

Executive Summary

Legislative initiatives, regulatory changes, and market forces have reshaped the natural gas industry during the past decade. While legislation and policy initiatives have created the conditions necessary for markets to expand, regulatory reform has focused on creating a more efficient and competitive market. This market reform has centered on the restructuring of interstate pipeline companies and their relationships with producers, local distribution companies (LDC's), and end users.

Regulatory reform has shifted the responsibility for gas purchasing from the pipeline companies to some end users and to the LDC's. These purchasers now can negotiate with many different suppliers, contract with pipeline companies for transportation service, and select and combine an assortment of other services to satisfy their needs. Accordingly, transportation patterns have been affected because customers make their own arrangements for service. Now that gas is no longer bought from interstate pipeline companies as part of a bundled service, the rate structure for transportation and other services provided by pipeline companies has also changed significantly.

Transportation tariffs for interstate pipeline companies are determined in Federal Energy Regulatory Commission (FERC) proceedings and are based on the total cost of providing pipeline service. Many factors influence total costs, and therefore final tariff rates, including up-front capital costs, capital depreciation, the allowed rate of return, operation and maintenance costs, gas throughput, and service quality. Also, rate design and the allocation of a pipeline company's fixed and variable costs can have an enormous impact on rates for different types of customers. For example, in 1992 FERC adopted the straight fixed-variable (SFV) rate design, allocating all fixed costs to a pipeline capacity reservation fee and all variable costs to a commodity or usage fee. This change moved approximately \$1.7 billion from the usage to the reservation fee, putting downward pressure on rates to consumers with relatively constant consumption patterns and upward pressure on rates to seasonal consumers.

This report is the second in a series of three reports requested by the U.S. Congress under Section 1340 of the Energy Policy Act of 1992. It examines how the Clean Air Act Amendments (CAAA) and other Federal actions have affected transportation patterns and rates for natural gas from 1988 through 1994. The legislative, regulatory, and market developments during this period have been so extensive that it is difficult to evaluate separately the effects of any one event such as the CAAA. However, to the extent that these developments alter natural gas consumption and production or allow more flexibility in rates

and services, natural gas flows and rates are affected. Chapter 1 briefly highlights the extensive changes in natural gas policy and markets during the past decade, while Chapter 2 summarizes the Federal laws and policies that have affected interstate transportation rates and flows. Subsequent chapters:

- Address the changing patterns of interstate gas flows, shifts in consumption and production, and the increased importance of imported gas from Canada (Chapter 3).
- Analyze the changes in maximum rates for transportation services in selected market areas, the effect of capacity release trading on interstate pipeline company rates, and trends in consumer transmission and distribution prices (Chapter 4).
- Present an update of information sources and data collection that could be used to assess the impacts of legislative and regulatory actions on transportation flows and rates (Chapter 5).

Improvements in electronic information systems during the past few years have increased the availability of some natural gas data. Despite these advances, many questions relating to pipeline rates cannot be addressed. For example, substantial information is available regarding capacity release transactions posted on the electronic bulletin boards, including the actual rates paid. However, these transactions represent only 13 percent of total deliveries. Thus, coverage of a significant part of the transportation market is not publicly available. The Energy Information Administration (EIA) continues to evaluate and monitor the need for future data collection in this and other areas.

Recent Regulatory and Legislative Actions Have Altered Natural Gas Markets

Arguably, the most significant regulatory actions that affected interstate transportation rates between 1988 and 1994 were FERC Orders 436 and 636 that restructured the natural gas industry. Order 436 encouraged, and Order 636 required, pipeline companies to provide customers equal access to unbundled pipeline services. Order 636, issued April 8, 1992, required interstate pipeline companies to unbundle, that is separate, their sales and transportation services by the beginning of the 1993-94 heating season (November 1, 1993). The net result was to provide other parties with access to capacity on interstate pipelines, leading to increased competition among gas sellers and buyers, diminished market power for pipeline companies, higher throughput, and lower transmission markups

(Figure ES1). There are two key provisions of Order 636 that have an impact on rates: (1) the change in rate design; and (2) the capacity release program.

During the period of this study, 1988 through 1994, some other major legislative and policy initiatives contributed to increased natural gas use in the U.S. economy. A major objective of policy makers during this period was to provide the regulatory and legislative framework that would ensure adequate energy supplies and also protect environmental quality. The Clean Air Act Amendments of 1990 (CAAA) provided opportunities for the expansion of the natural gas market. Other legislation and policy directives, including the U.S./Canadian Free Trade Agreement, the Natural Gas Wellhead Decontrol Act, and the amendment of the Power Plant and Industrial Fuel Use Act, also have had far-reaching implications for the industry. In general, legislation has increased market competition and encouraged the production and use of natural gas. (The initiatives have also affected transportation and distribution patterns.)

While CAAA Effects Are Limited to Date, Future Requirements Are Likely to Have a Greater Market Impact

The CAAA created new air quality standards that require companies to install more advanced pollution control equipment and to make other changes in industrial operations that will lead to reductions in emissions of air pollutants. The amendments are

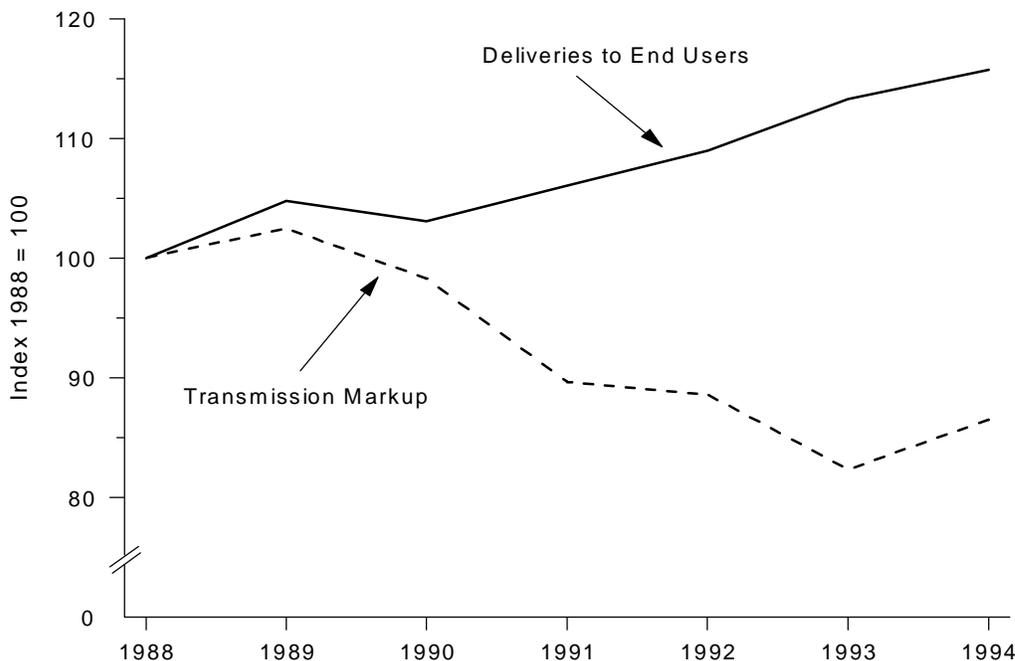
expected to increase the use of natural gas by electric utilities and to expand its commercial use in vehicles.

The upper Midwest and the New England areas are expected to use more gas-fired generators to produce electricity, while California is expected to continue leading the Nation in the use of natural gas-fueled vehicles. Subsequent phases of the Clean Air Act cover the period beginning in 2000, and require lower future emission levels. Natural gas use should rise as generators increase operations of existing gas-fired plants and retrofit other facilities for gas use. In addition, some new capacity fueled by natural gas is expected to be built in the future. The CAAA could have significant effects on future U.S. demand and supply levels and influence regional flow patterns, although the impacts are limited at present.

Regulatory Policies and Market Changes Have Contributed to Almost \$6.5 Billion in Annual Savings to Gas Consumers

In total, EIA estimates that consumers paid almost \$6.5 billion (9 percent) less, in real terms, for natural gas service (including wellhead purchases combined with transmission and distribution charges) in 1994 than they would have in 1988. This estimate includes \$2.5 billion in reduced transmission and distribution charges and \$4 billion of savings resulting from the 11-percent reduction in wellhead prices since 1988. The bulk of the \$2.5 billion represents the reduction in the fixed costs of transmission

Figure ES1. Indices of Natural Gas Transmission Markups and Deliveries to End Users, 1988-1994



Sources: Energy Information Administration, Office of Oil and Gas, derived from: 1988: *Historical Monthly Energy Review 1973-1992* (August 1994). 1989-1994: *Natural Gas Monthly* (August 1995).

and distribution that do not vary with the volumes delivered. Because of data limitations, the estimate of total savings may be low because for offsystem industrial customers only the savings in wellhead prices are included. However, of the \$6.5 billion savings, industrial customers were the main beneficiaries, receiving over half of the savings (\$3.8 billion), while electric utilities and commercial customers each saw savings of \$1.4 billion.

Another way to estimate savings is to compare the average price per thousand cubic feet to each end-use sector in 1994 and 1988. This method assumes that transmission and distribution costs would vary with the volumes delivered. In 1994, the price of 1 thousand cubic feet of gas (wellhead price plus delivery charges) to the various end-use sectors had decreased between 3 and 19 percent from 1988 levels (Table ES1).

Between 1988 and 1994, total transmission and distribution markups (the average unit cost of combined transportation and distribution services) to the residential and commercial sectors remained fairly constant in real terms, while comparable prices to the industrial and electric utility sectors declined by 20 and 42 percent, respectively (Figure ES2). Although total markups to captive residential and commercial consumers have remained unchanged, these customers appear to have benefited from the increased competition in natural gas markets brought about by changes in Federal policies. From 1988 through 1994, the average cost of transmission service from the wellhead to the local distributor decreased 16 percent, but this decrease was almost completely offset by 7 and 13 percent increases in the cost of distribution from the citygate to the residential and commercial end users, respectively.

Federal Policies Also Affect Transportation Rates: Impact Varies by Customer Class

Based on an examination of selected transportation markets, customers with relatively constant rates of gas consumption generally benefited more than customers with variable patterns of consumption from the change to straight fixed-variable (SFV) rates mandated by FERC Order 636. The results are based on a comparison of maximum tariff rates (maximum regulated rates), including transition costs, for firm transportation service during 1991 (pre-Order 636) and 1994 (post-Order 636) along 21 routes from supply to market areas.

The pattern of gas consumption during the year varies by customer. Some customers, such as large industrial plants,

consume gas at a fairly constant level throughout the year (high-load-factor customers), while others, such as residential consumers, alter their consumption with the seasons (low-load-factor customers). Although other influences may have mitigated SFV's downward pressure on high-load-factor rates and upward pressure on low-load-factor rates, the change in rate design was the dominant influence in widening the gap between the rates paid by the two groups. Except for the change in rate design, other key determinants of firm rates would tend to have the same general impact on customers regardless of their load factors.

The analysis of maximum allowable rates suggests that low-load-factor customers have benefited less than high-load-factor customers from the recent regulatory changes. Although both categories of customers had increases and decreases in tariffs, the change was more advantageous to the high-load-factor customers. In those cases where rates to high-load-factor customers increased, rates to low-load-factor customers increased even more in both absolute and percentage terms. Also, if both categories of customer experienced a decrease in rates, the decrease was always larger for the high-load-factor customer. In about half the cases considered, rates to the high-load-factor customers declined, while rates to the low-load-factor customers either decreased by a smaller amount or actually increased. For example, on the Gulf Coast to Louisville route, the high-load-factor rate declined by 18 percent while the low-load-factor rate increased by 9 percent.

Comparing pre- and post-Order 636 rates in the corridors served by multiple pipelines suggests that transportation services offered by different pipeline companies may have become more similar. The rate variation among pipeline companies in a corridor has decreased, particularly for low-load-factor customers. However, the convergence in rates for high-load-factor customers results from a decline in the high-end rates combined with an increase in the low-end rates, while the convergence in rates for low-load-factor customers results from low-end rates moving up to the level of high-end rates. Order 636's directive to use a common rate design method for all pipeline companies may have led to more similarity in the rates offered by pipeline companies serving the same corridor.

New Capacity Trading Mechanism Lowers the Cost of Gas Transmission

Another major development in the restructured transportation market was the establishment of a secondary market in pipeline capacity. Prior to Order 636, capacity rights on a pipeline were

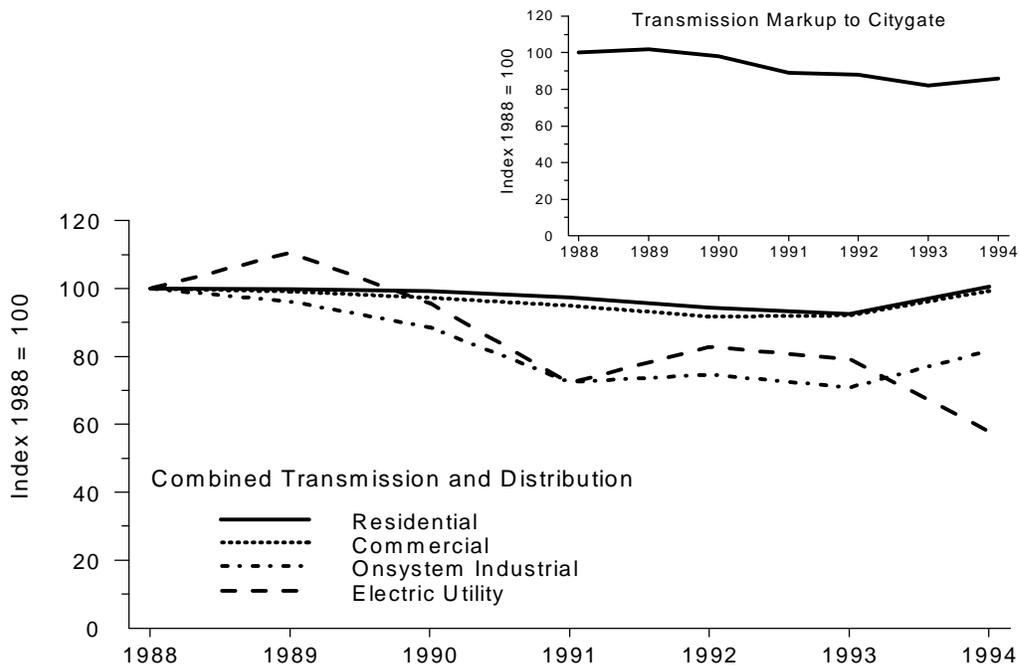
Table ES1. Average Natural Gas Prices and Price Changes, 1988 and 1994
(1994 Dollars per Thousand Cubic Feet)

Price	1988	1994	Price Change	Percent Change
Wellhead	2.05	1.83	-0.22	-11
Citygate	3.54	3.08	-0.46	-13
End Use				
Residential	6.64	6.41	-0.23	-3
Commercial	5.62	5.43	-0.19	-3
Onsystem Industrial	3.58	3.05	-0.53	-15
Electric Utility	2.83	2.28	-0.55	-19

Note: Industrial end-use price data represent onsystem sales only. The onsystem share of total sales to industrial consumers declined from 43 percent in 1988 to 22 percent in 1994.

Sources: Energy Information Administration. **1988:** *Natural Gas Annual 1992*, Vol. 2 (November 1993). **1994:** *Natural Gas Monthly* (August 1995).

Figure ES2. Indices of Transmission/Distribution Markups by Sector, 1988-1994



Notes: Industrial markups reflect end-use prices for onsystem sales only. The onsystem share of industrial deliveries was 43 percent in 1988 and 22 percent in 1994.

Source: Energy Information Administration, Office of Oil and Gas, derived from: **1988:** *Natural Gas Annual*, Vol. 2 (November 1993); **1989-1994:** *Natural Gas Monthly* (August 1995).

nontransferable. A customer could either use the capacity itself or it would be available to the pipeline company with no compensation to the customer. Under Order 636, a shipper with excess reserved capacity can release it in return for a credit on its reservation charge. Total credits during the period November 1993 through March 1995 were approximately \$568 million, of which \$528 million was generated from pipeline capacity releases and \$40 million from storage capacity releases.

While less than 2 years old, the capacity release market currently represents 13 percent of the overall volume of gas moved to market in 1994. Rates for capacity release transportation represent an average 64 percent discount from the maximum firm transportation rate. Rates for released capacity vary from region to region. The Southeast Region, with its expanding gas market and limited capacity available for release, has the highest rate for released capacity—more than three times

the national average price. The average U.S. price for released pipeline capacity has been fairly stable with only modest seasonal fluctuations during the winter months.

The capacity release market not only reduces the cost of reserving capacity on the system. It also provides replacement shippers with a generally lower cost alternative to capacity obtained directly from the pipeline company. Before this market emerged, competition along a corridor was limited. As a result of the emergence of the secondary market, the number of potential suppliers of firm capacity has increased significantly because each holder of firm capacity may release that capacity. This translates into a substantial increase in the degree of effective competition in the market for pipeline capacity. It preserves the economies of scale inherent in transmission while effectively providing for a competitive and thus more efficient market in pipeline capacity.

Major Shifts in Supply and Demand Have Altered Natural Gas Flows

The principal flow patterns of natural gas from supply areas to markets in the lower 48 States have not changed significantly since 1988. However, several new routes and major increases on several existing routes have developed (Figure ES3). The major change has been the rapid growth in imports of natural gas from Canada, principally to serve markets in California, the Midwest, and Northeast. In 1994, imports of Canadian natural gas were 2.6 trillion cubic feet, double the level in 1988. Currently, Canadian gas accounts for approximately 13 percent of U.S. gas consumption, up from 7 percent in 1988. Another major shift has been the development of pipeline capacity extending from the Central to the Western Region as well as within the Central Region itself. Most of this development has been to move new supplies from the Rocky Mountain

Figure ES3. Flow Patterns on the Interstate Pipeline Network, 1994

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

area of Colorado and Wyoming and the coalbed methane fields of southern Colorado and northern New Mexico.

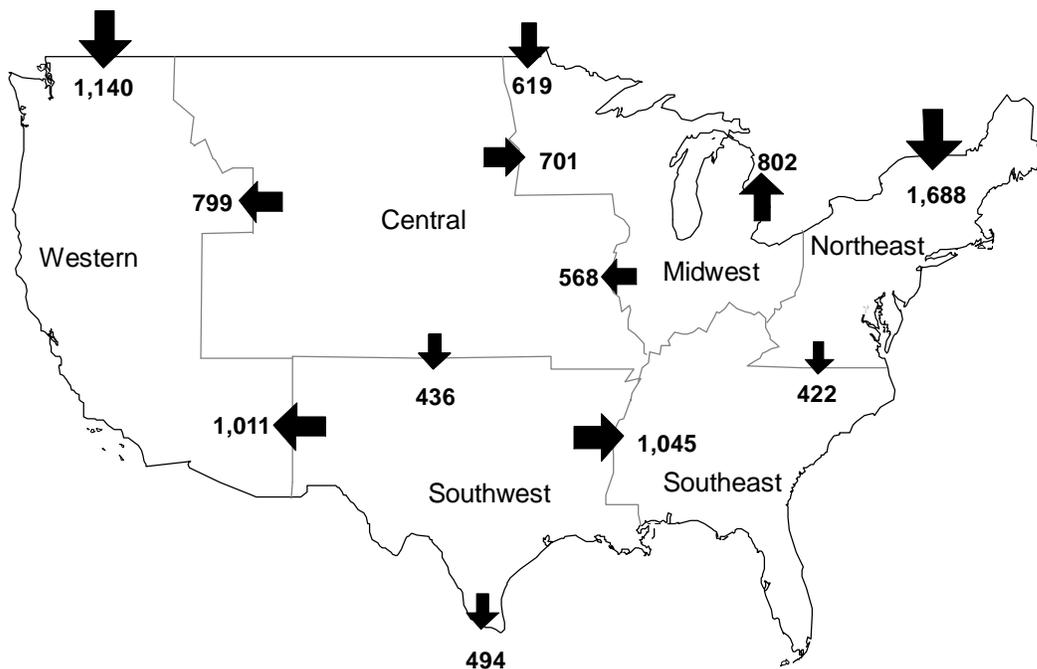
These shifts in gas flows can be attributed to many elements. Changes in flow patterns are driven by changes in demand and supply patterns, which vary considerably by region and sector because of differences in regional gas production and delivery costs, climate conditions, population density, and gas penetration rates. Legislative and regulatory policies vary in their impact on the trends and patterns in flows between the regions because of these differences.

Natural gas consumption has increased by 15 percent since 1988 with most of the growth occurring in the industrial sector, which includes nonutility generation of electricity. This increased consumption has been supported by an increase in U.S. production of 1.8 trillion cubic feet (10 percent) as well as by the increased imports from Canada. The increased gas flows have also been supported by significant expansion of the physical network of pipelines and storage facilities, and by the

increased flexibility and accessibility of the system that resulted from regulatory changes. Interregional pipeline capacity has increased by more than 10 billion cubic feet per day since 1990, from 75.5 to 85.9 billion cubic feet per day (Figure ES4).

A more general change to flow patterns has been brought on by the fundamental shift in the role of pipeline companies from sellers to transporters of gas for others. Although mandated by FERC Order 636, market forces had already been moving the industry in this direction. In 1994, approximately 96 percent of all natural gas transported on the interstate system represented transportation of gas for others, compared with 56 percent in 1986 and only 21 percent in 1981 when pipeline companies were primarily sellers of gas. The requirement under FERC Order 636 that all shippers have open access to transportation and storage services has also led to development of many market or supply hubs with numerous pipeline interconnections and services and access to storage facilities.

Figure ES4. Interregional Additions to Capacity on the Interstate Pipeline Network, 1991 Through 1994
(Volumes in Million Cubic Feet per Day)



Source: Energy Information Administration, EIAGIS-NG Geographic Information System, Natural Gas Pipeline State Border Capacity Database, August 1995.