

Natural Gas Productive Capacity for the Lower 48 States 1986 Through 1998

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Preface

The *Natural Gas Productive Capacity for the Lower 48 States 1986 Through 1998* is the sixth in this series of reports prepared by the Energy Information Administration (EIA). The five previous reports were published in 1991, 1993, 1994, 1996, and 1997 {1,2,3,4,5} The EIA Dallas Field Office has prepared five earlier reports regarding natural gas productive capacity. These reports, *Gas Deliverability and Flow Capacity of Surveillance Fields*, reported deliverability and capacity data for selected gas fields in major gas-producing areas. {6,7,8,9,10} The data in the reports were based on gas-well back-pressure tests and estimates of gas-in-place for each field or reservoir. These reports use proven well testing theory, most of which has been employed by industry since 1936, when the Bureau of Mines first published *Monograph 7*. {11}

This publication is used by the Congress, Federal and State agencies, industry, and other interested parties to obtain accurate data of the lower 48 States' natural gas production history and wellhead productive capacity. Capacity projections from this report are used in EIA's *Short-Term Energy Outlook Quarterly Projections*. The report also contains a projection of lower 48 States' gas production requirements and wellhead productive capacity. These data are essential for the evaluation of the adequacy of future gas supplies, especially in periods of peak heating or cooling demand.

Total demand for natural gas in the United States is met by a combination of natural gas production, underground gas storage, imported gas, and supplemental gaseous fuels. This report examines the natural gas production element of the total gas demand. Domestic natural gas production supplies the majority of the natural gas demand requirements for the lower 48 States. The production requirement continues to increase while drilling has remained at low levels, a fact that this has raised some concern about the adequacy of future gas supplies, and gas producers' ability to meet periods of peak heating or cooling demand.

A history of natural gas production and natural gas productive capacity at the wellhead, along with a projection of the same, is shown in tables and figures. Data are compiled and presented for the lower 48 States, Texas, Louisiana,

California, Kansas, New Mexico, Oklahoma, Gulf of Mexico Outer Continental Shelf (OCS), Southeast area, Rocky Mountain area, and an eighteen State area that includes the remaining gas producing States. The EIA generates projections based on historical gas-well drilling and production data from State, Federal, and private sources. In addition to conventional gas-well gas, coalbed gas and oil-well gas are also included. Also presented for each category are charts showing the number of gas-well completions by year and the percent of total wellhead productive capacity by age. Alaska is excluded from this report because Alaskan gas does not enter the lower 48 States pipeline system.

Appendix A contains the model abstract. Appendix B compares the results of previous productive capacity reports. Appendix C contains the calculations and a table of productive capacity per new gas-well completion. A glossary of terms used in this report is provided to assist readers in more fully understanding the data.

This annual gas capacity report was prepared by the Reserves and Production Division (located in Dallas, Texas), Office of Oil and Gas, Energy Information Administration. General information regarding preparation of the report may be obtained from Kenneth A. Vagts, Director of the Office of Oil and Gas (202/586--6401) or John H. Wood, Director of the Dallas Field Office (214/720-6150).

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Executive Summary

Natural gas productive capacity in the lower 48 States is expected to be adequate to meet monthly production requirements under normal weather conditions through 1998 for three drilling cases (Figure ES1). Capacity projections are shown for *low*, *base*, and *high* drilling cases associated with *low*, *base*, and *high* price scenarios from the Energy Information Administration *Short-Term Integrated Forecasting System, August 1997* (Table ES1). Exceptionally high peak-day or peak-week heating or cooling demand may exceed projected productive capacity, or production may be limited by other factors, such as pipeline availability. Wellhead productive capacity sets the upper limit on natural gas production. Nonetheless, the natural gas industry has developed methods to meet peak demand, such as deliveries from storage and peak-day shaving. These developments have been greatly promoted at the Federal level by the movements to lessen regulation by the Federal Energy Regulatory Commission. Increased reliance on market forces also encourages industry efficiency, as customers with fuel-switching capability consume other fuels in response to higher gas prices. Lastly, effective demand might be lowered

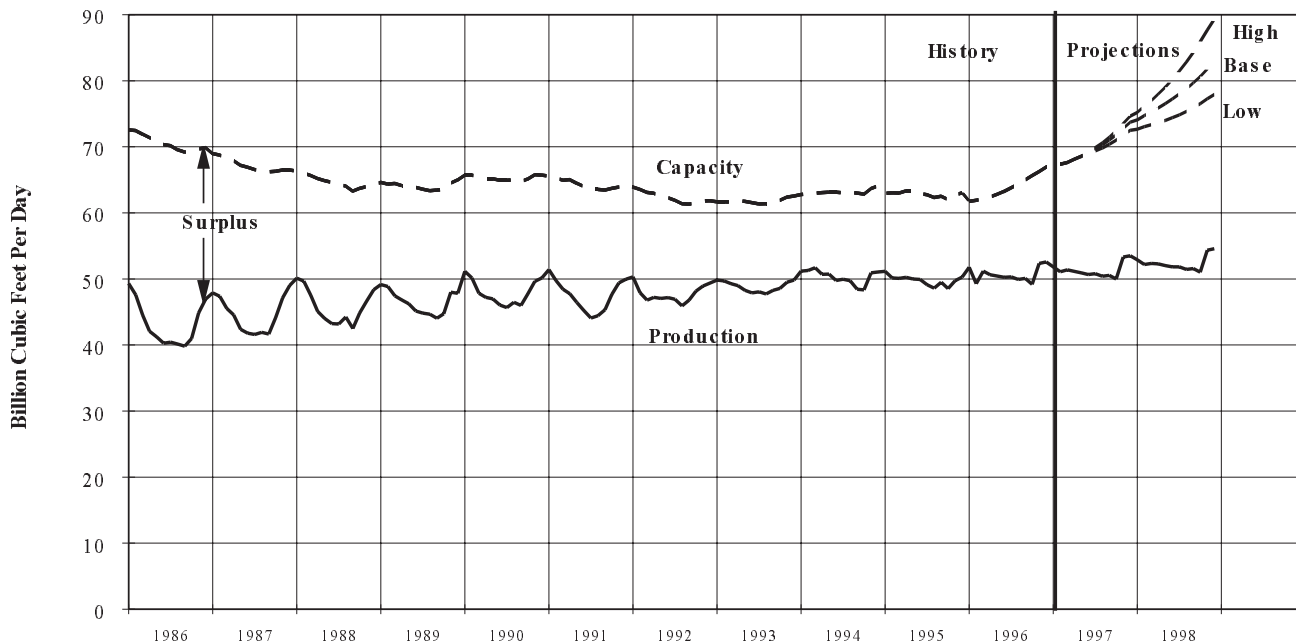
by reducing service to customers that have interruptible contracts.

This is the sixth in the series of EIA reports on natural gas wellhead productive capacity in the lower 48 States. The series document a decline in gas productive capacity beginning in 1986 that was clearly reversed in 1996. Natural gas productive capacity is projected to increase in 1997 and 1998 for the *low*, *base*, and *high* drilling cases (Figure ES1). This increase in surplus capacity reflects mainly new discoveries in the Gulf of Mexico Outer Continental Shelf.

The major conclusions of this study are:

- Monthly wellhead productive capacity of dry gas will be adequate to meet production requirements in the *low*, *base*, and *high* cases through 1998.
- In fact, the surplus monthly productive capacity will be higher in December 1998 than in December 1996 for the *low*, *base*, and *high* cases.
- In particular, the largest gas producing area, the Gulf of Mexico Federal Offshore, is expected to meet its

Figure ES1. Lower 48 States Dry Gas Monthly Production Rate and Wellhead Productive Capacity, 1986-1998



Note: Production projection plotted for base case only. The 1996 estimated history is based on Model GASCAP94 C102997 projections.
 Sources: Production History: Energy Information Administration, Office of Oil and Gas; Dwight's Energydata, Inc.; and Model GASCAP94 C102997. Productive Capacity: Model GASCAP94 C102997. Production Projections: Energy Information Administration, Short-Term Integrated Forecasting System, August 1997, and Model GASCAP94 C102997.

historical market share of U.S. production and maintain a substantial surplus productive capacity.

- Beyond 1998, a sufficient number of new wells and/or imports must be added each year in order to ensure an adequate gas capacity and supply.

For decades the lower 48 States natural gas productive capacity has been adequate to meet production requirements. In the 1970's, the capacity surplus was small because of market structure (split between interstate and intrastate), increasing production requirements, and insufficient drilling. In the early 1980's lower production requirements, together with increased drilling and tight gas price incentives, led to a large surplus capacity. After 1986, this large surplus began to decline as requirements for gas increased, gas prices fell along with oil prices, and gas-well completions dropped sharply. In late December 1989, the decline in this surplus, accompanied by exceptionally high requirements and temporary weather-related production losses, led to concerns about the adequacy of productive capacity for natural gas. These concerns were moderated by the gas system's performance during the unusually severe winter weather in March 1993 and January 1994.

Monthly natural gas wellhead productive capacity estimates are for conventional and coalbed gas-well completions and oil-well completions in the lower 48 States. The different drilling levels assumed in three cases are functions of oil and gas prices and gas production requirements (Table ES1).

Beginning in 1987, coalbed gas production and capacity began a rapid increase. By the end of 1995, the coalbed gas capacity was over 5 percent of the total gas-well gas capacity. Coalbed gas capacity is projected to be over 4 percent of the total at the end of 1998.

The existence of a surplus wellhead productive capacity does not signify that the entire gas capacity could be produced and delivered. The ability of a well to deliver gas into a pipeline system (deliverability) is always equal to or less than wellhead productive capacity. Deliverability is that volume of gas that can be produced from a well, reservoir, or field during a given period of time against a certain wellhead back-pressure under actual reservoir conditions, taking into account restrictions imposed by pipeline capacity, gas plant capacity, contracts, or regulatory bodies.

At the end of 1995, deliverability into the lower-48 pipeline system was estimated to be 53 billion cubic feet per day of

Table ES1. Annual Wellhead Price, December Production, and December Productive Capacity of Gas, 1986, 1995, 1996, 1997, and 1998

Year/Case	Price (nominal dollars)	Production (billion cubic feet per day)	Productive Capacity (billion cubic feet per day)	Productive Capacity Surplus (billion cubic feet per day)	Productive Capacity Utilization (percent)
History					
1986	1.94	47.0	69.9	22.9	67.2
1995	1.55	50.3	63.0	12.7	79.8
1996	2.17	52.6	66.9	14.3	78.6
Projections					
1997/Low	2.00	53.5	72.5	19.0	73.8
1997/Base	2.30	53.5	73.7	20.2	72.6
1997/High	2.47	53.5	74.6	21.1	71.7
1998/Low	1.66	54.6	77.9	23.3	70.1
1998/Base	2.23	54.6	82.7	28.1	66.0
1998/High	2.63	54.6	89.3	34.7	61.1

Sources: History: Energy Information Administration, Office of Oil and Gas; Dwight's Energydata, Inc. Projections: Short-Term Integrated Forecasting System, August 1997, and Model GASCAP94 C102997.

dry gas, only 85 percent of the dry gas productive capacity at the wellhead. However, there is substantial uncertainty in this deliverability estimate. Should the surplus in wellhead productive capacity decline, more reliance would be placed

on gas withdrawals from storage to meet peak heating and cooling demand. Gas storage requirements can be met by maintaining gas production that is closer to gas productive capacity throughout the year. This would lead to smaller seasonal variations in gas production.