periods of dynamic readjustment. It is unlikely that the electric power industry will achieve a new integrated structure more quickly than was the case in other industries.

In general, restructurings improve economic efficiency because they grow directly out of opportunities to lower costs. In addition, restructurings that substitute market discipline, when competition is viable, for command-and-control regulation can usually result in improved incentives for efficient behavior that will bring additional pressures to lower prices. Therefore, restructurings generally hold the promise of overall benefits for the economy. Even if the benefits of restructurings are not distributed in the ways that society might prefer, the net gains can then be rearranged without giving up the newly gained efficiency improvements.

gas by setting wellhead price-ceiling schedules that were directed toward its eventual price deregulation (to encourage more high-value production), programs to improve highway vehicle mileage (to reduce the need for imported oil), and programs that mandated electric utilities to purchase electricity produced by some nonutility generators (to enhance efficient energy use).

During the 1980's, Congress and other policy makers periodically reassessed these experiments. A number of programs were modified or dropped. For example, the restrictions on industrial and electric utility gas uses were greatly reduced. In addition, the natural gas pipeline companies and the Federal Energy Regulatory Commission (FERC) devised ways to open gas pipelines to multiple users; and, in 1989, Congress passed legislation to decontrol natural gas wellhead prices completely as of January 1, 1993. This period of energy policy reassessment culminated in 1992 when Congress passed the Energy Policy Act (EPACT). EPACT is very comprehensive legislation addressing nearly every

aspect of energy production and consumption in the national economy. Almost incidentally among its many sections are requirements that provide for open electric generation ownership and transmission access. This legislation effectively made possible the restructuring of the electric power industry by permitting outside entry into the supply of electricity for the first time in many years.

FERC has followed through on EPACT by requiring transmitting electric utilities to provide open transmission services. Order 888, the electricity open-access rule, is similar to Order 636, which encouraged gas pipeline companies to become open providers of gas transportation services (Table FE1). As it did in the gas industry, FERC will require transmission-owning utilities to separate power sales functionally from the provision of transmission services.

The experiences of the natural gas industry during restructuring provide useful parallels for examining

Table FE1. Comparing Milestones in Restructuring Industries

Event	Natural Gas Industry	Electric Industry
First step toward competition	Intrastate gas markets never federally regulated. Some large consumers in the interstate market started purchasing gas and pipeline transportation separately—mid-1970's.	Short-term, inter-utility coordination trade at negotiated prices subject to regulated caps—1950's. Utilities file FERC rates with "up-to" cost-based formulas—early 1980's.
Explicit exceptions to cost-of-service rates appear	NGPA removes some natural gas price ceilings—1978. Pipeline companies use Special Marketing Programs to accommodate direct sales under price ceilings—early 1980's. FERC sets up blanket certificates to encompass SMPs—1984.*	PURPA mandates purchases from QF's at utility's avoided cost—1978. FERC accepts power pool agreement with weighted aggregate price ceilings in lieu of individual company rates—1978. FERC recognizes competitive bidding for new capacity—1988.
Transition costs start accumulating	FERC relieves distributors of their obligations to purchase from pipeline companies without relieving pipeline companies of their obligations to purchase gas supplies—1984.	States subject new utility plants to review for large cost overruns—1970's. Avoided cost QF contracts start a PURPA boom—1984.
Transmission access proposed to dampen anticompetitive behavior and encourage competition	FERC encourages pipelines to make unbundled sales and provide open-access transportation—1985.	NRC requires transmission access for some licenses—1970's. FERC initiates transmission access conditions for merger approval—1988; and for market-priced power sales—1990. Energy Policy Act authorizes FERC to order transmission access to encourage competition—1992.
Standards to mitigate monopoly control in transmission announced	Order 636 issued 1992: <ul style="list-style-type: none"> ● Comparable transmission and storage open-access required. ● Functional unbundling of product and transportation sales required. ● Pipeline companies allowed to make market-priced gas sales through affiliates. ● Capacity release established. ● Firm transportation customers get flexible receipt and delivery points. ● Transportation rates usually set by SFV method. 	Orders 888 and 889 issued 1996: <ul style="list-style-type: none"> ● Nondiscriminatory, comparable open access required. ● Public utilities must file transmission tariffs and take service under them. ● Ancillary services must be offered under a general tariff. ● Functional unbundling of accounting and billing for all new wholesale sales required. ● Resale of transmission with access to flexible receipt and delivery points on an "as available" basis must be offered.
Access to information to support market functions	Trade press publishes spot gas prices—1989. FERC mandates individual pipeline EBB's—1992. FERC mandates standardized Internet communication protocol—1997.	Market-based pricing includes requirements for EBB's—1992; EPACT requires public capability reporting—1992; FERC orders OASIS—1996.
Market characteristics evolve	Company consolidation starts—mid-1980's. Product markets active; prices transparent—1987. Gas marketing evolves as an unregulated industry—1987. Robust market centers/hubs for physical trade—1993. Some private swaps and options available—1993. Futures market matures and large consumer access to transportation is available in most States—1994. Transportation trade in formulative stage—1995.	Company consolidation starts—late 1980's. Spot and forward markets still largely restricted to utilities—1995. Neither transportation nor product prices are transparent yet—1995. Development of a futures market hindered by a lack of a standardized spot market for benchmarking. New entrants are trying to find product niches. Innovators hope to combine gas and electric market instruments for added value—1995.
Rates address risk	FERC starts trying to accommodate take-or-pay liabilities—1985. FERC's move to SFV rates for pipeline transportation shifts the risk of capital recovery to customers—1992. FERC broadens views on transition costs—1994.	FERC allows recovery of 100 percent of legitimate and verifiable wholesale stranded costs—1996.

*The courts later rejected Special Marketing Programs.

FERC=Federal Energy Regulatory Commission; NGPA=Natural Gas Policy Act; PURPA=Public Utility Regulatory Policies Act; QF=PURPA qualifying facility; NRC=Nuclear Regulatory Commission; NOPR=Notice of proposed rulemaking; SFV=Straight fixed-variable; SMP=Special Marketing Program; EBB=Electronic bulletin board; EPACT=Energy Policy Act; and OASIS=Open Access Same-Time Information System.

Source: Energy Information Administration, Office of Oil and Gas.

potential change within the electric power industry. In examining the parallels, it is important to understand the differences in traditional organization and functions of the two industries.

Similarities and Differences

The gas and electric power industries, although very different in size and structure, share some important characteristics. However, even shared characteristics diverge at some point in the comparison. The similarities and differences between the two can be best viewed as a continuum. If the gas industry's experience in restructuring is to provide useful insights into the forthcoming restructuring of the electricity industry, it is important to understand where the parallels between the two industries may be predictive and where they may indicate limits.

Size

Based on aggregate company statistics, the electric power industry, with revenues from final sales of more than \$200 billion, is about four times as large as the regulated natural gas industry, which has final sales of about \$50 billion. However, this revenue comparison may understate the size of the natural gas industry, because as much as 36.5 percent of its final sales are made offsystem by firms that are not included in current statistical measures.⁶ However, if the offsystem gas deliveries to final consumers were valued at an approximation of their value, the estimated final revenues of the natural gas industry would still amount to only one-third of electric power sales to final consumers.⁷ As recently as 10 years ago, before a large numbers of gas customers had access to offsystem suppliers, final revenues from natural gas sales to final consumers were about one-half of electric power company revenues. However, as the natural gas industry has progressed through restructuring, prices to final consumers have fallen, which has reduced revenues. In real terms (adjusted for inflation), onsystem sales of natural gas show a price decline of 13 percent between 1990 and 1995. Over this same period, average real electric prices to final consumers have fallen by nearly 9 percent. Residential natural gas and electricity prices adjusted for inflation fell between 1990 and 1995 in each

⁶Offsystem sales are gas purchases from third-party gas suppliers and not from local distribution companies.

⁷Revenue estimates for 1995 use the average commercial/industrial price for offsystem commercial sales and the average of the industrial/electric utility price for offsystem industrial sales.

Census Division except New England (Figures FE1 and FE2).

Products

A significant difference between the two industries lies in the nature of the products. Simply put, because gas is not perishable and can be compressed, it can be stored economically—at the production site, in storage facilities along the way to market, and in high-volume pipelines while in transit. This feature of gas means that it can be produced at the most desirable rate in the field, stored if necessary, and delivered later to consumers according to their needs.

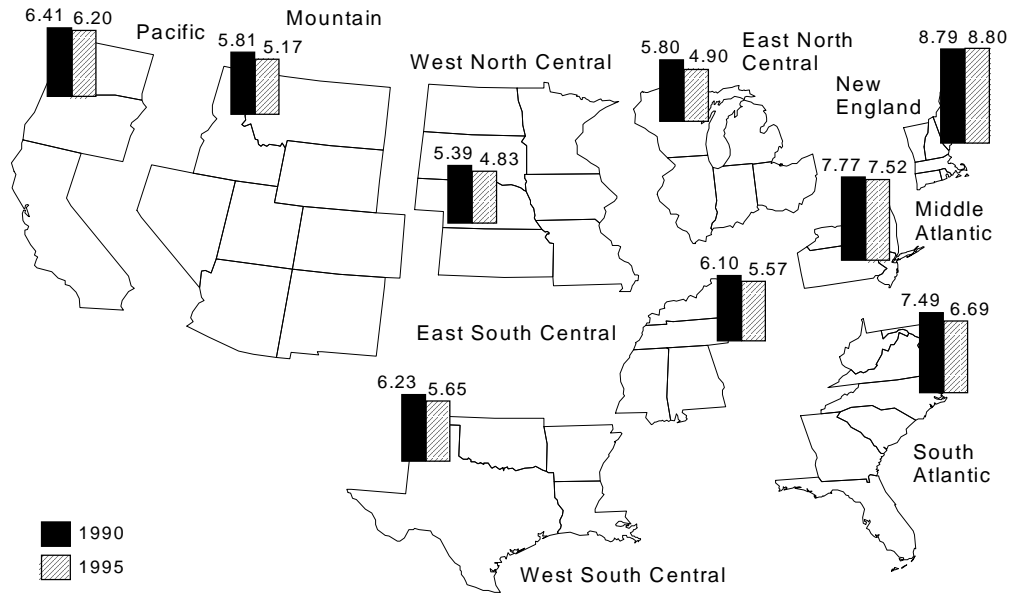
In contrast, under current technology, there are few economical ways to store electric power; consequently, electricity must be produced when it is demanded. This means that reliable electric service depends on the production and transmission of power when it is needed. Moreover, because many electric appliances cannot function if the voltage varies from the level for which these devices were designed, electricity must be delivered to consumers at constant voltage levels.⁸ Electric transmission systems cannot be used to compensate for differences in supply and demand. Basically, electricity has to be produced at the desired strength when it is demanded. This feature of electricity, combined with the interactive network structure of the electric transmission grid, requires that the production, transmission, and consumption of electricity stay balanced within quite narrow tolerances.

In addition, the nature of basic activities of the natural gas and electric power industries is very different. Natural gas is extracted from large underground deposits. The location of gas production depends on regional geology and economics. Capital investments in gas production are tied to the locations of gas reservoirs and transportation facilities to move gas to markets.

By way of contrast, electricity is produced by a manufacturing process that can be located at a convenient site based on the economics of fuel supply, environmental conditions, and customers. Although both industries are capital intensive, a large share of the total value of the gas industry is tied up in holding and developing natural gas reserves. The electric power industry asset values tend to be concentrated in generating facilities, but these can be located to optimize value.

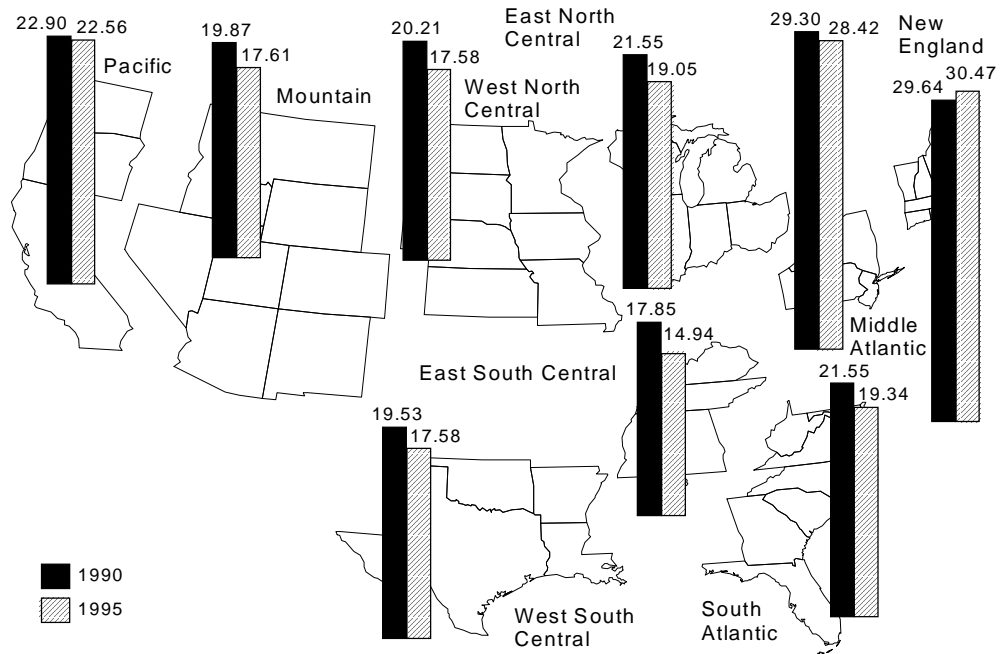
⁸Many applications of electricity from computers to street lights could be destroyed by relatively small voltage variances in power inputs.

Figure FE1. Residential Natural Gas Prices by Census Division
(1995 Dollars per Million Btu)



Source: Energy Information Administration, *Natural Gas Annual 1994 and 1995* (November 1995 and 1996).

Figure FE2. Residential Electricity Prices by Census Division
(1995 Dollars per Million Btu)



Source: Energy Information Administration, *Electric Power Annual 1991 and 1995* (July 1992 and 1996).

Ownership

The natural gas industry is generally characterized by separate ownership of the individual stages of the industry. Reserves and gas production usually are owned by large mineral extraction companies, such as the major oil companies, or by independent gas producers. Traditionally there have been numerous gas producers. Interstate gas pipeline companies and natural gas marketers are usually owned as individual corporations, and gas distribution companies tend to be publicly owned either as stand-alone companies or in combination with electric utility companies.

But the electric utility industry is dominated by comprehensive vertical ownership of the stages of production. A single firm owns generation, transmission, and distribution. In the electric power industry, although there are many generators, about 75 percent belong to utilities that are vertically integrated into transmission and distribution functions. And, it is not uncommon for electric utilities to extend this vertical ownership further back to fuel production and transportation.

The organization of ownership was influenced by the way each industry developed and by ownership restrictions imposed on public utilities by the Public Utility Holding Company Act. The implications of these differences for restructuring are significant because the distribution of regulatory oversight is determined by the differences in ownership organization and because the firms in natural gas production generally lacked significant market power before restructuring began. Moreover, the largely unaffiliated ownership of gas production, transportation, and distribution creates a natural competitive tension among industry participants that is lacking in the electric power industry.

Before restructuring, interstate gas pipeline companies bought gas from producers, transported it, and then resold it to distribution companies at a price that included the cost of the commodity, transportation, storage, handling, and delivery. Gas distribution companies, in turn, bought gas as needed at the city gate (the point where gas enters the distributor's system) and delivered it to final consumers on its distribution system under a similar "all inclusive" bundled price.

The electric industry also defines its products as inclusive bundles covered by a single price. The only differences between the two industries on this point are the result of the differences in ownership structure. The arrangements between gas producers and pipeline companies and between pipelines and gas distribution companies are,

for the most part, established along standard commercial lines for transactions between unrelated companies. In the electric power industry, although there are commercial relationships among unrelated entities, a majority of the production, transportation and distribution relationships are arranged under an umbrella of affiliated entities.

Regulation

Perhaps the greatest parallel between the two industries is in the area of regulation. The regulatory histories of the two industries are closely intertwined. Federal regulation of both was established when the Federal Power Act and the Natural Gas Act were incorporated in the Public Utility Holding Company Act in 1935. The acts were passed in response to regulatory problems and financial irregularities that had developed as the industries grew beyond State boundaries and matured. This set of laws authorized Federal oversight of both the financial and structural organization of interstate electric power and gas companies. The legislation charged the Securities and Exchange Commission (SEC) with the financial and organizational oversight of interstate public utility holding companies. The then Federal Power Commission (now the Federal Energy Regulatory Commission (FERC)) was charged with oversight of interstate transportation and sales of natural gas and electric power.

The differing ownership structure of the two industries is largely a consequence of the restrictions placed on the organization of public utility companies in the Public Utility Holding Company Act (PUHCA) and the timing of the development of each industry. PUHCA subjects multi-State utility holding companies to intense financial review, restricts their operations to physically integrated electric systems, and severely limits their ability to diversify into any other business. Much of the national expansion of the natural gas industry occurred after the passage of PUHCA, while electric power was already nationwide at the time the act was passed. The SEC reshaped the electric power industry to bring it into compliance with PUHCA in the 15 years following the act's passage.

In addition to the statutory parallels, both industries usually are regulated by the same board or commission at both Federal and State levels; hence, there is a tendency for regulatory bodies to apply the same approaches to both industries. In part because of the statutory parallels, the courts also generally have treated the industries as though they were parallel. In general, both State and Federal economic regulation used cost-of-service ratemaking that constrains a firm's profitability.

Profits are limited to fair returns that are no higher than needed to compensate invested capital. Moreover, prices may not be unduly discriminatory. Therefore, it was very much in keeping with this historical precedent for FERC to refer to the history of restructuring of the gas industry as it initiated new Federal rules for the electric industry.⁹ FERC has relied on this regulatory parallelism to form the foundation for electric industry restructuring.

Jurisdiction

Differences in ownership result in differences in the extent of Federal authority over the two industries despite the parallels in their regulatory histories. Because of these ownership differences, FERC's regulation of interstate natural gas pipeline companies is for all practical purposes exclusive,¹⁰ while its authority over investor-owned firms in the electric power industry is limited to their interstate wholesale sales and transmission functions.¹¹ Because transmission functions are integrated by an interconnected transmission network, Federal authority over the price for electric transmission services overrides State authority in all States except Alaska, Hawaii, and Texas.¹² Thus, FERC has jurisdiction over prices on most of the transmission system.

These differences in law and industry structure give FERC comprehensive regulatory oversight of interstate pipeline companies' assets and activities, but leave it little ability to influence directly the production and distribution firms in the industry. FERC's authority in the electric power industry is restricted to wholesale sales and interstate transportation, but because firms in the industry are vertically integrated, most of them fall under FERC's jurisdiction for some regulated activities. In terms of economic impacts, FERC currently regulates all revenues of interstate gas pipeline companies but only

about 10 to 15 percent of the revenues of public utility electric power companies.

In addition, FERC has the direct authority to certify pipeline construction and provide eminent domain for pipeline routes, but it does not have the authority to review gas pipeline mergers. In the electric power industry, FERC has authority to approve mergers of electric utilities for the public interest, but it generally does not have approval authority over construction of facilities. Electric utility construction decisions fall under State authority. There is no FERC authority for eminent domain for electric transmission corridors.¹³

Transportation

Both gas and electric power are transported via a unique means limited to transporting the product for which it is designed.¹⁴ Neither gas nor electric energy can be transported economically by any means other than a dedicated pipe or transmission line. These specialized transportation facilities have other characteristics in common—both are capital intensive, embody large-scale economies, and require special right-of-ways. As a result, most regulators presume that these transportation systems are susceptible to monopoly control and will continue to require some form of economic regulation for the foreseeable future.

In some other respects, however, the two transportation systems are very different. Natural gas pipelines are independently operated, easily directed, relatively slow-moving flow systems; while the high-voltage, interconnected electric transmission grids are rapidly responding networks distinguished by high degrees of physical interdependence. As a result, gas pipelines can allow for much larger tolerances in operating conditions. Pipelines continue to function robustly under a wide variety of operating conditions.

Electricity transmission networks must be operated under very narrow tolerances and, because of their interdependence, require high degrees of coordination and information sharing to be reliable. One of the implications of these physical differences between gas pipelines and electric transmission systems is that the restructured industry's rules for physical access are likely

⁹Federal Energy Regulatory Commission, Order 888 (April 24, 1996).

¹⁰It should be noted that FERC does not have jurisdiction over all gas transmission. Gas pipelines restricted to intrastate operation are regulated by the States in which they operate and are not subject to FERC authority. These intrastate pipelines are a significant part of gas transportation capacity in some States, especially States that produce large quantities of gas such as Texas, Louisiana, and Oklahoma; however they may also play a prominent role in the gas transportation industry in some other States, especially California.

¹¹FERC does not regulate the rates of the Federal Power Marketing Administrations, such as the Bonneville Power Authority, but is required to review their proposed rates for consistency and financial responsibility. Other publicly owned electric utilities are not under FERC regulatory oversight.

¹²Neither Alaska nor Hawaii is interconnected to the interstate electric transmission grid. A large area of the State of Texas also is not interconnected with the rest of the country. Hence, electric sales and transmission functions escape FERC jurisdiction in much of that State.

¹³Only FERC's hydroelectric oversight authority includes transmission lines for these facilities.

¹⁴Gas can be converted to a liquid and transported, but the conditions for maintaining it in such a state require special transportation facilities, and the economics of the conversion process plus the specialized facilities have been in general too costly to make this type of gas transportation competitive with pipeline movements in North America.

to be more exacting for electric power than for gas. Consequently, to ensure continued reliable service, the standards for access to electricity transmission networks are likely to be more closely monitored than similar functions for natural gas pipelines.

Environment

Both the natural gas and electric power industries face problems related to the potential impacts of growing environmental concerns. Although both industries are required to mitigate environmental damages, the environmental compliance implications of the electric power industry restructuring appear to be far more extensive than the gas industry's.

The potential impacts of environmental compliance are greatest in natural gas production and electric power generation. Natural gas producers, however, face a rather comprehensive set of regulatory and legislative provisions that specify acceptable activities and allowable tolerances for environmental impacts. Within this framework, natural gas producers conduct operations in the most economically advantageous way while complying with environmental standards. Individual electric generators have not been subjected to a uniform set of performance requirements. At the generating level, units must collectively conform to an area's specified range of emission level limits. Restructuring has raised concerns that generator-use decisions will be made on the basis of lowest costs only, and it is feared that this will result in increased use of units that have lower costs but higher environmental impact.

Other

There are other similarities and differences between the two industries. For example, the distribution systems of both industries are also closely parallel. This parallel is demonstrated by the large number of utility companies that combined gas and electric distribution. Both types of operations traditionally relied on franchised monopoly delivery systems to deliver bundled services to final consumers.

These distribution functions both normally bundle auxiliary services along with products. This bundling of delivery functions with other associated qualities may make it difficult to extend competition to small scale consumers. In addition, distribution systems convey valuable right-of-ways that would be uneconomic to replicate for multiple suppliers. Efficient means of sharing rights or separating retail transportation from

supply and auxiliary services remain to be devised in both industries.

Lastly, the characteristics of the demand for natural gas and electricity are quite different. Electricity is almost universally distributed and it has many different applications. Neither of these characteristics are features of gas demand. Compared with electricity, gas distribution is limited in geographic scope and its applications are limited mostly to heat processes.¹⁵ In many applications, a number of fuels can be substituted directly for gas. Although some of these substitutions take substantial time and investment, there are many that do not. Consequently, in recent years natural gas demand has been considerably affected by prices of competing fuels.

On the other hand, there are no substitutes for electricity in many uses. Although the price elasticity of demand for electricity is still largely a matter of speculation, it is likely to be more inelastic than that of natural gas in both the short and long run. The differences in the demand characteristics of the two products may influence the final outcome of the industries' restructuring.

Issues in Restructuring

During restructuring, most industries tend to encounter similar issues. Since the natural gas industry has made significant progress toward a complete restructuring, opportunities for anticipating events in the electric power industry can be identified by understanding how progress in the gas industry has occurred.

Issue: Identifying the Forces of Change

Industry restructurings usually are grounded in inefficient practices that resist change and innovation. In regulated industries, such as natural gas and electric power, an initiating event sometimes appears to be a change in the regulatory framework, but the underlying cause is usually the result of major economic stress in the industry. Gas industry restructuring started as a response to pinned up supplies and inflexible contract practices.

¹⁵Feedstocks use less than 10 percent of annual domestic gas consumption. Except for ornamental uses, gas for lighting was displaced by electricity early in the century. Vehicular use of natural gas has grown substantially but accounts for less than 3 billion cubic feet of the 21,581 billion cubic feet of total consumption as of 1995. Heat processes are defined to include all types of cooling applications because these processes basically use heat reversal to accomplish the objective.

Electric industry restructuring was initiated by technological improvements.

In the natural gas industry, the initial stress can be traced back to price differences between interstate and intrastate markets.¹⁶ Starting in the early 1970's, expanding gas demand caused gas prices in interstate markets to rise to the levels of Federal price ceilings, where they were constrained. Once the price ceilings were binding, supply shortages began to appear sporadically.¹⁷ Prices in intrastate markets, by contrast, were free to reach levels that would allow demand to be fully satisfied. Additional inflexibility in interstate markets grew out of their tendency to use fixed-price, long-term supply contracts (some up to 30 years long).¹⁸ Since the intrastate markets were more flexible and price responsive, they tended to attract incremental gas supplies, thus worsening the supply situation in the interstate markets. Rising price pressures and fear of curtailments in interstate markets initially were met with increased regulation and legislation to set price-ceiling escalation schedules.¹⁹ In subsequent years, when mandated wellhead price-ceiling increases and demand conservation policies led to growing gas surpluses, it became generally recognized that wellhead gas-price regulation had not worked.²⁰

Some large consumers and distribution companies quickly tried to find ways to avoid buying high-priced

¹⁶Intrastate markets are regulated by the States in which they operate and are not subject to FERC authority.

¹⁷In addition to periodic curtailed deliveries, another effect of these shortages was moratoriums on hookups for new customers.

¹⁸This contract term structure was required by regulatory practices that emphasized reliability. For example, pipeline companies were required to demonstrate control of sufficient gas supplies to serve additional customers in order to get certificates to construct new facilities.

¹⁹Interstate pipeline company gas costs that were passed on to their customers were calculated as weighted averages of the companies' cost of gas, and included both old contracts with relatively low gas prices and newer contracts with relatively high gas prices. Over time, the proportion of high-cost gas in the supply mix rose causing the weighted average gas costs to rise. The Energy Information Administration chronicled the impact of these programs over time in a series of publications. Interesting historical insight into these events can be found, for example, in *Natural Gas Producer/Purchaser Contracts and Their Potential Impacts on the Natural Gas Market*, DOE/EIA-0330 (Washington, DC, June 1982); *Structure and Trends in Natural Gas Wellhead Contracts*, DOE/EIA-0419 (November 1983); *A Study of Contracts between Interstate Pipelines and Their Customers*, DOE/EIA-0449 (July 1984); and *An Analysis of Natural Gas Contracts—Volume III: Contract Provisions Covering Production of New Gas*, DOE/EIA-0505 (May 1987).

²⁰Many analysts have argued that Congress never intended price regulation to be applied to producers' gas prices under the Natural Gas Act. Although some regulation of extractive activities can be justified by economics, gas production never demonstrated the characteristics of monopoly control that are supposed to provide the rationale for regulation of prices and profits.

pipeline gas. They turned to spot markets where production surpluses led to prices much below the weighted average price of pipeline companies' contracted supplies. These customers sought arrangements that would permit them to purchase gas and transportation services separately. These arrangements could produce substantial savings over the pipeline companies' bundled products that included high-cost contract gas. Efforts by these large customers to reduce their own cost of delivered gas service set the stage for further restructuring of the gas industry.²¹

In the electric power industry, the opportunity to reduce significantly the average price and locational price differences of electric power grew out of experiences with generators exempted from wholesale price regulation under the Public Utility Regulatory Policies Act (PURPA). The coincidence of technological progress in gas turbine design along with the PURPA conservation experiments encouraged the building of nonutility generators at costs that, in some cases, were significantly below electric utilities' average costs. More than half of the generation capacity built under this program used gas-fired technology.

Unlike the situation in the gas industry, the vast majority of U.S. generating capacity is still owned and operated by integrated public electric utility companies. And, most of the newly built PURPA generating facilities are under long-term contracts to sell their output at wholesale to those same integrated utilities. Even after the passage of the EPACT provisions,²² the electric power industry lacks the pre-existing competitive supply conditions that characterized the natural gas production industry. Moreover, the electric industry has proportionately fewer unaffiliated distribution companies eager to find arms-length supplier arrangements. In addition, it remains more difficult for large customers to gain access to new electricity suppliers because of the shared Federal/State jurisdiction and limits at the Federal level that do not allow requiring electric retail customer access as was done in the natural gas industry.

Issue: Surviving the Transition

Transition issues fall into two classes. One type stems from the need to dispose of leftovers from the old

²¹FERC supported customers' efforts to arrange cost-saving gas supplies including some approval of pipeline companies' applications to bypass distribution companies.

²²The EPACT provisions permit unfettered entry into electric generation and wholesale access to industry-owned transmission facilities.

structure that are impeding needed changes. The second type encompasses issues associated with developing new institutions and conventions to promote efficient operation in a restructured industry. Some would argue that the leftover issues have to be resolved before the industry is able to concentrate on devising new institutions and conventions. Others believe that both types of transition issues can be worked on at the same time. Transition issues are important because they open opportunities for individual losses or gains. For this same reason, it may be hard to get the industry to agree to consensus solutions.

Dealing with the Old

One of the most contentious of the leftover issues is stranded costs—costs that cannot be recovered in a competitive market because the current book value of some assets, contracts, or other long-lived commitments exceeds their market value. Restructuring threatens to turn these excess book values into losses. The natural gas industry's stranded costs were mainly the result of pipeline company take-or-pay liabilities to gas producers under high-cost, long-term gas supply contracts.²³ These contracts guaranteed payments to gas producers whether or not the gas was taken on the contract schedule. When the demand for natural gas fell (because of rising prices and conservation), pipeline companies reduced gas takes from producers and incurred liabilities for gas they did not take.

Over time, this gas supply situation developed into a dilemma. Faced with falling demand and growing take-or-pay liabilities, the pipeline companies could try to limit the growth of liabilities by taking delivery of more expensive gas first. But this raised consumers' prices, further decreasing consumption and raising a chorus of complaints about price gouging. Alternatively, the pipeline companies could concentrate on holding down their gas costs and thereby try to retain their markets. But this strategy resulted in ever larger accumulations of take-or-pay liabilities that threatened to drive the pipeline companies into bankruptcy.

In the physical market, gas production capacity exceeded gas demand, and producers, rich on paper, experienced

²³The high-cost, long-term gas supply contracts were negotiated under price ceiling schedules set out in the Natural Gas Policy Act of 1978, which placed high price ceilings (based on expectations of ever increasing oil prices) on categories of incremental gas production from certain types of wells, such as wells deeper than 15,000 feet. These price schedules were legislated in an effort to encourage gas production to meet shortages in interstate gas markets.

declining cash flows.²⁴ In order to generate more cash, producers turned to selling increasing amounts of gas on the spot market. Spot market prices, which are highly sensitive to the differences between gas supply and demand, fell. Producers tried to maintain cash flow to compensate for falling prices by pumping more gas and sending it to the market. This exacerbated the over-supply of gas and put more downward pressure on wellhead gas prices. Falling spot prices induced increasing numbers of gas traders and consumers to seek opportunities to buy gas in the spot market and undercut the pipeline companies.

In intrastate markets, traditionally many customers had bought gas supplies and transportation services separately. Now, the interstate pipeline companies came under pressure to provide separate transportation services. In the face of declining revenues, some pipeline companies, realizing that transportation sales could provide relief for their revenue problems, began to offer some customers limited transportation services. Over time these efforts caused traditional gas pipeline industry practices to unravel.

The gas industry's accumulated total take-or-pay liabilities are estimated to have amounted to about \$50 billion.²⁵ This amount is more than 60 percent of the 1985 value of final gas sales to final consumers (in 1995 dollars).²⁶ The stranded costs of the electric industry are, as yet, unknown,²⁷ but many experts have estimated a value of about \$135 billion with other estimates ranging from \$50 billion to \$300 billion. In 1995 as a percent of the value of final electric industry sales (\$208 billion), these amounts would be equivalent to 65, 24, or 144 percent, respectively. Thus, the upper end of the estimated range of electric industry stranded costs would be

²⁴The take-or-pay liabilities accumulated as debt owed by the pipeline companies to the producers.

²⁵Jeffrey Leitzinger, "Gas Experience Can Steer Power Away From Deregulation Snags," *Oil and Gas Journal*, Vol. 94, No. 33 (August 12, 1996). Estimates are based on the pipeline companies' claims to recover in regulated rates their cost of mitigating these liabilities.

²⁶The year 1985 was chosen for this comparison because it is probable that liabilities peaked at about this time. Revenues from the sale of gas to final consumers were approximately \$78 billion in 1985. Revenues from final sales by gas companies reporting to EIA on Form EIA-176 have declined significantly since 1985 because offsystem sales have grown as a share of final consumption. In 1985, approximately 12 percent of sales to final customers were offsystem sales to industrial users. The revenue impact of these sales is included in estimated total final-sales revenues by using the price paid by electric utilities in that year as a proxy for offsystem industrial prices; this estimate may understate total revenues; however, the impact is less than 1 percent.

²⁷Stranded costs in the electric power industry are expected to arise from high-cost generating plants, high-cost power purchase contracts, and regulatory assets that cannot be recovered in competitive power markets.

proportionately much larger than was the case in the gas industry. However, at the low point, relative impacts could actually be less than half those experienced in the gas industry. Using the widely used estimate for the electric industry stranded costs of \$135 billion, the proportionate impact would be about the same as that experienced by the gas industry measured against 1985 revenues.

The story of how take-or-pay liabilities were resolved is in some ways instructive. Basically, these liabilities were shared among the producers, pipeline companies, distribution companies, and gas consumers.²⁸ Rate filings at FERC show that the interstate pipeline companies have filed to recover about \$10.4 billion in take-or-pay related costs.²⁹ Approximately \$3.6 billion of these take-or-pay costs will be absorbed by the pipeline companies and their shareholders.³⁰ The bulk of the debt was negotiated away in settlements between the pipeline companies and the producers over a period of years. In some cases, pipeline companies were credited with releasing gas that the producers then sold to other buyers; in other cases, producers credited gas sales to third parties against pipeline company take obligations.³¹ But in many cases, the gas producers, or the parties who held the gas contracts as collateral, had to adjust their wealth by accepting lower values for the contracts they held. Some of this reduction in value may have been partially shifted to general taxpayers. This transfer would occur if losses are used as adjustments or credits for the purpose of calculating income taxes.

Although consumers eventually paid a share of the cost of the take-or-pay settlements along with higher gas bills for the high-cost gas that was delivered to them, they paid far less than if the high-cost contracts had run to maturity. Had the gas industry not been deeply divided and under intense financial pressure, negotiations to share the take-or-pay costs might not have worked out in

²⁸Initially FERC encouraged this negotiated approach by allowing pipeline companies to pass along to customers shares of the buy-down costs of gas contracts in proportion to the buy-down costs that the pipeline companies absorbed. Later, FERC augmented this approach by providing incentives for producers to settle contracts. Eventually, the courts rejected FERC's sharing approach and instructed the Commission to allow the pipeline companies to recover these settlement costs. By that time however, many write-downs had already been accomplished and competitive price pressures reduced the pipeline companies' ability to pass through these costs to customers.

²⁹United States of America 78 FERC ¶ 61,186, Federal Energy Regulatory Commission, Docket Nos. RM91-11-006 and RM87-34-072, Order 636 C (February 27, 1997).

³⁰This omits the outcome of some pipeline bankruptcies, which spread some of the cost to creditors of the pipeline companies.

³¹Energy Information Administration, "Take-or-Pay Settlements," *Natural Gas Monthly*, DOE/EIA-0130(91/01) (Washington, DC, January 1991).

the same proportions. Moreover, no one will ever know if gas industry restructuring would have moved quicker (and its benefits been realized faster) if the take-or-pay problem had been settled in the same fashion that FERC has chosen to use for stranded wholesale costs in the electric industry.³² FERC has ruled that electric utilities should recover 100 percent of their legitimate and verifiable stranded wholesale costs.³³ It certainly is true that arms-length negotiations among diverse interests that were instrumental in arriving at take-or-pay settlements in the gas industry are not possible among most generation, transmission, and distribution entities in the electric industry because they are vertically integrated.

Dealing with the New

The second type of transition issues—developing new institutions and practices—involves a wide expanse of functions, at least some of which are dictated by the previous structure and operational characteristics of individual industries. The natural gas industry has been quite successful in developing new institutions and practices to enhance restructured industry performance without raising a barrier of prohibitive transaction costs. These innovations range from improvements in the physical efficiency of the industry based on better pipeline utilization and expansions of the market center concept to the development of a whole new set of financial instruments that have revolutionized trading in natural gas.

In the physical gas market, improvements have centered on expanding pipeline capacity and developing rapid cycling gas storage facilities. Growth in unbundled short-term and spot markets appeared as though it might threaten reliability because production often is located great distances from consumption markets. Especially during the winter heating season, gas markets sometimes need to be able to move products quickly. But traditional gas markets that had been organized to move dedicated, bundled products to preassigned locations lacked the flexibility needed to respond to short-term changes in the quantity of product needed when markets changed. As the value of greater flexibility became more apparent, pipeline junctures began to expand to offer new exchange services and expanded storage capacity. The increasing value of storage coincided with the

³²In Order 636 (issued in 1992), FERC revised its approach to recovery of pipeline take-or-pay costs, allowing pipeline companies to recover 100 percent of costs, subject to market conditions.

³³See FERC Order 888 (issued April 24, 1996) for a summary and conclusion to this debate before the Commission.

development of new, rapid turnaround salt cavern storage—matching enhanced capability with new value.

As time passed, pipeline pooling points, exchange locations, and enhanced storage facilities expanded to include additional services at some locations. These services included aggregating and compensating for imbalances, parking, lending, and paper as well as physical exchanges.³⁴ An interesting observation about the growth of market centers in the gas business is the variety of centers that has developed.³⁵ One reasonably might have expected that all surviving market centers would offer nearly the same set of services. But this has not been the case, as instead a variety of market centers have developed. This evolution in the functions of market centers demonstrates the flexibility of the restructured gas industry.

Along with the greater capability of the gas industry to handle and direct gas flows has come the development of new gas marketing companies, which has contributed to the expansion of the gas industry under restructuring. Aggressive gas marketers sought opportunities to add new clients and in the process changed relationships in the gas industry. It was the determination of the gas marketers who pursued profits, breaking up old pipeline customer networks and demanding open access conditions, that really made the industry change. According to a directory compiled by Benjamin Schlesinger & Associates, the number of gas marketer firms rose from 51 in 1986 to 353 in 1994 before falling off to 264 in 1996.³⁶ The decline in numbers in recent years represents some shaking out in gas marketing as consolidation has occurred and profits have been squeezed.

One immediate and direct spillover for the electric power industry that stems from the success of gas marketers has been the rapid entry of gas marketers into the electric power industry. More than 100 marketers have registered with FERC to trade in electric power. To date, however, most of the trade in electric power continues to be among the established participants in the industry. It appears that the integrated ownership structure of the electric power industry may inhibit the development of spot and short-term power markets. Many observers have pointed to the emergence of dual-product marketer

firms along with the accelerating pace of gas-electric mergers and acquisitions to demonstrate the evolution of an integrated energy market that could displace the historically separate markets in natural gas and electric power.

In fact, it is the growth from collection points at pipeline junctures to market centers that underlies one of the biggest successes of the new gas industry—the gas financial instruments industry. The development of a futures contract to provide risk management depended on having sufficiently large, flexible product markets to handle deliveries for contracts should a contract holder wish to accept delivery of the gas. The volume of open contracts on futures markets last year averaged 150,000 daily, while the volume during November and December, the busiest times of the year, was considerably higher. Similarly options trading has expanded to large numbers during the past few years. These financial instruments enhance the liquidity of gas markets and, at the same time, offer means of risk management that make the commodity market an acceptable way to trade gas in energy markets.

One noticeable event in gas markets has been the development of considerable price volatility in both product and financial markets. Price volatility is not limited to energy markets, but the amount of price swing in natural gas markets has caused concern, especially among the many small consumers who continue to be captive customers of local distribution companies. These customers expect average-cost retail prices that vary little during the year. But as restructuring has progressed in the gas industry, high seasonal price volatility appears to have become a regular feature of the market. Some observers attribute the increased price volatility in commodity markets to industry efforts to reduce the cost of holding inventories by adopting just-in-time management systems. Most individual consumers can do little to avoid these price problems. Perhaps the periodicity of price volatility will present an opportunity for arbitrage that will encourage traders to correct undue volatility.

Thus far, electric power commodity and financial markets have been slow to develop. Attempts to introduce futures contracts in two West Coast markets have had only limited responses. More recent efforts to open trading on the East Coast are just beginning, but until active, liquid commodity markets develop, there will be little demand for liquidity and risk management financial instruments. Hence, the development of forward, options, futures, and other financial instruments will probably continue to lag in electricity markets.

³⁴Energy Information Administration, *The Value of Underground Storage in Today's Natural Gas Industry*, DOE/EIA-0591 (Washington, DC, March 1995).

³⁵Energy Information Administration, *Natural Gas 1996: Issues and Trends*, DOE/EIA-0560(96) (Washington, DC, December 1996), Chapter 3.

³⁶Daniel Macey, "Portrait of the Salesman as a Young Artist," *Gas Daily's NG* (December 1996/January 1997), p. 35.

It can be argued that the gas industry had some advantages in developing new practices that are lacking in the electric industry. Intrastate gas markets provided an early model for some broader market-based activities in the gas industry. These intrastate markets included active spot markets for gas and experience in externalizing supply and transportation arrangements through contracts.³⁷ The collapse of the market in long-term gas supply contracts encouraged development of larger spot and short-term commodity markets for gas and created an opportunity for the rapid growth in these markets. It also created opportunities for new entrants to the market—gas brokers and marketers. These developments, in turn, gave rise to the development of financial instruments, such as forward, futures, and options markets, that provide improved liquidity and risk management instruments for commodity markets.³⁸

Success in gas market development has not been limited to product markets; there has also been significant growth in secondary markets for pipeline capacity since FERC issued Order 636. However, gas transportation markets have expanded less rapidly than the commodity markets.³⁹ Tradable pipeline capacity rights have not developed sufficiently to allow an assessment of the potential for converting physical to financial rights in transportation. Furthermore, uncertainties about future transportation rate structures and developments in unbundling in retail markets are creating capacity turnback problems for the pipelines. Pipeline companies are finding that their traditional customers, the distribution companies, are reducing the amount of firm pipeline capacity they are willing to reserve as retail monopolies disappear. When transportation contracts come up for renewal, many distribution companies may “turn back” (decline to renew) large percentages of the capacity they once reserved. Under the current pricing formula for firm transportation services by interstate pipelines, reservation or demand fees are designed to recover pipeline companies’ fixed costs.⁴⁰ Turnbacks may

³⁷When the interstate gas system relied on pipeline companies to supply bundled services to local distribution companies, many supply, transportation, storage and handling activities were handled informally within the same company or family of companies. Once unbundled service became the general practice, most of these activities had to be arranged through formal contracts. The arrangements were in effect externalized and treated as third-party, arms-length arrangements even when the parties remained under the same corporate umbrella.

³⁸Energy Information Administration, *Natural Gas 1994: Issues and Trends*, DOE/EIA-0560(94) (Washington, DC, July 1994).

³⁹Energy Information Administration, *Natural Gas 1996: Issues and Trends*, DOE/EIA-0560(96) (Washington, DC, December 1996), Chapter 2.

⁴⁰Energy Information Administration, *Natural Gas 1994: Issues and Trends*.

erode a pipeline company’s income and threaten the company’s financial health.

Difficulties in establishing successful new practices and conventions for gas pipeline transportation probably indicate that the electric power industry also will find it difficult to design satisfactory new ways to address these issues. One approach that is being tried in the electric power industry, Regional Transmission Associations (RTAs) and Independent System Operators (ISOs), has not been tried in the gas industry. These agents would create regional governing bodies or empower third-party transmission operators to control transmission. This type of central governing body was not needed to oversee the operations of gas pipelines and therefore, has no parallel in the gas industry.

One area where the electric power industry may have had a head start on the gas industry is in establishing electronic trading, information, and monitoring systems. This is one restructuring requirement that the gas industry has been slow to develop.⁴¹ The electric power industry, with the benefit of observing the gas industry’s problems in achieving standardization, has turned to the North American Electric Reliability Council (NERC) and the Electric Power Research Institute (EPRI) to develop industry-wide standards and systems. This move appears to have speeded up development of electronic communication services in the electric power industry and been an improvement over the individual company systems that the gas industry tried to develop. Developing electronic information and trading systems for products and transportation rights may be one instance where it was an advantage to be second and to learn from others’ mistakes.

Issue: Defining New Boundaries

While restructuring may modify regulation, it does not necessarily do away with it. One basic concept of restructuring in both the natural gas and electric power industries is that regulation will still have a major role, at least, in the transportation and local distribution areas. Thus, both industries are engaged in seeking new ways to interface regulated and unregulated activities.

After some experimentation in the gas industry, FERC concluded (Order 636) that pipeline companies needed to separate their gas sales operations from their

⁴¹Significant progress has occurred during the past 2 years through the efforts of the Gas Industry Standards Board (GISB). Beginning April 1, 1997, the industry and FERC began implementation of standards designed to resolve problems with earlier electronic bulletin boards.

transportation activities, create open trading and transportation information systems, and agree to adhere to a new industry-wide standard of conduct. At the Federal level, FERC has invited innovations in transportation rate design, incentive regulation, negotiation, and arbitration. But the gas industry does not appear to have been eager to take up these challenges, perhaps fearing costly legal battles. Some State utility commissions are also studying ways to change distribution company regulations.⁴²

The Federal initiatives in the electric power industry appear to be modeled, as far as possible, on lessons learned in experimenting with the gas industry. One example of how this learning process has worked is shown by the detailed instructions provided by FERC for the new open access same-time information system (OASIS) mandated for trading in electric transmission capacity.⁴³ Unlike the gas bulletin boards, the electric power system will be standardized from the beginning. This appears to have speeded the first stage of the information system process for the electric power industry.

Because of the difference in industry ownership structure and the jurisdiction of regulators, the gas industry may provide only limited insight into problems of regulatory interface for retail unbundling. The gas industry has proceeded slowly in addressing the problems of universal retail competition.⁴⁴ In general, unbundling in the gas industry has been limited to wholesale traders and large customers. Some recent progress has been made in extending market choices to moderately sized industrial and commercial customers; but competitive choices for most retail customers, especially residential consumers, are at best only in the experimental stage in most States. This lack of progress in designing and implementing retail unbundling may be contributing to the Congressional debate over legislating retail access in electric power.⁴⁵

⁴²Energy Information Administration, *Natural Gas 1996: Issues and Trends 1996*, Chapter 5.

⁴³See FERC Order 889, issued April 24, 1996. This rule contains standards for an electric power industry real-time information system that will reside on the Internet and conform to communication protocols set by the Commission.

⁴⁴See Energy Information Administration, *Natural Gas 1996: Issues and Trends*, Chapter 5.

⁴⁵See Energy Information Administration, *Natural Gas 1996: Issues and Trends*, Chapter 6 for information on the status of retail programs in 25 selected States. More recent data may reflect significant progress in States such as New Jersey, New York, Pennsylvania, and Georgia.

Concluding Observations

The gas and electric power industries share features that caused them to be regulated as monopolies in the past. However, their sizes, production techniques, and operating constraints indicated that restructuring of the electric industry may not exactly parallel the gas industry. Furthermore, the fundamental differences in the nature of the two products, natural gas and electricity, have important implications for the comparison of industry restructuring. Common issues in industry restructuring—such as identifying the changes, laying to rest the leftovers of old regulatory systems, substituting new institutions for old, and finding ways to achieve promised efficiency improvement and flexibility—require much effort. This brief review of restructuring developments in the natural gas industry has pointed out both successes and potential pitfalls in the process.

Restructuring is not just about realigning an industry and adjusting regulations; it also requires that firms, regulators, and consumers undergo cultural change. These changes are not easily or quickly accomplished. For example, regulated firms have spent years trying to please regulators. Even Wall Street compiled indexes to measure how friendly or unfriendly public utility commissions were in an effort to predict what the best investments would be. But in the restructured industries, regulators' good will may no longer be a good index of profitability and new indicators will have to be developed.

Experience in the gas industry also suggests that regulators seeking to direct restructuring so as to get the best outcome for the public need to act judiciously. Traditional cost-of-service regulation may be incompatible with regulation of firms with competitive activities. At the very least, regulators probably should not create new classes of regulated, cost-of-service businesses for regulated firms as part of the restructuring. For example, by including expenditures for new information systems in cost-of-service activities, regulators lessened the incentives for gas pipeline companies to seek the most efficient methods of creating electronic bulletin boards and trading centers.

Profit-motivated firms seek market advantages. This quest is a natural drive and the basis of competitive market discipline. There is no reason to believe that firms in transition from sanctioned, regulated monopolies to competitive markets will bypass opportunities to seek market power. In fact, one could argue that seeking market power is, in some sense, a competitive firm's obligation. But, when firms are moving from

comprehensive regulation to mixed competitive/regulated environments, regulation may need to become more sensitive. For example, in both the natural gas and electric power industries, transportation involves many complicated parameters in addition to price. Designing a regime of equitable, open transportation access under these circumstances is difficult. Any ill-defined area invites efforts to find ways to exercise market power. In the gas industry, the so-called “grey markets” wherein transportation and product are rebundled outside the public trading systems are examples of how ambiguity in transition regulations can create suggestions of opportunistic behavior. Open, comparable, fair rules are needed to address these issues.

Gas industry restructuring, even if incomplete, has delivered very large benefits for the economy. Prices of gas to final consumers measured in nominal as well as constant dollars are significantly lower than they would have been under the old regime. The cost of transporting and handling gas has also fallen. All these restructuring improvements can be attributed to a variety of sources. Applied changes in technology, greater industry flexibility, better matches between products and customers’ needs and competitively driven reductions in economic rents are among the improvements that have contributed to these gains.

These improvements have worked to the advantage of all gas customers. Direct and indirect benefits from these gains are felt throughout the economy. But, the direct benefits from gas industry restructuring have not been shared equally among all final consumers of gas. Big users—industrial and electricity generating facilities—have experienced much larger price reductions than have other consumers. While it is true that the buying habits and usage patterns of large customers are different from those of smaller customers, there can be no question that part of the large customers’ successes in achieving low gas costs can be attributed to the opportunities they have to choose among competitive suppliers.

There is no good way to model a comparison between the results under current restructuring and the outcome that might have been obtained had competitive gas supply choices been available to a larger number and variety of consumers. But, in many quarters, there is a suspicion that the benefits of restructuring might have been larger if more consumers had been allowed to participate sooner. This suggests that restructuring will be more beneficial when the maximum number of customers has the ability to switch away from unsatisfactory suppliers without paying large price premiums.