Petroleum Storage & Transportation Capacities

Volume VI • Gas Pipeline

National Petroleum Council • December 1979

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Committee on U.S. Petroleum Inventories, and Storage and Transportation Capacities
Robert V. Sellers, Chairman

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INTRODUCTION AND EXECUTIVE SUMMARY

INTRODUCTION

In June 1978, the Secretary of Energy requested the National Petroleum Council to determine the nation's petroleum and gas storage and transportation capacities as part of the federal government's overall review of emergency preparedness planning (Appendix A). The National Petroleum Council has provided similar studies at the request of the federal government since 1948, most recently the 1967 report entitled <u>U.S. Petroleum and Gas Transportation Capacities</u> and the 1974 report entitled <u>Petroleum Storage Capacity</u>.

To respond to the Secretary's request, the National Petroleum Council established the Committee on U.S. Petroleum Inventories, and Storage and Transportation Capacities, chaired by Robert V. Sellers, Chairman of the Board, Cities Service Company. A Coordinating Subcommittee and five task groups were formed to assist the Committee (Appendix B).

The Gas Pipeline Task Group, chaired by L. E. Hanna, Vice President-Engineering, Panhandle Eastern Pipe Line Company, was requested by the Committee to:

- Compile gas flow data across state or regional boundaries, including flowing volumes and design capacities
- List underground storage fields by state, county, and field name and report their daily and annual delivery capacities
- Identify major pipeline interconnections and their delivery capabilities
- Compile the following statistical data of pipeline facilities:

  -Miles of transmission pipeline by diameter
  -Miles of gathering pipeline by diameter
  -Installed horsepower

- Discuss possible future gas sources (e.g., LNG, SNG, and new supplies from Alaska and Mexico) and how they may be handled by the gas transmission network
- Discuss the flexibility of the pipeline systems for peak day demand versus normal operational levels
- Include background information relating industry structure and operations and a glossary of industry terminology used in the report.

The report concentrates primarily upon cross country or long distance transportation of natural gas; thus, most of the data presented refer to interstate and major intrastate gas transmission companies. Distribution systems and their facilities and operating constraints were generally considered to be outside the scope of this report; however, in a few cases, references are made to pertinent distribution system data.

To develop the gas flow data, the National Petroleum Council surveyed the companies which transport approximately 95 percent of the gas moved over long distances in the United States. A copy of the questionnaire is attached as Appendix C, and the companies which responded to the questionnaire are listed in Appendix D.

The statistics in the report are current as of December 31, 1977; at the time the report was undertaken, 1977 data were the latest available. Comments on more recent developments within the industry are included in the section entitled "Gas Pipeline System Characteristics."

Previous NPC studies of natural gas transportation were prepared as part of the nation's emergency preparedness planning to withstand interruption of normal supplies by foreign military intervention. More recently, emphasis has shifted from military defense implications to distribution imbalances caused by relocation or shortfall of supplies, changing market demand, and economic embargoes such as the recent Arab (1973) and Iranian (1979) oil crises.

EXECUTIVE SUMMARY

Natural gas is a major source of energy for the United States, as reflected by statistics gathered for 1977. In that year, natural gas accounted for 36 percent of the nation's total energy produced in the United States and 26 percent of the nation's total energy consumption; it was ranked first as a domestic energy source and second in market share of consumption.[1]

The data resulting from the National Petroleum Council Survey of Gas Pipeline Transportation show that in 1977 the major pipelines in the United States were utilized at approximately 68 percent of design capacity on a daily average basis. This does not mean that all pipelines were utilized at 68 percent of capacity at all times. During periods of high demand, most pipelines operated at full capacity. The generalized case, however, does indicate significant spare capacity within the pipeline network at various times throughout the year. This appears to have been especially true in the Gulf Coast supply area.

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[1] Gas Facts: 1977 Data, American Gas Association, Department of Statistics, 1978, Table 52, p. 65.

The flexibility of the pipeline network is greatly enhanced by the use of underground storage to meet the peak shaving demands of the winter season and to provide a depository for off-peak deliveries of pipeline gas during the warm summer months. Economic and operational benefits result from such use in that high pipeline load factors can be maintained despite fluctuating markets. Underground storage also protects the reliability of transmission systems. Most major pipeline companies and many large distribution companies own such storage facilities, and approximately 40 percent of the natural gas consumed annually by residential customers in the United States is withdrawn from underground storage.[2] In 1977, there were 385 underground storage reservoirs located in 26 states. These reservoirs had a total capacity of 7.2 trillion cubic feet and actually contained 6.3 trillion cubic feet of gas volume.

A vast network of pipelines connects the gas producing regions (primarily the southwestern states, Louisiana, and the Gulf of Mexico) with consumers in nearly every area of the contiguous United States. Independent pipeline systems interconnect to form a grid across the United States. By means of this grid gas can flow from one pipeline to another in response to changes in supply locations, demand patterns, short-term system outages, and emergencies (Appendix G).

Interstate gas companies began experiencing difficulties in obtaining adequate supplies in the early 1970's. As a result, gas deliveries began to be curtailed, with the Federal Power Commission (FPC)[3] reporting curtailments of up to 50 percent in some cases. Flow conditions changed as curtailments restricted gas sales to high priority end use customers such as residential and commercial heating load users. These sales are extremely weather-sensitive and result in a seasonal demand pattern.

Many interstate pipelines indicate that the supply situation has improved since 1977 and may continue to do so in the near term, resulting in less unused capacity. However, spare capacity, especially that caused by the seasonality of sales, is inherent to the pipeline system.

Significant changes in the physical outlay of the national pipeline grid are not expected in the near future. Although there has been some shift in the gas market from industrial to residential and commercial loads because of a lack of readily available supplies of gas, the geographic locations of these markets will remain nearly the same. New sources or additional natural gas (such as LNG, SNG from coal, changes in Canadian imports, and supplies from Alaska and Mexico) could change the flow patterns for some

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[2] Gas Facts: 1977 Data, American Gas Association, Department of Statistics, 1978; Underground Storage of Gas in the United States and Canada, American Gas Association, 1976 and 1977.

[3] Now the Federal Energy Regulatory Commission (FERC).

transmission systems; however, for most of the currently proposed projects only minor additions or revisions will be required to move new supplies into existing pipeline systems. Because the use of hydrocarbon liquids for the production of SNG is of steadily decreasing priority, such SNG should not influence gas flow patterns.

The natural gas industry has demonstrated the flexibility of the pipeline network in responding to changing or unusual circumstances in the past. The natural gas emergency during the winter of 1976-77 during which gas was moved either by displacement or direct shipment to energy-critical areas is a recent example of the network's effectiveness. Based upon this experience, it is probable that new supplies could be connected to the transmission system network and moved across the country with existing facilities or minimal additions.

There are great advantages in using natural gas in the event of a national energy emergency: it can be readily used to replace other fuels on an emergency basis, and it has an extremely flexible transportation network through which it is possible to deliver gas when and where needed.

INDUSTRY OVERVIEW

PERSPECTIVE

Natural gas is a major source of energy for the United States. In 1977 natural gas constituted 26 percent of the nation's total energy consumption; only petroleum provided a larger share.[1] In that same year natural gas accounted for 36 percent of the energy produced in the United States, making it the largest single domestic source of energy.[2]

The vast majority of America's gas is produced in the southwestern states and off the coasts of Louisiana and Texas in the Gulf of Mexico. While the southwestern states and Louisiana consume significant quantities of natural gas, other major areas of consumption include the north central, northeastern, midwestern, and middle Atlantic states, and California. A link between the gas producing regions of the country and its market areas is essential, and it is the natural gas transportation industry which supplies this link. Through an intricate network of pipelines, the industry provides gas to consumers in nearly every area of the contiguous United States.

HISTORICAL BACKGROUND[3]

The gas industry in the United States can trace its origin to the early nineteenth century and the use of manufactured gas for residential or public lighting. At that time, coal, water, and oil gases were primarily produced, and more exotic sources, such as pine wood, cottonseeds, and refuse grease from slaughterhouses were occasionally tapped. Illumination with manufactured gas grew swiftly with the formation in 1825 of gas light companies in Baltimore, Boston, and New York City.

The earliest reported natural gas discoveries occurred about 1820. The first, in Pennsylvania, was made while drilling for saltwater for a local salt works. Unfortunately, the gas was not used productively. The second discovery, at Fredonia, New York, was more successfully employed for house lighting.

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[1] Gas Facts: 1977 Data, American Gas Association, Department of Statistics, Table 52, p. 65.

[2] Monthly Energy Review, U.S. Department of Energy, March 1979, p. 4.

[3] Adapted from: Hale, Dean, Ed., "Diary of an Industry," American Gas Journal, October 1966. Other sources: Oil and Gas Journal; Public Utilities Fortnightly.

In later years, new inventions such as the gas stove and heater expanded the market for gas; during the early years of natural gas discoveries, however, the use of natural gas for illumination was very rare. Because of isolated well locations and the lack of long distance transmission capabilities, natural gas served primarily as a fuel for nearby industries. As a result, the use of manufactured or "town" gas continued to thrive throughout the United States.

The latter half of the nineteenth century saw an increase in the number of discoveries of natural gas, and, as discoveries of natural gas increased, conversion from manufactured to natural gas also increased. Principal areas of development were Pennsylvania, West Virginia, and Ohio. Industry was still the primary user, although the use of natural gas for illumination was growing slightly. By 1915, the entrance of the electric generating industry into the lighting market prompted many gas companies to promote the use of gas for cooking, water heating, and space heating.

With the turn of the century, natural gas production began to shift from Pennsylvania and West Virginia to northeast Oklahoma, Texas, and Louisiana. It soon became apparent that the continued growth of the natural gas industry depended upon connecting these new southwestern fields with the industrial areas of the northeastern and north central states. This need was further emphasized by the discoveries in 1918-1919 of the Panhandle and Hugoton gas fields of Kansas, Oklahoma, and Texas.

In 1915 the first recorded experiment in storing gas underground was successfully completed in Ontario, Canada. The method used existing wells to reinject pipeline gas into a partially depleted gas reservoir, thus repressuring the reservoir. The following winter the gas was withdrawn to meet market requirements. This success motivated gas companies in the United States to develop depleted gas fields for storage use. The first such fields were developed in New York in 1916, Kentucky in 1919, and Pennsylvania in 1920. By the end of 1930, there were nine storage pools in six states with a total reservoir capacity of 18 billion cubic feet.

The development of underground storage techniques coincided with the development in 1925 of large diameter steel pipe capable of carrying gas at high pressures. The abilities to transport large volumes of gas over long distances and to store and withdraw gas to meet consumer demands signalled the beginning of modern gas transmission. During the next decades, several long distance, large diameter, high pressure transmission lines were constructed. The connection of the large gas discoveries in the southwest with the industrial areas of the northeastern and north central states was now a practical reality. Gas also began to flow from the southwest into California.

With the proliferation of pipelines which crossed many state lines, Congress enacted legislation to regulate the interstate transportation and sale of natural gas. Accordingly, the Natural

Gas Act of 1938 was passed to place interstate gas companies under the authority of the FPC. As a result of this act, the rates charged by gas pipeline companies engaged in interstate commerce are subject to government approval.

The sale of gas appliances and use of gas for new heating installations were restricted during World War II. The postwar recovery period, however, marked the start of a 30-year period of sustained growth for the natural gas industry in both industrial and domestic markets. War emergency pipelines from Texas to New Jersey were converted from crude and products service to gas transmission. Existing lines were looped or expanded and several new pipelines were constructed.

Although most of the existing flow patterns ran from the southwest to the northeast, some additional pipeline service was initiated to California and the western states. Imports from Canada to California and the Pacific northwest increased. Further advances in underground storage made it possible to assure high load factors for operating pipelines. Storage field locations were no longer restricted to areas with depleted gas reservoirs as techniques were discovered for using combination oil and gas reservoirs (1941), aquifers or waterbearing sands (1953), oil reservoirs (1954), and salt caverns (1961).

By the early 1970's, supplies from the traditional supply areas were declining and many companies in the gas industry began to face difficulties meeting increasing demands for gas. By this time, major main line expansion was ending and the emphasis was beginning to shift to further development of gathering systems and the search for new supplies. Offshore expansion continued in the Gulf of Mexico and new onshore sources were sought. Increased environmental regulation affected the speed with which new supplies could be added. Often, though, the greatest obstacle was one of price. While unregulated intrastate companies could attract producers with higher prices for their gas, the FPC-regulated interstate gas companies often found it difficult to compete for new supplies. As a result, gas deliveries to some customers were curtailed, and the FPC established curtailment schedules for all interstate gas companies which provided that high priority customers -- residential and small commercial -- would be served first. In some cases the FPC reported curtailments of up to 50 percent under this schedule. As a result, many industrial customers -- the traditional backbone of the gas industry -- left the natural gas market and were forced to seek alternative energy sources. This shift in demand patterns has led to an increased need for storage facilities and production flexibility to meet the seasonal demands of the remaining customers. One result of the curtailment situation has been an increased interest in conservation efforts and increased efficiency in the use of gas, as evidenced by the advisory services established by many natural gas companies to help their customers reduce their consumption of gas.

The severe winter of 1976-77 provoked critical energy shortages. In response, Congress passed the Emergency Natural Gas Act of 1977 which gave the President broad emergency powers, including the abilities to set terms by which interstate pipeline companies could make emergency purchases of gas from intrastate pipelines and producers at prices above normal FPC limits, require emergency deliveries between interstate pipelines, and require intrastate pipelines to transport interstate gas. These powers could be invoked only under those circumstances which endangered the nation's welfare. With their new freedom to pay higher gas prices, interstate pipelines were able to secure additional supplies from the intrastate market. Emergency gas was also made available from California and Canada. The problem of transporting these supplies to the fuel-short areas was met by voluntary cooperation among the pipelines in transferring volumes across the country by way of system interconnections.

Although the Emergency Natural Gas Act provided a solution to the natural gas emergency in 1977, its effect was only temporary. The Natural Gas Policy Act of 1978 provides guidelines for the deregulation of the price interstate pipelines are allowed to pay for gas and allows interstate companies to be more price competitive with intrastate companies. The intent of this Act is to promote a long-term solution to the supply problem by encouraging development of previously uneconomic areas and stimulating domestic onshore and offshore exploration.

The industry has continued its efforts to secure supplies to meet both short- and long-term needs. Transmission companies are seeking new supply sources; many have formed their own production companies and are actively pursuing new areas of development. Exploration for gas has taken place in the Arctic Islands and the North Slope of Alaska and plans are being made to bring the gas produced in these areas to the lower 48 states. The Rocky Mountain supply area has grown more promising as gas prices have made such development more economic. The possibility of importing gas from Mexico and increasing Canadian imports is being explored. Consideration of supplemental sources of natural gas is in the planning or implementation stage; this includes LNG imports, SNG, coal gasification, gas production from tight gas sands and Devonian shales, and the manufacture of gas from oil shale, peat, and biomass.

STRUCTURE AND OPERATION

The gas transportation industry is structured in such a way that the individual pipeline companies usually own a major portion of the gas moving through their respective systems; they also transport significant volumes of gas owned either by their customers or by other pipeline companies. While this transportation of gas for others has increased in recent years, the pipeline companies are still not generally considered common carriers.

Natural gas is normally purchased by gas pipeline companies from production companies in the gas fields. These gas pipeline companies transport the gas to the market area where it is sold to distribution companies which make deliveries to the end use customers. (The various components of a typical gas system from wellhead to consumer are shown in Figure 1.)

The gathering segment consists of a grid of pipelines spreading throughout the gas producing fields. This pipeline grid picks up gas either at individual wells, the outlet of processing plants, or at points of connection with producer-owned pipelines. Compressor stations are located where needed throughout the grid to move the gas through the system.

Since gas reserves are constantly being depleted, the gathering segment of a pipeline system must expand to connect new supply areas to the pipeline. In general, new gas discovery areas have become increasingly remote and in recent years have included the Rocky Mountain region as well as offshore locations in the Gulf of Mexico. Constructing, operating, and maintaining pipeline systems in these areas provide a continuing challenge to the industry.

Gathering pipelines funnel into the main line transmission portion of the system. It is the main line segment, often consisting of a single line and at most four or five parallel lines with compressor stations every 40 to 130 miles, which spans the distance between the gas field and the market area. In contrast to the web of gathering lines, the main line follows a relatively straight cross-country course.

Once at the market area, gas is sold and delivered to various distribution companies, local utilities, and, in some instances, directly to industrial customers. Often the delivery points are located directly on the main line. It is also common for deliveries to be made through a lateral line which branches out from the main line to link up with the buyer's distribution system.

During overland construction of a pipeline system, a proposed route is surveyed and a corridor approximately 40 feet wide is cleared for equipment access. A trench is dug and the welded joints of steel pipe are lowered into it. The trench is then filled and the surface is contoured to fit the terrain. Once the construction is complete, the surface can be returned to its original use with the exception that it remain clear of trees and buildings. The only visible signs of an operating inland pipeline are occasional surface facilities (e.g., compressor stations) and pipeline right-of-way markers.

Offshore pipelines require more elaborate construction techniques than inland lines. In this case, the pipeline is laid along the ocean floor, and, in many cases, is actually buried beneath it. The compressor, production, and measurement facilities are built on steel platforms above the ocean's surface and are the only components of the offshore system visible from the surface.

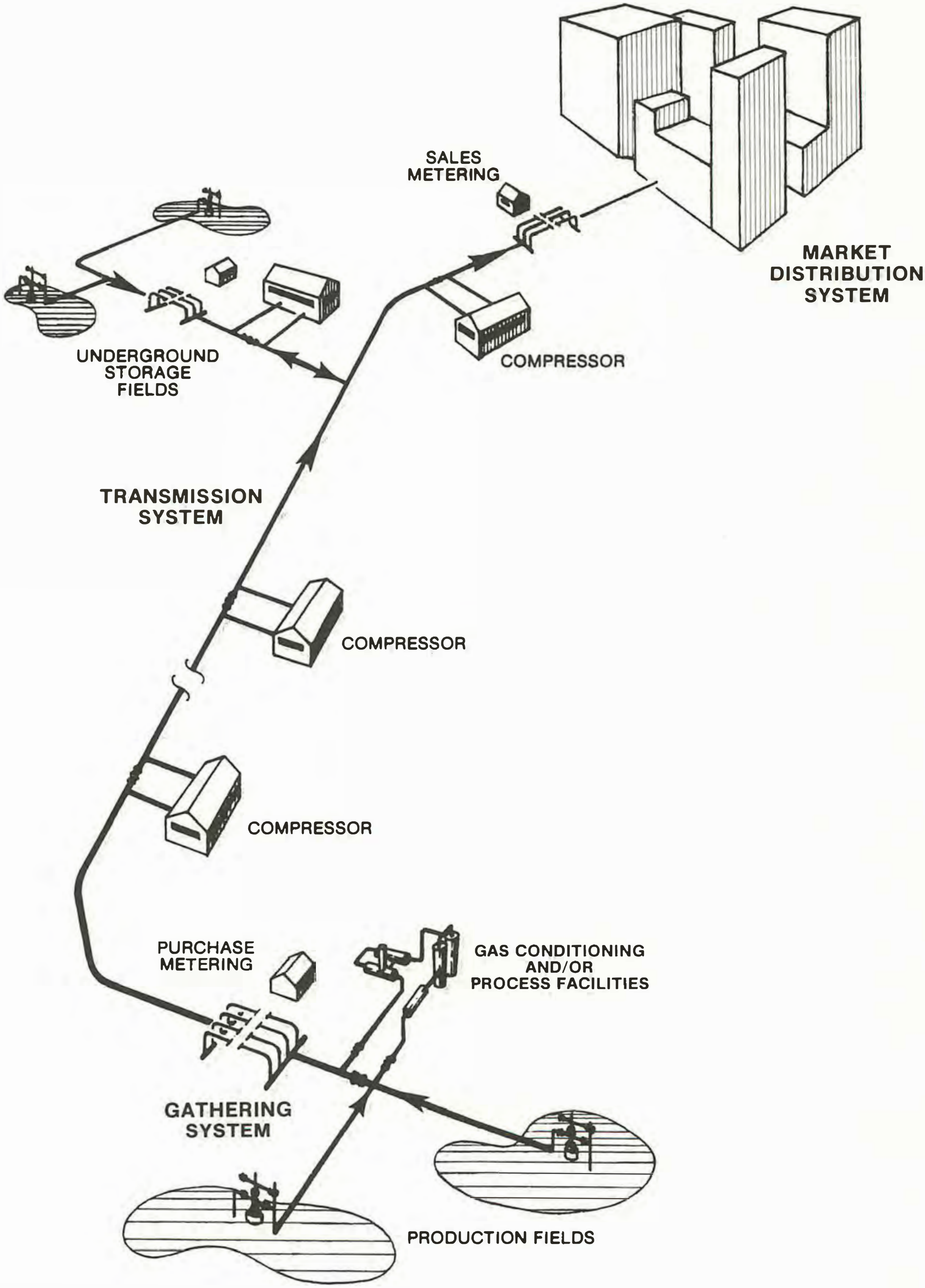

Figure 1. Typical Natural Gas Pipeline System.

Gas is frequently sold and exchanged from one pipeline company to another through interconnections in their pipeline systems which are established at locations agreed upon by the companies. As a result of the many interconnections which have been established, a complex pipeline grid extends across the nation (Figure 2). This grid gives the industry considerable flexibility to respond to changes in supply locations or demand patterns. Separate pipeline companies traditionally interact with one another through these interconnections to maintain gas flow during short-term system outages (e.g., maintenance). This voluntary interaction between individual companies provides the United States with the flexibility of a national pipeline grid while preserving the service and responsibility of independent pipeline companies.

In the early days of natural gas production, the vast majority of gas was consumed by industrial customers, and the energy requirements of this industrial market were relatively stable throughout the year. As the market for natural gas shifted toward space heating applications, the winter usage of gas rose far above the summer demand. This evolution of natural gas as a prime fuel for space heating has resulted in a seasonal fluctuation of sales for the gas industry. Gas field reservoir characteristics and gas purchase contracts, however, severely limit the seasonal flexibility of gas production within the pipeline system. In order to serve the seasonal fluctuations of the market with a relatively constant monthly pipeline supply, the gas pipeline companies have developed seasonal gas storage consisting of underground reservoirs into which gas is injected during the low market demand summer months and from which gas is withdrawn during the high demand winter months.

Gas pipeline companies must also be prepared to meet extremes, or "peaks," in demand. Gas flow on a peak day may be quite different from that on a normal operating day. Peak day demands are met not only from pipeline supply, but also from underground storage, LNG and SNG peak-shaving facilities, gas diverted from customers with non-critical needs, and other supplemental supplies. Pipeline systems must be designed to handle these other inputs, with the result that there is spare capacity in portions of the pipeline system. It is this design which gives flexibility to the total pipeline network in the United States.

A particular pipeline company supplies gas to customers over a wide range of locations and with varied requirements, and the cost of providing service to these customers also varies widely. For this reason, individual customers are charged rates reflecting the costs incurred by the pipeline company in providing them gas service. These rates are approved by the FERC.

The gas sales rates charged by interstate pipeline companies are regulated by the FERC as authorized by the Natural Gas Act of 1938 and interpreted by the Phillips Supreme Court decision of 1954. (Direct sale to industrial customers is not included within the jurisdiction of the FERC.) These regulated sales rates are

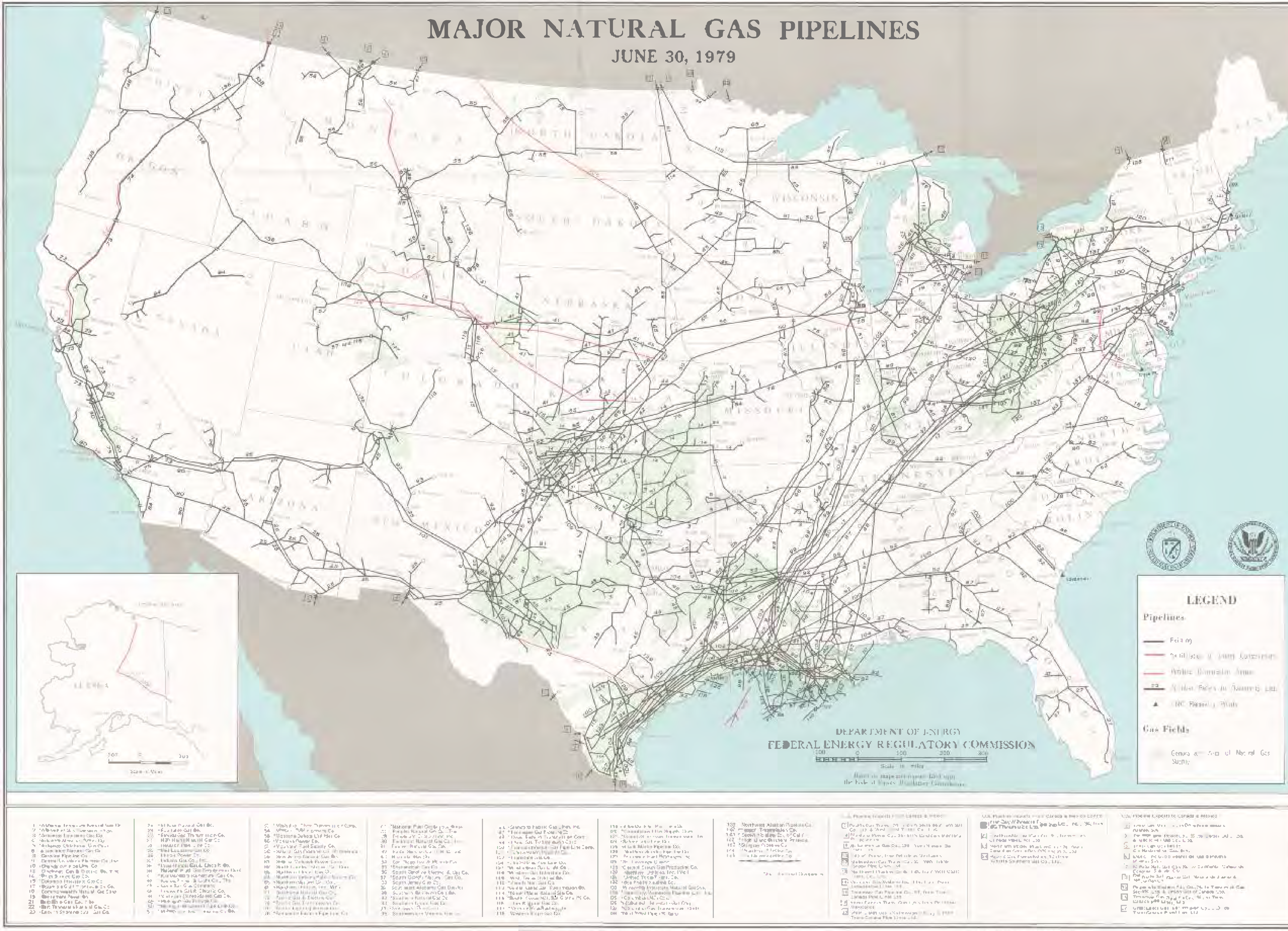

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Figure 2

based on a cost of service concept. Such a concept allows a regulated pipeline company to fully recover all costs associated with its operation and earn a fair and reasonable return on its invested capital. The cost of service is the sum of the company's expenses including depreciation, depletion and amortization, taxes, and return on rate base (investment). Since the pipeline system operates most efficiently and most economically at full capacity, the cost of service for a specific system increases as the pipeline volumes fall below full capacity.

As previously discussed, the Natural Gas Policy Act of 1978 has provided guidelines for phased deregulation of the gas prices which are paid by interstate pipeline companies. This act also provides for phased incremental pricing of gas sold to certain industrial users, although at this time the specific pricing rules are still being formulated. In addition to directly affecting the rates charged by pipeline companies, the Natural Gas Policy Act will require a major administrative effort on the part of both the interstate companies and the government.

Besides the Natural Gas Policy Act of 1978, other legislation enacted in 1978 will have an impact on the natural gas industry. The Public Utility Regulatory Policy Act of 1978 requires, among other things, that DOE undertake a major study in developing the rate design for gas utilities to help achieve conservation and a more efficient use of available gas supply. The Power Plant and Industrial Fuel Act of 1978 will also alter the marketing of gas supply because of the prohibition or restriction it contains regarding the use of natural gas in electric utilities or industrial boilers.

Pipelines are among the most efficient of transportation systems in operation today,[4] and new operating procedures aimed at improving efficiency are continually being implemented.

The environmental aspects of pipeline construction and operation are regulated by several governmental agencies. Permits must be acquired prior to the construction of facilities and pertinent operational parameters (e.g., noise and emission of air and water pollutants) must be monitored and maintained at acceptable levels. These requirements have resulted in an increase in the time required to plan and install new facilities.

Safety considerations are of great concern to the gas transportation industry. Because of the risk inherent in transporting large quantities of a volatile substance, the federal government enacted the Natural Gas Pipeline Safety Act of 1968. There are

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[4]National Energy Transportation, Congressional Research Service, May 1977, Vol. 1, Publication Number 95-15, p. 214, Figure 32.

industry safety guidelines enforced by the Department of Transportation concerning every aspect of pipeline construction and operation. Training programs and procedures are regularly reviewed in the interest of improving the pipeline industry safety record.

HIGHLIGHTS OF THE REPORT

NATURAL GAS FLOW PATTERN

Introduction

In most cases, the natural gas used in the United States is consumed at locations foreign to its production source. The distances from the source to the end use locations vary from close proximity to hundreds of miles. Except for the few instances in which minor gas volumes are liquified and transported by truck, the majority of the natural gas in the United States is transported by pipeline to its end use location.

Pipeline systems are designed to move gas directly from source to consumption area and to transport gas to and from storage locations. In some cases this requires that the pipeline system be designed to flow gas volumes in either direction. Also, most pipeline systems are interconnected with other pipeline systems to provide operating flexibility. These interconnections also provide a range of capabilities for transporting gas volumes through a specific pipeline system. It is the intent of this discussion to illustrate the flow pattern of natural gas transported by the gas pipeline network within the United States.

Gas Flow Data

Information illustrating the maximum capability to transport gas volumes and data representing the actual daily average volumes flowing during 1977 in the United States were obtained by questionnaire from interstate pipeline systems and major intrastate pipeline systems which transferred or exchanged gas volumes across the specific boundaries described in Appendix E. The flow data presented which pertain to interstate pipeline systems is information available from the same data source used by the companies in preparing the FERC Order No. 303-A Annual Report.

The questionnaire, which requested the existing design flow capacity and the actual daily average flowing volumes for the year 1977 at specific points on these pipeline systems, was completed by the companies listed in Appendix D. Flow data were requested of those points at the boundaries of the states at which the pipeline systems crossed or exchanged gas volumes. California was divided by an east-west boundary line and Texas was divided by a north-south boundary line to more clearly define the gas flow pattern in these states.

The data received by means of the questionnaire were assembled and analyzed, and in cases where inconsistencies seemed apparent, the reporting company was contacted to verify the interpretation of the data. Also, in instances in which a discrepancy existed in the reporting procedure, verbal contact was made with the companies involved.

Gas Flow Pattern

Figure 3 depicts the flow pattern of natural gas in the United States expressed as the daily flow rate. The gas flow volumes shown are expressed in million cubic feet per day (MMCF/D) measured at 14.73 psia and 60°F. Shown to approximate scale are the maximum design flow capacity as of December 31, 1977, and the actual daily average flowing volumes for the year 1977. The illustrated flow pattern is scaled in the proximity of the boundary lines provided the volumes are large enough. Minor gas volume flows greater than 25 MMCF/D are indicated with an arrow; the actual shape of the flow pattern within the location areas defined in the questionnaire was approximated. The FERC publication map "Major Natural Gas Pipelines in the United States" (Figure 2) was used as a reference in routing the flow pattern.[1]

Appendix E provides a tabulation of the data used in constructing the maximum design flow capacity pattern and the actual 1977 flow pattern of natural gas in the United States illustrated in Figure 3.

The flow data in Appendix E represent conditions at various points along the reporting pipeline systems based on the following assumptions:

- A specific purchase and sales pattern was assumed in determining the design capacity of each pipeline system. In some cases a different pattern existed during 1977.
- Specific pipeline segments were not analyzed as separate entities; instead, the pipeline system was examined as a whole. All pipeline system components are assumed to be in operation with no allowance for equipment outages.
- In pipeline systems with bi-directional flow (e.g., lines to storage locations), the direction and magnitude of the greater design flow capacities were reported. It was assumed that, in a majority of cases, the maximum design flow capacity reported is the capacity available when gas volumes are being withdrawn from storage and delivered to market. Generally, the withdrawal cycle (time period in which volumes are removed from storage) is shorter than the injection cycle (time period in which volumes are placed into storage).
- The daily average volume flowing in a bi-directional system, as in one directional flow systems, was derived by dividing by 365 the algebraic sum of the daily volumes for the year 1977 (the volumes flowing in one direction assumed

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[1] A larger, more detailed map, entitled "Natural Gas Pipeline Map of the United States and Canada," is available from the Petroleum Publishing Company of Tulsa, Oklahoma.


NATIONAL GAS FLOW PATTERNS
MAXIMUM DESIGN FLOW CAPACITIES AS OF DECEMBER 31, 1977
AND
ACTUAL AVERAGE 1977 DAILY FLOWING VOLUMES
WASHINGTON
OREGON
IDAHO
MONTANA
NORTH DAKOTA
SOUTH DAKOTA
WYOMING
NEBRASKA
NEVADA
UTAH
COLORADO
KANSAS
MINNESOTA
WISCONSIN
MICHIGAN
IOWA
ILLINOIS
INDIANA
OHIO
PENNSYLVANIA
NEW YORK
MAINE
VT.
N.H.
MASS.
CONN.
N.J.
DEL.
MD.
WEST VIRGINIA
VIRGINIA
KENTUCKY
MISSOURI
TENNESSEE
NORTH CAROLINA
SOUTH CAROLINA
GEORGIA
ALABAMA
MISSISSIPPI
ARKANSAS
OKLAHOMA
LOUISIANA
EAST TEXAS
WEST TEXAS
NEW MEXICO
ARIZONA
SOUTH CALIFORNIA
NORTH CALIFORNIA
FLORIDA
PACIFIC OCEAN
ATLANTIC OCEAN
MEXICO
LEGEND
MAXIMUM DESIGN FLOW CAPACITY
AVERAGE 1977 DAILY FLOWING VOLUMES
DIRECTION OF GAS FLOW
MINOR GAS VOLUME FLOW
LNG IMPORT LOCATION
LOCATIONS OF LNG IMPORTS PLACED IN SERVICE AFTER DECEMBER 31, 1977
PROJECTED DAILY IMPORT RATE (MMCF/D)

Figure 3.

positive and the volumes flowing in the opposite direction assumed negative).

- The daily average flow data include temporary and/or emergency volumes which were transported during the severe 1976-77 winter. This period produced unusual operating conditions.

- As the natural gas flow data are reported as of December 31, 1977, only one foreign LNG supply source is included in these data; it enters Massachusetts from the Atlantic Ocean.

Summary and Discussion

Figure 3 illustrates that the pipeline network in the United States is designed for long distance transportation of gas volumes from the following major supply areas:

- Gulf of Mexico
- Louisiana
- Southwestern states (Kansas, New Mexico, Oklahoma, Texas).

Volumes originating from other production areas, such as West Virginia, Wyoming, Canada, and Mexico, are also transported across state lines. The majority of these gas supplies are transported to the north central and northeastern sections of the United States. The west coast market is served by volumes transported across the west or imported from Canada through the Pacific northwest. Volumes are also delivered to the states through which the network crosses to supplement local supplies in meeting their consumption requirements.

Significant volumes are imported from Canada to Idaho, Washington, and Minnesota. Of the volumes that enter the United States from Canada, a portion is actually transported in the Great Lakes area back to Canada. During 1977, on a daily average basis, approximately 800 MMCF/D of the volume received from Canada near the North Dakota-Minnesota border was transported through Wisconsin and Michigan and delivered back to Canada in the Great Lakes area.

The data in Appendix E show that, on a daily average basis, approximately 68 percent of the design capacity of the total pipeline network was utilized during 1977. This capacity utilization refers to the capability to move gas volumes across the boundaries defined in this study.

It should be noted that this 68 percent capacity utilization figure is merely an indication of the degree to which the pipelines were unloaded during this period and is subject to all the constraints mentioned earlier. It is probable that, at certain times during the year, individual pipelines were utilized at 100 percent design capacity. Various factors, including supply, location, season, design criteria, etc., would determine the extent to which a line could be utilized. Thus, 68 percent utilization indicates that, for the pipeline network as a whole, there was a significant amount of spare capacity available at various times of the year.

The flow pattern in Figure 3 illustrating the maximum design capability of the gas pipeline network assumes total operation of all pipeline systems and each system transporting volumes from a specific supply pattern to specific delivery locations. Discussed in the following paragraphs are factors which could vary the capabilities shown and would affect the annual available capacity.

Changes in supply and delivery patterns have a major influence on transportation capability. For example, deliveries to weather-sensitive locations (e.g., residential heating loads in the northeast) vary greatly from winter to summer. Volumes consumed at industrial locations during the summer might be decreased and rerouted to residential or commercial locations during the winter. Also, volumes injected into storage during the summer at one rate and withdrawn during the winter at a greater rate significantly affect the magnitude and pattern of gas flow. Short-term and emergency volume exchanges between pipeline systems vary the pattern of gas volumes entering and leaving the pipeline network.

The transportation capability of a pipeline system can also be expressed assuming the displacement concept; that is, through interchanges between systems or new supply sources, additional volumes entering a pipeline system can be used to replace larger than normal deliveries upstream and still maintain the normal delivery pattern downstream of the point of entry. This demonstrates that the consumption of additional volumes entering a pipeline system can be realized upstream of the point of entry of these volumes. System transporting capacity also increased.

In some cases, the average flowing volume shown in Appendix E is larger than the maximum design capacity value. These values are not erroneous; they indicate that the actual supply pattern and/or delivery point locations vary from those assumed in determining the maximum capacity. Similarly, because of the use of net values for systems having bi-directional flow, the actual flowing volume would be reflected as a lower value than that actually experienced at various times during the year.

It appears from the data in Appendix E that the lines from the Gulf Coast supply area were more unloaded than those from the southwestern states. It is also interesting to note that, on a daily average basis, the percentage of design capacity of pipelines in the market and gathering areas utilized in 1977 is well below that of the total pipeline network. This low utilization reflects the effects of sales curtailments, supply shortages, and seasonal deliveries.

UNDERGROUND GAS STORAGE

Underground gas storage involves transporting gas from producing fields and reinjecting it into other reservoirs where it is stored until needed to supplement other natural gas supplies in meeting market requirements. Traditionally these underground storage reservoirs have been located near areas of consumption, but in some cases, the reservoirs are being developed in the producing areas. Today, approximately 40 percent of the natural gas consumed annually by residential space heating customers in the United States has been withdrawn from underground gas storage.[2]

The principal functions of underground gas storage are to meet the peak shaving demands of the winter season and to provide off-peak disposition for pipeline gas during the warm summer months. Underground storage played a particularly important role in meeting the nation's energy needs during the unusually severe winter of 1976-77. By the end of that winter season, nearly 72 percent of the available volume had been withdrawn for consumer use (Table 1). Because underground storage permits greater utilization of pipeline facilities (near 100 percent load factor) and more efficient gas deliveries to market, it is an important factor in conservation and the development of new markets.

Natural gas is stored in three types of storage pools. The oldest type of storage reservoir is a depleted gas or oil field. In some states, because of a lack of depleted gas and oil reservoirs, natural gas has been stored in water bearing sands (aquifers) which never contained hydrocarbons. In most recent years, salt cavities have been used, to a limited degree, to store natural gas.

The underground storage of gas is a principal factor in gas industry operations. The basic concept of underground storage operations is to inject gas into a depleted gas or oil reservoir. This acts to raise the pressure in the reservoir as the volume of gas injected increases. Thus, the reservoir pressure and the amount of gas stored can often attain the same level as the original gas in place. This process builds an inventory of supply which can be tapped to meet peaks in demand and replenished during periods of low demand.

Underground gas storage facilities are operated by many pipeline transmission companies as well as individual gas distribution utilities. Both operations have the same objective -- to provide an additional source of gas to augment the flowing supply during the colder portion of the year when both high priority customer needs and total customer demand are highest because of increased space heating.

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[2]Gas Facts: 1977 Data, American Gas Association, Department of Statistics, 1978; Underground Storage of Gas in the United States and Canada, American Gas Association, 1976 and 1977.

TABLE 1

Underground Gas Storage, 1973-1977*

Description	1973	1974	1975	1976	1977
Number of States	26	26	26	26	26
Number of Companies	85	86	86	87	85
Number of Pools	360	367	376	386	385
Total Number of Wells	15,607	15,950	16,246	16,937	16,928
Input and/or Output	13,008	13,005	13,080	13,610	13,662
Pressure Control and/or Observation	2,599	2,945	3,166	3,327	3,266
Total Number of Compressor Stations	255	254	259	272	263
Input Only	70	73	77	83	74
Output Only	28	21	20	23	27
Input and Output	157	160	162	166	162
Total Horsepower of Compressor Stations	1,241,957	1,186,502	1,318,071	1,342,415	1,374,141
Maximum Volume of Stored Gas†	4,361,902,006	4,504,647,688	4,865,073,573	5,113,681,756	5,236,877,925
Total Volume in Storage Reservoirs 12/31	4,898,327,818	4,962,225,803	5,297,628,860	5,166,908,871	5,711,476,980
Volume of Native Gas	992,095,415	993,471,734	1,020,644,640	1,055,251,840	1,043,189,016
Volume of Stored Gas	3,906,232,403	3,968,754,069	4,276,984,220	4,111,657,031	4,668,287,964
Input to Storage Calender Year	1,910,545,290	1,767,589,296	2,044,342,490	1,918,541,256	2,303,267,660
Output from Storage Calendar Year	1,521,368,368	1,705,211,152	1,731,506,729	2,059,897,948	1,735,867,827
Total Base Gas	2,863,810,397	2,911,949,208	2,996,967,245	3,121,425,124	3,152,269,721
Total Working Gas	2,034,020,854	2,050,276,595	2,300,661,615	2,045,483,747	2,559,207,259
Maximum Day Output from Storage	28,814,831	28,251,839	30,620,572	35,540,754	36,555,837
Total Reservoir Capacity	6,278,769,872	6,360,301,401	6,643,539,388	6,926,661,929	7,223,315,190
Number of New Pools Under Construction	14	20	12	11	5
Estimated Capacity of New Pools	283,828,800	460,248,800	425,700,619	304,454,246	73,555,000

SOURCE: Underground Storage of Gas in the United States and Canada, American Gas Association, 1977.

*Gas volumes are expressed in thousands of cubic feet at 14.73 psia and 60°F.
†Excludes all native gas.

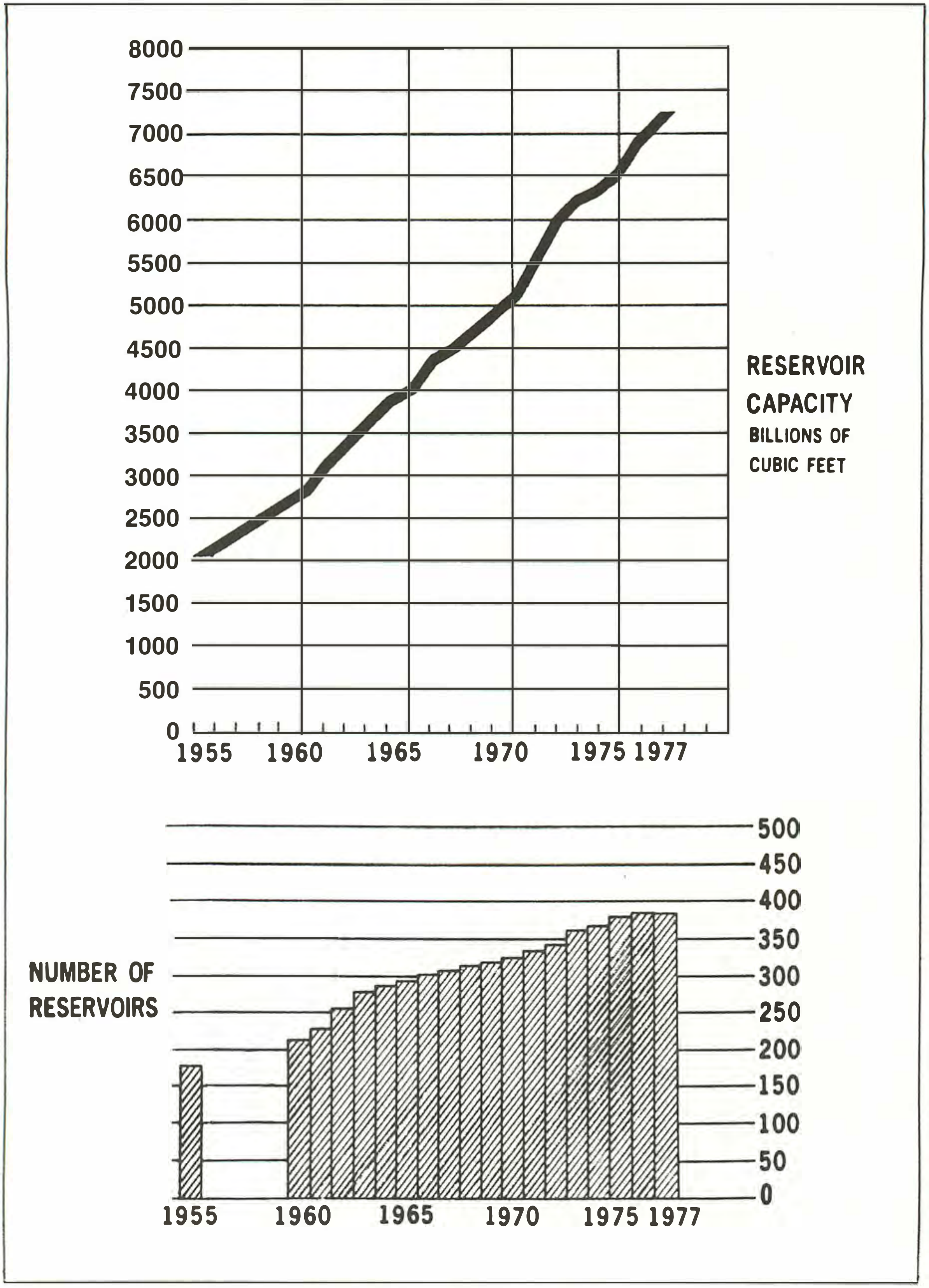
There is an inherent cyclical pattern to underground storage operations. During the warm summer months, the available gas supply in excess of that needed to serve high priority customer requirements is diverted from supplying lower priority customer requirements and injected into the storage reservoir. This is accomplished by means of large compressor facilities capable of handling hundreds of millions of cubic feet of gas per day.

During the winter period, when colder temperatures create increased customer demand for space heating, the gas is withdrawn from the reservoir and, using the pressure available from the reservoir, is moved into the transmission pipeline or distribution network to augment the gas supplies already flowing.

In the past 20 years the number of underground storage fields has nearly doubled. By the end of 1977, 26 states had some type of underground storage, increasing from 199 to 385 the number of reservoirs in existence (Figures 4 and 5). These 385 reservoirs had a total capacity of 7.223 trillion cubic feet and actually contained 6.268 trillion cubic feet of gas volume, as indicated in Table 1. Of the 385 reservoirs, 52 were aquifer-type storage reservoirs located in 10 states and having a total capacity of 1.578 trillion cubic feet. The maximum gas volume contained in these aquifers in 1977 was 1.137 trillion cubic feet. The unused capacity is primarily due to some reservoirs being in an early stage of development, thus not using all of their storage capacity. Additionally, some reservoirs are not being fully injected because of a lack of gas supply.

The 385 underground gas storage reservoirs are operated by either interstate or intrastate pipeline companies. Because the 266 underground storage reservoirs operated by interstate pipelines are under FERC jurisdiction while the intrastate pipelines operate independently, there are no consistent rules or regulations that apply to all reservoirs being developed or operated. In some cases, more than one company has ownership; in others, several companies share the operations. Similarly, some companies rent underground storage capacity from other companies; in some cases, the storage area is near their market areas and in others it is far removed from their area of operation. Appendix F presents the following statistics by individual reservoirs -- state, company affiliation or ownership (either interstate or intrastate), field name, location by county, and the estimated total gas in place, working volumes, and maximum design daily deliverability as of the end of the 1977 injection season. The information for each of the reservoirs provides a description of each reservoir just prior to the 1977-78 winter season. It also shows the number of fields available by state and the number of reservoirs operated by each company.

The data in Appendix F were obtained from a number of sources, thus enabling a cross-check of each source of data. The data were obtained from interstate pipeline companies, intrastate pipeline companies, FERC, the American Gas Association Underground Gas Storage Committee, and the _Pipeline and Gas Journal_. Statistical



SOURCE: *Gas Facts: 1977 Data*, American Gas Association, Department of Statistics, 1978.

Figure 4. Number and Capacity of Existing Underground Storage Reservoirs.

NOTE: Circled numbers indicate operational reservoirs.

Figure 5. Location of Underground Gas Storage Reservoirs in the United States--1977.

data for the 31 reservoirs in the state of Illinois were verified through the State of Illinois Annual Report for 1977. Statistical data were obtained or reviewed for each individual reservoir. Even with these varied sources of information, some of the data may not be totally correct or current for some individual reservoirs.

INTERCONNECTIONS

Early in the history of natural gas transmission pipelines, a need for interconnections between two pipeline systems became apparent. Interconnections were originally installed to provide relief in the case of an emergency. If a failure occurred on one of the pipelines and its markets were threatened, another pipeline could help alleviate the problem by supplying emergency supplies of gas until the failure was repaired and the first system was returned to service.

Interconnections were later installed to provide permanent exchanges of gas by the pipeline companies. If a company acquired gas in an area in which it had no facilities or spare pipeline capacity but in which another pipeline company crossing the first company's system had facilities, an exchange agreement could be made whereby the second company could take the new supply into its systems and return a like amount to the first company through the interconnection. Sales of gas can also occur at points of interconnection.

Since 1973 many interconnections have been installed in order to make use of excess capacity to transfer gas supplies from one pipeline to another. Interconnections are being used in conjunction with very complex exchange arrangements involving many pipelines in transferring gas supplies from one area of the nation to another. During the emergency of the winter of 1976-77, large volumes of gas were transferred from west coast markets to the Appalachian and southeast areas by use of interconnections. A severe shortage of natural gas occurred east of the Mississippi River and industries which were dependent on natural gas were forced to either curtail their production or close. Mild temperatures on the west coast had reduced customer demand for gas so that pipelines serving that market could, in turn, reduce their demand for supplies in western Texas and make that gas available for the east coast markets (i.e., gas moved from the west coast to western Texas by displacement rather than by physically flowing eastward through the pipeline.) Some of the pipelines supplying gas to the east coast had excess capacity available, and were thus able to deliver the additional higher volumes to the eastern markets.

In this manner a plan was developed to shift gas from the west coast to the east coast by using the network of pipelines in the United States and accompanying interconnections; this plan was coordinated through the Federal Power Commission. In the case of the shortage in the east, it was necessary to use intrastate pipelines in Texas. Congress therefore rapidly enacted the Emergency Natural Gas Act which permitted the FPC to authorize intrastate pipelines to transport interstate gas and continue to be exempt from permanent federal regulation.

Certain restrictions exist in the use of interconnections. Gas can be transferred only from a pipeline operating at a higher pressure to one operating at a lower pressure and the receiving pipeline must have unused capacity in order to receive the gas. The effect on the receiving pipeline is dependent on the distance that the gas is to be moved. Normally a pipeline can move gas a short distance much more easily than a long distance; in this latter case it must be compressed by one or more compressor stations and perhaps be supplemented with additional supplies into the pipeline downstream of the interconnection. In some cases, interconnections exist only for emergency purposes in which there may be interruptions on the pipelines, and as such, they do not contain all the necessary facilities required for a permanent installation. Thus, if an emergency interconnection is needed as an exchange or sales point, additional facilities (usually measuring facilities) must be installed. And, obviously, an interconnection can only be installed where two pipeline systems cross or meet.

The capacity of a pipeline system is affected by the use of interconnections. As stated above, the receiving pipeline must have unused capacity downstream of the interconnection in order to take gas, and may thus become fully loaded with the addition of the new gas supply. The volume of gas that the receiving pipeline may be able to take is dependent upon all of the operating parameters of the pipeline. The same is true with the pipeline supplying the exchanged gas -- full knowledge of the operating conditions is required before one can determine the volumes of gas that can be exchanged. It must be emphasized that these operating constraints can change from hour to hour. Generally only the operator can determine those constraints and is in a position to make the decision to exchange gas.

Interconnections between pipeline systems are being increasingly used. As new supplies become available in new areas where the pipeline companies do not have facilities, greater use is made of interconnections to move these new supplies into the purchasing pipeline companies' main pipeline systems. This is presently being done in the new supply areas of the Rocky Mountains where the number of interstate pipeline systems is limited. The same is true in the offshore systems of the Gulf of Mexico.

During the severe natural gas shortage of 1976-77, industry and FPC personnel found it necessary to compile a list of major pipeline interconnections in order to determine the paths by which gas could be transferred, either directly or by exchange, and a list of personnel familiar with the engineering constraints on the various pipelines at the given time. To aid in the determination of a "gas path," the staff of the FPC, in conjunction with employees of the gas industry, published a list of pipeline interconnections under the title "Natural Gas Pipeline Interconnections -- Commission Staff Report." The interstate companies are required to supply the Federal Energy Regulatory Commission with interconnection data each year under FPC Order 303-A. Excerpts from an updated version of the FERC report, supplemented by data prepared for this report, are attached as Appendix G and show all the major interconnections between interstate pipelines and a great many of those of the intrastate companies. In some cases, data were not available for maximum volume capabilities.

To assist in the rapid routing of emergency gas supplies, the Systems Analysis Branch of the FERC has developed a computer procedure to find possible paths for gas transfer. Each company included in the list is coded. The program is initiated by executing an associated command list procedure. The source pipeline and the destination pipeline codes are entered and transmitted. Execution is then automatic and the solutions are printed on a high-speed printer. Some interpretation of the printout is required. The program will list all direct as well as indirect transfer points (those involving third parties). As mentioned above, however, a check must be made with the operators of the pipelines to determine whether operating constraints will allow such transfers.

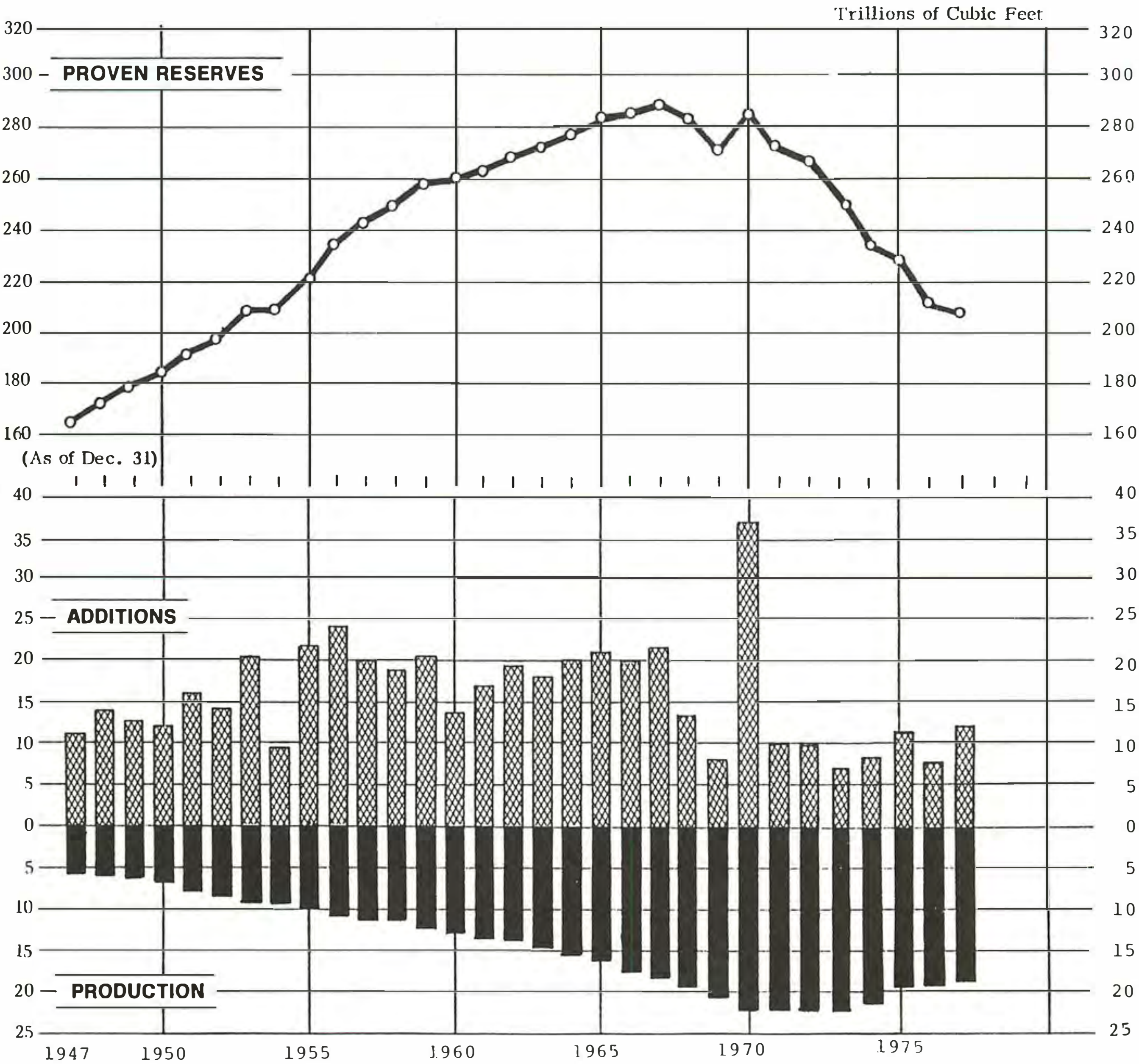
STATISTICAL DATA

Introduction

Selected statistics describing the proven reserves of natural gas, length and diameters of installed pipelines, total pipeline horsepower, and gas utility sales are tabulated herein to provide an indication of the overall size and scope of the natural gas transmission system. This information has been developed as a result of annual industry surveys. Standard data expansion techniques have been used to offset incomplete survey responses. These data are also reported annually in slightly modified form in the American Gas Association's Gas Facts. More detailed historical reporting of these statistics is available in past editions of Gas Facts.

Production and Proven Reserves

Natural gas production and proven reserves for 1977 are presented in Figure 6 and Table 2. Texas, Louisiana, Oklahoma, Kansas, and the Gulf of Mexico are the dominant producing areas, producing over 82 percent of the conventional natural gas; however, these regions contain only about 66 percent of the proven reserves. In 1977 only 37 percent of the nation's reserves were onshore in Texas and Louisiana. In contrast, 20 years earlier, over 66 percent of the nation's proven reserves were onshore in Texas and Louisiana.



SOURCE: *AGA Committee on Natural Gas Reserves.*

Figure 6. U.S. Natural Gas Reserves.

TABLE 2

1977 Production and Proven Reserves
of Natural Gas in the United States*
(Millions of Cubic Feet)

State	Net Production††	Proven Reserves
Total United States	19,447,050	208,877,878
Alabama	37,581	745,538
Alaska	187,375	31,832,616
Arkansas	107,083	1,680,336
California†	331,850	5,198,348
Colorado	186,795	2,025,987
Florida	43,571	215,323
Illinois	1,559	417,783
Indiana	200	53,249
Kansas	771,143	11,926,191
Kentucky	56,710	745,046
Louisiana†,§	7,029,367	52,685,970
Michigan	130,951	1,791,200
Mississippi	89,439	1,307,133
Montana	53,831	1,043,982
Nebraska	3,241	68,122
New Mexico	1,141,798	11,931,112
New York	10,000	247,303
North Dakota	25,493	392,066
Ohio	99,656	1,459,430
Oklahoma	1,662,576	11,712,342
Pennsylvania	92,293	1,884,932
Texas†	6,827,303	62,157,836
Utah	62,880	748,907
Virginia	8,202	69,041
West Virginia	147,337	2,375,855
Wyoming	338,062	3,962,850
Miscellaneous¶	754	199,380
Gulf of Mexico**	4,381,136	37,555,527

SOURCE: *Gas Facts: 1977 Data*, American Gas Association, 1978.

*Volumes are calculated at a pressure base of 14.73 psia, and at a standard temperature of 60°F. Reserves of dissolved gas were estimated jointly with the API Committee on Petroleum Reserves. As such, "Net Production" differs from the U.S. Bureau of Mines "Marketed Production," which includes natural gas liquids.

†Includes offshore reserves.

§Reported quantities include reserves estimated to be recoverable from some reservoirs considered natural gas bearing based on electric logs, core data, and other available engineering and geological data.

¶Includes Arizona, Iowa, Maryland, Minnesota, Missouri, South Dakota, Tennessee, and Washington.

**Included in Texas and Louisiana.

††As reported in *Reserves of Crude Oil, Natural Gas Liquids, and Natural Gas in the United States and Canada as of December 31, 1977*, American Petroleum Institute, American Gas Association, and Canadian Petroleum Association.

Transmission Pipeline by Diameter

Table 3 lists the miles of transmission pipeline by diameter in selected years. An examination of these data reveals that over 60 percent of the miles of pipe added in the 1960-70 period were pipelines of over 20 inches in diameter. This reflects an emphasis on main line expansion to connect traditional supply areas with growing market areas. The statistics for the 1970-77 period indicate a reversal in this trend. Main line expansion appears to have subsided, and new pipeline additions are predominantly small diameter pipe (10 inches and less), reflecting efforts to expand the gathering systems either by connecting new wells in existing supply areas or by spreading out in search of new supply areas.

TABLE 3

Estimated Miles of Transmission Pipeline by Diameter
(Excludes Storage Lines)

Diameter	1960	1965	1970	1975	1977
0-10"	43,355	45,130	55,490	67,198	66,127
10.1-20"	50,020	59,168	61,726	63,607	62,345
20.1-30"	83,807	94,464	110,317	106,349	106,209
Over 30"	3,971	8,628	19,820	20,454	20,623
Totals	181,153	207,390	247,353	257,608	255,304

SOURCE: DOE/EIA-0145 Statistics of Interstate Natural Gas Pipeline Companies, 1977.

Pipeline Lengths

As shown in Table 4, the total length of gas utility-installed field and transmission pipeline in the United States as of the end of 1977 was 331,976 miles. Of this total, 71,462 miles were field and gathering systems, and 260,514 miles were transmission lines. Field, gathering, and transmission mileage is greatest in the west south central area because most of the natural gas is produced in this region.

Installed Compressor Horsepower

Table 5 lists the aggregate gas utility-installed compressor horsepower for selected years 1955-1977. The steady increase in total horsepower reflects the growth of the industry's ability to deliver natural gas. Over 12 million of the total 15.6 million horsepower of compressor capability is used by the transmission

TABLE 4

Miles of Pipeline and Main, By Type, and By State, 1977*

Division and State	Total	Field and Gathering	Transmission Pipeline†
United States	331,976	71,462	260,514
New England	1,651	0	1,651
Connecticut	529	0	529
Maine	80	0	80
Massachusetts	800	0	800
New Hampshire	129	0	129
Rhode Island	53	0	53
Vermont	60	0	60
Middle Atlantic	23,187	6,337	16,850
New Jersey	1,318	0	1,318
New York	4,084	368	3,716
Pennsylvania	17,785	5,969	11,816
East North Central	40,204	4,234	35,970
Illinois	10,094	98	9,996
Indiana	5,842	253	5,589
Michigan	7,213	205	7,008
Ohio	13,889	3,678	10,211
Wisconsin	3,166	0	3,166
West North Central	47,255	7,806	39,449
Iowa	6,220	76	6,144
Kansas	23,286	7,628	15,658
Minnesota	3,983	0	3,983
Missouri	4,199	32	4,167
Nebraska	7,461	17	7,444
North Dakota	1,164	53	1,111
South Dakota	942	0	942
South Atlantic	30,415	8,695	21,720
Delaware	227	0	227
District of Columbia	23	0	23
Florida	3,100	0	3,100
Georgia	4,969	11	4,958
Maryland	752	27	725
North Carolina	2,270	0	2,270
South Carolina	2,316	0	2,316
Virginia	2,439	87	2,352
West Virginia	14,319	8,570	5,749
East South Central	30,813	3,808	27,005
Alabama	5,437	0	5,437
Kentucky	10,559	3,631	6,928
Mississippi	9,496	175	9,321
Tennessee	5,321	2	5,319
West South Central	104,232	24,310	79,922
Arkansas	7,565	888	6,677
Louisiana	25,598	2,437	23,161
Oklahoma	20,052	8,156	11,896
Texas	51,017	12,829	38,188
Mountain	42,393	15,439	26,954
Arizona	5,213	1	5,212
Colorado	8,371	2,281	6,085
Idaho	1,323	15	1,308
Montana	5,114	2,074	3,040
Nevada	1,260	0	1,260
New Mexico	15,040	8,901	6,139
Utah	1,464	558	906
Wyoming	4,613	1,609	3,004
Pacific	11,826	833	10,993
Alaska	198	0	198
California	8,729	833	7,896
Hawaii	0	0	0
Oregon	1,192	0	1,192
Washington	1,707	0	1,707

SOURCE: Adapted from Gas Facts: 1977 Data, American Gas Association, Department of Statistics, 1978.

*Excludes service pipe. Data not adjusted to common diameter equivalent. Mileage shown as of the end of the year.

†Includes 5,210 miles of underground storage pipe.

pipelines. The remaining 3.4 million horsepower is used by distribution, field, and gathering systems.

TABLE 5

Gas Utility Industry-Installed
Compressor Horsepower, 1955-1977
(Thousands of Horsepower)

Year	Total*	Transmission
1955	5,517	4,350
1960	7,843	6,359
1965	9,708	7,736
1970	13,150	9,692
1975	15,413	12,069
1976	15,472	12,046
1977	15,553	12,105

SOURCE: Gas Facts: 1977 Data, American Gas Association, Department of Statistics, 1978.

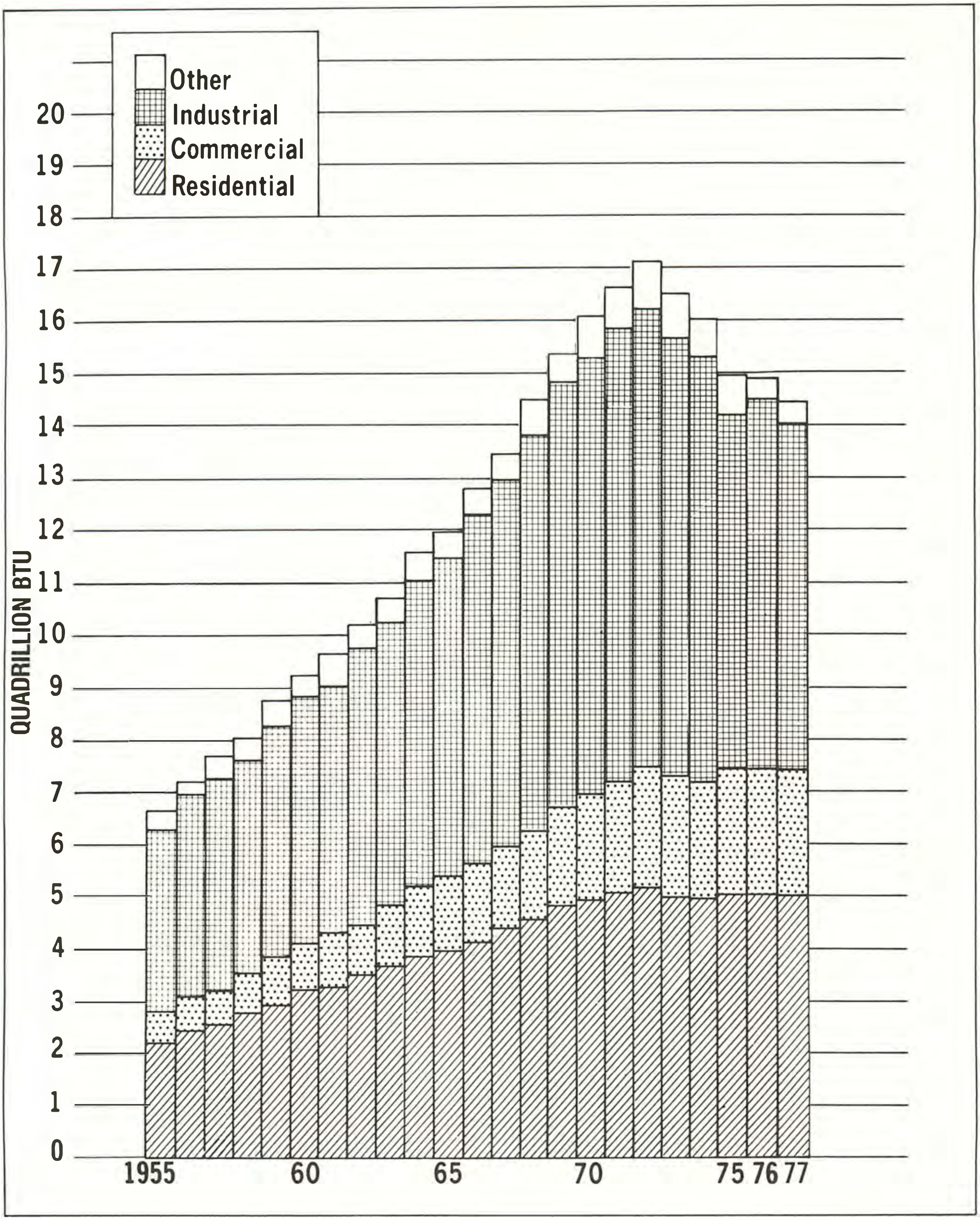
*Includes distribution, field, and gathering systems.

Gas Industry Sales

Sales by gas utilities are shown for selected years by class of service in Figure 7 and Table 6.[3] Sales peaked in 1972 and have been declining each year since that time. It can be seen that the weather-sensitive residential load has been more or less constant from 1970 to 1977. Commercial sales have shown some growth over this period and industrial sales have dropped from the peak level of over 8 quadrillion Btu per year.

Sales in 1977 are tabulated in Table 7 by state and class of service. These data underscore the importance of the east north central and west south central areas in the consumption of natural gas. Almost a third of the nation's total gas sales is consumed in Texas, California, and Illinois.

[3]These sales by transmission and distribution companies constitute only a part of the national consumption of natural gas. Sales and consumption by producers are a part of consumption but are excluded from gas utility sales.



SOURCE: *Gas Facts: 1977 Data*, American Gas Association, Department of Statistics, 1978.

Figure 7. Gas Utility Industry Sales by Class of Service.

TABLE 6

Gas Utility Industry Sales
By Class of Service, 1955-1977*
(Trillion Btu)

Year	Total	Residential	Commercial	Industrial	Other
1955	6,658.6	2,238.7	602.9	3,535.1	281.9
1960	9,287.7	3,188.1	919.8	4,709.4	470.4
1965	11,980.3	3,999.0	1,344.8	6,146.5	490.0
1970	16,043.5	4,923.7	2,006.6	8,439.2	674.0
1975	14,862.9	4,991.0	2,386.8	6,837.1	648.0
1976	14,813.5	5,014.2	2,422.6	7,107.0	269.6
1977	14,340.9	4,946.3	2,409.4	6,710.7	274.6

SOURCE: Gas Facts: 1977 Data, American Gas Association, Department of Statistics, 1978.

*Excludes data for Alaska and Hawaii prior to 1960.

Comparison of Data Sources

It is useful to compare national consumption of natural gas as reported by the Department of Energy and the gas utility sales as reported by the American Gas Association (Table 8).

Total national consumption (19,931 trillion Btu) exceeded the sales by gas utilities (14,341 trillion Btu) by 5,590 trillion Btu. This difference is attributable primarily to the purchase of natural gas by electric generating utilities and industrial users directly from producers; the use of gas in petrochemical facilities, in refineries, and on lease properties; and the use of gas as a compressor fuel.

A further demonstration of the flexibility that the gas industry possesses in responding to changes in market demands for gas is the recent DOE initiatives to encourage consumers to go back to gas who have used natural gas as a fuel but have had to switch to coal or oil because of natural gas supply shortages.

TABLE 7

Gas Utility Industry Sales, by State and Class of Service, 1977
(Trillions of Btu)

Division and State	Total	Class of Service: Residential	Commercial	Industrial*	Other	Average Btu Value	Electric Generation Included†
United States	14,340.9	4,946.3	2,409.4	6,710.7	274.6	1,021	1,363.0
New England	260.8	138.4	66.8	51.7	3.9	1,008	4.1
Connecticut	64.1	31.7	16.9	15.5	§	1,010	0.0
Maine	2.0	0.6	0.5	0.8	0.1	1,024	0.0
Massachusetts	159.1	86.8	42.6	26.5	3.1	1,007	4.0
New Hampshire	8.2	4.0	2.0	1.7	0.5	1,000	0.1
Rhode Island	23.8	13.8	4.2	5.8	0.0	1,013	0.0
Vermont	3.6	1.4	0.7	1.4	0.1	1,008	0.0
Middle Atlantic	1,479.5	799.7	272.6	377.3	30.0	1,019	3.2
New Jersey	259.4	146.3	57.8	55.0	0.3	1,034	1.1
New York	578.5	350.5	110.3	98.4	19.2	1,011	2.0
Pennsylvania	641.6	302.8	104.4	223.9	10.5	1,021	§
East North Central	3,605.7	1,595.8	732.1	1,263.5	14.2	1,016	46.8
Illinois	1,134.1	517.6	246.0	369.8	0.6	1,028	8.4
Indiana	431.7	171.2	68.0	190.9	1.6	990	0.1
Michigan	846.8	356.0	202.4	285.1	3.3	1,006	34.4
Ohio	871.7	429.6	160.5	274.9	6.7	1,024	0.1
Wisconsin	321.4	121.4	55.2	142.8	2.0	1,015	3.7
West North Central	1,444.5	505.6	274.3	652.0	12.6	996	129.9
Iowa	268.1	90.8	53.8	120.1	3.4	1,004	5.9
Kansas	389.7	85.9	41.8	257.6	4.4	981	76.7
Minnesota	248.9	100.1	44.4	101.5	3.0	997	3.0
Missouri	333.7	156.8	82.3	93.1	1.5	1,002	25.1
Nebraska	154.0	50.7	33.4	69.8	0.1	998	19.1
North Dakota	22.9	10.2	10.7	2.0	0.1	1,000	0.0
South Dakota	27.2	11.3	8.0	7.9	0.1	1,000	0.0

Table 7 (Continued)

Division and State	Total	Class of Service: Residential	Commercial	Industrial*	Other	Average Btu Value	Electric Generation Included†
South Atlantic	1,014.5	362.6	198.5	430.7	22.7	1,029	32.3
Delaware	17.7	7.6	3.1	6.2	0.8	1,030	0.0
Dist. of Columbia	25.6	13.6	10.4	1.6	0.0	1,016	0.0
Florida	140.3	16.0	28.2	92.3	3.8	1,045	26.6
Georgia	261.0	99.9	49.6	108.7	2.8	1,027	5.7
Maryland	137.2	71.3	22.0	43.1	0.8	1,016	0.0
North Carolina	79.0	29.6	17.5	30.2	1.7	1,019	0.0
South Carolina	104.8	20.7	15.0	62.4	6.7	1,022	0.0
Virginia	114.6	49.2	26.8	33.9	4.7	1,023	0.0
West Virginia	134.3	54.9	25.9	52.2	1.3	1,042	0.0
East South Central	702.2	220.4	111.7	355.2	14.9	1,025	20.2
Alabama	215.6	61.0	26.4	127.6	0.6	1,031	0.0
Kentucky	162.4	80.4	32.0	44.5	5.5	1,011	0.0
Mississippi	135.5	31.6	16.4	81.6	6.0	1,025	20.2
Tennessee	188.7	47.4	36.9	101.5	2.9	1,031	0.0
West South Central	3,087.5	444.4	245.7	2,251.4	146.1	1,028	640.2
Arkansas	195.8	47.8	31.7	115.1	1.2	1,021	2.4
Louisiana	487.5	78.4	29.3	364.9	14.9	1,038	43.0
Oklahoma	452.6	79.0	47.9	323.5	2.2	1,027	152.9
Texas	1,951.5	239.1	136.8	1,447.9	127.7	1,027	421.8

TABLE 7 (Continued)

Division and State	Total	Class of Service: Residential	Commercial	Industrial*	Other	Average Btu Value	Electric Generation Included†
Mountain	875.9	249.0	161.2	444.6	21.0	985	139.9
Arizona	137.7	33.1	22.4	79.2	3.0	1,056	19.6
Colorado	236.3	83.6	63.0	88.6	1.2	900	30.9
Idaho	49.9	9.1	9.7	31.1	0.0	1,060	0.0
Montana	65.8	23.2	15.6	24.3	2.6	1,009	0.0
Nevada	65.0	11.9	10.7	41.9	0.4	1,049	35.0
New Mexico	148.4	28.2	15.4	92.0	12.8	1,057	49.6
Utah	118.9	46.9	14.3	57.2	§	950	4.8
Wyoming	54.4	13.1	10.2	30.2	1.0	937	0.0
Pacific	1,870.4	630.4	346.5	884.2	9.3	1,050	366.3
Alaska	29.1	6.0	6.6	10.5	6.0	1,005	10.4
California	1,595.9	569.3	291.8	732.3	2.6	1,052	355.9
Hawaii	3.5	0.8	0.9	1.7	0.0	949	0.0
Oregon	90.7	21.0	14.6	55.1	0.0	1,042	0.0
Washington	151.1	33.3	32.6	84.6	0.7	1,045	0.0

SOURCE: Gas Facts: 1977 Data, American Gas Association, 1978.

*Includes Electric Generation.
†Included in Industrial.
§Less than 0.05 trillion Btu.

TABLE 8

Gas Utility Sales and National Consumption of Natural Gas - 1977
(Trillion Btu)

	Gas Utility Sales (AGA)	National Consumption (DOE)*
Residential	4,946.3	7,462
Commercial	2,409.4	
Industrial (excluding electric generation	5,106.6	8,641
Other	274.6	--
Electric Generation	1,604.1	3,285
Transportation	--	543
Total	14,341	19,931

*"Energy Data Reports," Natural Gas Production and Consumption: 1977, Department of Energy, November 1978.

GAS PIPELINE SYSTEM CHARACTERISTICS

The preceding sections have reported the capabilities of the natural gas industry in 1977 to meet changing supplies, demands, and emergency situations. This general discussion will attempt to build from that data and comment on current developments within the industry.

Factors Affecting Flow Patterns

Figure 3 illustrates that the principal flow patterns of natural gas in the continental United States run from the producing areas of the southwest and Gulf of Mexico to the major market areas of California, the midwestern states, and the middle Atlantic states. These flow patterns follow the traditional paths of energy source to industry. As the market shifts from industrial loads to higher priority commercial and residential loads, these flow patterns are not expected to change drastically. Population indices indicate that the population tends to locate near industrial complexes. Thus, although the end use of natural gas may change, its geographic delivery points will remain nearly the same. New sources of natural gas, on the other hand, may change the flow patterns for some of the transmission systems that have been defined.

Two major sources of new natural gas supply which may alter the flow direction are the Alaskan and Rocky Mountain area projects. New transmission systems are being considered which will move these two new significant sources of supply to the three major market areas.

The Alaskan project will require a new pipeline from Prudhoe Bay, Alaska, to James River Junction, Alberta, Canada. The gas will then take separate routes through existing pipeline systems to California and through new systems across the northern United States to the midwest. Proposed routes run from James River Junction, Alberta, through Kingsgate, British Columbia, Canada, to Antioch, California, and from James River Junction, through Monchy, Saskatchewan, Canada, to Dwight, Illinois. Interconnections with existing pipeline systems would displace some of the gas delivered near Chicago to the eastern states.

There are several Rocky Mountain projects currently on file before the FERC. These projects are designed to transport recently discovered gas reserves from the Rocky Mountain states to the west coast, midwest, and east coast market areas. Because this is a relatively new area of development, these projects generally entail building new transmission systems from the new supply sources (the states of Colorado, Utah, and Wyoming) to interconnection points with existing transmission systems. These systems will then move the new supply of natural gas to the market areas either by utilizing existing pipeline capacity or by displacing gas from other supply sources to pipeline systems.

A project in progress will link Wyoming gas supplies to a midwestern pipeline system originating in Kansas. The project includes the conversion of a crude oil pipeline to gas service. This action, in conjunction with the construction of a new pipeline, will result in a 610-mile natural gas system. Approval for conversion of the crude oil pipeline was obtained from the FERC after arrangements were made to move the crude oil through other petroleum pipeline systems.

A considerable amount of natural gas (approximately 2.8 billion cubic feet per day) is imported from Canada. Requests have been made with the Canadian National Energy Board concerning extensions and possible increases in imports. Large quantities of natural gas have been discovered in Mexico, and possibilities exist to import up to 2 billion cubic feet of natural gas per day from that country. Existing transmission systems with excess capacity are within 200 miles of the Mexico/United States border. Increases in import activity from either Canada or Mexico would not be expected to significantly affect national gas flow patterns.

Other new sources of gas supply whose influence on the flow patterns of transmission systems have been evaluated include LNG imports, SNG from petroleum plants, and coal gasification plants.

Three LNG import terminals are currently operational with a combined design capacity of about 400 billion cubic feet of LNG per year. These terminals are located at Everett, Massachusetts; Cove Point, Maryland; and Elba Island, Georgia. Another terminal is currently under construction at Lake Charles, Louisiana, and should be operational by 1980. The Lake Charles terminal alone is expected to handle 168.4 billion cubic feet of LNG each year. Together these four terminals represent approximately 1.5 billion cubic feet per day of imported natural gas.[4]

Since LNG is usually transported from foreign countries by tankers, import terminals are located on coastlines. Terminals located on the Atlantic or Pacific coastlines could significantly change gas flow patterns as most transmission systems originate in existing natural gas supply areas (Texas, Oklahoma, and Louisiana) and terminate at market areas near these coastlines. Volumes which arrive at the Atlantic or Pacific coastlines would reduce (or even reverse) traditional gas flow patterns. Terminals located on the Gulf of Mexico coastline, however, would not alter the flow patterns of the transmission system since Louisiana and the Gulf of Mexico are already major sources of gas supply. LNG delivered along the Gulf of Mexico coastline would serve to replace depleting sources of supply in this area, and could therefore be transported through the existing pipeline systems originating from this area.

There are presently 13 SNG plants which produce gas from liquid petroleum products (propane, butanes, gasoline, and naphtha). Twelve are located in the continental United States, the thirteenth in Hawaii. The total design capacity of the 12 continental plants is approximately 1.3 billion cubic feet of synthetic gas each day, the equivalent of about 200 billion cubic feet of synthetic gas during the November-March winter heating season.[5]

SNG plants are generally located near a major market area. However, because the use of hydrocarbon liquids for the production of gas from SNG is subject to allocation by the Department of Energy and because of the significant price of gas feedstocks, growth of such SNG plants is not expected. Other sources of synthetic gas are being investigated, but SNG from petroleum products should not influence gas flow patterns.

With the advent of natural gas, the manufacturing of gas from coal essentially disappeared in the United States. Because natural gas supply has not been able to keep up with demand in recent years, researchers are investigating possible alternate means of obtaining a synthetic gas that is interchangeable with natural gas. Because of its abundance in the United States, coal has been viewed as the most practical source material for such a conversion process.

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[4] Gas Supply Review Report, American Gas Association, December 1978, Vol. 7, No. 3.

[5] Gas Supply Review Report, American Gas Association, November 1978, Vol. 7, No. 2.

Coal gasification plants have been in the planning stages for the last several years, but because of the large capital requirements, implementation has been slow. The first phase of a demonstration commercial-size coal gasification plant is currently awaiting FERC approval. If approved, this plant will be constructed near Beulah, North Dakota, by a five-member consortium of gasification companies.

The effects of coal gasification plants on flow patterns cannot be determined at this time. Much will depend upon the locations of these plants -- whether they will be near coal supplies, existing pipelines, or market areas. It is probable that coal gasification plants will be connected to existing transmission systems with new spur or lateral pipelines and will have little impact upon gas flow patterns.

Impact of Underground Storage On System Operation and Flexibility

In the early part of this century, underground storage fields were used to supplement gas supply when demand exceeded pipeline capacity; this type of supplemental supply became known as "peak shaving." Many distribution companies today utilize their storage fields for peak shaving purposes.

As long distance transmission companies developed, the emphasis in underground storage shifted to the use of storage as an aid in maintaining high pipeline load factors despite fluctuating markets (such as the seasonal space heating load). For example, during the spring/summer months (when the demand for gas for heating purposes is very low), transmission companies can maintain high system flowing volumes by transporting much of the gas to storage. In the winter (when demand is much higher), this stored gas can be withdrawn to supplement pipeline capacities. Both economic and operational benefits result from the use of underground storage as a greater use of facilities (load factor) reduces the unit cost of transportation.

Underground storage is not only used to complement the operation of transmission systems near the market area; it also protects the reliability of transmission systems (e.g., gas stored in salt caverns in Louisiana is withdrawn to provide uninterrupted service when offshore facilities in the Gulf of Mexico are affected by hurricanes).

Seasonal operation of underground storage is displayed in Appendix E for cases in which maximum design flow capacity is significantly greater than the daily average flowing volume. The daily average flowing volume represents the arithmetic sum of flow patterns during the 1977 calendar year. Volumes that are withdrawn from storage during the winter season, thereby depleting these storage reservoirs, are injected back into them during the summer months. Because of this flow reversal phenomenon (in which storage is depleted and then replenished), the utilization of these transmission facilities may indeed be quite high.

System Flexibility

Once a pipeline is installed it is not practical to reroute it to another source of supply or market area. Additional quantities of gas can, however, be added to or taken from the system at virtually any point by a connection to another system. It is this ability which lends flexibility to a pipeline system.

Although most pipeline systems are independent corporate entities, interconnections join separate pipelines to form a natural gas pipeline network which can be used to substantially modify the direction and quantities of natural gas, and allows for exchanges, transfers, and emergency deliveries in times of temporary shortages. During the natural gas emergency of the winter of 1976-1977, the natural gas industry demonstrated the true flexibility of the pipeline network by moving natural gas that was ready for shipment from Texas to the west coast and delivering these quantities of gas to the east coast. Also, quantities of gas were imported from Canada and sent to the midwestern states, and volumes from Louisiana which would normally have gone to the midwest were displaced to the east coast. Based upon this experience, it is probable that new supplies could be connected to the transmission system network and moved across the country with existing facilities. If new facilities are needed, the number could be minimized by selective routing within the network.

Projected Trends

The 1977 data in this study show a considerable amount of spare pipeline capacity, especially for pipelines from the Gulf Coast area; however, due to an improvement in supplies, there is less spare capacity available today (1979) than in 1977. Many interstate pipeline companies project that the supply situation will continue to improve in the near future, resulting in even less spare capacity. This trend is expected to hold especially true for the Gulf Coast supply area.

Spare pipeline capacity and recent policy changes have encouraged a greater use of common pipeline facilities. The trend towards the transportation of gas for others has increased steadily since 1977. As new supplies become available, pipeline companies are more likely to seek transporation arrangements with pipeline companies already in the area rather than investing in new pipeline systems. High costs have also discouraged individual pipeline companies from embarking alone on major projects such as a large capacity system from Alaska or a coal gasification plant. The trend appears to be that the cost of such projects will have to be shared by several companies which will own the common facilities.

Summary

The U.S. natural gas pipeline network can provide a considerable degree of flexibility in matching supplies with areas of demand. With few exceptions, new supplies can be added through extensions of existing systems. The Alaskan and Rocky Mountain projects and LNG imports on the Atlantic and Pacific coasts may, however, entail entirely new systems or significantly affect flow patterns.

Although the use of natural gas has changed from industrial to residential and commercial heating, geographic areas of demand have remained stable, and underground storage is available to meet changing seasonal requirements. Many interstate pipeline companies project some easing of the supply outlook in the near term. Gas use is projected to be more seasonal in the future, and the use of load balancing or peak shaving methods must be increased. Spare pipeline capacity will allow pipelines to transport gas for other pipeline companies and reduce the need for individual pipelines to the same supply area. Large-scale projects will become increasingly expensive and joint ownership of facilities by several pipeline companies is expected.

APPENDICES

Department of Energy
Washington, D.C. 20585

June 20, 1978

Dear Mr. Chandler:

The National Petroleum Council has prepared numerous studies in the past on the Nation's petroleum transportation systems. The last study on this subject was prepared over ten years ago and published on September 15, 1967.

The transportation data collected over the years by the Council has been used by the Federal Government for emergency preparedness planning purposes. The data includes information on major crude oil and petroleum product pipelines, natural gas transmission lines, inland waterway barges, tank cars and tank trucks. Detailed information is also included on the location, capacity and type of pump stations and compressor stations.

As part of the Government's overall review and update of emergency preparedness planning, current data are needed on the Nation's petroleum transportation systems. I, therefore, request the National Petroleum Council to undertake a detailed study to determine current petroleum and gas transportation capacities including natural gas transmission lines, crude oil and petroleum product pipelines, crude oil gathering lines in major producing areas, inland waterway barges, tank cars and tank trucks. With respect to transportation of oil and petroleum products, the study should cover the spatial and transportation relationships--the match ups--among refineries of varying capacities and crude oil sources.

The study should examine the industry's flexibility to meet dislocations of supply and outline the changing supply patterns of the petroleum and natural gas deliverability systems.

For the purpose of this study, I will designate the Deputy Assistant Secretary for Policy and Evaluation to represent me and to provide the necessary coordination between the Department of Energy and the National Petroleum Council.

Sincerely,

James R. Schlesinger

James R. Schlesinger
Secretary

Mr. Collis P. Chandler, Jr.
Chairman, National Petroleum Council
1625 K Street, N.W.
Washington, D. C. 20006

Department of Energy
Washington, D.C. 20585

June 20, 1978

Dear Mr. Chandler:

The ability of this Nation to withstand interruptions in normal oil supplies, whether by domestic dislocation or by foreign intervention, is immediately served by recourse to existing inventories of oil stocks. In addition, the United States has embarked on a Strategic Petroleum Reserve program to aid in meeting its commitments abroad and its commitments to consumers at home in case of another interruption of foreign oil supply. For industry and Government to respond appropriately to an emergency, our need for accurate information and understanding of primary petroleum inventories is greater than it has ever been.

Implicit in an understanding of petroleum inventories is the distinction between total stocks and those stocks which would be readily available for use. Such information is essential in evaluating correctly the extent of the contribution our oil stocks would be able to make in times of oil supply emergency and planning the development and use of the Strategic Petroleum Reserve.

Periodically the National Petroleum Council has conducted for the Department of the Interior a survey of the availability of petroleum inventories and storage capacity. The last such report was issued in 1974, the eighth in a series which began in 1948.

Accordingly, the National Petroleum Council is requested to prepare for the Department of Energy a new report on available petroleum inventories and storage capacity. This new report should emphasize the distinction between available stocks and those unavailable. For the purpose of this study, I will designate the Deputy Assistant Secretary for Policy and Evaluation to represent me and to provide the necessary coordination between the Department of Energy and the National Petroleum Council.

Sincerely,

James R. Schlesinger
Secretary

Mr. Collis P. Chandler, Jr.
Chairman
National Petroleum Council
1625 K Street, N.W.
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Murphy Oil Corporation

John H. Murrell
Chief Executive Officer and
Chairman of Executive Committee
DeGolyer and MacNaughton

R. L. O'Shields
Chairman and
Chief Executive Officer
Panhandle Eastern
Pipe Line Company

John G. Phillips
Chairman of the Board and
Chief Executive Officer
The Louisiana Land
& Exploration Company

T. B. Pickens, Jr.
President
Mesa Petroleum Company

L. Frank Pitts, Owner
Pitts Oil Company

Rosemary S. Pooler
Chairwoman and
Executive Director
New York State
Consumer Protection Board

Donald B. Rice, President
Rand Corporation

Corbin J. Robertson
Chairman of the Board
Quintana Petroleum Corporation

James C. Rosapepe, President
Rosapepe, Fuchs & Associates

Henry A. Rosenberg, Jr.
Chairman of the Board and
Chief Executive Officer
Crown Central Petroleum
Corporation

Ned C. Russo, President
Stabil-Drill Specialties, Inc.

Robert V. Sellers
Chairman of the Board
Cities Service Company

Robert E. Seymour
Chairman of the Board
Consolidated Natural Gas
Company

J. J. Simmons, Jr.
President
Simmons Royalty Company

Theodore Snyder, Jr.
President
Sierra Club

Charles E. Spahr

John E. Swearingen
Chairman of the Board
Standard Oil Company (Indiana)

Robert E. Thomas
Chairman of the Board
MAPCO Inc.

H. A. True, Jr.
Partner
True Oil Company

Martin Ward, President
United Association of Journeymen
and Apprentices of the
Plumbing and Pipe Fitting
Industry of the United States
and Canada

Rawleigh Warner, Jr.
Chairman of the Board
Mobil Corporation

John F. Warren
Independent Oil Operator/Producer

Lee C. White, President
Consumer Energy Council
of America

Alton W. Whitehouse, Jr.
Chairman of the Board and
Chief Executive Officer
The Standard Oil Company (Ohio)

Joseph H. Williams
Chairman of the Board and
Chief Executive Officer
The Williams Companies

Robert E. Yancey, President
Ashland Oil, Inc.

NATIONAL PETROLEUM COUNCIL SURVEY OF GAS PIPELINE TRANSPORTATION

Cover Page

Reporting Company ______________________________

Address ______________________________

____

____

Employee of Reporting Company to be Contacted if Questions Arise ______________________________

Telephone Number ______________________________

Date ______________________________

Number of Pages Attached ______________________________

Please Return Form To

Mrs. Joan Walsh Cassedy
Committee Coordinator
National Petroleum Council
1625 K Street, N.W.
Washington, D.C. 20006

Telephone Number (202) 393-6100

1/79

NATIONAL PETROLEUM COUNCIL
GAS PIPELINE TRANSPORTATION
QUESTIONNAIRE

FROM LOCATION 1/	TO LOCATION 1/	MAXIMUM DESIGN FLOW CAPACITY 2/5/ (MMCF/D) 3/	DAILY AVERAGE FLOWING VOLUMES 4/ 5/ (MMCF/D) 3/

NOTES:

1/ Indicate adjacent locations *(From* and *To)* between which capacity exists. Locations include states with the exception of California (which comprises two locations, North and South, separated by latitude 36° N) and Texas (which comprises two locations, East and West, separated by Interstate Highway 35). Canada, the Pacific Ocean, Mexico, the Gulf of Mexico, and the Atlantic Ocean are also locations.

2/ Report the existing maximum design flow capacity as of December 31, 1977 across the boundary of the *From* and *To* locations shown. In pipelines with bi-directional flow, report the greater design flow capacity and corresponding direction only.

3/ Million cubic feet per day at a measurement base of 60°F and 14.73 psia.

4/ Report the daily average flowing volumes for the year 1977 across the boundary of the *From* and *To* locations shown.

5/ In cases where volumes are exchanged at the borders described in footnote 1, the volumes exchanged should be reported by the recipient only.

1/79

NATURAL GAS PIPELINE COMPANIES WHICH RESPONDED
TO THE 1979 NPC SURVEY OF GAS PIPELINE TRANSPORTATION

Algonquin Gas Transmission Company
Black Marlin Pipeline Company
Cities Service Gas Company
Colorado Interstate Gas Company
Columbia Gas Transmission Company
Columbia Gulf Transmission Corporation
Consolidated Gas Supply Corporation
Distrigas Corporation
East Tennessee Natural Gas Company
El Paso Natural Gas Company
Equitable Gas Company
Florida Gas Transmission Company
Great Lakes Gas Transmission Company
Houston Pipe Line Company
Kansas-Nebraska Natural Gas Company
LoVaca Gathering Company
Michigan Wisconsin Pipe Line Company
Midwestern Gas Transmission Company
Mississippi River Transmission Corporation
Montana-Dakota Utilities Company
Montana Power Company
Mountain Fuel Resources
Mountain Fuel Supply Company
National Fuel Gas Supply Corporation
Natural Gas Pipeline Company of America
Northern Natural Gas Company
Northwest Pipeline Corporation
Oasis Pipeline Company
Pacific Gas and Electric Company
Pacific Gas Transmission Company
Panhandle Eastern Pipe Line Company
Sea Robin Pipeline Company
Southern California Gas Company
Southern Natural Gas Company
Stingray Pipeline Company
Tennessee Gas Pipeline Company
Texas Eastern Gas Pipeline Company
Texas Gas Transmission Corporation
Transcontinental Gas Pipe Line Corporation
Transwestern Pipeline Company
Trunkline Gas Company
United Gas Pipe Line Company

NATIONAL GAS FLOW PATTERNS
Maximum Design Flow Capacities as of December 31, 1977
And Actual Average 1977 Daily Flowing Volumes

FROM LOCATION[2] Reporting Company[1]	TO LOCATION[2] Volumes (MMCF/D)[3 4 5]							
	Maximum Design	Actual	Maximum Design	Actual	Maximum Design	Actual	Maximum Design	Actual
ALABAMA	**FLORIDA**		**GEORGIA**		**TENNESSEE**			
Florida Gas Transmission Co.	734	547						
Southern Natural Gas Co.			1222	825				
Tennessee Gas Pipeline Co.					1780	1496		
Texas Eastern Gas Pipeline Co.					2148	1677		
Transcontinental Gas Pipe Line Corp.			2937	1744				
United Gas Pipe Line Co.	163	79						
Totals	**897**	**626**	**4159**	**2599**	**3928**	**3173**		
ARIZONA	**CALIF. (SO.)**							
Pacific Gas and Electric Co.	1140	811						
Southern California Gas Co.	2500	2055						
Totals	**3640**	**2866**						
ARKANSAS	**MISSISSIPPI**		**MISSOURI**					
Michigan Wisconsin Pipe Line Co.	1430	1015						
Mississippi River Transmission Corp.			682	374				
cont'd								

NATIONAL GAS FLOW PATTERNS
Maximum Design Flow Capacities as of December 31, 1977
And Actual Average 1977 Daily Flowing Volumes

FROM LOCATION[2] Reporting Company[1]	TO LOCATION[2] Volumes (MMCF/D)[3 4 5]							
	Maximum Design	Actual	Maximum Design	Actual	Maximum Design	Actual	Maximum Design	Actual
ARKANSAS *cont'd*	**MISSISSIPPI**		**MISSOURI**					
Natural Gas Pipeline Co. of America			1587	1336				
Tennessee Gas Pipeline Co.	1548	1147						
Texas Eastern Gas Pipeline Co.	293	210						
Texas Gas Transmission Corp.	2268	1558						
Trunkline Gas Co.	1854	1499						
Totals	**7100**	**5219**	**2562**	**1920**				
ATLANTIC OCEAN	**MASSACHUSETTS**							
Distrigas Corp.	58	37						
Totals	**58**	**37**						
CALIFORNIA (SO.)	**CALIF. (NO.)**							
Pacific Gas and Electric Co.	1007	684						
Totals	**1007**	**684**						

NATIONAL GAS FLOW PATTERNS
Maximum Design Flow Capacities as of December 31, 1977
And Actual Average 1977 Daily Flowing Volumes

FROM LOCATION[2] Reporting Company[1]	TO LOCATION[2] Volumes (MMCF/D)[3 4 5]							
	Maximum Design	Actual	Maximum Design	Actual	Maximum Design	Actual	Maximum Design	Actual
CANADA	**IDAHO**		**MINNESOTA**		**MONTANA**		**WASHINGTON**	
Great Lakes Gas Transmission Co.			1356	1204				
Midwestern Gas Transmission Co.			396	372				
Montana Power Co.					164	87		
Northwest Pipeline Corp.							976	785
Pacific Gas Transmission Co.	1176	1201						
Totals	**1176**	**1201**	**1752**	**1576**	**164**	**87**	**976**	**785**
COLORADO	**NEW MEXICO**		**UTAH**		**NEBRASKA**			
El Paso Natural Gas Co.	220	43						
Kansas-Nebraska Natural Gas Co.					50	30		
Mountain Fuel Resources			68	12				
Northwest Pipeline Corp.			328	262				
Totals	**220**	**43**	**396**	**274**	**50**	**30**		
CONNECTICUT	**RHODE ISLAND**							
Algonquin Gas Transmission Co.	389	195						
Totals	**389**	**195**						

NATIONAL GAS FLOW PATTERNS
Maximum Design Flow Capacities as of December 31, 1977
And Actual Average 1977 Daily Flowing Volumes

FROM LOCATION[2] Reporting Company[1]	TO LOCATION[2] Volumes (MMCF/D)[3 4 5]							
	Maximum Design	Actual	Maximum Design	Actual	Maximum Design	Actual	Maximum Design	Actual
FLORIDA	**ALABAMA**							
United Gas Pipe Line Co.	13	8						
Totals	**13**	**8**						
GEORGIA	**SO. CAROLINA**		**TENNESSEE**					
Southern Natural Gas Co.	213	205	52	39				
Transcontinental Gas Pipe Line Corp.	2834	1681						
Totals	**3047**	**1886**	**52**	**39**				
GULF OF MEXICO	**LOUISIANA**		**TEXAS (EAST)**					
Black Marlin Pipeline Co.			157	65				
Columbia Gulf Transmission Co.	902	557						
Houston Pipe Line Co.			300	100				
LoVaca Gathering Co.			200	62				
Michigan Wisconsin Pipe Line Co.	1726	1054						
Natural Gas Pipe-line Co. of America	52	12	131	55				
Sea Robin Pipeline Co.	1185	637						
Southern Natural Gas Co.	334	315						
Stingray Pipeline Co.	1146	1132						
Tennessee Gas Pipeline Co.	3359	2010						
cont'd								

NATIONAL GAS FLOW PATTERNS
Maximum Design Flow Capacities as of December 31, 1977
And Actual Average 1977 Daily Flowing Volumes

FROM LOCATION[2] Reporting Company[1]	TO LOCATION[2] Volumes (MMCF/D)[3 4 5]							
	Maximum Design	Actual	Maximum Design	Actual	Maximum Design	Actual	Maximum Design	Actual
GULF OF MEXICO *cont'd*	**LOUISIANA**		**TEXAS (EAST)**					
Texas Eastern Gas Pipeline Co.	1045	769						
Texas Gas Transmission Corp.	183	52						
Transcontinental Gas Pipe Line Corp.	2388	1296	199	91				
Trunkline Gas Co.	913	609						
United Gas Pipe Line Co.	355	66						
Totals	**13588**	**8509**	**987**	**373**				
IDAHO	**WASHINGTON**		**NEVADA**					
Northwest Pipeline Corp.			125	99				
Pacific Gas Transmission Co.	1163	1190						
Totals	**1163**	**1190**	**125**	**99**				
ILLINOIS	**INDIANA**		**MISSOURI**		**WISCONSIN**			
Michigan Wisconsin Pipe Line Co.					1021	161		
Mississippi River Transmission Corp.			591	268				
Northern Natural Gas Co.					220	147		
Panhandle Eastern Pipe Line Co.	1417	1240						
cont'd								

NATIONAL GAS FLOW PATTERNS
Maximum Design Flow Capacities as of December 31, 1977
And Actual Average 1977 Daily Flowing Volumes

FROM LOCATION[2] Reporting Company[1]	TO LOCATION[2] Volumes (MMCF/D)[3 4 5]							
	Maximum Design	Actual	Maximum Design	Actual	Maximum Design	Actual	Maximum Design	Actual
ILLINOIS *cont'd*	**INDIANA**		**MISSOURI**		**WISCONSIN**			
Texas Eastern Gas Pipeline Co.	272	166						
Trunkline Gas Co.	808	519						
Totals	**2497**	**1925**	**591**	**268**	**1241**	**308**		
INDIANA	**ILLINOIS**		**MICHIGAN**		**OHIO**			
Michigan Wisconsin Pipe Line Co.	1060	23	727	412	1350	1013		
Midwestern Gas Transmission Co.	594	453						
Panhandle Eastern Pipe Line Co.					1193	787		
Texas Eastern Gas Pipeline Co.					311	155		
Texas Gas Transmission Corp.	46	26			931	710		
Trunkline Gas Co.			769	478				
Totals	**1700**	**502**	**1496**	**890**	**3785**	**2665**		
IOWA	**ILLINOIS**		**MINNESOTA**		**SO. DAKOTA**			
Michigan Wisconsin Pipe Line Co.	398	406						
Natural Gas Pipeline Co. of America	1759	990						
Northern Natural Gas Co.	350	278	1200	674	65	26		
Totals	**2507**	**1674**	**1200**	**674**	**65**	**26**		

NATIONAL GAS FLOW PATTERNS
Maximum Design Flow Capacities as of December 31, 1977
And Actual Average 1977 Daily Flowing Volumes

FROM LOCATION[2] Reporting Company[1]	TO LOCATION[2] Volumes (MMCF/D)[3,4,5]							
	Maximum Design	**Actual**	**Maximum Design**	**Actual**	**Maximum Design**	**Actual**	**Maximum Design**	**Actual**
KANSAS	**COLORADO**		**MISSOURI**		**NEBRASKA**		**OKLAHOMA**	
Cities Service Gas Co.			902	354	7	7	60	35
Colorado Interstate Gas Co.	200	92						
Kansas-Nebraska Natural Gas Co.					145	58		
Michigan Wisconsin Pipe Line Co.					588	496		
Natural Gas Pipeline Co. of America					1684	1150		
Northern Natural Gas Co.	5	2			2460	1737		
Panhandle Eastern Pipe Line Co.			1559	1280				
Totals	**205**	**94**	**2461**	**1634**	**4884**	**3448**	**60**	**35**
KENTUCKY	**ILLINOIS**		**INDIANA**		**OHIO**		**WEST VIRGINIA**	
Columbia Gas Transmission Corp.					574	191	2194	1103
Michigan Wisconsin Pipe Line Co.			1444	1034				
Midwestern Gas Transmission Co.			596	459				
Tennessee Gas Pipeline Co.					1678	1482	796	629
cont'd								

NATIONAL GAS FLOW PATTERNS
Maximum Design Flow Capacities as of December 31, 1977
And Actual Average 1977 Daily Flowing Volumes

FROM LOCATION[2] Reporting Company[1]	TO LOCATION[2] Volumes (MMCF/D)[3 4 5]							
	Maximum Design	Actual	Maximum Design	Actual	Maximum Design	Actual	Maximum Design	Actual
KENTUCKY *cont'd*	**ILLINOIS**		**INDIANA**		**OHIO**		**WEST VIRGINIA**	
Texas Eastern Gas Pipeline Co.					2054	1661		
Texas Gas Transmission Corp.			1318	931				
Trunkline Gas Co.	1811	1471						
Totals	**1811**	**1471**	**3358**	**2424**	**4306**	**3334**	**2990**	**1732**
LOUISIANA	**ARKANSAS**		**MISSISSIPPI**		**TEXAS (EAST)**			
Columbia Gulf Transmission Co.			2133	1265				
Florida Gas Transmission Co.			738	545				
Michigan Wisconsin Pipe Line Co.	1435	1015						
Mississippi River Transmission Corp.	724	368						
Natural Gas Pipeline Co. of America					1403	921		
Southern Natural Gas Co.			1413	1325				
Tennessee Gas Pipeline Co.	1548	1148	2590	2043				
Texas Eastern Gas Pipeline Co.			1753	1355	482	168		
Texas Gas Transmission Corp.	2275	1568						
Transcontinental Gas Pipe Line Corp.			2990	1794				
Trunkline Gas Co.	1854	1499						
United Gas Pipe Line Co.			811	746	176	37		
Totals	**7836**	**5598**	**12428**	**9073**	**2061**	**1126**		

NATIONAL GAS FLOW PATTERNS
Maximum Design Flow Capacities as of December 31, 1977
And Actual Average 1977 Daily Flowing Volumes

FROM LOCATION[2] Reporting Company[1]	TO LOCATION[2] Volumes (MMCF/D)[3 4 5] Maximum Design	Actual	Maximum Design	Actual	Maximum Design	Actual	Maximum Design	Actual
MARYLAND	**PENNSYLVANIA**		**WEST VIRGINIA**					
Columbia Gas Transmission Corp.	54	17	12	4				
Texas Eastern Gas Pipeline Co.	300	0						
Transcontinental Gas Pipe Line Corp.	2016	1248						
Totals	**2370**	**1265**	**12**	**4**				
MASSACHUSETTS	**CONNECTICUT**		**NEW HAMPSHIRE**					
Tennessee Gas Pipeline Co.	17	24	79	46				
Totals	**17**	**24**	**79**	**46**				
MEXICO	**TEXAS (EAST)**							
Texas Eastern Gas Pipeline Co.	300	7						
Totals	**300**	**7**						
MICHIGAN	**CANADA**		**INDIANA**		**WISCONSIN**			
Great Lakes Gas Transmission Co.	903	792						
Michigan Wisconsin Pipe Line Co.			1169	57	529	222		
Totals	**903**	**792**	**1169**	**57**	**529**	**222**		

NATIONAL GAS FLOW PATTERNS
Maximum Design Flow Capacities as of December 31, 1977
And Actual Average 1977 Daily Flowing Volumes

FROM LOCATION[2] Reporting Company[1]	TO LOCATION[2] Volumes (MMCF/D)[3 4 5]							
	Maximum Design	Actual	Maximum Design	Actual	Maximum Design	Actual	Maximum Design	Actual
MINNESOTA	**NO. DAKOTA**		**WISCONSIN**					
Great Lakes Gas Transmission Co.			1185	1088				
Midwestern Gas Transmission Co.	19	13	341	335				
Northern Natural Gas Co.			115	102				
Totals	**19**	**13**	**1641**	**1525**				
MISSISSIPPI	**ALABAMA**		**ARKANSAS**		**LOUISIANA**		**TENNESSEE**	
Columbia Gulf Transmission Co.							2102	1255
Florida Gas Transmission Co.	736	543						
Michigan Wisconsin Pipe Line Co.							1418	1011
Southern Natural Gas Co.	2006	1319						
Tennessee Gas Pipeline Co.	1880	1554					2100	1544
Texas Eastern Gas Pipeline Co.	2164	1685						
Texas Gas Transmission Corp.			15	7			2112	1500
Transcontinental Gas Pipe Line Corp.	2972	1795						
Trunkline Gas Co.							1836	1486
United Gas Pipe Line Co.	552	155			6	3		
Totals	**10310**	**7051**	**15**	**7**	**6**	**3**	**9568**	**6796**

NATIONAL GAS FLOW PATTERNS
Maximum Design Flow Capacities as of December 31, 1977
And Actual Average 1977 Daily Flowing Volumes

FROM LOCATION[2] Reporting Company[1]	TO LOCATION[2] Volumes (MMCF/D)[3 4 5]							
	Maximum Design	Actual	Maximum Design	Actual	Maximum Design	Actual	Maximum Design	Actual
MISSOURI	**ILLINOIS**		**IOWA**					
Michigan Wisconsin Pipe Line Co.			558	488				
Mississippi River Transmission Corp.	582	274						
Natural Gas Pipeline Co. of America	1545	1328						
Panhandle Eastern Pipe Line Co.	1379	1178						
Texas Eastern Gas Pipeline Co.	270	189						
Totals	**3776**	**2969**	**558**	**488**				
MONTANA	**CANADA**		**NO. DAKOTA**					
Montana-Dakota Utilities Co.			161	70				
Northern Natural Gas Co.	120	37						
Totals	**120**	**37**	**161**	**70**				
NEBRASKA	**IOWA**		**MISSOURI**		**SO. DAKOTA**			
Michigan Wisconsin Pipe Line Co.			588	496				
Natural Gas Pipeline Co. of America	1640	1116						
Northern Natural Gas Co.	1900	1477			45	22		
Totals	**3540**	**2593**	**588**	**496**	**45**	**22**		

Maximum Design Flow Capacities as of December 31, 1977
And Actual Average 1977 Daily Flowing Volumes

FROM LOCATION[2] Reporting Company[1]	TO LOCATION[2] Volumes (MMCF/D)[3 4 5]							
	Maximum Design	Actual	Maximum Design	Actual	Maximum Design	Actual	Maximum Design	Actual
NEW HAMPSHIRE	**MASSACHUSETTS**							
Tennessee Gas Pipeline Co.	50	31						
Totals	**50**	**31**						
NEW JERSEY	**NEW YORK**							
Algonquin Gas Transmission Co.	634	315						
Tennessee Gas Pipeline Co.	307	165						
Texas Eastern Gas Pipeline Co.	326	106						
Transcontinental Gas Pipe Line Corp.	1042	415						
Totals	**2309**	**1001**						
NEW MEXICO	**ARIZONA**		**TEXAS (WEST)**		**COLORADO**			
El Paso Natural Gas Co.	3613	2843						
Natural Gas Pipeline Co. of America			510	321				
Northern Natural Gas Co.			300	260				
Northwest Pipeline Corp.					316	210		
Transwestern Pipeline Co.	762	526						
Totals	**4375**	**3369**	**810**	**581**	**316**	**210**		

NATIONAL GAS FLOW PATTERNS
Maximum Design Flow Capacities as of December 31, 1977
And Actual Average 1977 Daily Flowing Volumes

FROM LOCATION[2] Reporting Company[1]	TO LOCATION[2] Volumes (MMCF/D)[3 4 5]							
	Maximum Design	Actual	Maximum Design	Actual	Maximum Design	Actual	Maximum Design	Actual
NEW YORK	**CANADA**		**CONNECTICUT**		**MASSACHUSETTS**		**PENNSYLVANIA**	
Algonquin Gas Transmission Co.			602	299				
National Fuel Gas Supply Corp.							57	32
Tennessee Gas Pipeline Co.	62	0	109	52	402	268		
Totals	**62**	**0**	**711**	**351**	**402**	**268**	**57**	**32**
NO. CAROLINA	**VIRGINIA**							
Transcontinental Gas Pipe Line Corp.	2302	1417						
Totals	**2302**	**1417**						
NO. DAKOTA	**SO. DAKOTA**							
Montana-Dakota Utilities Co.	45	21						
Totals	**45**	**21**						
OHIO	**INDIANA**		**MICHIGAN**		**PENNSYLVANIA**		**WEST VIRGINIA**	
Columbia Gas Transmission Corp.					20	1	5	1
Consolidated Gas Supply Corp.					408	153		
cont'd								

NATIONAL GAS FLOW PATTERNS
Maximum Design Flow Capacities as of December 31, 1977
And Actual Average 1977 Daily Flowing Volumes

FROM LOCATION[2] Reporting Company[1]	TO LOCATION[2] Volumes (MMCF/D)[3 4 5]							
	Maximum Design	Actual	Maximum Design	Actual	Maximum Design	Actual	Maximum Design	Actual
OHIO *cont'd*	**INDIANA**		**MICHIGAN**		**PENNSYLVANIA**		**WEST VIRGINIA**	
Michigan Wisconsin Pipe Line Co.	767	426	570	580				
Panhandle Eastern Pipe Line Co.			750	384				
Tennessee Gas Pipeline Co.					1576	1336		
Texas Eastern Gas Pipeline Co.							2402	1629
Totals	**767**	**426**	**1320**	**964**	**2004**	**1490**	**2407**	**1630**
OKLAHOMA	**COLORADO**		**KANSAS**		**MISSOURI**		**TEXAS (WEST)**	
Cities Service Gas Co.			737	532	1	1		
Colorado Interstate Gas Co.	100	110	27	25				
Kansas-Nebraska Natural Gas Co.			55	72				
Michigan Wisconsin Pipe Line Co.			596	505				
Natural Gas Pipeline Co. of America			1732	1164			210	75
Northern Natural Gas Co.			1900	1758				
Panhandle Eastern Pipe Line Co.			1271	956				
Transwestern Pipeline Co.							30	4
Totals	**100**	**110**	**6318**	**5012**	**1**	**1**	**240**	**79**

NATIONAL GAS FLOW PATTERNS
Maximum Design Flow Capacities as of December 31, 1977
And Actual Average 1977 Daily Flowing Volumes

FROM LOCATION[2] Reporting Company[1]	TO LOCATION[2] Volumes (MMCF/D)[3 4 5]							
	Maximum Design	Actual	Maximum Design	Actual	Maximum Design	Actual	Maximum Design	Actual
OREGON	**CALIF. (NO.)**		**IDAHO**					
Northwest Pipeline Corp.			201	12				
Pacific Gas and Electric Co.	980	1023						
Totals	**980**	**1023**	**201**	**12**				
PENNSYLVANIA	**MARYLAND**		**NEW JERSEY**		**NEW YORK**		**OHIO**	
Columbia Gas Transmission Corp.	70	26			130	83		
Consolidated Gas Supply Corp.					1368	373	490	110
Equitable Gas Co.					130	31		
National Fuel Gas Supply Corp.					390	192		
Tennessee Gas Pipeline Co.			407	183	716	515		
Texas Eastern Gas Pipeline Co.			1532	681				
Transcontinental Gas Pipe Line Corp.			2065	1027				
Totals *cont'd*	**70**	**26**	**4004**	**1891**	**2734**	**1194**	**490**	**110**
PENNSYLVANIA *cont'd*	**WEST VIRGINIA**							
Columbia Gas Transmission Corp.	140	69						
Totals	**140**	**69**						

NATIONAL GAS FLOW PATTERNS
Maximum Design Flow Capacities as of December 31, 1977
And Actual Average 1977 Daily Flowing Volumes

FROM LOCATION[2] Reporting Company[1]	TO LOCATION[2] Volumes (MMCF/D)[3 4 5]							
	Maximum Design	Actual	Maximum Design	Actual	Maximum Design	Actual	Maximum Design	Actual
RHODE ISLAND	**MASSACHUSETTS**							
Algonquin Gas Transmission Co.	290	149						
Totals	**290**	**149**						
SO. CAROLINA	**NO. CAROLINA**							
Transcontinental Gas Pipe Line Corp.	2684	1615						
Totals	**2684**	**1615**						
TENNESSEE	**KENTUCKY**		**VIRGINIA**					
Columbia Gulf Transmission Co.	2081	1249						
East Tennessee Natural Gas Co.			28	19				
Michigan Wisconsin Pipe Line Co.	1393	1002						
Midwestern Gas Transmission Co.	599	460						
Tennessee Gas Pipeline Co.	2699	2267						
Texas Eastern Gas Pipeline Co.	2101	1665						
cont'd								

NATIONAL GAS FLOW PATTERNS
Maximum Design Flow Capacities as of December 31, 1977
And Actual Average 1977 Daily Flowing Volumes

FROM LOCATION[2] Reporting Company[1]	TO LOCATION[2] Volumes (MMCF/D)[3 4 5]							
	Maximum Design	Actual	Maximum Design	Actual	Maximum Design	Actual	Maximum Design	Actual
TENNESSEE	**KENTUCKY**		**VIRGINIA**					
Texas Gas Transmission Corp.	1677	1299						
Trunkline Gas Co.	1819	1478						
Totals	**12369**	**9420**	**28**	**19**				
TEXAS (EAST)	**ARKANSAS**		**LOUISIANA**		**MEXICO**		**OKLAHOMA**	
Florida Gas Transmission Co.			270	123				
Kansas-Nebraska Natural Gas Co.							300	92
LoVaca Gathering Co.					15	1		
Mississippi River Transmission Corp.			118	4				
Natural Gas Pipeline Co. of America	1612	1385						
Southern Natural Gas Co.			15	9				
Tennessee Gas Pipeline Co.			1303	929				
Texas Eastern Gas Pipeline Co.	338	219	171	126				
Texas Gas Transmission Corp.			38	16				
Transcontinental Gas Pipe Line Corp.			596	41				
Trunkline Gas Co.			338	141				
United Gas Pipe Line Co.			384	299				
Totals	**1950**	**1604**	**3233**	**1688**	**15**	**1**	**300**	**92**

NATIONAL GAS FLOW PATTERNS
Maximum Design Flow Capacities as of December 31, 1977
And Actual Average 1977 Daily Flowing Volumes

FROM LOCATION[2] Reporting Company[1]	TO LOCATION[2] Volumes (MMCF/D)[3 4 5]							
	Maximum Design	**Actual**	**Maximum Design**	**Actual**	**Maximum Design**	**Actual**	**Maximum Design**	**Actual**
TEXAS (WEST)	**MEXICO**		**NEW MEXICO**		**OKLAHOMA**		**TEXAS (EAST)**	
Cities Service Gas Co.					188	184		
Colorado Interstate Gas Co.					65	67		
El Paso Natural Gas Co.	22	9	2571	2232				
Houston Pipe Line Co.							50	50
LoVaca Gathering Co.							2152	804
Michigan Wisconsin Pipe Line Co.					148	134		
Natural Gas Pipeline Co. of America			223	92	1509	1010		
Northern Natural Gas Co.			8	1	1800	1460		
Oasis Pipeline Co. (HNG)							963	510
Panhandle Eastern Pipe Line Co.					391	298		
Transwestern Pipeline Co.			774	376	82	49		
Totals *cont'd*	**22**	**9**	**3576**	**2701**	**4183**	**3202**	**3165**	**1364**
TEXAS (WEST) *cont'd*	**TEXAS (WEST)**							
LoVaca Gathering Co.	900	413						
Totals	**900**	**413**						

NATIONAL GAS FLOW PATTERNS
Maximum Design Flow Capacities as of December 31, 1977
And Actual Average 1977 Daily Flowing Volumes

FROM LOCATION[2] Reporting Company[1]	TO LOCATION[2] Volumes (MMCF/D)[3 4 5]							
	Maximum Design	Actual	Maximum Design	Actual	Maximum Design	Actual	Maximum Design	Actual
UTAH	**NEW MEXICO**		**WYOMING**					
El Paso Natural Gas Co.	100	12						
Northwest Pipeline Corp.			360	266				
Totals	**100**	**12**	**360**	**266**				
VIRGINIA	**MARYLAND**		**WEST VIRGINIA**					
Columbia Gas Transmission Corp.	980	398						
Consolidated Gas Supply Corp.			2	2				
Transcontinental Gas Pipe Line Corp.	2037	1262						
Totals	**3017**	**1660**	**2**	**2**				
WASHINGTON	**OREGON**							
Northwest Pipeline Corp.	305	248						
Pacific Gas Transmission Co.	1028	1056						
Totals	**1333**	**1304**						

NATIONAL GAS FLOW PATTERNS
Maximum Design Flow Capacities as of December 31, 1977
And Actual Average 1977 Daily Flowing Volumes

FROM LOCATION[2] Reporting Company[1]	TO LOCATION[2] Volumes (MMCF/D)[3 4 5]							
	Maximum Design	**Actual**	**Maximum Design**	**Actual**	**Maximum Design**	**Actual**	**Maximum Design**	**Actual**
WEST VIRGINIA	**KENTUCKY**		**MARYLAND**		**OHIO**		**PENNSYLVANIA**	
Columbia Gas Transmission Corp.	36	14	3	1	880	384	780	383
Consolidated Gas Supply Corp.					892	350	204	31
Equitable Gas Co.							166	58
Texas Eastern Gas Pipeline Co.							2402	1612
Totals *cont'd*	**36**	**14**	**3**	**1**	**1772**	**734**	**3552**	**2084**
WEST VIRGINIA *cont'd*	**VIRGINIA**							
Columbia Gas Transmission Corp.	1532	617						
Totals	**1532**	**617**						
WISCONSIN	**MICHIGAN**							
Great Lakes Gas Transmission Co.	1177	1084						
Northern Natural Gas Co.	70	51						
Michigan Wisconsin Pipe Line Co.	36	13						
Totals	**1283**	**1148**						

NATIONAL GAS FLOW PATTERNS
Maximum Design Flow Capacities as of December 31, 1977
And Actual Average 1977 Daily Flowing Volumes

FROM LOCATION[2] Reporting Company[1]	TO LOCATION[2] Volumes (MMCF/D)[3 4 5]							
	Maximum Design	Actual	Maximum Design	Actual	Maximum Design	Actual	Maximum Design	Actual
WYOMING	**COLORADO**		**MONTANA**		**SO. DAKOTA**		**UTAH**	
Colorado Interstate Gas Co.	396	304						
Montana-Dakota Utilities Co.			121	59	9	8		
Montana Power Co.			17	2				
Mountain Fuel Supply Co.							547	229
Totals *cont'd*	**396**	**304**	**138**	**61**	**9**	**8**	**547**	**229**
WYOMING *cont'd*	**IDAHO**		**NEBRASKA**					
Northwest Pipeline Corp.	426	184						
Kansas-Nebraska Natural Gas Co.			105	72				
Totals	**426**	**184**	**105**	**72**				

FOOTNOTES

[1]The reporting companies are listed in Appendix D. These companies reported flow data pertaining to points on their system intersecting the boundary lines of the location areas defined below.

[2]The From and To locations are:

(A) Each state of the United States of America with the exception of California and Texas.

(1) California is divided into (1) North California and (2) South California using latitude 36°N as the boundary line.

(2) Texas is divided into (1) West Texas and (2) East Texas using Interstate Highway 35 as the boundary line.

(B) Canada

(C) Pacific Ocean

(D) Mexico

(E) Gulf of Mexico

(F) Atlantic Ocean

[3]Volumes shown indicate capacities and actual flows across the boundary lines of areas defined in Footnote 2.

[4]The maximum design capacity shown is expressed in million cubic feet per day measured at 14.73 psia and 60°F.

The maximum design capacity reported assumes total system operation and does not allow for equipment outages.

In pipeline systems with bi-directional flow (storage lines, for example), the direction of the greater design capacity and the corresponding capacity is reported.

[5]The average flowing volumes shown are daily average flowing volumes in million cubic feet per day measured at 14.73 psia and 60°F for calendar year 1977.

In some cases, data shown include systems which have bi-directional flow. The average volumes flowing in a bi-directional system were derived by dividing the algebraic sum of the daily volumes for the year 1977 by 365 days; these data may in some cases appear to be inconsistent.

The actual average flowing volumes shown for the year 1977 may include temporary and/or emergency volumes due to short-term gas purchases and/or emergency exchanges.

In some instances where actual average volumes exceed maximum design capacities, the actual operating flow pattern is different from the assumed flow pattern used in determining maximum capacities.

United States Underground Gas Storage Statistics
By State and Individual Fields
All Volumes in Million Cubic Feet Per Day (MMCF)

State	Company	Field	County	Total Gas in Place†	Total Working Volumes§	Maximum Design Daily Deliver-ability
Arkansas	Arkansas Oklahoma Gas Corp. (Stephens Prod. Co.)	Lavaca Deep	Sebastion	4,501	2,827	12
	Arkansas Western Gas Co.*	White Oak	Franklin	7,000	4,000	50
		Watalula	Franklin	1,000	500	5
		Lone Elm	Franklin	16,000	4,000	20
		Jethro	Franklin	31,564	9,564	
California	Pacific Gas & Electric Co.*	McDonald Island	San Joaquin	111,947	66,447	1,200
		Pleasant Creek	Yolo	7,218	2,140	60
		Los Medanos	Contra Costa	9,597	1,597	230
	Pacific Ltg. Service Co.*	East Whittier	Los Angeles	1,225	800	75
		La Goleta	Santa Barbara	50,117	13,500	460
		Montebello, West	Los Angeles	44,043	13,000	1,000
		Playa del Rey	Los Angeles	6,047	4,917	
		Aliso Canyon	Los Angeles	147,000	70,000	1,500
Colorado	Colorado Interstate Gas Co.	Fort Morgan	Morgan	14,993	5,493	294
		Latigo	Arapaho	12,425	1,432	130
	Kansas-Nebraska Natural Gas Co., Inc.	Springdale	Logan	5,105	2,703	16
	Peoples Natural Gas Division, Western Region Northern Natural Gas Co.	House Creek	Montezuma	45	35	1

United States Underground Gas Storage Statistics By State and Individual Fields (Continued)

State	Company	Field	County	Total Gas in Place†	Total Working Volumes§	Maximum Design Daily Deliver-ability
Colorado	Public Service Co. of Colorado	Leyden Mine	Jefferson	2,681	1,847	205
	Western Slope Gas Co.*	Asbury Creek	Mesa	3,508	2,277	12
		Fruita	Mesa	353	315	1
Illinois	Central Illinois Light Co.*	Glasford	Peoria	11,590	6,290	120
		Lincoln	Logan	11,835	5,325	50
	Central Illinois Public Service Co.*	Ashmore, So.	Coles	3,563	1,572	36
		Corinth	Williamson	525	386	5
		Sciota	McDonough	2,829	925	30
	Gas Utilities Co.	Richwoods	Crawford	97	76	2
	Illinois Power Co.	Eden	Randolph	1,403	535	8
		Centralia East	Marion	643	227	17
		Freeburg	St. Clair	7,089	2,453	38
		Gillespie-Benld	Macoupin	152	36	5
		Hillsboro	Montgomery	8,957	4,707	47
		Hookdale	Bond	975	690	31
		Shanghai	Warren & Mercer	11,122	5,115	73
		Tilden North	Washington	3,072	1,252	55
	Midwestern Gas Transmission Co.	Nevins	Edgar	7,277	1,592	20
		Elbridge	Edgar	7,437	1,142	16
		State Line	Clark & Vigo	5,064	1,144	13
	Mississippi River Transmission Corp.	St. Jacob	Madison	5,603	1,703	75

United States Underground Gas Storage Statistics By State and Individual Fields (Continued)

State	Company	Field	County	Total Gas in Place†	Total Working Volumes§	Maximum Design Daily Deliver-ability
Illinois	Natural Gas Pipeline Co. of America	Cooks Mills	Coles & Douglas	4,738	3,000	60
		Herscher Galesville	Kankakee	39,369	16,500	790
		Herscher Mt. Simon	Kankakee	67,078	18,750	180
		Herscher NW	Kankakee	17,360	4,800	65
		Loudon	Fayette & Effingham	67,461	28,625	390
	Northern Illinois Gas Co.*	Crescent City	Iroquois	(Under Development)		
		Pontiac	Livingston	47,290	17,320	190
		Troy Grove	La Salle	75,515	41,533	820
		Ancona-Garfield	La Salle & Livingston	167,188	66,875	685
		Lake Bloomington	McLean	48,340	14,500	120
		Hudson	McLean	35,055	8,765	85
		Pecatonica	Winnebago	3,180	1,225	45
		Lexington	McLean	41,750	10,440	85
	Panhandle Eastern Pipeline Co.	Waverly Galesville	Morgan	49,057	10,320	220
		Waverly St. Peter				
		Tuscola	Douglas	4,760	330	16
	Peoples Gas Light & Coke Co.*	Manlove	Champaign	122,100	37,900	700

United States Underground Gas Storage Statistics By State and Individual Fields (Continued)

State	Company	Field	County	Total Gas in Place†	Total Working Volumes§	Maximum Design Daily Deliver-ability
Indiana	Central Indiana Gas Co.*	Unionport	Randolph	1,050	425	20
		Modoc	Randolph	400	140	10
	Citizens Gas & Coke Utility*	Dixon	Greene	2,758	833	50
		Howesville	Greene	4,400	1,200	80
		Linton	Greene	1,380	208	20
		Mineral City	Greene	1,961	378	13
		Simpson-Chappel	Greene	4,716	700	12
		Switz City	Greene	5,530	821	20
		Worthington	Greene	12,740	3,390	50
	Hoosier Gas Corp.*	Loogootee	Daviess	158	55	1
		Monroe City	Knox	4,303	1,135	25
		North Glendale	Daviess	346	131	1
	Indiana Gas Co., Inc.*	Greensburg	Decatur	1,000	300	1
		Unionville	Monroe	6,275	3,275	64
		West Point 1 & 2	Tippecanoe	1,000	230	9
		Sellersburg	Clark	1,300	100	12
		Wolcott	White	7,000	2,500	61
		Unionport No. & So.	Randolph	1,600	167	25
	No. Indiana Public Service Co.*	Royal Centre	Cass, Fulton	27,112	9,528	280
		Grass Creek	Fulton, Pulaski	(Under development)		
		Lakeside	Pulaski, White	(Under development)		

United States Underground Gas Storage Statistics By State and Individual Fields (Continued)

State	Company	Field	County	Total Gas in Place†	Total Working Volumes§	Maximum Design Daily Deliver-ability
Indiana	Panhandle Eastern Pipeline Co.	Calcutta-Carbon	Parke, Clay	(Under development)		
		Montezuma	South Alta	(Under development)		
	Southern Indiana Gas & Electric Co.*	Oliver	Posey	3,403	1,661	48
		Midway	Spencer	3,442	2,139	50
	Texas Gas Transmission	Alford	Pike	2,518	989	40
		Leesville	Lawrence	3,774	1,530	40
		Oaktown	Knox	1,052	623	9
		White River	Pike	510	306	5
		Wilfred	Sullivan	3,417	2,193	37
Iowa	Natural Gas Pipeline Co. of America	Cairo St. Peter	Louisa	27,522	9,400	145
		Cairo Mt. Simon	Louisa	38,913	15,000	150
		Cairo Galesville	Louisa	5,192	2,400	24
		C. City Mt. Simon	Louisa	29,724	11,700	117
		C. City St. Peter	Louisa	6,901	2,000	20
		Keota	Washington	5,606	2,700	50
	Northern Natural Gas Co.	Redfield	Dallas	118,000	30,400	350
Kansas	Arkansas Louisiana Gas Co.	Collinson	Cowley	2,393	1,133	13
	Cities Service Gas Co.	Alden	Rice	14,773	4,645	55
		Boyer	Butler	1,020	299	3
		Colony	Anderson	9,204	5,399	97
		Craig	Johnson	6,076	1,830	36
		Elk City	Elk, Choutauqua, Montgomery	22,000	13,200	100

United States Underground Gas Storage Statistics By State and Individual Fields (Continued)

State	Company	Field	County	Total Gas in Place†	Total Working Volumes§	Maximum Design Daily Deliver-ability
Kansas	Cities Service Gas Co. (cont.)	McLouth	Jefferson, Leavenworth	12,914	6,850	90
		Piqua	Woodson, Allen	3,230	1,027	7
		Welda North	Anderson	10,021	3,636	75
		Welda South	Anderson	11,789	5,215	83
	Colorado Interstate Gas Co.	Boehm	Morton	(Under development)		
	Kansas-Nebraska Natural Gas Co., Inc.	Adolph	Barton	5,687	2,242	16
	Northern Natural Gas Co.	Lyons	Rice	36,000	12,000	130
	Union Gas System, Inc.	Buffalo	Wilson	8,205*	2,833*	30*
		Fredonia	Wilson			
		Liberty No.	Montgomery	(*Includes volumes for all		
		Liberty So.	Montgomery	five UGS reservoirs)		
		Longton	Choutauqua			
Kentucky	Louisville Gas & Electric Co.	Ballardsville	Oldam	2,100	(Under development)	
		Doe Run Deep	Meade	3,350	525	10
		Doe Run Upper	Meade	5,650	3,680	80
		Magnolia Deep	Hart, Larue, Green	4,100	2,510	45
		Flint Hill	Hardin	1,800	325	8
		Magnolia Upper	Hart, Larue, Green	5,100	3,600	75
		Muldraugh	Meade	3,850	2,510	215
		Center	Metcalfe	5,300	2,750	40
		Canmer	Hart	1,700	55	

United States Underground Gas Storage Statistics By State and Individual Fields (Continued)

State	Company	Field	County	Total Gas in Place†	Total Working Volumes§	Maximum Design Daily Deliver-ability
Kentucky	Texas Gas Transmission Corp.	Dixie	Henderson	7,250	2,575	101
		Graham Lake	Muhlenberg	4,280	1,325	15
		Hanson	Hopkins	12,080	3,927	70
		West Greenville	Muhlenberg	7,650	3,385	94
		Midland	Muhlenberg	126,114	64,912	334
	Union Light, Heat & Power Co.	Eagle Creek	Grant	922	372	18
	Western Kentucky Gas Co.*	Bon Harbor	Daviess	2,017	997	21
		Grandview	Daviess	630	271	2
		Hickory School	Daviess	1,228	625	19
		Kirkwood Springs	Daviess	585	279	10
		Owensboro	Daviess		60	2
		St. Charles	Hopkins	6,729	3,553	36
Louisiana	Arkansas-Louisiana Gas Co.	Ruston	Lincoln	4,500	1,000	150
	Mid-Louisiana Gas Co.	Hester	St. James	20,000	8,474	100
	Mississippi River Transmission Corp.	East Unionville	Lincoln	55,200	16,347	170
		West Unionville	Lincoln	69,000	22,000	200
	South Louisiana Prod.*	Holly	DeSoto	1,500	1,000	4
	United Gas Pipeline Co. & Arkansas Louisiana Gas Co.	Bistineau	Bienville, Bossier	134,000	61,800	800
	Transcontinental Gas Pipeline Corp.	Washington	Landry	85,168	40,000	600

United States Underground Gas Storage Statistics By State and Individual Fields (Continued)

State	Company	Field	County	Total Gas in Place†	Total Working Volumes§	Maximum Design Daily Deliver-ability
Maryland	Texas Eastern Transmission Corp.	Accident	Garrett	61,978	22,890	300
Michigan	Battle Creek Gas Co.	Lacey	Barry	200	200	40
	Consumers Power Co.*	Ira	St. Clair	7,500	4,000	250
		Lenox	Macomb	3,500	1,500	150
		Northville	Wayne, Washtenaw, Oakland	24,192	10,290	100
		Overisel	Allegan	64,000	24,000	200
		Puttygut	St. Clair	16,600	11,000	250
		Ray	Macomb	66,000	46,000	1,000
		Salem	Allegan	35,000	10,000	100
		Four Corners	St. Clair	3,780	2,390	13
		Swan Creek	St. Clair	650	420	13
		Hessen	St. Clair	17,980	14,070	100
	Michigan Consolidated Gas Co.*	Belle River Mills	St. Clair	72,193	49,000	1,500
		Columbus (73-74)	St. Clair	19,085	16,500	300
		New Haven	St. Clair	15,949	6,800	50
		W. C. Taggart	Mecosta-Montcalm	84,856	54,000	900
		W. Columbus (73-74)	St. Clair	25,879	22,000	400
	Michigan Gas Storage Co.	Cranberry Lake	Missaukee, Clare	30,000	11,000	120
		Riverside	Missaukee	12,000	5,000	20
		Winterfield	Clare, Osceola	75,000	30,000	360
	Michigan Gas Utilities Co.*	Partello	Calhoun	4,160	2,000	20
		Cambell	Calhoun	810	200	5
		Cambell	Calhoun	1,400	400	5

United States Underground Gas Storage Statistics By State and Individual Fields (Continued)

State	Company	Field	County	Total Gas in Place†	Total Working Volumes§	Maximum Design Daily Deliver-ability
Michigan	Michigan Wisconsin Pipeline Co. (leased from Michigan Consolidated Gas Co.)	Austin	Mecosta	23,323	12,000	700
		Goodwell	Newaygo	29,625	24,700	300
		Lincoln-Freeman	Clare	35,440	22,000	320
		Loreed	Osceola, Lake	48,210	32,500	640
		N. Hamilton	Clare	12,140	5,000	50
		Norwich	Newaygo	8,413	4,200	50
		Orient	Osceola, Clare	9,805	5,700	60
	Michigan Wisconsin Pipeline Co. (owned)	Reed City	Osceola, Lake	28,600	18,000	300
		Coldwater	Isabella	12,990	8,000	28
		Winfield	Montcalm	15,883	7,400	60
		Croton	Newaygo	5,357	4,500	45
		Muttonville	Macomb	13,414	8,000	250
	Panhandle Eastern Pipeline Co.	Howell	Livingston	31,550	13,250	240
	Southeastern Michigan Gas Co.*	Morton Salt Well No. 16	St. Clair	320	265	40
		Morton Storage	Marysville	4,566	(NA)	(NA)
Minnesota	Minnesota Gas Co.*	Waseca	Waseca, Rice, Lesueur	4,500	1,600	50
Mississippi	Mississippi Valley Gas Co.*	Amory	Monroe	1,264	946	12
	Southern Natural Gas Co.	Muldon	Monroe	92,800	42,800	459
	Transcontinental Gas Pipeline Co.	Eminence	Covington	8,361	6,233	1,120
	United Gas Pipeline Co.	Jackson	Hinds, Rankin	5,750	3,050	250

United States Underground Gas Storage Statistics By State and Individual Fields (Continued)

State	Company	Field	County	Total Gas in Place†	Total Working Volumes§	Maximum Design Daily Deliver-ability
Missouri	Laclede Gas Co.*	Florissant (Lange)	St. Louis	27,603	15,844	350
Montana	Montana-Dakota Utilities Co.	Baker (Cedar Creek)	Fallon	108,388	92,050	140
	Montana Power Co.*	Box Elder	Blaine, Hill	3,546	1,814	11
		Cobb	Glacier, Toole	35,280	7,296	75
		Dry Creek	Carbon	21,545	7,445	32
		Shelby	Toole	3,125	1,914	6
Nebraska	Kansas-Nebraska Natural Gas Co.	Huntsman	Cheyenne	38,412	26,743	70
		Big Springs	Deuel	15,798	955	140
New Mexico	El Paso Natural Gas Co.	Rhodes Storage Unit	Lea	25,900	11,200	102
	Southern Union Gas Co.*	San Ysioro	Sandoval	9,107	5,464	40
New York	Consolidated Gas Supply Corp.	Woodhull	Steuben	35,904	18,477	357
	Columbia Gas Transmission Corp.	Dundee	Schuyler, Steuben, Yates	11,360	4,689	68
		Gilbert	Allegany	587	205	7
		South Greenwood	Steuben	3,725	1,804	20
		North Greenwood	Steuben	3,200	672	25
	Felmont Oil Corp.	Allegany State Park	Cattaraugus	(No Data)		

United States Underground Gas Storage Statistics By State and Individual Fields (Continued)

State	Company	Field	County	Total Gas in Place†	Total Working Volumes§	Maximum Design Daily Deliver-ability
New York	National Fuel Gas Supply Corp.	Bennington	Erie, Wyoming	5,130¶	2,000	75
		Collins	Erie	6,050¶	2,850	30
		Derby	Erie	470¶	250	5
		Holland	Erie	2,670¶	1,000	25
		Lawtons	Erie	2,840¶	1,000	21
		Nashville	Cattaraugus, Chautauqua	9,150¶	4,200	80
		Perrysburg	Cattaraugus	5,200¶	2,100	35
		Sheridan	Chautauqua	4,460¶	1,650	25
		Zoar	Erie	2,250¶	925	40
	National Fuel Gas Supply Corp. and Tennessee Gas Pipeline	Colden	Erie	18,720¶	7,550	80
	National Fuel Gas Supply Corp. (Sylvania)	N.E. Independence	Allegany	5,100	3,300	22
		Tuscarora	Steuben	6,306	3,720	57
Ohio	Columbia Gas Transmission	Benton	Hocking, Ross, Vinton	24,800	9,052	103
		Brinker	Columbiana	7,650	3,422	49
		Guernsey	Guernsey, Coshocton, Muskingum	7,300	1,944	32
		Holmes	Holmes, Wayne, Ashland	23,100	7,422	68
		Knox	Knox	7,000	2,567	22
		Laurel	Hocking	23,000	10,884	152
		Lorain	Lorain	11,100	3,173	106
		Lucas	Richland, Ashland	60,400	27,282	274
		McArthur	Vinton	11,000	5,298	65

United States Underground Gas Storage Statistics By State and Individual Fields (Continued)

State	Company	Field	County	Total Gas in Place†	Total Working Volumes§	Maximum Design Daily Deliver-ability
Ohio	Columbia Gas Transmission	Medina	Medina	12,500	5,129	59.4
		Pavonia	Ashland, Richland	49,500	20,205	464.7
		Wayne	Holmes, Ashland, Wayne	18,000	8,603	74.1
		Weaver	Knox, Richland, Ashland	50,200	18,568	296.1
		Wellington	Lorain, Medina	23,300	6,959	172.9
		Zane	Muskingum	145	79	5
	East Ohio Gas Co.*	Chippewa	Wayne	11,622	6,350	547
		Columbiana	Columbiana	3,363	1,360	35
		Gabor	Wayne	3,801	1,650	107
		Stark-Summit	Stark, Summit	140,397	61,000	2,159
	National Gas & Oil Corp.*	Muskie	Muskingum	1,300	650	3
		Perry	Perry	2,600	1,300	19
Oklahoma	Arkansas Louisiana Gas Co.	North Ada	Pontotoc	12,500	4,000	200
		Ulan	Pittsburg	7,926	1,188	20
	Cities Service Gas Co.	Webb	Grant	35,993	16,994	200
	Mustang Fuel Corp.*	Butter Creek	Muskogee	563	191	7
	National Zinc Co.*		Osage	447	267	5
	Natural Gas Pipeline Co. of America	Sayre	Beckham	73,000	40,000	400

United States Underground Gas Storage Statistics By State and Individual Fields (Continued)

State	Company	Field	County	Total Gas in Place†	Total Working Volumes§	Maximum Design Daily Deliver-ability
Oklahoma	Oklahoma Natural Gas Co.	Depew	Creek	65,900	17,300	500
		Edmond	Logan, Kingfisher	40,500	8,300	350
		Haskell	Muskogee	12,800	2,800	40
		Osage	Osage	3,200	1,300	60
		Sayre (shared with NGPL)	Beckham	13,000	3,000	20
	Phillips Petroleum Co.	Enfisco	Osage	1,072	334	11
	Transok Pipeline Co.	Greasy Creek	Hughes	19,453	16,818	83
Pennsylvania	Columbia Gas of Pennsylvania*	Blackhawk	Beaver	2,500	1,550	8
	Columbia Gas Transmission Co.	Cross Creek	Washington	(Being depleted)		
		Donegal	Washington	9,900	5,281	148
		Heard	Greene, Washington	9,800	3,152	10
		Holbrook	Greene	1,540	618	4
		Iowa	Jefferson	353	119	3
		Irwin	Westmoreland	77	24	1
		Majorsville	Greene, Washington, Marshall, W. Va.	28,506	9,730	103
		Munderf.	Jefferson	60	53	1
		Artemas A & B	Bedford	16,004	6,790	84
	Consolidated Gas Supply Corp.	Greenlick	Potter, Clinton	54,060	27,030	600
		Sabinsville	Tioga	35,618	17,697	418
		Sharon	Potter	3,213	1,083	6
		South Bend	Indiana	17,340	5,810	173
		Tioga	Tioga	15,500	9,500	304
	Consolidated Gas Supply Corp., Tennessee Gas Pipeline, and National Fuel Gas Supply Corp.	Ellisburg	Potter	98,430	52,530	1,046.

United States Underground Gas Storage Statistics By State and Individual Fields (Continued)

State	Company	Field	County	Total Gas in Place†	Total Working Volumes§	Maximum Design Daily Deliver-ability
Pennsylvania	Consolidated Gas Supply Corp. and Tennessee Gas Pipeline	Harrison	Potter	33,456	20,074	255
	Consolidated Gas Supply Corp., Texas Eastern Transmission Corp., & Transco Gas Pipeline	Leidy & Tamarack Pool	Clinton & Potter	113,223	61,200	1,224
	Consolidated Gas Supply Corp. & Texas Eastern Transmission	Oakford	Westmoreland	123,176	71,402	775
	Victor Gas Co.*	Trafford	Westmoreland	320	200	2
	Equitable Gas Co.	Bunola	Allegheny	5,944	4,302	200
		Finleyville	Washington	546	397	32
		Hunters Cave	Greene	2,487	1,436	22
		Pratt	Greene	4,278	2,611	65
		Swarts	Greene	867	547	50
		Swarts West	Greene	702	147	70
		Tepe	Allegheny	948	691	52
	Kane Gas Light & Heat Co.*	Meade Run	McKean	222	162	2
	North Penn Gas Co.	Meaker	Tioga	5,000	3,500	50
		Palmer	Tioga	15,500	9,500	150
	National Fuel Gas Supply Corp.	Corry	Erie	1,250	200	50
		Deerlick	Warren	130	110	1
		Durhing	Forest	395	140	7

United States Underground Gas Storage Statistics By State and Individual Fields (Continued)

State	Company	Field	County	Total Gas in Place†	Total Working Volumes§	Maximum Design Daily Deliver-ability
Pennsylvania	National Fuel Gas Supply Corp. (cont'd)	East Branch "A & B"	Warren, McKean	13,930	7,850	60
		Owls Nest	Elk	2,760	900	12
		Summit	Erie	4,200	2,000	75
		Swede Hill	McKean	1,100	300	15
		Keelor	McKean	2,850	1,330	60
	Peoples Natural Gas Co.*	Colvin	Washington	2,393	510	87
		Gamble-Hayden	Allegheny	2,849	1,122	36
		Mt. Royal	Allegheny	648	230	18
		Murrysville	Allegheny	3,245	1,530	112
		Patton	Westmoreland	161	76	10
		Truittsburg	Clarion	3,690	2,142	102
		Webster	Westmoreland	1,171	551	26
		Rager Mountain	Cambria	21,393	10,200	102
	T. W. Phillips Gas & Oil Co.	Alabran	Indiana	(No data available)		
		Clark	Indiana	"		
		Fair-Helm	Armstrong	"		
		Hughes	Butler	"		
		Kinter	Indiana	"		
		Portman	Butler	"		
		Sprankle	Jefferson	"		
	Saxonburg Heat & Light Co.*	Keasey	Butler	(No data available)		
		Neubert	Butler	7	5	
		Saxonburg	Butler	30	20	

United States Underground Gas Storage Statistics By State and Individual Fields (Continued)

State	Company	Field	County	Total Gas in Place†	Total Working Volumes§	Maximum Design Daily Deliver-ability
Pennsylvania	National Fuel Gas Supply Corp.	Belmouth	Elk	1,360	960	7
		Boone Mountain	Elk, Clearfield	2,119	990	12
		Galbraith	Jefferson	1,928	950	20
		Henderson	Mercer, Venango	4,758	2,050	25
		Markle	Jefferson	260	110	15
		Queen	Forest, Warren	935	310	3
		St. Mary's	Elk	486	255	5
		Wellendorf	McKean	1,093	470	15
	National Fuel Gas Supply and Tennessee Gas Pipeline	Hebron	Potter	26,993	7,556	180
	National Fuel Gas Supply, North Penn Gas Co., & Transco Gas Pipeline Corp.	Wharton	Potter	29,932	8,235	300
Texas	Brady, Texas Municipal Gas Corp.	Janellen	Brown	7,210	1,995	6
	Coastal States Gas Producing Co.	Yoast	Bastrop	500	250	10
		South Burnell	Bee, Karnes	2,500	1,250	25
	Houston Pipeline Co.*	Bammel	Harris	97,192	45,022	600
	Lone Star Gas Co.	Ambassador	Clay	2,098	1,471	40
		Chapman	Comanche	407	305	2
		Hill	Eastland	10,806	8,568	95
		Lake Dallas	Denton	4,575	3,132	70
		Leeray	Stephens	7,360	5,197	20

United States Underground Gas Storage Statistics By State and Individual Fields (Continued)

State	Company	Field	County	Total Gas in Place†	Total Working Volumes§	Maximum Design Daily Deliver-ability
Texas	Lone Star Gas Co. (cont'd.)	New York City	Clay	7,459	5,395	100
		Pecan Station	Tom Green	2,984	2,089	38
		Pottsville South	Hamilton	8,702	4,152	21
		Tri-Cities (Bacon)	Henderson	28,246	1,085	(325
		Tri-Cities (Rodessa)	Henderson	10,716	7,981	both (zones)
		View	Taylor	4,774	3,232	20
	Natural Gas Pipeline Co. of America	North Lansing	Harrison	132,500	57,500	740
	Phillips Petroleum Co.	Rudy	Hutchison	86	27	59
		Clemens Dome	Brazoria	600	400	50
	Pioneer Natural Gas Co.	W. Panhandle	Potter	1,000	1,000	6
	Southwestern Gas Pipeline, Inc.*	Lone Camp	Palo Pinto	746	392	20
		Millsap	Parker	358	118	14
Utah	Mountain Fuel Supply Corp.	Chalk Creek	Summit	2,089	1,579	50
		Coalville	Summit	2,129	1,223	30
		Clay Basin	Daggett	20,169	12,753	30
Washington	Washington Water Power Co., Washington Natural Gas Co., & Northwest Pipeline Corp.	Jackson Prairie	Lewis	19,300	7,600	240
		Zone 2	Lewis	25,658	10,458	300
		Zone 9			(Under development)	
West Virginia	Cabot Corp., Gas Utility Div.	Heizer X-1	Putnam	3,600	2,100	80
		Raleigh	Raleigh	1,490	890	8

United States Underground Gas Storage Statistics By State and Individual Fields (Continued)

State	Company	Field	County	Total Gas in Place†	Total Working Volumes§	Maximum Design Daily Deliver-ability
West Virginia	Columbia Gas Transmission	Brown's Creek (X-15)	Kanowha, Putnam	4,367	1,196	15
		Cleveland (X-56)	Randolph, Upshur, Webster	8,170	2,324	15
		Coco (X-52)				
		A	Kanawha	45,000	14,742	262
		B	Kanawha	9,600	3,622	120
		C	Kanawha	17,270	8,770	150
		Derrick's Creek (X-6)	Kanawha	6,300	2,319	33
		Glady (X-77)	Randolph, Pocahontas	30,000	12,029	213
		Grapevine A (X-8)	Kanawha	1,185	405	2
		Grapevine B (X-53)	Kanawha	78	60	5
		Hunt (X-54)	Kanawha	6,280	1,859	23
		Lake (X-4)	Putnam	2,958	948	12
		Lanham (X-2)	Kanawha, Putnam	4,800	2,050	43
		Poca (X-49)	Kanawha, Putnam	810	367	4
		Ripley (X-59)	Jackson	23,750	7,367	146
		Rockport (X-58)	Jackson, Wirt, Wood	8,060	2,932	114
		Sissonville (X-7)	Kanawha	1,248	307	7
		Terra Alta (X-76)	Preston	40,163	11,975	223
		Terra Alta "S" (X-76S)	Preston	16,700	6,241	69
		Victory A & B	Marshall, Wetzel	31,050	14,583	228
	Consolidated Gas Supply Corp.	Bridgeport	Harrison	8,160	4,121	82
		Fink-Kennedy	Lewis, Dodridge, Harrison	158,950	83,590	945
		Lost Creek	Lewis, Harrison	(Under Development)		
		Newbern-Racket	Gilmer, Ritchie	7,446	3,570	51

United States Underground Gas Storage Statistics By State and Individual Fields (Continued)

State	Company	Field	County	Total Gas in Place†	Total Working Volumes§	Maximum Design Daily Deliver-ability
West Virginia	Equitable Gas Co.	Comet	Taylor	3,526	2,154	80
		Drain	Gilmer	251	106	1
		Hayes	Marion	174	106	7
		Logansport	Marion	1,950	1,025	75
		Maple Lake	Taylor	1,154	481	18
		Mobley	Wetzel	4,202	2,578	101
		Rhodes	Lewis	5,224	3,082	101
		Shirley	Tyler	1,987	248	100
		Skin Creek	Lewis	1,234	812	28
	Hampshire Gas Co.	August-Little Capon	Hampshire	13,989	4,596	50
Wyoming	Montana-Dakota Utilities Co.	Billy Creek	Johnson	2,993	2,409	15
		Elk Basin	Park	26,856	20,505	70
	Mountain Fuel Supply Co.	Le Roy	Uinta	6,454	3,315	150
	Northern Gas Co.	Oil Springs	Carbon	13,052	7,052	24
		Mahoney Dome	Carbon	(Under Development)		
		Bunker Hill	Carbon		"	
		Kirk Ranch	Fremont	1,049	496	3

* Intrastate
† Working and base gas.
§ Available for system supply.
¶ Native gas not included.

INTERCONNECTIONS

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[1]Intrastate pipelines.

Gas Pipeline Interconnections
(Million Cubic Feet Per Day)

Company: ALABAMA-TENNESSEE NATURAL GAS COMPANY

Receives Gas From	County	State	Maximum Volume Capability (MMCFD)
TENNESSEE GAS	Alcorn	MS	*
TENNESSEE GAS	Colbert	MS	
Delivers Gas To			
TENNESSEE GAS	Alcorn	MS	
TENNESSEE GAS	Colbert	MS	

Company: ALGONQUIN GAS TRANSMISSION COMPANY

Receives Gas From	County	State	Maximum Volume Capability (MMCFD)
COLUMBIA GAS	Rockland	NY	*
TENNESSEE GAS	Bergen	NJ	
TENNESSEE GAS	Hartford	CN	
TENNESSEE GAS	Worchester	MA	
Delivers Gas To			
COLUMBIA GAS	Rockland	NY	
TENNESSEE GAS	Bergen	NJ	
TENNESSEE GAS	Hartford	CN	
TENNESSEE GAS	Middlesex	MA	
TENNESSEE GAS	Worchester	MA	

Company: ARKANSAS OKLAHOMA GAS CORPORATION

Receives Gas From	County	State	Maximum Volume Capability (MMCFD)
ARKANSAS LOUISIANA	Sebastian	AR	*
ARKANSAS WESTERN GAS	Franklin	AR	
Delivers Gas To			
ARKANSAS LOUISIANA	Sebastian	AR	
ARKANSAS WESTERN GAS	Franklin	AR	

Gas Pipeline Interconnections (Continued)

Company: CHANNEL INDUSTRIES GAS COMPANY

Receives Gas From	County	State	Maximum Volume Capability (MMCFD)
AMOCO	Brazoria	TX	95
CITIES SERVICE	Nueces	TX	65
EXXON	Klereal	TX	36
MOBIL	Jim Wells	TX	70
MOBIL	Jim Wells	TX	80
TENNECO	Arkansas	TX	60
TENNECO	Arkansas	TX	55
TEXACO	Jim Wells	TX	50
TEXACO	Matagorda	TX	30
Delivers Gas To			
AMOCO GAS	Harris	TX	69
CELANESE CHEMICAL	Harris	TX	130
CELANESE CHEMICAL	Matagorda	TX	45
CELANESE CHEMICAL	Nueces	TX	50
OWENS-ILLINOIS	Orange	TX	35
PETRO TEX CHEMICAL	Harris	TX	70
PHILLIPS	Matagorda	TX	50
ROHM & HAAS TEXAS	Harris	TX	29
TENNECO CHEMICAL	Harris	TX	85
TENNECO OIL	Harris	TX	10
U.S. STEEL	Harris	TX	65
UNION CARBIDE	Calhoun	TX	50

Company: CITIES SERVICE GAS COMPANY

Receives Gas From	County	State	Maximum Volume Capability (MMCFD)
ARKANSAS LOUISIANA	McDonald	MO	135
DELHI	Major	OK	30
KANSAS NEBRASKA	Reno	KS	60
MICHIGAN WISCONSIN	Brown	KS	20
NATURAL GAS PIPELINE	Carson	TX	20
NATURAL GAS PIPELINE	Carter	OK	60
NATURAL GAS PIPELINE	Lincoln	KS	24
NORTHERN NATURAL	Grant	KS	20
NORTHERN NATURAL	Ellsworth	KS	30
OKLAHOMA NATURAL	Texas	OK	20
OKLAHOMA NATURAL	Oklahoma	OK	20
OKLAHOMA NATURAL	Woodward	OK	40
OKLAHOMA NATURAL	Grady	OK	30
OKLAHOMA NATURAL	Ellis	OK	40
PANHANDLE EASTERN	Johnson	MO	30

Gas Pipeline Interconnections (Continued)

Company: CITIES SERVICE GAS COMPANY (Continued)

Receives Gas From	County	State	Maximum Volume Capability (MMCFD)
PANHANDLE EASTERN	Beaver	OK	40
TRANSWESTERN	Hamphill	TX	200
TRANSWESTERN	Harper	OK	57
TRANSWESTERN	Beaver	OK	93
Delivers Gas To			
ARKANSAS LOUISIANA	Reno	KS	20
ARKANSAS LOUISIANA	Sedgwick	KS	20
KANSAS NEBRASKA	Grant	KS	60
NATURAL GAS PIPELINE	Ford	KS	40
NATURAL GAS PIPELINE	Beaver	OK	50
NATURAL GAS PIPELINE	Carson	TX	30
NATURAL GAS PIPELINE	Gray	TX	50
NORTHERN NATURAL	Haskell	KS	30
NORTHERN NATURAL	Woodward	OK	30
PANHANDLE EASTERN	Franklin	KS	40
PANHANDLE EASTERN	Grant	KS	20

Company: COLORADO INTERSTATE GAS COMPANY

Receives Gas From	County	State	Maximum Volume Capability (MMCFD)
MCCULLOCH INTERSTATE	Converse	WY	5
NORTHWEST PIPELINE	Sweetwater	WY	165
PANHANDLE EASTERN	Adams	CO	150
Delivers Gas To			
CITIES SERVICE GAS	Texas	OK	45
KANSAS NEBRASKA	Weld	CO	32
KANSAS NEBRASKA	Finney	KS	6
MICHIGAN WISCONSIN	Beaver	OK	54
MOUNTAIN FUEL SUPPLY	Sweetwater	WY	56
NATURAL GAS PIPELINE	Beaver	OK	65
NATURAL GAS PIPELINE	Hutchinson	TX	160
NATURAL GAS PIPELINE	Texas	OK	113
NORTHERN GAS	Albany	WY	1
NORTHERN NATURAL	Moore	TX	42
PANHANDLE EASTERN	Kearney	KS	75
PANHANDLE EASTERN	Beaver	OK	30
PANHANDLE EASTERN	Morton	KS	43
WESTERN SLOPE	Weld	CO	5
WESTERN SLOPE	Weld	CO	33
WESTERN SLOPE	Weld	CO	69
WESTERN SLOPE	Adams	CO	154

Gas Pipeline Interconnections (Continued)

Company: COLUMBIA GAS TRANSMISSION CORPORATION

Receives Gas From	County	State	Maximum Volume Capability (MMCFD)
ALGONQUIN	Rockland	NY	*
COLUMBIA GULF TRANS.	Boyd	KY	
COLUMBIA GULF TRANS.	Madison	KY	
COLUMBIA GULF TRANS.	Madison	KY	
COLUMBIA GULF TRANS.	Menifee	KY	
COLUMBIA GULF TRANS.	Powell	KY	
COLUMBIA LNG	Loudoun	VA	
CONSOLIDATED GAS	Chemong	NY	
GAS TRANSPORT	Washington	OH	
HAMPSHIRE GAS	Hampshire	WV	
INLAND GAS	Boyd	KY	
KENTUCKY-WEST VA	Martin	KY	
KENTUCKY-WEST VA	Pike	KY	
KENTUCKY-WEST VA	Pike	KY	
NATIONAL FUEL	McKean	PA	
NATIONAL FUEL	Cameron	PA	
PANHANDLE	Lucas	OH	
PANHANDLE	Darke	OH	
PANHANDLE	Paulding	OH	
TENNESSEE GAS	Madison	KY	
TENNESSEE GAS	Montgomery	KY	
TENNESSEE GAS	Boyd	KY	
TENNESSEE GAS	Greenup	KY	
TENNESSEE GAS	Wayne	WV	
TENNESSEE GAS	Wayne	WV	
TENNESSEE GAS	Kanawha	WV	
TENNESSEE GAS	Kanawha	WV	
TENNESSEE GAS	Kanawha	WV	
TENNESSEE GAS	Guernsey	OH	
TENNESSEE GAS	Columbiana	OH	
TENNESSEE GAS	Columbiana	OH	
TENNESSEE GAS	Lawrence	PA	
TENNESSEE GAS	Beaver	PA	
TENNESSEE GAS	Beaver	PA	
TENNESSEE GAS	Allegheny	PA	
TENNESSEE GAS	Elk	PA	
TENNESSEE GAS	Pike	PA	
TENNESSEE GAS	Jackson	OH	
TEXAS EASTERN	Butler	OH	
TEXAS EASTERN	Butler	OH	
TEXAS EASTERN	Warren	OH	
TEXAS EASTERN	Warren	OH	
TEXAS EASTERN	Warren	OH	
TEXAS EASTERN	Clinton	OH	
TEXAS EASTERN	Fayette	OH	
TEXAS EASTERN	Fayette	OH	
TEXAS EASTERN	Fairfield	OH	
TEXAS EASTERN	Greene	PA	

Gas Pipeline Interconnections (Continued)

Company: COLUMBIA GAS TRANSMISSION CORPORATION (Continued)

Receives Gas From	County	State	Maximum Volume Capabilit[y] (MMCFD)
TEXAS EASTERN	Greene	PA	*
TEXAS EASTERN	Greene	PA	
TEXAS EASTERN	Fayette	PA	
TEXAS EASTERN	Westmoreland	PA	
TEXAS EASTERN	Somerset	PA	
TEXAS EASTERN	Lancaster	PA	
TEXAS EASTERN	Lancaster	PA	
TEXAS EASTERN	Lancaster	PA	
TEXAS EASTERN	Chester	PA	
TEXAS EASTERN	Dauphin	PA	
TEXAS EASTERN	Lebanon	PA	
TEXAS EASTERN	Berks	PA	
TEXAS EASTERN	Berks	PA	
TEXAS EASTERN	Berks	PA	
TEXAS EASTERN	Centre	PA	
TEXAS EASTERN	Bucks	PA	
TEXAS EASTERN	York	PA	
TEXAS EASTERN	Bucks	PA	
TEXAS EASTERN	Marshall	WV	
TEXAS GAS	Hamilton	OH	
TEXAS GAS	Warren	OH	
TEXAS GAS	Butler	OH	
TRANSCONTINENTAL	Montgomery	MD	
TRANSCONTINENTAL	Fairfax	VA	
TRANSCONTINENTAL	Chester	PA	
TRANSCONTINENTAL	Lycoming	PA	
TRANSCONTINENTAL	Lycoming	PA	
TRANSCONTINENTAL	Clinton	PA	
TRANSCONTINENTAL	Warren	NJ	
TRANSCONTINENTAL	Baltimore	MD	
TRANSCONTINENTAL	Baltimore	MD	
TRANSCONTINENTAL	Northhampton	PA	
Delivers Gas To			
ALGONQUIN	Rockland	NY	
BLUEFIELD GAS	Mercer	WV	
CONSOLIDATED GAS	Chemong	NY	
CONSOLIDATED GAS	Wirt	WV	
EQUITABLE GAS	Wetzel	WV	
EQUITABLE GAS	Greene	PA	
GAS TRANSPORT	Wood	WV	
HAMPSHIRE GAS	Hampshire	WV	
INLAND GAS	Boyd	KY	
INLAND GAS	Pike	KY	
NATIONAL FUEL	Cameron	PA	
NATIONAL FUEL	Beaver	PA	

Gas Pipeline Interconnections (Continued)

Company: COLUMBIA GAS TRANSMISSION CORPORATION (Continued)

Delivers Gas To	County	State	Maximum Volume Capability (MMCFD)
NATIONAL FUEL	Warren	PA	*
SHENANDOAH GAS	Warren	VA	
SHENANDOAH GAS	Warren	VA	
SHENANDOAH GAS	Shenandoah	VA	
SHENANDOAH GAS	Shenandoah	VA	
TEXAS EASTERN	Greene	PA	
TEXAS EASTERN	Fairfield	OH	
TEXAS EASTERN	Bucks	PA	
TEXAS EASTERN	Montgomery	KY	
TEXAS EASTERN	Clark	KY	
TRANSCONTINENTAL	Baltimore	MD	
TRANSCONTINENTAL	Baltimore	MD	
TRANSCONTINENTAL	Northhampton	PA	
UNION LIGHT, H&P	Campbell	KY	
UNION LIGHT, H&P	Campbell	KY	
UNION LIGHT, H&P	Kenton	KY	
UNION LIGHT, H&P	Kenton	KY	
WASHINGTON GAS	Prince William	VA	
WASHINGTON GAS	Fairfax	VA	
WASHINGTON GAS	Fairfax	VA	
WASHINGTON GAS	Loudoun	VA	
WASHINGTON GAS	Loudoun	VA	
WASHINGTON GAS	Montgomery	VA	

Company: COLUMBIA GULF TRANSMISSION COMPANY

Receives Gas From	County	State	Maximum Volume Capability (MMCFD)
CONSOLIDATED GAS	Eugene Is.	LA (OFFSHORE)	300
CONSOLIDATED GAS	Eugene Is.	LA (OFFSHORE)	300
GULF	Eugene Is.	LA (OFFSHORE)	70
MICHIGAN WISCONSIN	St. Mary	LA	300
MICHIGAN WISCONSIN	St. Mary	LA	300
NATURAL GAS PIPELINE	Vermillion	LA	-
NATURAL GAS PIPELINE	Cameron	LA	38
NATURAL GAS PIPELINE	Eugene Is.	LA (OFFSHORE)	110
NATURAL GAS PIPELINE	Eugene Is.	LA (OFFSHORE)	15
NORTHERN NATURAL GAS	Eugene Is.	LA (OFFSHORE)	-
NORTHERN NATURAL GAS	Cameron	LA	9
NORTHERN NATURAL GAS	Eugene Is.	LA (OFFSHORE)	-
SEA ROBIN PIPELINE	Vermillion	LA	130
TENNESSEE GAS	Rowan	KY	100
TENNESSEE GAS	Lasalle	LA	100
TENNESSEE GAS	Cameron	LA	25
TEXAS EASTERN	Adair	KY	100
TEXAS EASTERN	Cameron	LA	-

Gas Pipeline Interconnections (Continued)

Company: COLUMBIA GULF TRANSMISSION COMPANY (Continued)

Receives Gas From	County	State	Maximum Volume Capability (MMCFD)
TEXAS GAS TRANSMISSION	Eugene Is.	LA (OFFSHORE)	300
TEXAS GAS TRANSMISSION	Acadia	LA	130
TEXAS GAS TRANSMISSION	Eugene Is.	LA (OFFSHORE)	500
TEXAS GAS TRANSMISSION	Acadia	LA	40
TEXAS GAS TRANSMISSION	Eugene Is.	LA (OFFSHORE)	300
TEXAS GAS TRANSMISSION	Warren	OH	-
TRANSCONTINENTAL	Evangeline	LA	100
TRUNKLINE	St. Mary	LA	475
TRUNKLINE	Eugene Is.	LA (OFFSHORE)	130
UNITED GAS PIPELINE	Rapides	LA	110
Delivers Gas To			
CONSOLIDATED GAS	Acadia	LA	200
MICHIGAN WISCONSIN	Eugene Is.	LA (OFFSHORE)	130
NATURAL GAS PIPELINE	Vermillion	LA	300
NATURAL GAS PIPELINE	Eugene Is.	LA (OFFSHORE)	-
NATURAL GAS PIPELINE	Cameron	LA	565
NATURAL GAS PIPELINE†	Cameron	LA	475
NORTHERN NATURAL	Acadia	LA	-
NORTHERN NATURAL	Acadia	LA	9
SEA ROBIN PIPELINE	Vermillion	LA (OFFSHORE)	500
SEA ROBIN PIPELINE	Vermillion	LA (OFFSHORE)	-
TENNESSEE GAS	Cameron	LA	750
TENNESSEE GAS	Eugene Is.	LA (OFFSHORE)	25
TEXAS EASTERN	Cameron	LA	-
TRANSCONTINENTAL	Vermillion	LA	-
TRUNKLINE†	Cameron	LA	475

Company: CONSOLIDATED GAS SUPPLY CORPORATION

Receives Gas From	County	State	Maximum Volume Capability (MMCFD)
COLUMBIA GAS	Wood	WV	*
TENNESSEE GAS	Kanawha	WV	
TENNESSEE GAS	Potter	PA	
TENNESSEE GAS	Livingston	NY	
TENNESSEE GAS	Ontario	NY	
TENNESSEE GAS	Madison	NY	
TENNESSEE GAS	Madison	NY	
TENNESSEE GAS	Albany	NY	
TENNESSEE GAS	Rensselaer	NY	
TENNESSEE GAS	Mahoning	OH	
TENNESSEE GAS	Crawford	PA	
TENNESSEE GAS	Tuscarawas	OH	
TENNESSEE GAS	Erie	NY	

Gas Pipeline Interconnections (Continued)

Company: CONSOLIDATED GAS SUPPLY CORPORATION (Continued)

Receives Gas From	County	State	Maximum Volume Capability (MMCFD)
TEXAS EASTERN	Marshall	WV	*
TEXAS EASTERN	Westmoreland	PA	
TEXAS EASTERN	Clinton	PA	
TEXAS EASTERN	Monroe	OH	
TEXAS EASTERN	Noble	OH	
TEXAS GAS	Warren	OH	
TRANSCONTINENTAL	Clinton	PA	
Delivers Gas To			
COLUMBIA GAS	Chemung	NY	
NATIONAL FUEL GAS	Erie	NY	
NATIONAL FUEL GAS	Cameron	PA	
NATIONAL GUEL GAS	Clarion	PA	
TENNESSEE GAS	Potter	PA	
TEXAS EASTERN	Clinton	PA	
TRANSCONTINENTAL	Clinton	PA	

Company: EAST OHIO GAS COMPANY

Receives Gas From	County	State	Maximum Volume Capability (MMCFD)
COLUMBIA GAS OF OHIO	Cuyahoga	OH	*
COLUMBIA GAS OF OHIO	Lucas	OH	
Delivers Gas To			
COLUMBIA GAS OF OHIO	Lucas	OH	
COLUMBIA GAS OF OHIO	Cuyahoga	OH	
COLUMBIA GAS TRANS.	Holmes	OH	
CONSOLIDATED GAS	Belmont	OH	
CONSOLIDATED GAS	Monroe	OH	
CONSOLIDATED GAS	Carrol	OH	
CONSOLIDATED GAS	Cuyahoga	OH	
CONSOLIDATED GAS	Mahoning	OH	
CONSOLIDATED GAS	Mahoning	OH	
CONSOLIDATED GAS	Ashtabula	OH	
CONSOLIDATED GAS	Tuscarawas	OH	
PANHANDLE EASTERN	Lucas	OH	
TEXAS EASTERN	Monroe	OH	

Company: EAST TENNESSEE NATURAL GAS COMPANY

Receives Gas From	County	State	Maximum Volume Capability (MMCFD)
TENNESSEE GAS	Hickman	TN	*
TENNESSEE GAS	Hickman	TN	
TENNESSEE GAS	Perry M	TN	
TENNESSEE GAS	Robertson	TN	
TENNESSEE GAS	Robertson	TN	
TEXAS EASTERN	Trousdale	TN	
TEXAS EASTERN	Giles	TN	
Delivers Gas To			
TENNESSEE GAS	Hickman	TN	
TENNESSEE GAS	Hickman	TN	
TEXAS EASTERN	Trousdale	TN	
TEXAS EASTERN	Giles	TN	

Company: EL PASO NATURAL GAS COMPANY

Delivers Gas To	County	State	Maximum Volume Capability (MMCFD)
INTRA TEX	Puckett	TX	140
LO VACA	Ward	TX	60
LO VACA	Terral	TX	130
LO VACA	Pecos	TX	30
LO VACA	Jackson	TX	40
TRANSWESTERN	Ward	TX	190

Company: EQUITABLE GAS COMPANY

Receives Gas From	County	State	Maximum Volume Capability (MMCFD)
CARNEGIE NATURAL	Wetzel	WV	*
CARNEGIE NATURAL	Marion	WV	
CARNEGIE NATURAL	Marion	WV	
CARNEGIE NATURAL	Greene	PA	
CARNEGIE NATURAL	Washington	PA	
CARNEGIE NATURAL	Allegheny	PA	
COLUMBIA GAS	Allegheny	PA	
COLUMBIA GAS	Allegheny	PA	
CONSOLIDATED GAS	Doddridge	WV	
CONSOLIDATED GAS	Wetzel	WV	
CONSOLIDATED GAS	Marion	WV	
CONSOLIDATED GAS	Wetzel	WV	
PEOPLES NATURAL	Greene	PA	
PEOPLES NATURAL	Allegheny	PA	
PEOPLES NATURAL	Allegheny	PA	

mpany: EQUITABLE GAS COMPANY (Continued)

livers Gas To	County	State	Maximum Volume Capability (MMCFD)
CARNEGIE NATURAL	Harrison	WV	*
CARNEGIE NATURAL	Lewis	WV	
CARNEGIE NATURAL	Lewis	WV	
CARNEGIE NATURAL	Lewis	WV	
CARNEGIE NATURAL	Gilmer	WV	
CARNEGIE NATURAL	Gilmer	WV	
CARNEGIE NATURAL	Gilmer	WV	
CARNEGIE NATURAL	Gilmer	WV	
CARNEGIE NATURAL	Gilmer	WV	
CARNEGIE NATURAL	Gilmer	WV	
CARNEGIE NATURAL	Gilmer	WV	
CARNEGIE NATURAL	Marion	WV	
CARNEGIE NATURAL	Ritchie	WV	
COLUMBIA GAS	Washington	PA	
COLUMBIA GAS	Washington	PA	
COLUMBIA GAS TRANSMISSION	Wetzel	WV	
COLUMBIA GAS TRANSMISSION	Greene	PA	
CONSOLIDATED GAS	Marion	WV	
PEOPLES NATURAL	Greene	PA	
PEOPLES NATURAL	Allegheny	PA	
PEOPLES NATURAL	Westmoreland	PA	
TENNESSEE GAS	Allegheny	PA	
TEXAS EASTERN	Greene	PA	
TEXAS EASTERN	Greene	PA	
TEXAS EASTERN	Greene	PA	
TEXAS EASTERN	Greene	PA	
TEXAS EASTERN	Westmoreland	PA	

ıpany: FLORIDA GAS TRANSMISSION

:eives Gas From	County	State	Maximum Volume Capability (MMCFD)
HOUSTON NATURAL GAS	Brazoria	TX	100
MICHIGAN WISCONSIN	St. Landry	LA	85
NATURAL GAS PIPELINE	Nueces	TX	7
SOUTHERN NATURAL GAS	Washington	LA	240
SOUTHERN NATURAL GAS	Escombia	AL	20
TENNESSEE GAS	Stone	MS	170
TEXAS EASTERN	St. Landry	LA	120
TEXAS GAS TRANSMISSION	Acadia	LA	120
TRANSCONTINENTAL	Starr	TX	10
TRANSCONTINENTAL	Jim Wells	TX	15
TRANSCONTINENTAL	St. Helena	LA	312
TRUNKLINE	Brazoria	TX	85
UNITED GAS PIPELINE	St. Landry	LA	-

Gas Pipeline Interconnections (Continued)

Company: FLORIDA GAS TRANSMISSION (Continued)

Delivers Gas To	County	State	Maximum Volume Capabil (MMCFD)
MICHIGAN WISCONSIN	St. Landry	LA	85
TENNESSEE GAS	Stone	MS	170
TEXAS EASTERN TRANS.	St. Landry	LA	120
TEXAS GAS TRANSMISSION	Acadia	LA	120
TRANSCONTINENTAL	Starr	TX	10
TRANSCONTINENTAL	Jim Wells	TX	15
TRANSCONTINENTAL	Vermillion	LA	180
TRANSCONTINENTAL	St. Helena	LA	312
UNITED GAS PIPELINE	Refugio	TX	90
UNITED GAS PIPELINE	St. Landry	LA	120
UNITED GAS PIPELINE	Perry	MS	-
UNITED GAS PIPELINE	Escambia	AL	35

Company: GREAT LAKES GAS TRANSMISSION COMPANY

Receives Gas From	County	State	Maximum Volume Capabil (MMCFD)
MICHIGAN WISCONSIN	Macomb	MI	180
NORTHERN NATURAL§	Gogedic	MI	100
TRANS-CANADA	Kittson	MN	1350
Delivers Gas To			
MICHIGAN CONSOLIDATED	St. Clair	MI	100
MICHIGAN WISCONSIN	Iron	MI	700
MICHIGAN WISCONSIN	Clare	MI	540
MICHIGAN WISCONSIN	Macomb	MI	180
NORTHERN NATURAL	Itasca	MN	70
NORTHERN NATURAL	Carlton	MN	200
NORTHERN NATURAL§	Gogedic	MI	100
PANHANDLE EASTERN	Saginaw	MI	40
TRANS-CANADA	St. Clair	MI	900

Company: HOUSTON PIPE LINE COMPANY

Receives Gas From	County	State	Maximum Volume Capabil (MMCFD)
CHANNEL INDUSTRIES	Chambers	TX	75
CHANNEL INDUSTRIES	Jackson	TX	30
CHANNEL INDUSTRIES	Nueces	TX	170
CHANNEL INDUSTRIES	Refugio	TX	180
CHANNEL INDUSTRIES	San Patricio	TX	80
CHANNEL INDUSTRIES	Wharton	TX	25
DELHI	Jackson	TX	11
DELHI	Polk	TX	20

Gas Pipeline Interconnections (Continued)

Company: HOUSTON PIPE LINE COMPANY (Continued)

Receives Gas From	County	State	Maximum Volume Capability (MMCFD)
DELHI	Victoria	TX	25
LOVACA	Nueces	TX	33
LONE STAR	Harris	TX	20
MOBIL	Wharton	TX	10
PHILLIPS NATURAL GAS	Harris	TX	31
SOUTHLAND ENERGY	Polk	TX	30
UNION OIL	Jefferson	TX	17
UNITED TEXAS TRANS.	Harris	TX	125
UNITED TEXAS TRANS.	Victoria	TX	53
VALLEY PIPELINE	Matagorda	TX	25
VALLEY PIEPLINE	Nueces	TX	35
VALLEY PIPELINE	Nueces	TX	15
VALLEY PIPELINE	San Patricio	TX	75
VALLEY PIPELINE	San Patricio	TX	40
Delivers Gas To			
CHANNEL INDUSTRIES	Brazoria	TX	210
CHANNEL INDUSTRIES	Chambers	TX	48
CHANNEL INDUSTRIES	Harris	TX	270
CHANNEL INDUSTRIES	Harris	TX	38
CHANNEL INDUSTRIES	Jefferson	TX	280
CHANNEL INDUSTRIES	Jim Wells	TX	55
CHANNEL INDUSTRIES	Liberty	TX	16
CHANNEL INDUSTRIES	Matagorda	TX	48
COASTAL STATES	Brazoria	TX	40
COASTAL STATES	Jackson	TX	43
DELHI	Webb	TX	10
LO VACA	Fort Bend	TX	180
LO VACA	Webb	TX	25
LONE STAR	Victoria	TX	55
TEXAS INTRASTATE	Harris	TX	40

Company: INTRA TEX GAS COMPANY

Receives Gas From	County	State	Maximum Volume Capability (MMCFD)
DELHI	Pecos	TX	60
LO VACA	Crone	TX	65
LONE STAR	Pecos	TX	90

Gas Pipeline Interconnections (Continued)

Company: KENTUCKY WEST VIRGINIA GAS COMPANY

Receives Gas From	County	State	Maximum Volume Capability (MMCFD)
COLUMBIA GAS TRANS.	Floyd	KY	*
COLUMBIA GAS TRANS.	Floyd	KY	
COLUMBIA GAS TRANS.	Martin	KY	

Company: LONE STAR GAS COMPANY

Receives Gas From	County	State	Maximum Volume Capability (MMCFD)
ARKANSAS LOUSIANA	McClain	OK	25
EL PASO NATURAL GAS	Pecos	TX	100
NATURAL GAS PIPELINE	Stephens	OK	60
NATURAL GAS PIPELINE	Ward	TX	50
OKLAHOMA NATURAL	Garvin	OK	50
TRANSWESTERN	Pecos	TX	100
Delivers Gas To			
EL PASO NATURAL GAS	Pecos	TX	50
NATURAL GAS PIPELINE	Fort Bend	TX	100
NATURAL GAS PIPELINE	Ward	TX	50
TENNESSEE GAS	Waller	TX	100
TEXAS EASTERN TRANS.	Waller	TX	100
TRANSCONTINENTAL	Waller	TX	100
TRANSWESTERN	Pecos	TX	50
TRUNKLINE	Waller	TX	100
UNITED GAS PIPELINE	Fort Bend	TX	100
UNITED GAS PIPELINE	Dallas	TX	100

Company: MICHIGAN GAS STORAGE COMPANY

Receives Gas From	County	State	Maximum Volume Capability (MMCFD)
PANHANDLE EASTERN	Washtenaw	MI	*

Company: MICHIGAN WISCONSIN PIPE LINE COMPANY

Receives Gas From	County	State	Maximum Volume Capability (MMCFD)
ARKANSAS LOUISIANA	Caster	OK	30
CITIES SERVICE	Brown	KS	30
COLUMBIA GULF TRANS.	Marsh Is.	LA (OFFSHORE)	40

Gas Pipeline Interconnections (Continued)

Company: MICHIGAN WISCONSIN PIPE LINE COMPANY (Continued)

Receives Gas From	County	State	Maximum Volume Capability (MMCFD)
COLUMBIA GULF TRANS.	Eugene Is.	LA (OFFSHORE)	315
GREAT LAKES GAS	Iron	MI	700
GREAT LAKES GAS	Clare	MI	500
MIDWESTERN GAS TRANS.	Spencer	IN	95
MIDWESTERN GAS TRANS.	Wood	WI	350
NATURAL GAS PIPELINE¶	Eugene Is.	LA (OFFSHORE)	315
NATURAL GAS PIPELINE	Wheeler	TX	100
NATURAL GAS PIPELINE	Hansford	TX	100
NATURAL GAS PIPELINE	McHenry	IL	100
NORTHERN NATURAL	Rock	WI	150
SUGAR BOWL	Jeff Davis	LA	50
TEXAS GAS TRANSMISSION	Eugene Is.	LA (OFFSHORE)	315
TEXAS GAS TRANSMISSION	Eugene Is.	LA (OFFSHORE)	36
TEXAS GAS TRANSMISSION	Marsh Is.	LA (OFFSHORE)	77
TEXAS GAS TRANSMISSION	Misc.	LA (OFFSHORE)	55
TEXAS GAS TRANSMISSION	Webster	KY	100
TEXAS GAS TRANSMISSION	Lawrence	IN	40
TRUNKLINE	St. Mary	LA	33
TRUNKLINE	Fayette	TN	160
TRUNKLINE	Elkhart	IN	150

Delivers Gas To	County	State	Maximum Volume Capability (MMCFD)
ARKANSAS LOUISIANA	Caddo	OK	30
CITIES SERVICE	Brown	KS	30
COLUMBIA GULF TRANS.	St. Mary	LA	140
FLORIDA GAS TRANS.	St. Landry	LA	90
GREAT LAKES GAS TRANS.	Clare	MI	500
MIDWESTERN GAS TRANS.	Spencer	IN	95
MIDWESTERN GAS TRANS.	Will	IL	50
NATURAL GAS PIPELINE	Cameron	LA	140
NATURAL GAS PIPELINE	Hansford	TX	100
NATURAL GAS PIPELINE	Wheeler	TX	100
NATURAL GAS PIPELINE	Bureau	IL	175
NATURAL GAS PIPELINE	McHenry	IL	100
NATURAL GAS PIPELINE	Will	IL	500
NATURAL GAS PIPELINE	McHenry	IL	500
SUGAR BOWl	St. Mary	LA	50
TEXAS GAS TRANSMISSION	Cameron	LA	60
TEXAS GAS TRANSMISSION	St. Mary	LA	140
TEXAS GAS TRANSMISSION	Acadia	LA	160
TEXAS GAS TRANSMISSION	Webster	KY	100

Gas Pipeline Interconnections (Continued)

Company: MICHIGAN WISCONSIN PIPE LINE COMPANY (Continued)

Delivers Gas To	County	State	Maximum Volume Capability (MMCFD)
TRANSCONTINENTAL	Acadia	LA	120
TRUNKLINE	St. Mary	LA	200
TRUNKLINE	Fayette	TN	160
TRUNKLINE	Tate	MS	120
TRUNKLINE	Elkhart	IN	150

Company: MIDWESTERN GAS TRANSMISSION COMPANY

Delivers Gas To	County	State	Maximum Volume Capability (MMCFD)
MICHIGAN WISCONSIN	Spencer	IN	132
MICHIGAN WISCONSIN	Will	IL	34
NORTHERN NATURAL	Hisago	MN	150
NORTHERN NATURAL	Isanti	MN	36
NORTHERN NATURAL	Morrison	MN	100
TEXAS EASTERN	Pike	IN	33
TEXAS GAS TRANS.	Daviess	KY	12
TEXAS GAS TRANS.	Knox	IN	40
TRUNKLINE	Vermillion	IL	120

Company: MISSISSIPPI RIVER TRANSMISSION CORPORATION

Receives Gas From	County	State	Maximum Volume Capability (MMCFD)
DORCHESTER	Harrison	TX	235
MID LOUISIANA	Quachita Parish	LA	50
NATURAL GAS PIPELINE	Randolph	AR	80
NATURAL GAS PIPELINE	Clinton	IL	230
TEXAS EASTERN	White	AR	160
TEXAS GAS TRANSMISSION	Lincoln Parrish	LA	92
TEXAS GAS TRANSMISSION	Morehouse Parish	LA	70
TRUNKLINE	Wayne	IL	225
UNITED GAS PIPELINE	Quachita Parish	LA	429

Delivers Gas To	County	State	Maximum Volume Capability (MMCFD)
MID LOUISIANA	Quachita Parish	LA	50
NATURAL GAS PIPELINE	Randolph	AR	80
TEXAS EASTERN	White	AR	160
TEXAS GAS TRANSMISSION	Lincoln Parish	LA	92
TEXAS GAS TRANSMISSION	Morehouse Parish	LA	70

Gas Pipeline Interconnections (Continued)

Company: MONTANA-DAKOTA UTILITIES COMPANY

Receives Gas From	County	State	Maximum Volume Capability (MMCFD)
COLORADO INTERSTATE	Fremont	WY	*
KANSAS NEBRASKA	Fremont	WY	
Delivers Gas To			
COLORADO INTERSTATE	Fremont	WY	
KANSAS NEBRASKA	Fremont	WY	
KANSAS NEBRASKA	Fremont	WY	

Company: MOUNTAIN FUEL RESOURCES, INC.

Receives Gas From	County	State	Maximum Volume Capability (MMCFD)
NORTHWEST PIPELINE	Rio Blanco	CO	*
ROCKY MOUNTAIN	Rio Blanco	CO	
Delivers Gas To			
ROCKY MOUNTAIN	Mesa	CO	

Company: MOUNTAIN FUEL SUPPLY COMPANY

Receives Gas From	County	State	Maximum Volume Capability (MMCFD)
COLORADO INTERSTATE	Sweetwater	WY	*
MOUNTAIN FUEL RESOURCES	Uintah	UT	
NORTHWEST PIPELINE	Sweetwater	WY	
NORTHWEST PIPELINE	Uintah	UT	
Delivers Gas To			
COLORADO INTERSTATE	Sweetwater	WY	
COLORADO INTERSTATE	Sweetwater	WY	
McCULLOCH INTERSTATE	Converse	WY	

Gas Pipeline Interconnections (Continued)

Company: NATURAL GAS PIPELINE COMPANY OF AMERICA

Receives Gas From	County	State	Maximum Volume Capability (MMCFD)
ARKANSAS LOUISIANA	Woodward	OK	70
ARKANSAS LOUISIANA	Harrison	TX	300
ARKANSAS LOUISIANA	Clark	AR	150
CITIES SERVICE	Gray	TX	20
CITIES SERVICE	Beaver	OK	140
CITIES SERVICE	Ford	KS	30
CITIES SERVICE	Lincoln	KS	10
COLORADO INTERSTATE	Beaver	OK	50
COLORADO INTERSTATE	Texas	OK	70
COLORADO INTERSTATE	Hutchinson	TX	200
COASTAL STATES	Brooks	TX	40
EL PASO	Dewey	OK	40
FLORIDA GAS TRANS.**	Jefferson	TX	100
KANSAS NEBRASKA	Barton	KS	60
LONE STAR	Wise	TX	100
MICHIGAN WISCONSIN	Hansford	TX	100
MICHIGAN WISCONSIN	Beaver	OK	90
MICHIGAN WISCONSIN	Bureau	IL	80
MICHIGAN WISCONSIN	McHenry	IL	480
MICHIGAN WISCONSIN	McHenry	IL	100
MICHIGAN WISCONSIN	Cameron	LA	160
MICHIGAN WISCONSIN	Will	IL	430
MISSISSIPPI RIVER	Randolph	AR	30
NORTH ILLINOIS	McHenry	IL	50
NORTHERN NATURAL	Mills	IA	65
OKLAHOMA NATURAL	Grady	OK	70
PANHANDLE EASTERN	Clark	KS	60
PANHANDLE EASTERN	Moultrie	IL	90
PHILLIPS	Gray	TX	140
PHILLIPS	Woodward	OK	150
PHILLIPS	Beaver	OK	90
PHILLIPS	Brazoria	TX	10
PHILLIPS	Brazoria	TX	50
TENNESSEE GAS	Willacy	TX	50
TEXACO	Jim Wells	TX	40
TEXAS EASTERN TRANS.	Brazoria	TX	60
TEXAS EASTERN TRANS.	Brazoria	TX	40
TEXAS EASTERN TRANS.††	Brazoria	TX	100
TRANSCONTINENTAL§§	Jim Wells	TX	200
TRANSCONTINENTAL¶¶	Vermillion	LA	150
TRANSCONTINENTAL***	Cameron	LA	250

Gas Pipeline Interconnections (Continued)

Company: NATURAL GAS PIPELINE COMPANY OF AMERICA (Continued)

Receives Gas From	County	State	Maximum Volume Capability (MMCFD)
TRANSWESTERN	Gray	TX	60
TRANSWESTERN	Hansford	TX	90
TRANSWESTERN	Eddy	NM	80
TRANSWESTERN	Kenedy	TX	100
UNITED GAS PIPELINE	Polk	TX	100
UNITED GAS PIPELINE	Vermillion	LA	160

Delivers Gas To	County	State	Maximum Volume Capability (MMCFD)
ARKANSAS LOUISIANA	Grady	OK	70
ARKANSAS LOUISIANA	Beckham	OK	30
ARKANSAS LOUISIANA	Harrison	TX	300
ARKANSAS LOUISIANA	Clark	AR	150
ARKANSAS LOUISIANA	Wheeler	TX	30
CITIES SERVICE GAS	Carson	TX	10
CITIES SERVICE GAS	Carter	OK	20
CITIES SERVICE GAS	Ford	KS	30
COLORADO INTERSTATE	Texas	OK	70
COLORADO INTERSTATE	Caddo	OK	70
DIAMOND SHAMROCK	Moore	TX	40
EL PASO	Reeves	TX	10
FLORIDA GAS TRANS.†††	Jefferson	TX	100
LONE STAR	Wise	TX	100
MICHIGAN WISCONSIN	Bureau	IL	80
MICHIGAN WISCONSIN	McHenry	IL	100
MISSISSIPPI RIVER	Randolph	AR	30
MISSISSIPPI RIVER	Clinton	IL	80
NORTH ILLINOIS	McHenry	IL	50
NORTH ILLINOIS	Grundy	IL	400
NORTH ILLINOIS	Durage	IL	180
NORTHERN NATURAL	Mills	IA	65
PANHANDLE EASTERN	Beckham	OK	75
PANHANDLE EASTERN	Clark	KS	60
PANHANDLE EASTERN	Moultrie	IL	90
PHILLIPS	Roberts	TX	70
PHILLIPS	Brazoria	TX	50
PHILLIPS§§§	Brazoria	TX	10
TENNESSEE GAS	Brooks	TX	20
TENNESSEE GAS	Wharton	TX	30
TRANSCONTINENTAL¶¶¶	Vermillion	LA	160
TRANSCONTINENTAL****	Cameron	LA	250
TRANSWESTERN	Eddy	NM	80
UNITED GAS PIPELINE	Polk	TX	100
UNITED GAS PIPELINE	Vermillion	LA	160

Gas Pipeline Interconnections (Continued)

Company: NORTHERN NATURAL GAS COMPANY

Receives Gas From	County	State	Maximum Volume Capability (MMCFD)
DELHI GAS††††	Pecos	TX	130
GREAT LAKES GAS TRANS.§§§§	Carlton	MN	200
INTRA TEX	Pecos	TX	120
NATURAL GAS PIPELINE	Mill	IA	150
TRANSWESTERN	Hutchison	TX	70
Delivers Gas To			
MICHIGAN WISCONSIN	Rock	WI	-
NATURAL GAS PIPELINE¶¶¶¶	Mill	IA	150
NI GAS	Joe Davis	IL	-
NI GAS	Joe Davis	IL	-
PANHANDLE EASTERN¶¶¶¶	Kiowa	KS	175

Company: NORTHWEST PIPELINE CORPORATION

Receives Gas From	County	State	Maximum Volume Capability (MMCFD)
MOUNTAIN FUEL SUPPLY	Sweetwater	WY	110
N.W. NATURAL GAS	Multiple	OR	-
PACIFIC GAS TRANS.	Spokane	WA	185
PACIFIC GAS TRANS.	Omatilla	OR	140
SOUTHWEST GAS CORP.	Multiple	NV	-
WASHINGTON NATURAL GAS	Multiple	WA	-
WASHINGTON WATER	Multiple	WA	-
Delivers Gas To			
COLORADO INTERSTATE	Sweetwater	WY	165
EL PASO	La Plata	CO	240
PACIFIC GAS TRANS.	Spokane	WA	135

Gas Pipeline Interconnections (Continued)

Company: OASIS PIPELINE (HOUSTON PIPE LINE)

Receives Gas From	County	State	Maximum Volume Capability (MMCFD)
DOW-TENNESSEE	Waller	TX	500
HOUSTON PIPELINE	Waller	TX	500
LO VACA	Edwards	TX	60
LO VACA	Pecos	TX	300
LO VACA	Pecos	TX	150
LO VACA	Pecos	TX	13
PIONEER NATURAL	Pecos	TX	50
Delivers Gas To			
LO VACA	Reeves	TX	60
LO VACA	Sutton	TX	20
LONE STAR	Sutton	TX	15
LONE STAR	Sutton	TX	45

Company: OKLAHOMA NATURAL GAS COMPANY

Delivers Gas To	County	State	Maximum Volume Capability (MMCFD)
ARKANSAS LOUSIANA	Grady	OK	60
CITIES SERVICE	Woodward	OK	40
CITIES SERVICE	Grady	OK	50
CITIES SERVICE	Ellis	OK	40
LONE STAR	Garvin	OK	60
MICHIGAN WISCONSIN	Woodward	OK	65
NATURAL GAS PIPELINE	Custer	OK	90
NATURAL GAS PIPELINE	Woodward	OK	90
NORTHERN NATURAL	Woodward	OK	40
PANHANDLE EASTERN	Dewey	OK	170
PRODUCERS GAS	Woodward	OK	20

Company: PACIFIC GAS AND ELECTRIC COMPANY
Company: PACIFIC GAS TRANSMISSION COMPANY

Delivers Gas To	County	State	Maximum Volume Capability (MMCFD)
NORTHWEST PIPELINE	Spokane	WA	*
NORTHWEST PIPELINE	Umatilla	OR	
PACIFIC GAS & ELECTRIC	Klamath	OR	

Gas Pipeline Interconnections (Continued)

Company: PACIFIC LIGHTING SERVICE COMPANY

Receives Gas From	County	State	Maximum Volume Capability (MMCFD)
EL PASO	Clarke	NV	*
NORTHWEST PIPELINE	Clarke	NV	

Company: PANHANDLE EASTERN PIPE LINE COMPANY

Receives Gas From	County	State	Maximum Volume Capability (MMCFD)
ARKANSAS LOUISIANA	Hemphill	TX	109
CITIES SERVICE	Grant	KS	20
CITIES SERVICE	Franklin	KS	40
CITIES SERVICE	Morton	KS	27
COLORADO INTERSTATE	Hutchison	TX	10
COLORADO INTERSTATE	Texas	OK	52
COLORADO INTERSTATE	Texas	OK	14
COLORADO INTERSTATE	Beaver	OK	30
COLORADO INTERSTATE	Morton	KS	43
COLORADO INTERSTATE	Morton	KS	10
COLORADO INTERSTATE	Kearny	KS	75
DELHI	Dewey	OK	42
DELHI	Woodward	OK	22
DELHI	Major	OK	44
GREAT LAKES GAS	Saginaw	MI	40
KANSAS NEBRASKA	Reno	KS	35
KANSAS NEBRASKA	Grant	KS	20
KANSAS NEBRASKA	Dewey	OK	250
MESA	Stevens	KS	14
MESA	Stevens	KS	14
MICHIGAN GAS	Oakland	MI	215
MICHIGAN GAS	Grant	KS	365
MICHIGAN WISCONSIN	Defiance	OH	150
MICHIGAN WISCONSIN	Dewey	OK	140
NATURAL GAS PIPELINE	Dewey	OK	140
NATURAL GAS PIPELINE	Beckham	OK	75
NATURAL GAS PIPELINE	Clark	KS	60
NATURAL GAS PIPELINE	Moultrie	IL	90
NORTHERN NATURAL	Ellis	OK	12
NORTHERN NATURAL	Kiowa	KS	175
NORTHERN NATURAL	Stevens	KS	33
OKLAHOMA NATURAL	Dewey	OK	170
PRODUCERS GAS	Dewey	OK	30
PRODUCERS GAS	Ellis	OK	23
PRODUCERS GAS	Woods	OK	12
TRANSWESTERN	Sherman	TX	70
TRANSWESTERN	Hansford	TX	58
TRUNKLINE	Douglas	IL	800

Gas Pipeline Interconnections (Continued)

Company: PANHANDLE EASTERN PIPE LINE COMPANY (Continued)

Delivers Gas To	County	State	Maximum Volume Capability (MMCFD)
ARKANSAS LOUISIANA	Hemphill	TX	109
CITIES SERVICE	Johnson	MO	33
CITIES SERVICE	Johnson	MO	30
CITIES SERVICE	Franklin	KS	40
COLORADO INTERSTATE	Adams	CO	150
COLUMBIA GAS TRANS.	Lucas	OH	448
COLUMBIA GAS TRANS.	Lucas	OH	448
EAST OHIO	Lucas	OH	511
KANSAS NEBRASKA	Reno	KS	35
KANSAS NEBRASKA	Converse	WY	200
MICHIGAN GAS	Oakland	MI	215
MICHIGAN GAS	Washtenaw	MI	365
MICHIGAN WISCONSIN	Defiance	OH	150
MICHIGAN WISCONSIN	Dewey	OK	140
NATURAL GAS PIPELINE	Clark	KS	60
NATURAL GAS PIPELINE	Moultrie	IL	90
NORTHERN NATURAL	Hansford	TX	24
TRANSWESTERN	Hansford	TX	58
UNION GAS OF CANADA	Wayne	MI	137

Company: PIONEER NATURAL GAS COMPANY

Receives Gas From	County	State	Maximum Volume Capability (MMCFD)
EL PASO	Randall	TX	*
EL PASO	Lamb	TX	
EL PASO	Castro	TX	
EL PASO	Misc.	TX	
NORTHERN NATURAL	Martin	TX	
NORTHERN NATURAL	Gaines	TX	
TRANSWESTERN	Parmer	TX	
Delivers Gas To			
NORTHERN NATURAL	Temple	TX	
TRANSWESTERN	Temple	TX	

Gas Pipeline Interconnections (Continued)

Company: SOUTH GEORGIA NATURAL GAS COMPANY

Receives Gas From	County	State	Maximum Volume Capability (MMCFD)
FLORIDA GAS TRANS.	Leon	FL	*
SOUTHERN NATURAL	Lea	AL	

Company: SOUTHERN NATURAL GAS COMPANY

Receives Gas From	County	State	Maximum Volume Capability (MMCFD)
FLORIDA GAS TRANS.	Iberville	LA	20
FLORIDA GAS TRANS.	Washington	LA	90
MICHIGAN WISCONSIN	St. Mary	LA	196
TENNESSEE GAS	St. Mary	LA	69
TENNESSEE GAS	St. Mary	LA	25
TENNESSEE GAS	Clarke	MS	69
TENNESSEE GAS	Lowndes	MS	34
TEXAS EASTERN TRANS.	Attala	MS	43
TEXAS EASTERN TRANS.	Attala	MS	29
TEXAS GAS TRANS.	Ouachita	LA	17
TRANSCONTINENTAL	Dallas	AL	98
TRANSCONTINENTAL	Clayton	GA	62
TRANSCONTINENTAL	Multiple	GA	70
UNITED GAS PIPELINE	St. Mary	LA	520
UNITED GAS PIPELINE	St. Mary	LA	88
UNITED GAS PIPELINE	Ouachita	LA	236
UNITED GAS PIPELINE	Attala	MS	184
UNITED GAS PIPELINE	Warren	MS	33
Delivers Gas To			
FLORIDA GAS TRANS.	Washington	LA	177
MICHIGAN WISCONSIN	St. Mary	LA	173
MID-LOUISIANA GAS	Perryville	LA	25
TENNESSEE GAS	Plaquemines	LA	25
TENNESSEE GAS	Clarke	MS	69
TENNESSEE GAS	Lowndes	MS	34
TEXAS EASTERN	Bienville	LA	36
TEXAS EASTERN	Attala	MS	73
TEXAS EASTERN	Attala	MS	29
TEXAS GAS TRANS.	Morehouse	LA	29
TRANSCONTINENTAL	Dallas	AL	107
TRANSCONTINENTAL	Clayton	GA	87
UNITED GAS PIPELINE	Tangipahoa	LA	32
UNITED GAS PIPELINE	Shelby	TX	35
UNITED GAS PIPELINE	W. Carroll	LA	45
UNITED GAS PIPELINE	Attala	MS	80

Gas Pipeline Interconnections (Continued)

Company: SOUTHERN NATURAL GAS COMPANY (Continued)

Delivers Gas To	County	State	Maximum Volume Capability (MMCFD)
UNITED GAS PIPELINE	Ouachita	LA	80
UNITED GAS PIPELINE	St. Mary	LA	280

Company: SOUTHERN UNION GATHERING COMPANY

Receives Gas From	County	State	Maximum Volume Capability (MMCFD)
EL PASO	Eddy	NM	*
EL PASO	Lea	NM	
Delivers Gas To			
EL PASO	San Juan	NM	
EL PASO	San Juan	NM	

Company: TENNESSEE GAS PIPELINE COMPANY

Receives Gas From	County	State	Maximum Volume Capability (MMCFD)
AMOCO	Bay City	TX	16
ATLANTIC RICHFIELD	St. Mary	LA	44
CHAMPLIN PETROLEUM	Gulf Plains	TX	104
CITIES SERVICE	Robstown	TX	21
COASTAL STATES	El Toro	TX	50
COASTAL STATES	La Gloria	TX	30
COLUMBIA GULF TRANS.	Acadia	LA	480
COLUMBIA GULF TRANS.	Cameron	LA	240
CONTINENTAL	Rincon	TX	12
CONTINENTAL	Acadia	LA	61
EXXON	Kelsey	TX	84
GETTY	W. Bernard	TX	10
INTRASTATE GATHERING	Rio Grande	TX	17
MOBIL	Cameron	LA	235
MOBIL	Hagist	TX	25
MOBIL	Seeligson	TX	160
NATURAL GAS PIPELINE	Brooks	TX	50
NATURAL GAS PIPELINE	Wharton	TX	120
NATURAL GAS PIPELINE	Terrebone	LA	50
PHILLIPS	Jefferson Davis	LA	135
PLACID	Terrebone	LA	43
PLACID	St. Mary	LA	70
SHELL	Houston	TX	166
SOUTHERN NATURAL	Cameron	LA	30

Gas Pipeline Interconnections (Continued)

Company: TENNESSEE GAS PIPELINE COMPANY (Continued)

Receives Gas From	County	State	Maximum Volume Capability (MMCFD)
SOUTHERN NATURAL	St. Mary	LA	30
SOUTHERN NATURAL	Terrebone	LA	5
SOUTHERN NATURAL	Plaquemines	LA	30
SUN	Red Fish Bay	LA	32
SUN	Sun	TX	74
SUPERIOR	Cameron	LA	141
TENNECO	Chesterville	TX	28
TENNECO	Laebo	TX	18
TENNGAS	Waller	TX	300
TEXAS EASTERN	Plaquemines	LA	160
TEXAS EASTERN	Eugene	LA	160
TEXAS GAS TRANS.	Cameron	LA	5
TRANSCONTINENTAL	N. Louise	TX	240
TRANSCONTINENTAL	Waller	TX	160
TRUNKLINE	St. Mary	LA	480
TRUNKLINE	Kuykendaal	TX	360
UNITED GAS PIPELINE	N. Leroy	LA	60
UNITED GAS PIPELINE	Loveitta	TX	120

Delivers Gas To

MICHIGAN WISCONSIN	St. Mary	LA	80
NATURAL GAS PIPELINE	Raymondville	TX	30
NATURAL GAS PIPELINE	Brooks	TX	50
NATURAL GAS PIPELINE	Wharton	TX	-
NATURAL GAS PIPELINE	Terrebone	LA	50
SOUTHERN NATURAL	St. Mary	LA	80
TEXAS EASTERN	Granado	TX	80
TEXAS EASTERN*****	La Fourche	LA	240
TEXAS EASTERN	Allen	LA	120
TRANSCONTINENTAL	Allen	LA	80
TRANSCONTINENTAL	Crowley	LA	80
TRUNKLINE	Jefferson Davis	LA	600
TRUNKLINE	Waller	LA	120
TRUNKLINE	Jefferson Davis	LA	480
UNITED GAS PIPELINE	Jefferson Davis	LA	240
UNITED GAS PIPELINE	St. Mary	LA	160
UNITED GAS PIPELINE	Cameron	LA	50
UNITED GAS PIPELINE	Plaquemines	LA	120
UNITED GAS PIPELINE	St. Mary	LA	240

Gas Pipeline Interconnections (Continued)

Company: TEXAS EASTERN TRANSMISSION CORPORATION

Receives Gas From	County	State	Maximum Volume Capability (MMCFD)
ARKANSAS LOUISIANA	Harrison	TX	65
CITIES SERVICE	Gregg	TX	38
COLUMBIA GAS TRANS.	Montgomery	KY	350
COLUMBIA GAS TRANS.	Fairfield	OH	194
FLORIDA GAS TRANS.	Matagorda	TX	51
HOUSTON PIPELINE	Hardin	TX	11
HOUSTON PIPELINE	Nueces	TX	37
MIDWESTERN GAS TRANS.	Pike	IN	47
MISSISSIPPI RIVER	White	AR	130
MISSISSIPPI RIVER	Lincoln	LA	15
MOBIL	Jackson	TX	110
NATURAL GAS PIPELINE	Kenedy	TX	100
NATURAL GAS PIPELINE	Jefferson	TX	136
SEA ROBIN	E. Cameron	LA	150
SEA ROBIN	E. Cameron	LA	160
SOUTHERN NATURAL	Bienville	LA	75
SOUTHERN NATURAL	Attaca	MS	123
SOUTHERN NATURAL	Plaquemines	LA	800
STINGRAY	E. Cameron	LA	17
SUGAR BOWL	Assumption	LA	40
TENNESSEE GAS	Allen	LA	215
TENNESSEE GAS	Terrebone	LA	270
TENNESSEE GAS	Lavaca	TX	152
TENNESSEE GAS	W. Cameron	LA	90
TEXAS GAS TRANS.	Lawrence	IN	47
TEXAS GAS TRANS.	Bossier	LA	52
TEXAS GAS TRANS.	Lincoln	LA	120
TEXAS GAS TRANS.	Claiborne	LA	35
TEXAS GAS TRANS.	E. Cameron	LA	50
TRANSCONTINENTAL	Orange	TX	60
TRANSCONTINENTAL	Chester	PA	115
TRANSCONTINENTAL	Montgomery	PA	100
TRANSCONTINENTAL	E. Feliciana	LA	200
TRANSCONTINENTAL	Somerset	NJ	75
TRANSCONTINENTAL	Clinton	PA	325
TRUNKLINE	Williamson	IL	62
TRUNKLINE	Allen	LA	58
TRUNKLINE	Hidalgo	TX	60
UNITED GAS PIPELINE	Bienville	LA	171
UNITED GAS PIPELINE	St. Landry	LA	341
UNITED GAS PIPELINE	Lafourche	LA	300
UNITED GAS PIPELINE	Panola	TX	68

Gas Pipeline Interconnections (Continued)

Company: TEXAS EASTERN TRANSMISSION CORPORATION (Continued)

Delivers Gas To	County	State	Maximum Volume Capability (MMCFD)
ARKANSAS LOUISIANA	Pulaski	AR	85
ARKANSAS LOUISIANA	Harrison	TX	65
CITIES SERVICE	Gregg	TX	38
COLUMBIA GAS TRANS.	Clark	KY	190
COLUMBIA GAS TRANS.	Bucks	PA	210
COLUMBIA GULF TRANS.	Adair	KY	113
FLORIDA GAS TRANS.	St. Landry	LA	150
HOUSTON PIPELINE	Hardin	TX	11
HOUSTON PIPELINE	Nueces	TX	37
MISSISSIPPI RIVER	White	AR	139
MISSISSIPPI RIVER	Lincoln	LA	15
MOBIL	Chambers	TX	50
NATURAL GAS PIPELINE	Brazoria	TX	36
NATURAL GAS PIPELINE	Brazoria	TX	57
NATURAL GAS PIPELINE	Kenedy	TX	100
NATURAL GAS PIPELINE	Jefferson	TX	136
SEA ROBIN	E. Cameron	LA	150
SEA ROBIN	E. Cameron	LA	160
SOUTHJERN NATURAL	Plaquemines	LA	800
STINGRAY	E. Cameron	LA	90
STINGRAY	E. Cameron	LA	17
SUGAR BOWL	Assumption	LA	40
TENNESSEE GAS	Jackson	TX	110
TENNESSEE GAS	Scioto	OH	156
TENNESSEE GAS	Trousdale	TN	220
TENNESSEE GAS	Giles	TN	109
TENNESSEE GAS	Lauaca	TX	152
TENNESSEE GAS	W. Cameron	LA	90
TENNESSEE GAS	Issaquena	MS	200
TEXAS GAS TRANS.	Bossier	LA	106
TEXAS GAS TRANS.	St. Landry	LA	57
TEXAS GAS TRANS.	Orange	TX	95
TEXAS GAS TRANS.	Jackson	IN	81
TEXAS GAS TRANS.	Ripley	OH	30
TEXAS GAS TRANS.	Gibson	IN	32
TEXAS GAS TRANS.	Clairborne	LA	35
TEXAS GAS TRANS.	Bossier	LA	52
TEXAS GAS TRANS.	Lincoln	LA	120
TEXAS GAS TRANS.	E. Cameron	LA	50
TRANSCONTINENTAL	Beauregard	LA	83
TRANSCONTINENTAL	Union	NJ	321
TRANSCONTINENTAL	E. Felicana	LA	200
TRANSCONTINENTAL	Clinton	PA	325
TRANSCONTINENTAL	Morris	PA	322
TRUNKLINE	Wharton	TX	63
TRUNKLINE	Hildalgo	TX	60
UNITED GAS PIPELINE	W. Carrol	LA	35
UNITED GAS PIPELINE	Jackson	TX	235
UNITED GAS PIPELINE	Beauregard	LA	255

Gas Pipeline Interconnections (Continued)

Company: TEXAS EASTERN TRANSMISSION CORPORATION (Continued)

Delivers Gas To	County	State	Maximum Volume Capability (MMCFD)
UNITED GAS PIPELINE	Clairborne	LA	48
UNITED GAS PIPELINE	Panola	TX	68
UNITED GAS PIPELINE	Lafourche	LA	300

Company: TEXAS GAS TRANSMISSION CORPORATION

Receives Gas From	County	State	Maximum Volume Capability (MMCFD)
COLUMBIA GULF TRANS.	Acadia	LA	15
COLUMBIA GULF TRANS.	Warren	OH	100
CONSOLIDATED GAS	Warren	OH	100
FLORIDA GAS TRANS.	Acadia	LA	75
MICHIGAN WISCONSIN	Webster	KY	37
MICHIGAN WISCONSIN	Acadia	LA	50
MICHIGAN WISCONSIN	Lawrence	IN	50
MICHIGAN WISCONSIN	St. Mary	LA	25
MIDWESTERN GAS TRANS.	Davies	KY	50
MISSISSIPPI RIVER	Lincoln	LA	100
MISSISSIPPI RIVER	Morehouse	LA	100
TENNESSEE GAS	Washington	MS	25
TEXACO - HENRY PLANT	Vermillion	LA	200
TEXACO - CHAMPUN PLT.	Panola	TX	50
TEXAS EASTERN TRANS.	Warren	OH	100
TEXAS EASTERN TRANS	Evangeline	LA	50
TEXAS EASTERN TRANS.	Claiborne	LA	100
TEXAS EASTERN TRANS.	Bossier	LA	25
TRUNKLINE	Dyer	TN	100
UNITED GAS PIPELINE	Iberia	LA	10
UNITED GAS PIPELINE	Morehouse	LA	100

Delivers Gas To			
COLUMBIA GULF TRANS.	Acadia	LA	15
COLUMBIA GULF TRANS.	Warren	OH	90
CONSOLIDATED GAS	Warren	OH	50
FLORIDA GAS TRANS.	Acadia	LA	75
MICHIGAN WISCONSIN	Webster	KY	100
MICHIGAN WISCONSIN	Acadia	LA	100
MICHIGAN WISCONSIN	Lawrence	IN	50
MICHIGAN WISCONSIN	St. Mary	LA	75
MIDWESTERN GAS TRANS.	Davies	KY	50
MISSISSIPPI RIVER	Lincoln	LA	100
MISSISSIPPI RIVER	Morehouse	LA	100
TEXAS EASTERN TRANS.	Orange	IN	50
TEXAS EASTERN TRANS.	Evangeline	LA	50
TEXAS EASTERN TRANS.	Claiborne	LA	100
TEXAS EASTERN TRANS.	Bossier	LA	25

Company: TEXAS GAS TRANSMISSION CORPORATION (Continued)

Delivers Gas To	County	State	Maximum Volume Capability (MMCFD)
TRANSCONTINENTAL	Evangeline	LA	100
TRANSCONTINENTAL	Acadia	LA	50
TRUNKLINE	Dyer	TN	100
UNITED GAS PIPELINE	Morehouse	LA	200
UNITED GAS PIPELINE	Vermillion	LA	200

Company: TRANSCONTINENTAL GAS PIPE LINE CORPORATION

Receives Gas From	County	State	Maximum Volume Capability (MMCFD)
COLUMBIA GAS TRANS.	Clinton	PA	124
COLUMBIA GULF TRANS.	Acadia	LA	77
COLUMBIA GULF TRANS.	St. Landry	LA	70
COLUMBIA GULF TRANS.	Evangeline	LA	85
FLORIDA GAS TRANS.	St. Helena	LA	290
FLORIDA GAS TRANS.	Starr	TX	96
FLORIDA GAS TRANS.	Vermillion	LA	180
MICHIGAN WISCONSIN	Evangeline	LA	130
MID-LOUISIANA	E. Feliciana	LA	150
MID-LOUISIANA	St. James	LA	125
MID-LOUISIANA	Cameron	LA	255
NATIONAL FUEL GAS	Potter	PA	86
NATURAL GAS PIPELINE	Jim Wells	TX	104
NATURAL GAS PIPELINE	Cameron	LA	255
SOUTH TEXAS NATURAL	Jim Wells	TX	144
SOUTH TEXAS NATURAL	LaSalle	TX	111
TENNESSEE GAS	Acadia	LA	57
TENNESSEE GAS	Acadia	LA	365
TENNESSEE GAS	Waller	TX	35
TENNESSEE GAS	Allen	LA	150
TENNESSEE GAS	Cameron	LA	255
TENNESSEE GAS	Bergen	NJ	75
TENNESSEE GAS	Starr	TX	96
TEXAS EASTERN TRANS.	Morris	NJ	275
TEXAS EASTERN TRANS.	Newton	TX	60
TEXAS EASTERN TRANS.	Union	NJ	117
TEXAS EASTERN TRANS.	Allen	LA	125
TEXAS EASTERN TRANS.	E. Feliciana	LA	180
TEXAS GAS TRANS.	Acadia	LA	57
TEXAS GAS TRANS.	Acadia	LA	480
TEXAS GAS TRANS.	Terreborne	LA	25
TEXAS GAS TRANS.	St. Landry	LA	200
TEXAS GAS TRANS.	St. Landry	LA	160
TEXAS GAS TRANS.	Vermillion	LA	82
TRUNKLINE	Bee	TX	90

:as Pipeline Interconnections (Continued)

:ompany: TRANSCONTINENTAL GAS PIPE LINE CORPORATION (Continued)

eceives Gas From	County	State	Maximum Volume Capability (MMCFD)
TRUNKLINE	Acadia	LA	57
TRUNKLINE	Vermillion	LA	50
TRUNKLINE	Waller	TX	90
TRUNKLINE	Beauregard	LA	125
UNITED GAS PIPELINE	Pike	MS	40
UNITED GAS PIPELINE	Terreborne	LA	186
UNITED GAS PIPELINE	Cameron	LA	255
UNITED GAS PIPELINE	Acadia	LA	57

'elivers Gas To

COLUMBIA GAS TRANS.	Baltimore	MD	80
COLUMBIA GAS TRANS	Carroll	MD	125
COLUMBIA GAS TRANS.	Chester	PA	39
COLUMBIA GAS TRANS.	Clinton	PA	124
COLUMBIA GAS TRANS.	Fairfax	VA	86
COLUMBIA GAS TRANS.	Lycoming	PA	15
COLUMBIA GAS TRANS.	Montgomery	MD	142
COLUMBIA GAS TRANS.	Northampton	PA	216
COLUMBIA GULF TRANS.	Cameron	LA	255
COLUMBIA GULF TRANS.	St. Landry	LA	70
MID-LOUISIANA	E. Feliciana	LA	150
MID-LOUISIANA	St. James	LA	125
NATIONAL FUEL GAS	Potter	PA	86
SOUTHERN NATURAL	Clinton	GA	150
SOUTHERN NATURAL	Dallas	AL	153
SOUTHERN NATURAL	Dallas	AL	50
SOUTHERN TEXAS NAT.	Matagorda	TX	80
TENNESSEE GAS	Jasper	MS	50
TENNESSEE GAS	Starr	TX	96
TENNESSEE GAS	Wharton	TX	300
TEXAS EASTERN TRANS.	Allen	LA	125
TEXAS EASTERN TRANS.	Chester	PA	110
TEXAS EASTERN TRANS.	E. Feliciana	LA	180
TEXAS EASTERN TRANS.	Montgomery	PA	100
TEXAS EASTERN TRANS.	Morris	NJ	275
TEXAS EASTERN TRANS.	Newton	TX	60
TEXAS EASTERN TRANS.	Somerset	NJ	60
TEXAS GAS TRANS.	Acadia	LA	65
TEXAS GAS TRANS.	St. Martin	LA	23
TEXAS GAS TRANS.	Vermillion	LA	82
TRUNKLINE	Beauregard	LA	125
UNITED GAS PIPELINE	Pike	MS	40
UNITED GAS PIPELINE	Victoria	TX	200
UNITED GAS PIPELINE	Whlthall	MI	100

Gas Pipeline Interconnections (Continued)

Company: TRANSWESTERN PIPELINE COMPANY

Receives Gas From	County	State	Maximum Volume Capability (MMCFD)
EL PASO	Mohave	AZ	60
EL PASO	Valencia	NM	100
EL PASO	Ward	TX	200
NORTHERN NATURAL	Ward	TX	58
NORTHERN NATURAL	Ward	TX	64
PHILLIPS	Gray	TX	60
PHILLIPS	Sherman	TX	35
SOUTHERN CALIFORNIA	Mohave	AZ	400
Delivers Gas To			
CAPROCK	Parmer	TX	13
CITIES SERVICE	Beaver	OK	75
CITIES SERVICE	Harper	OK	40
CITIES SERVICE	Hemphill	TX	180
COLORADO INTERSTATE	Harper	OK	14
EL PASO	Beaver	OK	13
EL PASO	Valencia	NM	100
NATURAL GAS PIPELINE	Eddy	OK	80
NATURAL GAS PIPELINE	Gray	TX	60
NATURAL GAS PIPELINE	Hansford	TX	60
NORTHERN NATURAL	Beaver	OK	15
NORTHERN NATURAL	Hutchinson	TX	60
PACIFIC LIGHTING	Mohave	AZ	750
PANHANDLE EASTERN	Hansford	TX	58

Company: TRUNKLINE GAS COMPANY

Receives Gas From	County	State	Maximum Volume Capability (MMCFD)
AMOCO	Waller	TX	100
EXXON	Brooks	TX	50
EXXON	Hidalgo	TX	50
FLORIDA GAS TRANS.	Brazoria	TX	100
LOVACA	Bee	TX	150
LOVACA	Brazoria	TX	125
MICHIGAN WISCONSIN	St. Mary	LA	200
NATURAL GAS PIPELINE	Cameron	TX	500
NATURAL GAS PIPELINE	Montgomery	TX	80
TENNESSEE GAS	Harris	TX	200
TENNESSEE GAS	Jeff Dams	LA	600
TEXAS EASTERN TRANS.	Allen	LA	80
TEXAS EASTERN TRANS.	Brooks	TX	50
TEXAS EASTERN TRANS.	Hidalgo	TX	60
TEXAS EASTERN TRANS.	Wharton	TX	100
TEXAS GAS TRANS.	Acadia	LA	45

Gas Pipeline Interconnections (Continued)

Company: TRUNKLINE GAS COMPANY (Continued)

Receives Gas From	County	State	Maximum Volume Capability (MMCFD)
TRANSCONTINENTAL	Acadia	LA	45
TRANSCONTINENTAL	Waller	TX	80
UNITED GAS PIPELINE	Acadia	LA	45
SOUTH TEXAS NATURAL	Hidalgo	TX	100
Delivers Gas To			
AMOCO	Waller	TX	25
CONSUMER POWER	Elkhart	IN	750
CONSUMER POWER	Elkhart	IN	750
MICHIGAN WISCONSIN	Cameron	IN	25
MICHIGAN WISCONSIN	Elkhart	IN	110
MICHIGAN WISCONSIN	Elkhart	IN	110
MICHIGAN WISCONSIN	Tate	MS	100
MIDWESTERN	Vermillion	IL	150
MIDWESTERN	Vermillion	IL	150
MISSISSIPPI RIVER	Clay	IL	160
MISSISSIPPI RIVER	Clay	IL	160
NORTHERN INDIANA	Marshall	IN	75
NORTHERN INDIANA	Marshall	IN	75
PANHANDLE EASTERN	Douglas	IL	800
PANHANDLE EASTERN	Douglas	IL	800
TENNESSEE GAS	Bolivar	MS	100
TENNESSEE GAS	Harris	TX	115
TENNESSEE GAS	St. Mary	LA	600
TEXAS GAS TRANS.	Dyersburg	TN	100
TEXAS EASTERN TRANS.	Williamson	IL	80
TEXAS EASTERN TRANS.	Williamson	IL	80
TRANSCONTINENTAL	Beauregard	LA	120
TRANSCONTINENTAL	Bee	TX	120
TRANSCONTINENTAL	Vermillion	LA	65
UNITED GAS PIPELINE	LaSalle	LA	225

Company: UNITED GAS PIPE LINE COMPANY

Receives Gas From	County	State	Maximum Volume Capability (MMCFD)
ARKANSAS LOUISIANA	Bienville	LA	
DELHI GAS	Victoria	TX	110,000
FLORIDA GAS TRANS.	Escambia	AL	
FLORIDA GAS TRANS.	Stone	MS	
FLORIDA GAS TRANS.	St. Helena	LA	124,000
FLORIDA GAS TRANS.	Refugio	TX	

Gas Pipeline Interconnections (Continued)

Company: UNITED GAS PIPE LINE COMPANY (Continued)

Receives Gas From	County	State	Maximum Volume Capability (MMCFD)
NATURAL GAS PIPELINE	Vermillion	LA	265,000
SOUTHERN NATURAL	Jeff Davis	MS	
SOUTHERN NATURAL	Tangiphom	LA	36,000
SOUTHERN NATURAL	Vermillion	LA	
TENNESSEE GAS	Cameron	LA	86,000
TENNESSEE GAS	Jeff Davis	LA	200,000
TENNESSEE GAS	Hancock	MS	115,000
TENNESSEE GAS	St. Mary	LA	200,000
TENNESSEE GAS	Terrebonne	LA	
TENNESSEE GAS	Terrebonne	LA	
TEXAS EASTERN TRANS.	Beauregard	LA	125,000
TEXAS EASTERN TRANS.	Bienville	LA	
TEXAS EASTERN TRANS.	Jackson	TX	185,000
TEXAS EASTERN TRANS.	Lafourche	LA	
TEXAS EASTERN TRANS.	Madison	MS	29,000
TRANSCONTINENTAL	Pike	MS	19,000
TRANSCONTINENTAL	Victoria	TX	170,000
TRUNKLINE	LaSalle	LA	150,000

Delivers Gas To

ARKANSAS LOUISIANA	Bienville	LA	
ARKANSAS LOUISIANA	Caddo	LA	
COLUMBIA GAS TRANS.	Rapides	LA	
COLUMBIA GAS TRANS.	Vermillion	LA	144,000
FLORIDA GAS TRANS.	St. Landry	LA	
FLORIDA GAS TRANS.	Stone	MS	
MID-LOUISIANA	E. Baton Rouge	LA	55,000
MID-LOUISIANA	E. Baton Rouge	LA	
MID-LOUISIANA	Ouachita	LA	
MISSISSIPPI RIVER	Ouachita	LA	
NATURAL GAS	Polk	TX	75,000
SUGAR BOWL	Ascension	LA	117,000
SOUTHERN NATURAL	Attala	MS	
SOUTHERN NATURAL	Jeff Davis	MS	
SOUTHERN NATURAL	Ouachita	LA	
SOUTHERN NATURAL	St. Mary	LA	400,000
TENNESSEE GAS	Hancock	MS	115,000
TENNESSEE GAS	Ouachita	LA	100,000
TENNESSEE GAS	Terrebonne	LA	
TENNESSEE GAS	Terrebonne	LA	
TENNESSEE GAS	Vermillion	LA	
TEXAS EASTERN TRANS.	Attala	MS	630,000
TEXAS EASTERN TRANS.	Bienville	LA	
TEXAS EASTERN TRANS.	Claiborne	LA	35,000
TEXAS EASTERN TRANS.	Harrison	TX	
TEXAS EASTERN TRANS.	Lafourche	LA	

Gas Pipeline Interconnections (Continued)

Company: UNITED GAS PIPE LINE COMPANY (Continued)

Delivers Gas To	County	State	Maximum Volume Capability (MMCFD)
TEXAS EASTERN TRANS.	Ouachita	LA	
TEXAS EASTERN TRANS.	St. Landry	LA	327,000
TEXAS GAS TRANS.	Bossier	LA	
TEXAS GAS TRANS.	Ouachita	LA	413,000
TRANSCONTINENTAL	Cameron	LA	77,000
TRANSCONTINENTAL	Pike	MS	130,000
TRANSCONTINENTAL	Terrebonne	LA	172,000
TRANSCONTINENTAL	Walthall	MS	100,000
UNITED TEXAS TRANS.		TX	
UNITED TEXAS TRANS.	Polk	TX	

Company: UNITED TEXAS TRANSMISSION COMPANY

Receives Gas From	County	State	Maximum Volume Capability (MMCFD)
AMOCO	Galveston	TX	24
CHANNEL INDUSTRIES	Orange	TX	52
DOW-TENNECO	Fort Bend	TX	87
HOUSTON PIPE LINE	Fort Bend	TX	60
HOUSTON PIPE LINE	Jefferson	TX	70
HOUSTON PIPE LINE	Victoria	TX	45
LOVACA	Fort Bend	TX	190
LOVACA	Harris	TX	60
LOVACA	Jackson	TX	101
MOBIL	Jefferson	TX	31
OASIS PIPELINE	Waller	TX	60
UNITED GAS PIPE LINE	Jasper	TX	
UNITED GAS PIPE LINE	Jefferson	TX	
Delivers Gas To			
CHANNEL INDUSTRIES	Harris	TX	35
HOUSTON PIPE LINE	Harris	TX	72
LONE STAR	Harris	TX	56
UNION TEXAS	Orange	TX	55

Gas Pipeline Interconnections (Continued)

Company: VALLEY PIPE LINES, INC. (HOUSTON PIPE LINE)

Receives Gas From	County	State	Maximum Volume Capability (MMCFD)
HOUSTON PIPE LINE	Nueces	TX	35
Delivers Gas To			
CHANNEL	Matagorda	TX	25
HOUSTON PIPE LINE	Matagorda	TX	25
HOUSTON PIPE LINE	Nueces	TX	15
HOUSTON PIPE LINE	San Patricio	TX	75
HOUSTON PIPE LINE	San Patricia	TX	40

Company: WESTERN GAS INTERSTATE COMPANY

Receives Gas From	County	State	Maximum Volume Capability (MMCFD)
COLORADO INTERSTATE	Sherman	TX	*
COLORADO INTERSTATE	Sherman	TX	
COLORADO INTERSTATE	Beaver	OK	

*Data not available.
†Gas delivered to both companies - volumes combined.
§This interconnection is impractical to use.
¶This interconnection is a common delivery for Colorado Interstate, Texas Gas Transmission, and Natural Gas Pipeline.
**Winnie Plant - Texas United, Transcontinental, Texas Eastern, and Trunkline.
††Exxon Plant - Lavaca.
§§Lagloria Plant - Tennessee, Coastal States, Lavaca, Shell, and Channel Industries.
¶¶Henry Plant - Trunkline, Colorado, Gulf, Sea Robin, United, Texas Gas.
***Cameron Meadows - Michigan Wisconsin, Tennessee, Gulf, United Gas.
†††Winnie Pant - Amoco, Texas Union, Texas Eastern, and Transcontinental.
§§§Amoco, Texaco, and Trunkline.
¶¶¶Henry Plant - Trunkline, Columbia, Sea Robin, United Gas Pipeline, and Texas Gas.
****Cameron Plant - Michigan Wisconsin, Tennessee, Columbia, and United Gas Pipeline.
††††Columbia and Northern Natural customers.
§§§§From Canada.
¶¶¶¶Columbia.
*****Offshore.

GLOSSARY[1]

aquifer storage -- the storage of gas underground in porous and permeable rock stratum, the pore space of which was originally filled with water and in which the stored gas is confined by suitable structure, permeability barriers, and hydrostatic water pressure. (G)

base gas -- the total volume of gas in storage which will maintain the required rate of delivery during an output cycle. (G)

Btu (British thermal unit) -- the quantity of heat that must be added to one pound of water to raise its temperature one degree Fahrenheit from 58.5 to 59.5°F, under standard pressure of 30 inches of mercury. (G)

coal gasification -- a controlled process of reacting coal, steam, and oxygen under pressure and elevated temperature which produces low Btu gas. Subsequent catalytic upgrading produces high Btu pipeline grade gas. (G)

common carrier -- one engaged in the transportation of materials as a public utility and common carrier for hire. (M)

compress -- to decrease the volume of gas by subjecting it to increased pressure. (G)

compressor -- a mechanical device for increasing the pressure of a gas. (G)

compressor station -- any permanent combination of facilities which supplies the energy to move gas in transmission lines or into storage by increasing the pressure. (G)

condensate -- the liquid resulting when a vapor is subjected to cooling and/or pressure reduction. Also, liquid hydrocarbons condensed from gas and oil wells. (TG)

daily average flowing volumes -- gas volumes being transported in a pipeline section, determined by dividing the total annual volume transported by 365 days. In this report, the annual volume of pipeline sections with bi-directional flow is determined by the sum of all volumes (the volumes in one

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[1]Definitions adapted, as indicated, from:
(G) - Glossary for the Gas Industry, American Gas Association.
(M) - Manual of Oil and Gas Terms, Williams and Meyers, 1976.
(T) - "Standard Definitions of Petroleum Statistics," Technical Report No. 1, American Petroleum Institute.
(TG) - Gas Pipeline Task Group.

direction assumed positive and the volumes flowing in the opposite direction assumed negative). (TG)

daily flow rate -- gas volumes transported per day in a pipeline section, usually expressed in million cubic feet per day (MMCF/D) measured at 14.73 psia pressure and 60°F temperature. (TG)

demand day -- that 24-hour period specified by a supplier-user contract for purposes of determining the purchaser's daily quantity of gas used. This term is primarily used in pipeline distribution company agreements. It is similar to, and usually coincides with, the distribution company "sendout day." (G)

design capacity -- the capability of a pipeline section to move gas volumes, based on one specific set of flowing parameters for the pipeline system comprising the pipeline section being analyzed. In this report, the design capacity of pipeline sections having bi-directional flow is the greater of the two flowing capacities. (TG)

distribution system -- generally mains, services, and equipment which carry or control the supply of gas from the point of local supply to and including the sales meters. (G)

exchange gas -- gas that is received from (or delivered to) another party in exchange for gas delivered to (or received from) such other party. (G)

FERC -- Federal Energy Regulatory Commission. (G)

FPC -- Federal Power Commission. (G)

field system -- pipelines which transport natural gas from individual wells to compressor station, processing point, or main trunk pipeline. (G)

flowing gas -- a term used in the Permian Basin Area Rate Proceeding as including all gas other than new gas-well gas or residue gas derived therefrom, i.e., including old gas-well gas, all casinghead gas, and residue gas derived from old gas-well or casinghead gas. (M)

gas, manufactured -- a gas obtained by destructive distillation of coal, or by the thermal decomposition of oil, or by the reaction of steam passing through a bed of heated coal or coke. Examples are coal gases, coke oven gases, producer gas, blast furnace gas, blue (water) gas, carbureted water gas. Btu content varies widely. (G) gas, natural -- a naturally occurring mixture of hydrocarbon and nonhydrocarbon gases found in porous geologic formations beneath the earth's surface, often in association with petroleum. The principal constituent is methane.

1. dry -- gas whose water content has been reduced by a dehydration process. Gas containing little or no hydrocarbons commercially recoverable as liquid product. Specified small quantities of liquids are permitted by varying statutory definitions in certain states.

2. wet -- wet natural gas is unprocessed natural gas or partially processed natural gas, produced from strata containing condensable hydrocarbons and water. The term is subject to varying legal definition as specified by certain state statutes.

Gas volumes mentioned in the report are dry gas volumes. Gas in the gathering lines, however, may contain condensates, minor impurities, inert gases, etc. (G)

gas from biomass -- gaseous fuel which can be produced from vegetation by either thermal decomposition or anaerobic digestion; i.e., the biological breakdown of organic matter into methane and other materials by bacterial action in the absence of oxygen. (TG)

gas from Devonian shale -- natural gas produced from shale rock formations formed in the Devonian geologic era. This gas is produced principally in the eastern United States in Ohio, Kentucky, Pennsylvania, and West Virginia. (TG)

gathering line -- a pipeline which transports natural gas from individual wells to compressor station, processing point, or main trunk pipeline. (G)

grid -- the layout of a gas distribution system in which pipes are connected at intersections. (G)

horsepower -- a unit of power; equivalent to 33,000 ft-lb per minute, or 550 ft-lb per second (mechanical horsepower). (G)

hydrocarbon -- a chemical compound composed solely of carbon and hydrogen. The compounds have a small number of carbon and hydrogen atoms in their molecule are usually gaseous; those with a larger number of atoms are liquid and the compounds with the largest number of atoms are solid. (G)

injection season -- those months of the year in which the normal net flow of gas is into the storage reservoir. The injection season generally starts in March or April and October is the final month. (TG) interstate pipeline company -- a company which transmits materials by pipeline across state boundaries. (TG)

interconnection -- the equipment and facilities necessary to transfer gas from one system to another. (TG)

intrastate pipeline company -- a company which transmits materials by pipeline within state boundaries. (TG)

lateral pipe -- a pipe in a gas distribution or transmission system which branches away from the central and primary part of the system. (G)

load -- the amount of gas delivered or required at any specified point or points on a system; load originates primarily at the gas consuming equipment of the customers. (G)

load factor -- the ratio of the average requirement to the maximum requirement for the same time period, as one day, one hour, etc. (G)

LNG (Liquefied Natural Gas) -- natural gas which has been liquefied by reducing its temperature to minus 260°F at atmospheric pressure. It remains a liquid at -116°F and 673 psig. In volume it occupies 1/600 of the gas in the vapor state. (G)

main line -- distribution line that serves as a common source of supply for more than one service line. (G)

native gas -- the total volume of gas indigenous to the storage reservoir at the time gas storage started. (G)

natural gas proven reserves -- proven reserves of natural gas as of December 31 of any given year are the estimated quantities of natural gas which geological and engineering data demonstrate with reasonable certainty to be recoverable in the future from known natural oil and gas reservoirs under existing economic and operating conditions. Reservoirs are considered proven if economic producibility is supported by either actual production or conclusive formation tests. The area of a reservoir considered proven includes that portion delineated by drilling and defined by gas-oil, gas-water, or oil-water contracts, and the adjoining portions not yet drilled but which can be reasonably judged as economically productive on the basis of available geological and engineering data. In the absence of information on fluid contacts, the lowest known structural occurrence of hydrocarbons controls the lower proven limit of the reservoir.

Reserve estimates are prepared for total recoverable natural gas, nonassociated gas, and associated-dissolved gas. Estimates do not include gaseous equivalents of natural gas liquids expected to be recovered from reservoir natural gas as it is produced, natural gas being held in underground storage, or nonhydrocarbon gases.

Classifications of reservoirs by regulatory agencies are used as the basis for dividing total reserves between nonassociated and associated-dissolved reserves. In the absence of classification by a regulatory agency, allocations are based on the natural occurrence of the gaseous hydrocarbons in reservoirs as determined by the operator. (T)

natural gas reservoir -- a porous and permeable underground formation containing an individual and separate natural accumulation of producible hydrocarbons (oil and/or gas) which is confined by impermeable rock or water barriers and is characterized by a single natural pressure system. (T)

operator -- the individual or company responsible for the development of an oil or gas lease; or a person who engages in the transportation of gas. (G)

peak demand -- the greatest of all the demands under consideration occurring during a specified period of time. (G)

peak shaving -- supplying fuel gas for distribution system from an auxiliary source during peak periods of maximum demand, when the primary source is not adequate. (G)

pipeline system -- pipelines installed for the purpose of transmitting gas from a source or sources of supply to one or more distribution centers, or to one or more large volume customers, or a pipeline installed to interconnect sources of supply. (G)

psig (Pressure, Guage) -- pounds per square inch above atmospheric pressure. (G)

rate base -- the value established by a regulatory authority, upon which a utility is permitted to earn a specified rate of return. Generally, this represents the amount of property used and useful in public service and may be based on the following values or combinations thereof: fair value, prudent investment, reproduction costs, or original cost; and may provide for the inclusion of cash working capital, materials and supplies, and deductions for: accumulated provision for depreciation, contributions in aid of construction, accumulated deferred investment tax credits. (G) reservoir capacity -- the amount of gas able to be contained in a given pore space under a static pressure and temperature. (G)

right-of-way -- a strip of land acquired for the construction and operation of a pipeline or other facility. (G)

space heating load -- buildings, i.e. houses, stores, and barns, which require heat to maintain desired inside temperature. This heat requirement fluctuates due to outside ambient temperature, wind speeds, sunlight, and the quality of the insulation installed in the building. (TG)

storage reservoir -- that part of the storage zone having a defined limit of porosity and/or permeability which can effectively accept, retain, and deliver gas. (G)

synthetic natural gas -- a descriptive term used interchangeably with SNG and substitute natural gas. (G)

tight gas sands -- gas-filled rock formations with low permeability. (TG)

underground storage -- the utilization of subsurface facilities for storing gas which has been transferred from its original location for the primary purposes of conservation, fuller utilization of pipeline facilities, and more effective and economic delivery to markets. The facilities are usually natural geological reservoirs such as depleted oil or gas fields or water-bearing sands sealed at the top by an impermeable cap rock. The facilities may be manmade or natural caverns. (G)

unloaded pipeline -- a pipeline which is not operating at full potential; i.e., the pipeline is capable of transmitting more gas. (TG)

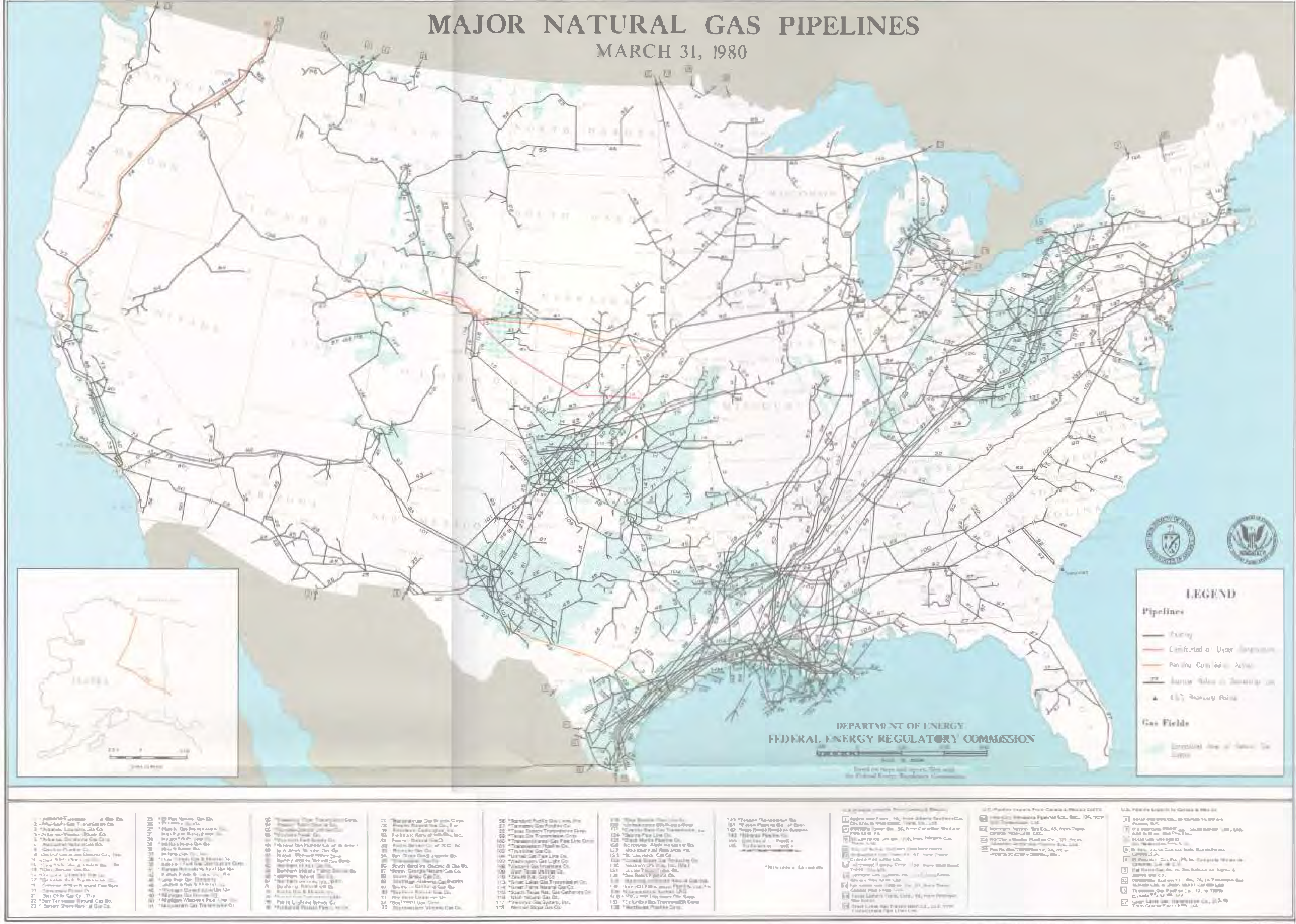

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Figure 73