

Deliverability on the Interstate Natural Gas Pipeline System

Executive Summary

The following article is the Executive Summary from the recently published report *Deliverability on the Interstate Natural Gas Pipeline System*, DOE/EIA-0618(98), prepared by the Office of Oil and Gas of the Energy Information Administration (EIA). The report may be accessed electronically from EIA's World Wide Web Site at http://www.eia.doe.gov/oil_gas/natural_gas/analysis_publications/deliverability/deliver.html. Printed copies of the report are available from the U.S. Government Printing Office (202) 512-1800 or through EIA's National Energy Information Center, Forrestal Building, Room 1F-048, Washington, DC 20585 (202) 586-8800.

Deliverability on the Interstate Natural Gas Pipeline System examines the capability of the interstate pipeline network to move natural gas to various markets within the United States, highlighting the changes that have occurred since 1990. Significant changes have occurred in the natural gas industry since the Energy Information Administration (EIA) published the predecessor to this report in 1992.¹ Fundamental changes in industry structure were imposed with the issuance of Order 636 in 1992 by the Federal Energy Regulatory Commission that allowed market forces and competition to become the primary factors influencing change in the natural gas marketplace. Several new concepts in natural gas trading and distribution have developed, such as the market center, and changes have been made in how certain network resources are being used in support of these system changes, such as open access to underground storage capacity.

For the most part, these changes have been positive. Total U.S. natural gas consumption has increased by 17 percent since 1990, marketed production has increased by 6 percent, net imports have nearly doubled, and the interstate pipeline system has increased in size and capability. Overall growth in the pipeline network has occurred in both its deliverability and usage levels. For instance, between 1990 and the end of 1996:

- **Deliverability (capacity) on the interstate pipeline system increased by more than 15 percent, or 10.9 billion cubic feet per day, at regional borders (Table SF1).** The largest increase in interregional deliverability was to the Western Region, with an additional 3.2 billion cubic feet (Bcf) per day, or 45 percent (Figure SF1). The second largest increase was 2.4 Bcf per day, 24 percent, into the Northeast Region. The development of so much capacity in the

West led to a surplus of capacity and an overall drop in the pipeline capacity usage rate, whereas in the Northeast, demand growth fully supported the increase. In fact, pipelines into the Northeast saw a substantial increase in average daily usage rates, up 6 percentage points from 1990 levels.

- **Pipeline utilization rates also increased, by 7 percentage points, reaching a high of 75 percent (on an average day) in 1996.** This increase in interregional pipeline use, occurring simultaneously with a major increase in pipeline capacity, would seem to indicate that demand for natural gas was growing faster than new capacity was being added and that, in some areas, occasional bottlenecks or periodic capacity constraints might have occurred or were developing. In other areas, the increase in pipeline usage rates simply reflected a greater use of existing capacity that had been previously underutilized because of overbuilding or a temporary dropoff in demand.
- **Reflecting its growing role in the U.S. natural gas market, Canadian import capacity into the United States increased by 69 percent, or 4.5 billion cubic feet per day.** It also represents the largest portion of new interregional pipeline capacity proposed for development during the next several years. Although it is unlikely that all projects will be built, more than 7.7 Bcf per day of import capacity expansion has been proposed, most of it feeding into the U.S. Midwest and Northeast regions. To a great degree, the proposals are driven by producers in Western Canada seeking markets for that region's expanding production capability. Plans to develop fields in the Sable Island area off the east coast of Canada have also triggered a need to find markets for that production as well. (Between 1990 and 1996, Canadian marketed natural gas production increased at an 8-percent annual rate, while natural gas end-use consumption in Canada increased at

¹Energy Information Administration, *Capacity and Service on the Interstate Natural Gas Pipeline System 1990: Regional Profiles and Analyses*, DOE/EIA-0556 (Washington, DC, June 1992).

Table SF1. Regional Summary of Changes in Interstate Pipeline Capacity, 1990-1996, and Planned Additions, 1997-2000

Region	Entering the Region ^a (MMcf/d)						Within the Region ^b (MMcf/d)					
	Capacity End of 1990	Capacity End of 1996	Percent Change 1990-96	Estimated Capacity Added in 1997	Proposed Additions to Capacity 1998-2000 ^c	Percent Change 1996-2000	Capacity End of 1990	Capacity End of 1996	Percent Change 1990	Estimated Capacity Added in 1997	Proposed Additions to Capacity 1998-2000	Percent Change 1996-2000
Central	11,824	12,824	8	3	3,012	23	20,754	23,593	14	1,143	1,081	9
Midwest	22,818	24,787	9	306	5,306	21	23,354	23,151	10	820	2,721	15
Northeast	10,009	12,403	24	24	4,973	40	29,261	32,966	13	364	5,037	16
Southeast	19,914	21,393	7	0	438	2	47,788	51,128	7	436	1,999	5
Southwest	2,048	2,869	40	180	115	10	43,583	45,072	3	2,341	1,461	8
Western	7,126	10,331	45	0	326	3	9,924	15,489	56	13	193	1
U.S. Total	73,739	84,606	15	513	14,170	17	174,664	191,399	10	3,874	12,492	9
Canada	1,277	2,609	104	0	1,300	50	NA	NA	NA	NA	NA	NA
Mexico	399	889	123	237	1,375	181	NA	NA	NA	NA	NA	NA

^aIncludes only the sum of capacity levels for the States and Canadian Provinces bounding the respective region.

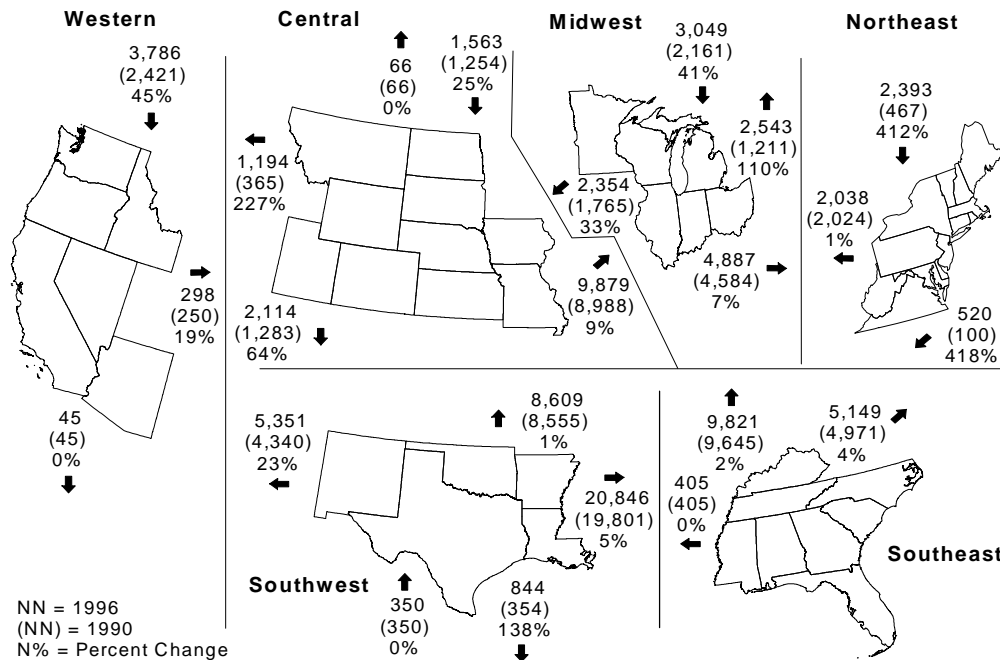
^bRepresents the sum of the interstate pipeline capacity, or planned capacity, on a State-to-State basis as measured at individual State border crossing points, exclusive of capacities "Entering the Region." Does not include projects that are entirely within one State. Gulf of Mexico projects are considered within the Southwest or Southeast region.

^cProposed capacity has been counted in only one region even though some projects may cross regional boundaries. In the case of a new line, the additional capacity has been included within the region in which it terminates. For an expansion project, the added capacity is included in the region where most of the expansion effort is focused.

MMcf/d = Million cubic feet per day. NA = Not available.

Sources: **Capacity:** Energy Information Administration (EIA), EIAGIS-NG Geographic Information System, Natural Gas Pipeline State Border Capacity Database, as of December 1997. **Capacity Additions:** EIAGIS-NG Geographic Information System, Natural Gas Pipeline Construction Database, as of March 1998, compiled from Federal Energy Regulatory Commission, Natural Gas Act Section 7(c) Filings, "Application for Certificate of Public Convenience and Necessity," and various natural gas industry news sources.

Figure SF1. Region-to-Region Natural Gas Pipeline Capacity, 1990 and 1996
(Volumes in Million Cubic Feet per Day)



Source: Energy Information Administration (EIA), EIAGIS-NG Geographic Information System, Natural Gas Pipeline State Border Capacity Database, as of December 1997.

only a 3.5-percent rate, thus the desire to expand export capabilities.)

Growth and changes in deliverability on the natural gas network have also resulted in some shifts in transportation corridors and access to production areas. Deliverability out of the Rocky Mountain area is increasing as producers there are seeking customers in expanding markets, such as the U.S. Midwest, to supplement their traditional markets in the Western Region. Likewise, producers and pipeline companies in the areas of West Texas and New Mexico have also shifted a larger portion of their capabilities toward Eastern markets.

In 1997, at least 41 natural gas pipeline projects were completed and placed in service in the United States, adding 6.3 Bcf per day of capacity overall, with 0.5 Bcf per day of that representing added interregional deliverability and 3.9 Bcf intraregional deliverability (Table SF1). A major portion of the new pipeline capacity represented increased receipt capability in expanding supply regions. For instance, the largest projects were in the Gulf of Mexico (3.2 Bcf per day) as offshore and deep-water development efforts in the area continue to expand. In addition, several major projects were completed that expanded access to the Wind River and Powder River basins of the Rocky Mountain area by almost 0.7 Bcf per day. The first new export lines to Mexico to be completed in 5 years were also placed in service during 1997. The increase in pipeline utilization levels since 1990 can be attributed in part to new trading and shipping arrangements that evolved with the introduction of pipeline open-access transportation and storage. The increased opportunities for trading, variable routing of gas shipments, and the development of new services to complement and expedite network operations have done much to improve the efficiency and utilization of available capacity. Several factors can be cited as contributing to the improvement, including:

- **Development of a release market for pipeline capacity, whereby unused firm capacity can be sublet by other shippers.** The pipeline capacity release market reached a level of about 3.6 trillion cubic feet in 1996 (the equivalent of 16 percent of available capacity). Before FERC Order 636, there was only limited experience with capacity brokering, which had been authorized by the Federal Energy Regulatory Commission in 1989.
- **Development of market centers.** Since 1990, when only one formal market center/hub was operational (the Henry Hub in Louisiana), more than 36 market centers have developed at strategic points within the North American pipeline grid. These centers have

contributed significantly to providing shippers greater access to lowest-cost gas supplies. Shippers now use market centers for rerouting gas supplies from one pipeline to another and also for access to services, such as short-term gas loans and parking, that facilitate gas trading and improve pipeline capacity usage. The Henry Hub, the Chicago Center (Illinois), and the Leidy Hub (Pennsylvania) are the three most active market centers in the United States today.

- **Improved access to underground storage.** Open access to underground storage services, mandated in Order 636, has also played a large role in improving the quality of transacting business on the natural gas pipeline network. The major trend in underground storage growth has been the increasing development of high-deliverability facilities, mostly salt cavern sites, which are designed to permit rapid access and turnover of stored inventory. These types of sites have become closely associated with market centers as they complement the short-term parking and loaning services offered by these centers. Since 1993, daily deliverability from salt cavern and other types of high-deliverability storage facilities has grown to represent more than 15 percent of total underground storage daily withdrawal capability, up from 10 percent. Practically all salt cavern storage sites are accessible from market centers.
- **Availability of electronic trading.** Another growing feature of the new natural gas marketplace is the increased use of computer-based electronic trading. Although there are only a few dominant systems in this marketplace, the number of trades conducted via electronic trading has grown steadily during the past several years. These systems bring together gas traders, capacity seller/buyers, and others at a number of optional points on the pipeline grid and assist the parties in carrying out their transactions. Most of the major market centers/hubs in North America, as well as a number of the most active spot-market trading points on the pipeline grid, are accessible to traders. Not to be forgotten, however, is trading on the non-electronic spot market, which still accounts for the large majority of trading activity covering short-term buying and selling of natural gas. Currently there are more than 120 trading points within the national pipeline network at which trading is conducted by open-market traders.

In the market for pipeline capacity, shippers prefer long-term contracts (a year or more in length) over short-term contracts and firm rather than interruptible transportation services. During the 12 months ended

March 31, 1997, about 78 percent of capacity was reserved under firm transportation contracts. However, not all of that capacity was used by the contract holders and, in addition, substantial firm transportation capacity is unsubscribed and available to shippers (27 trillion Btu per day, or 21 percent of maximum capability in 1997). Although this uncommitted capacity may not suit the needs of a particular shipper because of its location or term etc., it could support additional market growth beyond current levels. Shippers also have access to additional transportation services in which deliveries may not necessarily be guaranteed by the pipeline company. These services include capacity release and interruptible transportation service and are available to shippers depending on the actual use of the pipeline system by firm transportation customers. Marketers are the most active in the short-term and capacity release markets because these markets provide the flexibility to meet varying and unexpected demand levels.

Outlook

Based upon EIA natural gas consumption projections, the market for natural gas will continue to grow steadily into the next century. EIA forecasts about a 2-percent annual growth rate during the next 10 years (1999-2008). Excluding demand in the supply areas, this translates into a projected increase in consumption of nearly 1.2 trillion cubic feet by the year 2001.

In fact, the extensive number of currently planned capacity additions and expansion projects indicates that substantial activity is underway to address these potential increases in demand. If all the projects currently proposed through 2000 were built, interregional capacity would increase by as much as 14.7 billion cubic feet (Bcf) per day, or about 17 percent, from the level in 1996. Additional projects that are limited to providing service within a specific region comprise an additional 15.3 Bcf per day of capacity.

Natural gas consumption is projected to grow at a 5-percent annual rate in the Southeast Region through 2008, supported by anticipated growth in electric utility and industrial markets for natural gas. Markets in the Northeast and Midwest are projected to expand at

annual rates of only 3.3 and 1.6 percent, respectively. Current proposals to expand pipeline capacity into these regions between 1998 and 2000 amount to the equivalent of about 10.7 Bcf per day, with 5.3 Bcf per day directed to the Midwest, 5.0 Bcf to the Northeast, and 0.4 Bcf to the Southeast.

Based on current expansion proposals, the most extensive development of new capacity during the next several years will occur along the Canadian corridors. At least four new pipelines and several expansions are planned that will expand deliverability from Canada to the U.S. Midwest and Northeast markets and also to Canadian domestic markets. These lines will improve access to natural gas supplies in Western Canada and also create a new corridor to bring production from the developing fields off the coast of Eastern Canada (Sable Island) to Canadian and U.S. markets. These expansions could add between 5.9 and 7.0 Bcf per day to U.S. import capacity from Canada during the next 3 years along these corridors, an increase of more than 52 percent over 1997 levels.

Current interregional and State-to-State capacity levels, in most instances, appear to be adequate to meet current customer demands, although in a few instances average daily pipeline utilization rates increased significantly between 1990 and 1996. This rise in usage is a strong indicator that instances of peak-period capacity constraint could begin to occur if demand for natural gas in the affected markets were to increase at a faster rate than expected. Also, while the amount of new capacity proposed for the next several years appears to be adequate, and in some instances more than adequate, to meet forecasted demand, there will probably be some local areas with capacity constraints.

The capability of the pipeline network to transport and deliver gas from supply areas to ultimate consumers has grown measurably since 1990, and the quality and flexibility of service has improved as well. Substantial further growth in system capability is expected in light of the many expansion projects scheduled for completion during the next few years. Further integration, improved services, and more inter-connections along the grid should also help accommodate anticipated future demand.