

Private sector

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Development of Competitive Natural Gas Markets in the United States

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The United States enjoys a highly competitive natural gas market and an increasingly efficient market for pipeline transportation. Consumers have benefited from changes to both the structure and regulation of the industry in the past ten to fifteen years. These changes have lowered natural gas prices and broadened the range of services offered by gas companies. This Note reviews the forces driving the regulatory changes and the effects of the changes on the functioning of gas markets. It also provides an overview of natural gas trading mechanisms in the United States. The focus is primarily on the wholesale natural gas market, the market most affected by deregulation.

Deregulation of the gas industry

The U.S. natural gas market is the world's largest, with a total supply in 1996 of 25.6 trillion cubic feet. About 75 percent of this supply is produced domestically, with the balance from storage withdrawals and imports (12 percent each). Gas production is concentrated in the South, along the Gulf Coast in Louisiana and Texas, and in smaller producing regions in Alaska, the Southwest, and the central United States. But most natural gas consumers are in the Northeast, the Midwest, and the Pacific Coast region, all areas where imports of Canadian gas play an important part in meeting demand. The geographic imbalance between producers and consumers means that large quantities of natural gas must be transported long distances across the country and the continent. So even small inefficiencies in production or transportation of natural gas can have a large economic effect on the gas industry.

The U.S. natural gas industry has gone through a full cycle of government regulation in the past sixty years. During the first several decades of the century the industry enjoyed limited oversight by the government. That changed in 1938,

when the Natural Gas Act established a basis for regulating the prices and activities of gas companies. Over the next forty years regulation gradually increased its reach as new regulatory institutions and policies emerged. Interstate transactions came under regulation by the Federal Power Commission (FPC), later succeeded by the Federal Energy Regulatory Commission (FERC), while intrastate transactions were regulated by state agencies.

Overregulation

By the 1970s regulatory agencies controlled almost all aspects of business in the industry. Regulation was applied not only to industry segments dominated by natural monopolies, such as pipeline transportation, but also to competitive segments, such as production and wholesale supply. The excessive control burdened companies and distorted natural gas prices and consumption patterns.

Excessive regulation of gas producers, for example, led to gas shortages in the 1970s.¹ In the 1950s the FPC had started to regulate prices at the wellhead where interstate pipeline companies purchased natural gas from



producers. But with hundreds of active wellheads in the country, the commission was unable to process all the tariff applications. By 1960 it had completed 10 out of 2,900 applications. It was forced to adopt an “area rates” approach, setting a uniform tariff for all producers in the same geographic area. Although this step decreased the number of tariff cases, the approval process was still very slow, averaging ten years per case.

The area rates were based on average historical costs of production. These averages became very low relative to the increasing costs of production in the 1960s and early 1970s. Producers found sales of natural gas to interstate pipelines unprofitable and curtailed gas supply to the interstate market. They found it more profitable

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to supply gas to the intrastate market in Texas or Louisiana, for example, where wellhead prices were unregulated or considerably higher than in the interstate market. As a result interstate pipelines faced shortages of gas supply and consumers in the Northeast and Midwest experienced supply interruptions.

To attract producers back to the interstate market, the FPC adopted new regulation in the mid 1970s. A uniform national wellhead tariff was set at an average of current and expected costs of gas production, leading to a quintupling in wellhead prices. However, the new regulation did not eliminate the main cause of gas shortages—the regulation itself. Average cost-based national tariffs seldom reflected the true economic value of natural gas as it would be set in a competitive market. And even if national tariffs did reflect economic value, they applied only

to supply contracts concluded after 1975. Supply contracts concluded earlier were priced at low historical tariffs. Since interstate pipelines had a large portfolio of old gas contracts, the average wellhead costs of natural gas were well below the economic value. Consumer demand was therefore much higher than it would have been in a competitive market. This aggravated supply shortages. The costs of gas shortages in the 1970s were estimated at US\$2.5–5.0 billion a year.

Deregulation

Gas shortages prompted deregulation in order to promote efficiency in production and bulk supply of natural gas. The main approach was to allow free competition among producers and suppliers in the wholesale gas market. The process was launched in 1978 when Congress adopted the Natural Gas Policy Act, authorizing the FPC to liberalize interstate natural gas markets. The FPC adopted a number of regulatory measures that partially liberalized wellhead prices of gas, allowed competition in the wholesale gas market, and enhanced regulation of interstate gas pipelines. Congress adopted additional legislation in 1989 and 1992 further liberalizing wellhead gas prices and interstate natural gas transactions.

Among the most important measures adopted by the FERC was Order No. 436 of 1985, which introduced open access to interstate pipeline transportation and limited the use of long-term contracts. Local distribution utilities and large end users were allowed to purchase natural gas directly from producers, bypassing interstate pipeline companies. Companies that agreed to provide open access to their interstate pipelines were allowed to charge an open access tariff, regulated by FERC, for provision of transportation services. To promote competition in the bulk supply of natural gas, FERC allowed gas marketing companies to arrange purchases and sales of natural gas on behalf of other industry participants.

Deregulation of the gas industry followed when FERC adopted Order No. 636 of 1992, which

FIGURE 1 TRADITIONAL STRUCTURE OF THE U.S. GAS INDUSTRY, BEFORE 1985

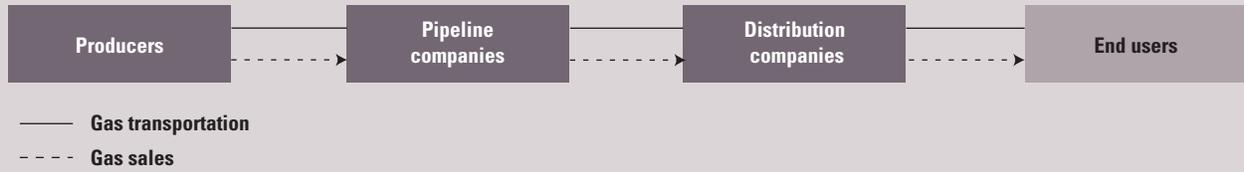


FIGURE 2 OPEN ACCESS TO PIPELINE TRANSPORTATION, 1985–92

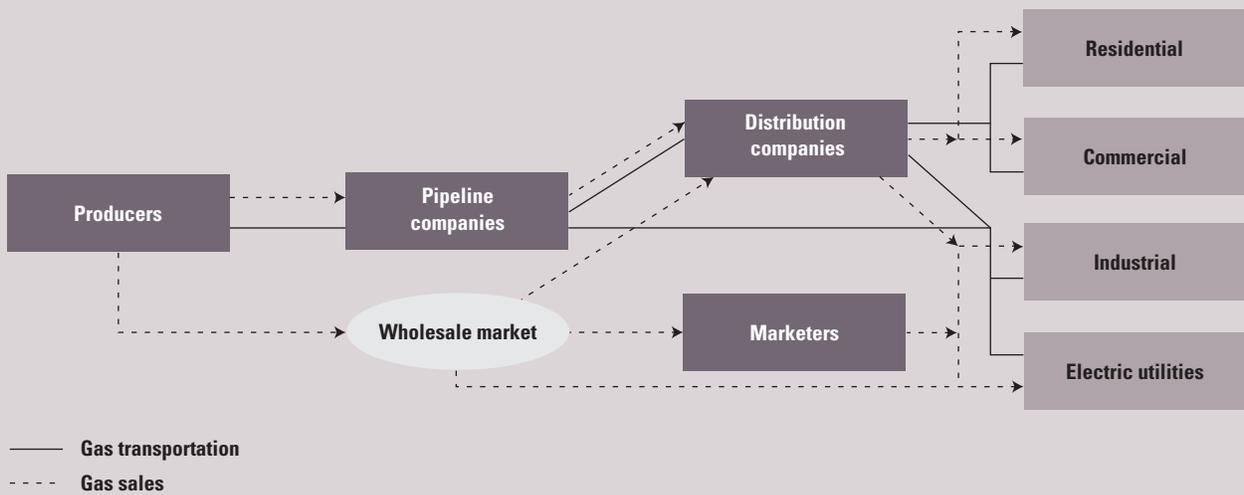
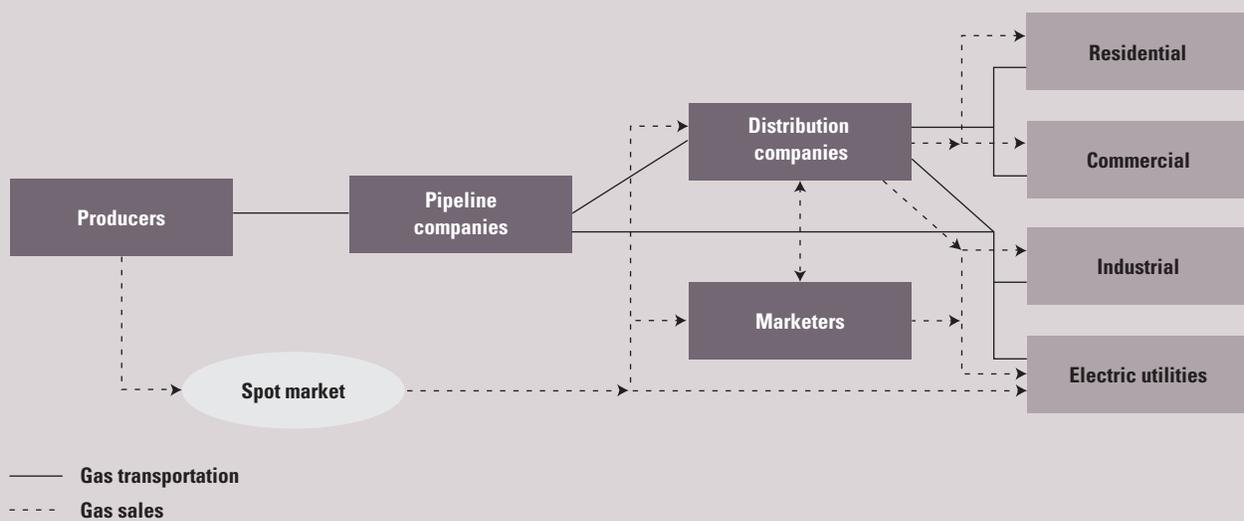


FIGURE 3 UNBUNDLING OF GAS SALES FROM PIPELINE TRANSPORTATION, 1992 AND BEYOND



required the interstate pipeline companies to unbundle natural gas sales from pipeline transportation by setting up separate affiliates to handle these activities. This removed an incentive for interstate pipeline companies to distort bulk supply competition through restricting access to pipelines.

To minimize distortions in the gas market caused by regulated prices for interstate pipeline transportation, Order No. 636 also enhanced the method for calculating transportation tariffs and introduced a program for the resale of firm transportation contracts. This program, the capacity release program, allows shippers (any users of pipeline transportation) to purchase pipeline capacity from shippers that have temporary or permanent excess reserved capacity. The capacity release market promotes the efficient allocation of transportation contracts among shippers and allows gas market participants to match transportation contracts to their gas supply contracts.

The two orders dramatically changed the operation of the gas industry, from tight regulation to free competition in the wholesale gas market. But implementation of the orders imposed large transition costs on some industry participants, which naturally opposed changes. Opposition to Order No. 436 was particularly strong. The transition costs related to Order No. 436 were estimated at US\$11.7 billion in 1986, half the total book value of interstate pipelines in 1984, at US\$23.4 billion. The actual value of transition costs was \$10.2 billion as of 1995.² Only after FERC worked out a mechanism to distribute the costs among all industry participants could the orders be successfully implemented and competition flourish.

The costs arose in the following way. Before 1985 interstate pipelines entered long-term supply contracts to purchase from producers and sell to distribution companies. Many of these contracts were concluded at very high wellhead prices, which pipelines, fearing a recurrence of the supply interruptions of the 1970s, were willing to pay. The uneconomic costs of gas purchases at the wellhead were borne by

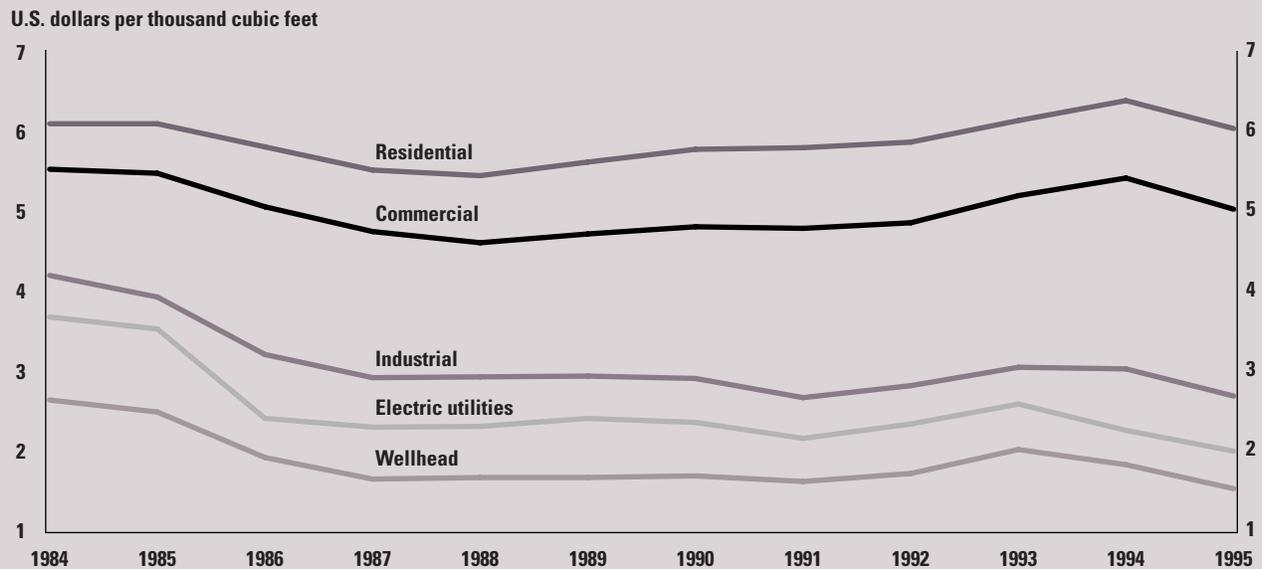
distribution companies and final consumers, since regulators allowed a pass-through of gas purchase costs to consumers. Order No. 436 allowed distribution companies to exit these long-term supply contracts with pipeline companies and purchase natural gas directly from producers. But pipeline companies were not allowed to exit their contracts with producers and so were left with large contractual obligations that they were unable to meet. The pipeline companies challenged the order in court, and FERC had to issue a new order (Order No. 500 of 1987) allowing the companies to pass on up to 75 percent of the transition costs to producers, distribution companies, and large consumers. Only then did the interstate pipeline companies begin to implement the open access regime on a large scale.

Order No. 636 completed the deregulation of the wholesale gas market by liberalizing entry into gas marketing. It was followed by a series of FERC orders to promote competition in the wholesale gas market and increase flexibility in interstate pipeline transportation. FERC is now focusing on developing short-term capacity resale and standardizing gas supply and transportation contracts.

Impact

Deregulation has changed the structure of the U.S. gas industry. Until 1985 the industry was vertically separated into production, pipeline transportation, and distribution (figure 1). However, all transactions were tightly regulated and completed under long-term contracts. The introduction of open access to interstate pipeline transportation in 1985 gave rise to the competitive wholesale gas market, and gas marketing emerged as a new segment of the industry (figure 2). The unbundling of interstate pipeline transportation completed the wholesale market's transformation into a fully competitive market in 1992 (figure 3).

The liberalization of gas marketing and wholesale gas prices attracted many new companies into the wholesale gas market. The fierce com-

FIGURE 4 AVERAGE NOMINAL NATURAL GAS PRICES IN THE UNITED STATES, 1984–95

Source: Energy Information Administration, Washington, D.C.

petition that ensued among marketing firms and gas producers increased the pressure on wholesale gas prices. The price competition benefited not only wholesale market participants, but also final consumers of natural gas. Nominal prices of natural gas decreased or remained stable for all consumer categories after 1985 (figure 4). This meant a substantial decrease in real prices. Wellhead prices dropped on average 26 percent in real terms between 1988 and 1995, while prices at city gates (the entry points to pipeline networks for local distribution) fell by 24 percent.

Although there was an overall decline in retail gas prices, the distribution of benefits was uneven. Large consumers such as electric utilities and industrial consumers, which now purchase about 75 percent of their gas requirements in the competitive wholesale market, saw a 26 to 31 percent decline in real prices between 1988 and 1995. Most small consumers, however, are still captive to local distribution companies, and only about 25 percent of gas consumed by commercial users is purchased directly in the wholesale gas market. As a result, commercial and residential consumers saw only a 12 percent decline in the average real price of natural gas between 1988 and 1995.

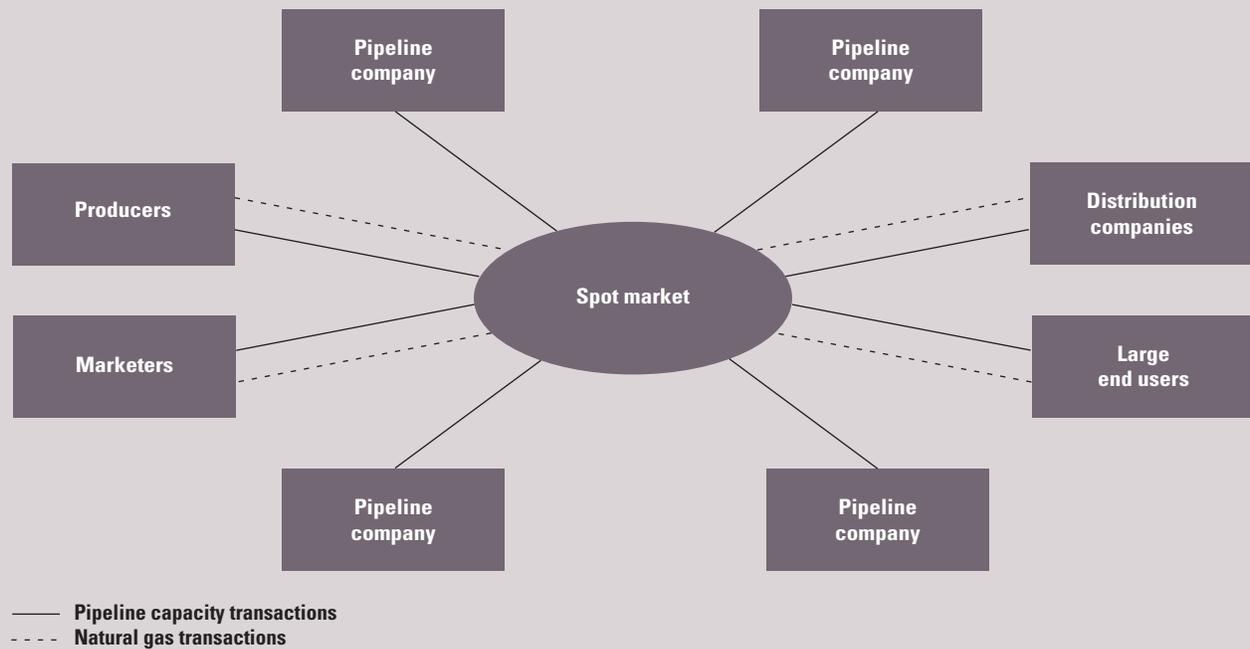
The functioning of a competitive gas market

After fifteen years of deregulation, the wholesale gas market in the United States is fully liberalized and very competitive. Producers, pipeline companies, marketers, distribution companies, and large consumers trade natural gas in a large number of regional markets. Natural gas transactions are mostly arranged by gas marketers, which buy and sell natural gas on behalf of producers, distribution companies, and large consumers. Most trading takes place in spot markets at major market centers and hubs on interstate pipelines (figure 5). Important trading activity also occurs in financial gas markets (futures and options), where participants minimize the price risks in natural gas spot markets. And recently electronic trading systems have developed that allow the trading of natural gas and pipeline capacity in all major markets in the United States and Canada.

Gas marketers

Gas marketing companies are a dynamic and competitive segment of the U.S. natural gas

FIGURE 5 TRADING IN MARKET CENTERS AND HUBS



industry. The share of deliveries they arrange increased from 20 percent of the total in 1987 to 49 percent in 1995. The first marketing companies emerged in the late 1980s, but the main boom occurred after implementation of Order No. 636 in 1992, as producers, pipeline companies, and distribution companies formed marketing subsidiaries to take over natural gas acquisition and sales.

Marketing companies benefit other participants in the gas market by minimizing transactions costs and supply and price risks. They group the supply and demand needs of market participants and match them with appropriate contracts on a large scale. This intermediation reduces the costs of transactions by freeing buyers and sellers from having to shop for the best contract. At the same time, by aggregating contracts, marketers can diversify the supply and price risks of individual contracts. These risks often arise when market participants with different supply and demand characteristics try to arrange transactions on a bilateral basis. Because marketers can pool contracts in one portfolio, they are better able to absorb fluctuations in supply or demand.

As natural gas markets have become increasingly complex, marketing companies have sought to expand their size and scope in order to accommodate the diverse needs of their clients. In 1995 and 1996 a wave of mergers increased the concentration of sales. In 1994 the top ten marketers arranged average daily sales of about 31 billion cubic feet of natural gas, 42 percent of total U.S. daily consumption. In 1996, after mergers between several large players, the top four marketers alone accounted for this volume of sales. Despite this concentration, small marketers continue to play an important role, particularly in local markets, which are commercially unattractive for major players.

Hubs and spot markets

Over the past ten years natural gas transactions in the wholesale market have gradually moved from wellheads to hubs at major interconnections of interstate and intrastate pipelines. Today most gas trading in the United States takes place in large hubs and market centers. Hubs are typically operated by one or several interstate pipeline companies, which own the pipelines interconnected at the hub. Hubs allow market

participants to acquire natural gas from several independent sources and ship it to several different markets. This eliminates the need to contract natural gas and pipeline capacity all the way from the wellhead to the consumption site. Instead, shippers can combine supply routes across several hubs to diversify supply risks and minimize costs. Hub operators offer a wide variety of services—ranging from physical transportation of natural gas to storage, processing, and trading—providing great flexibility for shippers and marketers in trading and delivering natural gas.

Hubs have become very popular among marketers and other players in the wholesale gas market. More than fifty have been created across the United States since the first one, the Henry Hub, was established in May 1988 in Erath, Louisiana. The Henry Hub, which is also the largest hub in the United States, is a major natural gas interchange operated by Sabine Pipe Line Company, a subsidiary of Texaco. At this hub marketers and traders have access to large consumer markets in the Midwest, Northeast, and Southeast and along the Gulf Coast through nine interstate and three intrastate interconnecting pipelines. The market participants transported about 550 million cubic feet of gas a day through the Henry Hub in 1995.

Almost all major hubs in the United States have developed into spot markets where natural gas is traded continuously. The most important natural gas spot market is at the Henry Hub. This highly liquid and efficient spot market determines the market price of natural gas on a continuous basis. The Henry Hub spot price plays a key role in the U.S. gas industry. Gas industry participants use the spot prices to evaluate their contract portfolios and make consumption or investment decisions. And the Henry Hub is the pricing point for the first financial gas contract, the New York Mercantile Exchange (NYMEX) natural gas futures contract.

Financial gas market

Participants in natural gas spot markets in the United States face substantial price risks, as spot

gas prices occasionally become highly volatile. A cold spell in February 1996, for example, caused extreme changes in spot prices at the Henry Hub. The average spot price in February 1996 was US\$4.41 per million British thermal units (Btu), a record high compared to the average annual price of about US\$2 per million Btu. The spot price at Henry Hub peaked at more than US\$15 on February 2, 1996, and some industrial customers in Chicago paid a city gate price of US\$45 per Btu.³

Most players in the gas market dislike high volatility in gas prices and seek ways to diminish the price risk in the financial gas market. They are aided by a large number of intermediaries—gas marketers that compete fiercely to structure the best ways of minimizing price risk for customers.

The U.S. financial gas market had its beginnings in the late 1980s, when several financial institutions began to offer custom-tailored natural gas futures contracts. As noted, the first standardized financial gas contract was introduced by NYMEX in April 1990, in the form of a natural gas futures contract with delivery at the Henry Hub. In April 1992 NYMEX added a natural gas options contract for delivery at the same location. NYMEX and the Kansas City Board of Trade have since introduced three more natural gas futures and options contracts, with three different delivery locations, to reflect regional differences in the market value of natural gas.

Financial gas trading has proved popular among gas market participants. Between 1991 and 1995 the volume of natural gas futures contracts traded increased from 0.42 trillion cubic feet to 80 trillion—four times the physical consumption of natural gas in 1995. The turnover in futures trading was US\$125 billion in 1994, about 60 percent more than the turnover in physical gas that year. Most financial gas trading is conducted by marketers (which held 34 percent of the open interest on natural gas futures in the first quarter of 1996), producers (25 percent), and financial institutions (20 percent).

Electronic trading and market centers

The introduction of electronic trading systems in the past two years has led to the development of market centers connected to multiple hubs by electronic networks. Electronic trading allows market participants to trade not only natural gas, but also pipeline capacity and storage services at all interconnected hubs and pipelines. It also facilitates communication between pipeline companies, shippers, and hub operators. Many electronic trading systems are linked to other commercial networks that supply information and news relevant to the gas industry.

Electronic trading has its origins in the electronic bulletin boards established by interstate pipeline companies in 1993 to support resale of pipeline capacity. Standardization of these electronic bulletin boards simplified the trading of pipeline capacity and showed the advantages of electronic trading. In late 1994 three commercial electronic trading systems were introduced that allowed market participants to trade natural gas and pipeline capacity electronically across several markets and pipelines. By the end of 1996 almost all major pipeline companies in the United States had introduced electronic systems.

The largest electronic trading system in the United States today is Altra Streamline, which is linked to eight market centers and forty-five interstate pipelines in the United States and Canada. The average daily volumes traded in this system range from 10 million to 200 million cubic feet of natural gas. Many small systems are integrating with larger ones to offer shippers and marketers a wide variety of services across all major gas markets in the United States. Electronic trading systems have great potential in the world of deregulated natural gas and power industries: they can link marketers to all major regional gas and electricity markets in the United States.

Conclusion

The U.S. experience in gas industry deregulation shows that the development of competitive gas markets must be supported by continuing

improvement of the regulatory framework for the gas industry. Such measures as liberalizing wholesale gas prices and the bulk supply of natural gas free market forces in segments where competition is both feasible and socially desirable. Regulators also must focus on improving the regulation of pipeline transportation and minimizing its distortive effect on competitive gas markets. Introducing flexibility into pricing and other conditions of transportation contracts—such as delivery locations or the balancing of gas shipments—and standardizing pipeline operations promote more efficient use of pipelines and benefit all industry participants.

The U.S. experience also shows the viability of competition in the deregulated wholesale gas market and the important role of gas marketers and spot markets in increasing the efficiency of gas transactions and prices. Liberalized wholesale prices create many profit opportunities in the gas market, and these attract new entrants to production, marketing, and supply. Many of the new entrants bring new services and products that increase the range and quality of choices for gas industry participants.

Deregulation of the U.S. gas industry is far from complete, however. Regulation of charges for interstate pipeline transportation and capacity release still limits the efficient allocation of transportation contracts. But the most important task, and the biggest challenge for regulators, remains the deregulation of retail gas markets in individual states. These issues will continue to keep U.S. gas regulators busy.

¹ This example draws on Richard J. Pierce Jr., "Reconstituting the Natural Gas Industry from Wellhead to Burnertip," *Energy Law Journal* 9 (January 1988): 1–57.

² Pierce (1988) and U.S. Department of Energy, *Energy Policy Act Transportation Study: Interim Report on Natural Gas Flows and Rates* (DOE/EIA-0602[95], Energy Information Administration, Washington, D.C., 1995).

³ Energy Information Administration, *Natural Gas 1996: Issues and Trends* (DOE/EIA-0560[96], Washington D.C., 1996).

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