

Appendix C

**Data Sources**

## Appendix C

# Data Sources

The data presented in the body of the report came from many sources and often required some adjustment to provide information on a comparable basis for use in the analysis. This appendix provides detailed information on the methodology and source material used to develop the estimates of 1990 interstate pipeline capacity at State borders and the changes in energy usage patterns from 1980 through 1989.

The following is a list of the data sources discussed in this appendix.

- Annual pipeline company reports filed with the Federal Energy Regulatory Commission (FERC) under 18 CFR 260.8, Format 567, “System Flow Diagrams”
- FERC Form 11, “Natural Gas Pipeline Monthly Statement”
- Energy Information Administration, Form EIA-176, “Annual Report of Natural and Supplemental Gas Supply and Disposition”
- *Natural Gas Annual*, DOE/EIA-0130, various issues.

## Pipeline Capacity

The measure of pipeline capacity that was estimated and addressed in this report is the daily capacity of the interstate natural gas pipeline network at regional and State boundaries. Specifically it is an estimate of the maximum volume of gas that can be transported under normal operating conditions for a sustained period of time. While the pipeline systems have considerable operational flexibility to increase deliveries of natural gas to certain areas above design capacity for short periods of time, this often means either reduced deliveries elsewhere or the use of line packing. Neither measure is likely to be sustainable for more than a short period of time.

Information on capacity levels for the interstate pipeline systems is generally available from filings at the Federal Energy Regulatory Commission (FERC). However, this information is typically associated with compressor stations and not State border capacity. Thus, an approach was required to estimate the State-to-State capacities on the pipelines. Further, while there is a regulatory requirement for the submission of design information, the terminology provided in the submissions sometimes is unclear as to whether the data provided by a company are in fact the information requested.

The original compilation of pipeline capacity estimates was done by the Energy Information Administration during 1991 and 1992, using 1990 as the base year. The initial approach taken to derive the State-to-State capacity information was the following:

- Develop initial capacity estimates using the compressor station data from FERC Format 567, “System Flow Diagrams.”
- Adjust initial estimates using delivery requirements of customers located between the State line and the station and for any contracted receipts from other pipelines.
- When compressor station data were unavailable on Format 567, derive a statistical estimate using a regression equation based upon the diameter(s) of the pipeline segment in question.
- Impute remaining missing values using proxies for capacity. Data used for this purpose included the contract demand data (CD) that were available for the years 1988 and 1989 for pipeline sales customers.
- Cross check the State border capacities for reasonableness, using contract demand levels (if not used as a proxy for capacity), flow data from Form EIA-176, “Annual Report of Natural and Supplemental Gas Supply and Disposition,” and consultations with FERC staff and company officials.

Capacity estimates for 1994 were developed using the 1990 estimates as a starting point. Next, the 1994 and 1990 FERC Format 567 “System Flow Diagram” were compared to determine to what extent the throughput capabilities of the pipeline compressor stations had changed. In addition, comparisons of receipt and delivery point volumes were also performed to determine changes in peak-day deliverabilities and as a replacement for contract demand data that were no longer current. Available data on pipeline construction projects proposed to be built between 1991 and 1994 and their current status were also factored into the estimates. These comparisons were done, to the extent possible, through comparative analyses of updated databases. Initial estimates of revised capacity levels were produced and displayed on annotated pipeline maps.

These initial estimates were then forwarded to willing pipeline company staff for their review and evaluation. If company input was not available, the estimates were given to FERC staff for an evaluation. These input were used to settle upon a final estimate.

The initial (1990) estimates of capacity on a pipeline segment at a State border were based on reported compressor station throughput, the daily output of whichever compressor station appeared to be closest to the State border. The working assumption was that throughput capability, even if only an estimated flow under current operating conditions, of any compressor station is a reasonably good estimate of peak-period throughput at that point on the line. (Compressor station output may be a “constraint” on throughput when downstream pipeline diameter, and other characteristics of the segment, may allow the physical pipeline to handle greater loads than required under current customer peak-day commitments. Conversely, the designed compressor output may be greater than can be sent through existing pipeline configurations.)

When no delivery or receipt points were between the selected compressor station and the State line, the capacity at the State border was assumed to equal the station capability, even though some friction losses would occur because of the distance between the line and compressor. When data were available for both receipts and contract demand deliveries between the compressor station and the State line, then the initial capacity estimates were adjusted to account for these volumes.

In some cases, peak-day information rather than design capacity was reported on FERC Format 567. These estimates were considered a reasonable proxy for capacity.

Under certain conditions, contract demand (CD) data were used to estimate capacity levels at a State border. CD data were assumed to be a reasonable reflection of current peak-day demands on the pipeline system and therefore a close approximation of the capability or capacity of the pipeline to supply those customers. A pipeline company's CD commitment levels within a State were used as a surrogate for a measure of that pipeline's capacity into the State when the pipeline system, or a branch, terminated in the State. Even in this instance, however, the pipeline company could meet a portion of its commitments from sources within the State borders.

In some cases, compressor station data and contract demand data were inadequate to develop an initial capacity estimate, and other methods were pursued to make the initial capacity estimate. For instance, regression equations to estimate capacity were developed using a universe of 814 compressor stations with known pipeline diameters, capacity, and pressure, extracted from the Format 567 filings. The results indicated that diameter alone was a good predictor of capacity in these equations.

## Average Daily Pipeline Flow

The data source for actual average daily pipeline volume flows across State borders was Form EIA-176, “Annual Report of Natural and Supplemental Gas Supply and Disposition.” In

addition, these data are the basis for supply, consumption, and transportation volumes presented on each State in this report.

The respondent universe of the Form EIA-176 includes interstate and intrastate pipeline companies; investor and municipally owned natural gas distributors; underground natural gas storage operators; synthetic natural gas plant operators; and field, well, or processing plant operators that deliver natural gas directly to consumers and/or transport gas to, across, or from a State border through field or gathering lines.

The average daily flow volumes presented in the “Interregional Capacity” tables in Chapter 3 are based upon preliminary 1994 data extracted from Form EIA-176. They are the sum of data that can be identified as volumes brought across a border: onsystem purchases received at a State border, plus transportation and/or exchange receipts received at a State line, plus transported into the report State. The data on Form EIA-176 are annual; average daily levels were computed on a 365-day basis.

Greater detail concerning Form EIA-176, its background and EIA processing methodology, may be found in the appendices of the EIA publication, *Natural Gas Annual 1990* (DOE/EIA-0131).

## System Flow Rate Data

The pipeline system-wide flow rate data discussed in Chapter 3 and used for utilization analysis are based on monthly throughput volume data reported on FERC Form 11, “Natural Gas Pipeline Monthly Statement.” These data for the period January 1979 through December 1994 are maintained and available on computer tape.

Transportation, sales, and intercompany transfer throughput volumes are reported, but for the total pipeline system only. As a result, these data cannot be used to compute regional or State-level utilization levels. However, the historical data were used to identify and quantify the largest monthly throughput level occurring on individual pipeline systems over 16 years, 1979 through 1994. Average monthly throughput rates for 1989 and 1994 were then divided by the largest monthly throughput (which was used as an approximation of a 100-percent load factor or a surrogate measure for full capacity utilization) to estimate the overall relative flow rate (throughput) on the various pipeline systems in 1994.

## Maps and Mapped Data

The geographic displays in the main body of this report were produced, in whole or in part, using the EIAGIS-NG Geographic Information System. The system consists of a series

of site-specific databases and digitized pipeline maps residing in a PC (personal computer) environment. The pipeline map files were developed from publicly available sources, although in some cases, more detailed maps were provided by the individual pipeline companies. Currently, the EIAGIS-NG contains map data for 60 interstate and 55 intrastate pipeline companies.

Each interstate pipeline map file also contains profile (attribute) data, such as pipe diameter, maximum allowable pressure, looping, etc., for each pipeline segment. These data were compiled from the pipeline system schematic contained in the FERC Format 576 “System Flow Diagram.” The individual databases supporting the system include such pipeline related data as:

- Compressor stations
- Delivery points
- Receipt points
- Major interconnections
- State border crossings and capacity levels.

Nonpipeline-related databases include:

- Underground storage sites
- Planned underground storage projects
- Proposed construction projects
- Local distribution company service areas
- Exports and imports
- Market hubs
- Electric power plants, etc.

The principal geographic data used in this report to compile capacity estimates were the pipeline maps and their receipt, delivery, interconnection, and compression station points.

Planned and existing underground storage site data were used to develop estimates of supplemental peak day deliverability to the pipeline network.

## U.S. Regional Definitions

The six regions used in this report were based in whole or in part upon the 10 Federal regions originally defined by the Bureau of Labor Statistics. The groupings are as follows:

**Northeast Region**—*Federal Region 1*: Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island, and Vermont. *Federal Region 2*: New Jersey, and New York. *Federal Region 3*: Delaware, District of Columbia, Maryland, Pennsylvania, Virginia, and West Virginia.

**Southeast Region**—*Federal Region 4*: Alabama, Florida, Georgia, Kentucky, Mississippi, North Carolina, South Carolina, and Tennessee.

**Midwest Region**—*Federal Region 5*: Illinois, Indiana, Michigan, Minnesota, Ohio, and Wisconsin.

**Southwest Region**—*Federal Region 6*: Arkansas, Louisiana, New Mexico, Oklahoma, and Texas.

**Central Region**—*Federal Region 7*: Iowa, Kansas, Missouri and Nebraska. *Federal Region 8*: Colorado, Montana, North Dakota, South Dakota, Utah, and Wyoming.

**Western Region**—*Federal Region 9*: Arizona, California, and Nevada. *Federal Region 10*: Idaho, Oregon, and Washington.