

1. Introduction

Natural gas demand in the lower 48 States has been increasing during the last few years. Natural gas-well drilling has remained at low levels during these same years. This has raised concern about 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. Unpredictable market forces affect the number of new well completions and recompletions, which are related to drilling activity and rig efficiency. These forces include prices for oil and gas, imports, gas storage, regulatory changes, market dynamics, and total system deliverability.

This report addresses these concerns for the natural gas production element of total demand by presenting a historical analysis of the monthly productive capacity of natural gas at the wellhead for 1986 through 1996 and projecting productive capacity for 1997 and 1998. The impact of drilling, well completions, oil and gas price assumptions, and demand on gas productive capacity are integrated into the capacity projections as *low*, *base*, and *high* cases to account for the unpredictable market forces.

The *base* case reflects what would most likely occur if current market trends continue and drilling and production levels perform as they have in the past. The *high* case reflects an increase in the amount of drilling and favorable market conditions, while the *low* case reflects a decrease in drilling due to less favorable market conditions.

Assumptions used in the *Wellhead Productive Capacity Model* are summarized as follows:

- Wellhead gas productive capacity is a function of drilling, which adds new capacity, and production, which lowers existing capacity over time.
- The number of new gas-well completions is a function of drilling, which is influenced by oil and gas prices and production.
- Abandonment of individual conventional and coalbed gas-well completions is captured by decline functions for the group of wells included in a given vintage year for each area.
- Producing characteristics of new conventional and coalbed gas-well completions can be modeled from the characteristics of historical completions.
- Oil-well completions are currently producing at full capacity; therefore, the oil-well gas production rate equals oil-well gas capacity.

- U.S. gas production requirements are allocated to the lower 48 producing areas by month on the basis of 1995's production market share.

This report is based on of 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. Natural gas production from Alaska is excluded from this report because Alaskan gas does not enter the lower 48 States pipeline system.

For this report, monthly gas-well production data were as obtained on a per completion basis for 14 States and the Gulf of Mexico Outer Continental Shelf (OCS) from Dwight's EnergyData, Inc. (Dwight's). Dwight's data are not available for the entire lower 48 States. Production data on a State basis for the remaining States were obtained from EIA's *Natural Gas Monthly* reports, and the number of gas-well completions were obtained from the American Petroleum Institute (API) drilling statistics. Rig activity data for the Rig Model are obtained from Baker Hughes.

The method used to estimate natural gas productive capacity follows. Details of the methodology are found in previous reports { 1,2,3,4,5}.

By use of monthly gas-well production data, wells are grouped by vintage (the year a well first produced) for each State or area. A monthly peak production rate was selected each year for every vintage in each State or area. These data were input into the *Wellhead Productive Capacity Model* (Appendix A), where equation parameters were defined and a monthly productive capacity was estimated for each of the vintage years. Vintage-level capacities were summed to obtain the total capacities for each State or area. These were assumed to be the historical productive capacities. The model was used to project *low*, *base* and *high* case productive capacities for 1997 and 1998.

The projected gas production from the model was prorated by State and area on the basis of historical market share as follows. If scheduled gas-well gas production was less than gas-well gas productive capacity in a given State or area, the production required was set equal to the scheduled production. If the required scheduled gas-well gas production was greater than gas productive capacity in a given State or area, the production was set equal to productive capacity. When a State or area did not have adequate capacity to meet scheduled production, the unfilled capacity requirement was prorated to other States or areas that had surplus productive capacity. Surplus gas productive capacity occurs when the gas productive capacity is greater than and the scheduled gas production.