

**STATEMENT OF**  
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**before the**  
**COMMITTEE ON ENERGY AND COMMERCE**  
  
**U. S. HOUSE OF REPRESENTATIVES**

**June 10, 2003**

Mr. Chairman and Members of the Committee:

I appreciate the opportunity to appear before you today to discuss EIA's outlook for the U.S. natural gas market. The source of our short term projections is the June 2003 release of EIA's monthly Short-Term Energy Outlook; the long term projections are drawn from the National Energy Modeling System (NEMS).

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## Summary

### Short-Term Natural Gas Market (Through 2004)

Currently, the natural gas market in the United States is tight, with gas storage levels lagging well behind normal levels. Spot natural gas prices reflect this deficit and the expectation that demand, while not necessarily expected to exceed levels seen in 2002 on an annual basis, remains at a high level relative to domestic natural gas supply capability. The high market prices and strong drilling efforts are expected to ultimately allow gas storage volumes to move closer to normal by the beginning of the next heating season. This expectation, however, is predicated on prices continuing at high levels (\$5.50-\$6.00 per million Btu) through the next winter.

### Longer-Term Natural Gas Market (Through 2025)

By 2025 total natural gas consumption is expected to increase to almost 35 trillion cubic feet (Tcf) or 26 percent of U.S. delivered energy consumption. Such a demand level represents an increase of about 52 percent from the expected 2003 level. Domestic gas production is expected to increase more slowly than consumption over the forecast, rising from 19.5 Tcf in 2001 to 26.4 Tcf in 2025. Growing production reflects increasing natural gas demand and is supported by rising wellhead gas prices, relatively abundant gas resources, and improvements in technologies, particularly for unconventional gas.

## **Short-Term Gas Market Analysis**

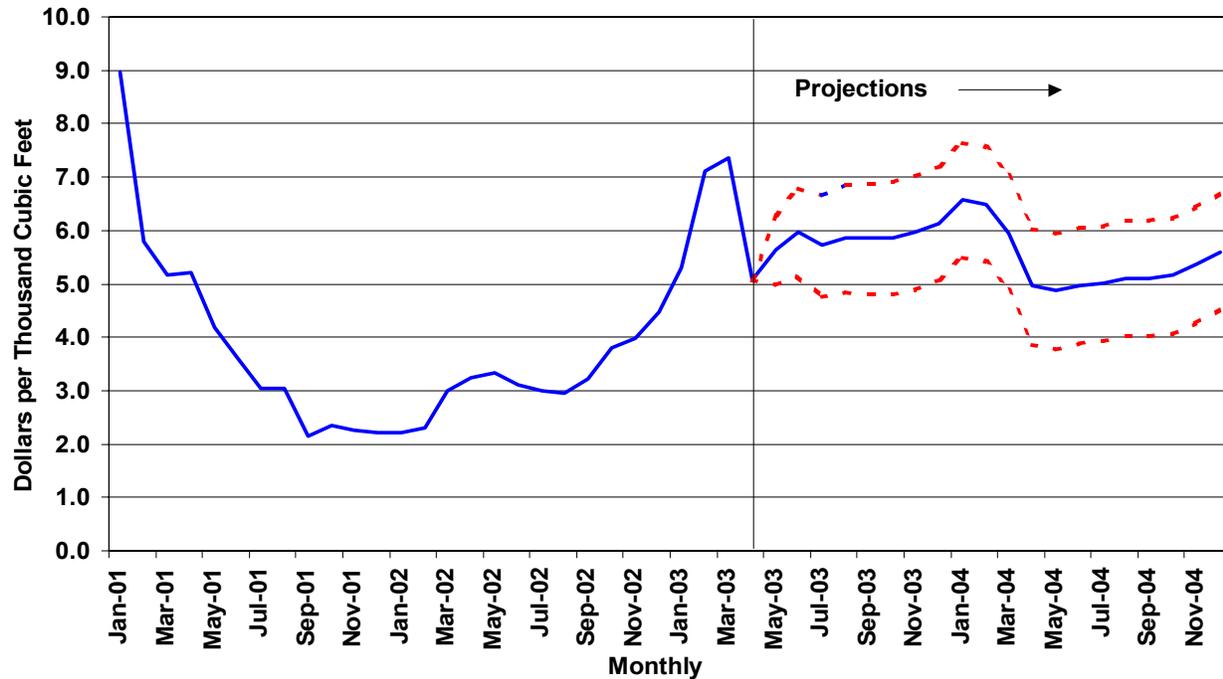
### **Overview of U.S. Natural Gas Markets**

The natural gas market is tight. The natural gas spot price at the Henry Hub (the market location used for pricing the New York Mercantile Exchange gas futures contracts) is high in historical terms for this time of the year. Spot natural gas prices have fluctuated around \$6 per million btu (mmbtu) over the last several weeks, and levels of natural gas in underground storage remain low two months into the injection season. At the end of May, working gas in storage stood about 38 percent below end-of-May 2002 levels and 28 percent below the previous 5-year average. Spot natural gas prices will likely average \$5-\$6 per mmbtu through the rest of this year. The exceptionally low level of natural gas storage continues to place unusually strong upward pressure on near-term natural gas prices. In the current environment companies will need to obtain large amounts of natural gas from other sources to refill storage for the next heating season. Moreover, if abnormally warm weather prevails this summer the current market may become highly sensitive to demand, particularly in the Western and South Central United States, where natural gas is heavily used for power generation. Such conditions could cause a mid-year run-up in prices well above current levels (about \$6 per mmbtu). However such price run-ups are usually short lived.

The projections outlined above are made at the national level, but it is important to emphasize that regional prices can diverge. Regional prices can also be highly volatile. For example, the average April spot price for natural gas traded at New York City was \$5.94, down considerably from the \$8.81 seen in March, a result of the usual change in seasonal demand levels but also of the high margins between the New York city gate and the Henry Hub that sometimes arise during peak

demand periods.

### Natural Spot Price (Base Case and 95% Confidence Range\*)

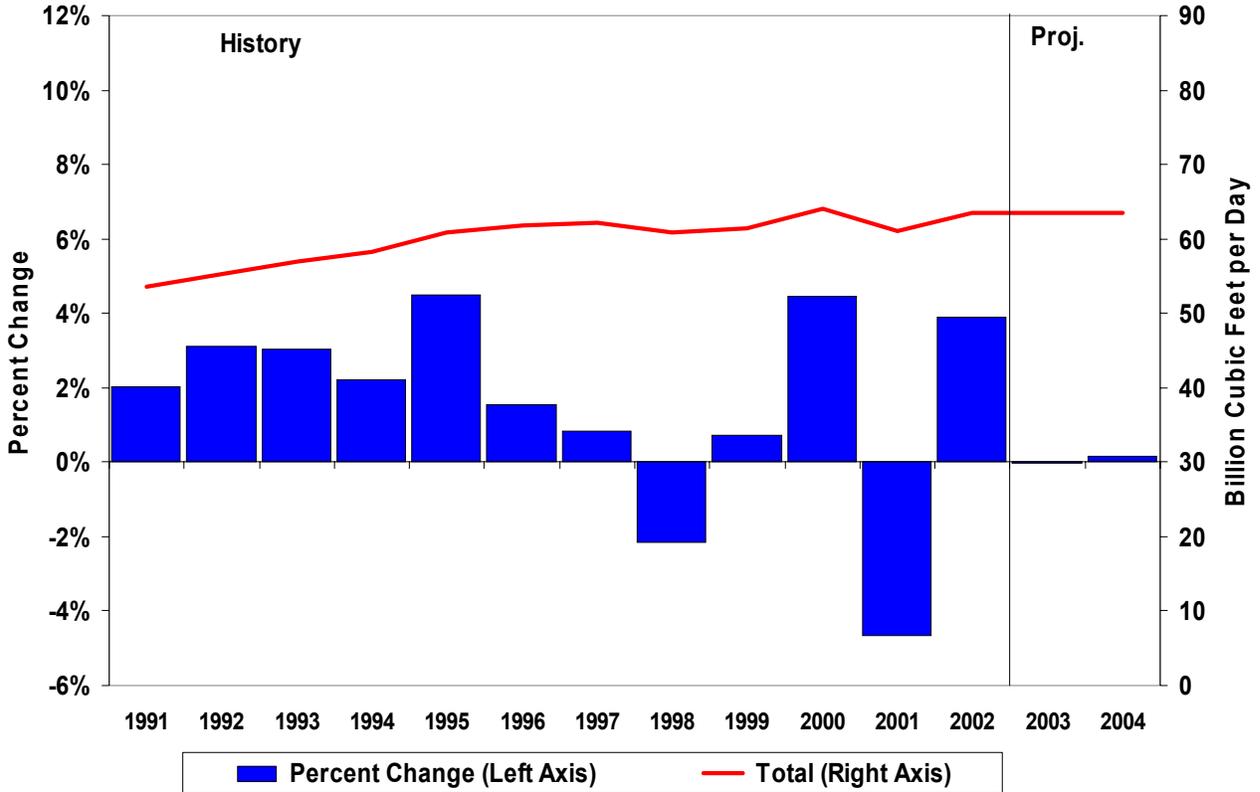


*\*The confidence intervals show +/- 2 standard errors based on the properties of the model. The ranges do not include the effects of major supply disruptions.* Sources: History: Natural Gas Week; Projections: Short-Term Energy Outlook, June 2003.

### Natural Gas Supply and Demand

With high natural gas prices, natural gas demand is expected to remain flat in 2003. Flat demand this year is likely despite sharply higher weather-related demand during the first quarter of 2003. Natural gas demand in 2004 is expected to remain flat as high prices discourage use enough to offset increases that might otherwise have accompanied industrial growth. Gas-

## Natural Gas Demand Trends



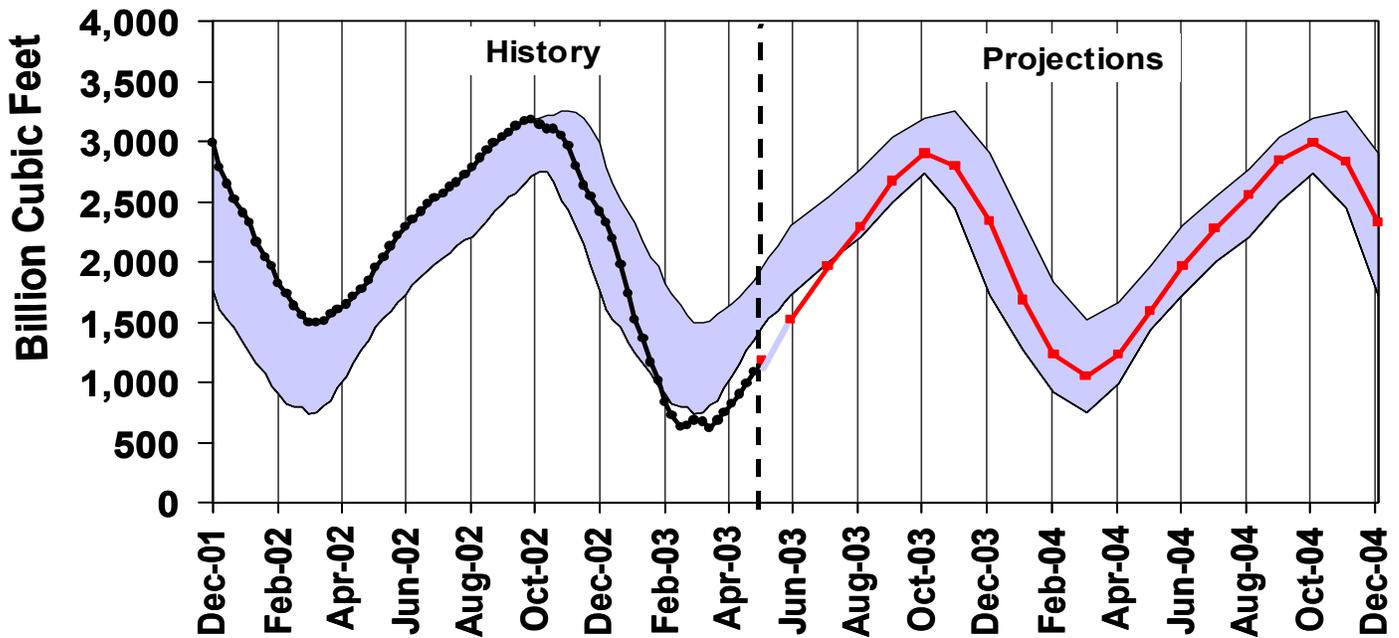
Sources: History: EIA; Projections: Short-Term Energy Outlook, June 2003.

intensive industrial growth (i.e., a composite index of industrial output, weighted by industry use of natural gas) is likely to be well below 1 percent this year, if indeed it is positive.

Demand for natural gas this summer is expected to fall by about 1 percent from last summer's level. This is in part due to weaker industrial demand. Under our assumption of normal weather, cooling degree-days for the season (Q2 2003 and Q3 2003) would be close to 10 percent below year-ago levels, reducing gas usage for power generation. In the event of a hotter-than-

normal summer this year, natural gas prices could move higher as cooling-related demand would compete with the need to build storage inventories. The National Climate Prediction Center currently indicates that above-average temperatures in the U.S. Southwest and parts of Texas are likely in June and possibly in the third quarter as well. Such a development could increase gas demand for power generation and increase pressure on spot prices.

### U.S. Working Gas in Underground Storage

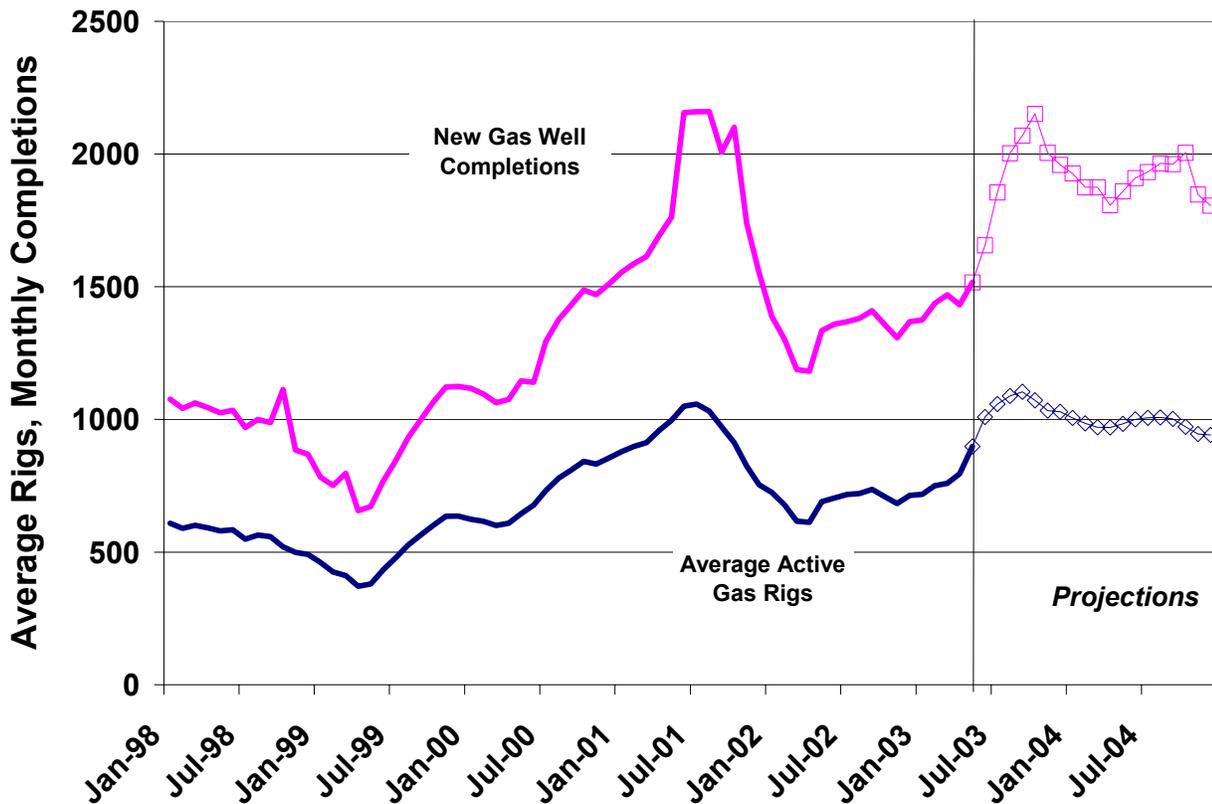


NOTE: Colored Band is Minimum & Maximum Values 1998-2002

Sources: History: EIA. Projections: Short-Term Energy Outlook, June 2003.

Working natural gas in storage is estimated to have reached about 1,212 billion cubic feet (bcf) at the end of May, 38 percent below the year-ago level. This is the second lowest aggregate inventory level for the end of May recorded by EIA. Eastern and producing regions stocks, in particular, are at very low levels. Demand for natural gas to refill working gas storage in 2003 will be higher than average, which means that prices are likely to remain volatile. Storage is expected to build to about 2,900 billion cubic feet by the end of October. Under normal weather conditions, this should be enough to allow storage to be about 1 trillion cubic feet at the end of next winter, near to normal for that stage of the storage cycle.

### Domestic Natural Gas Drilling Activity

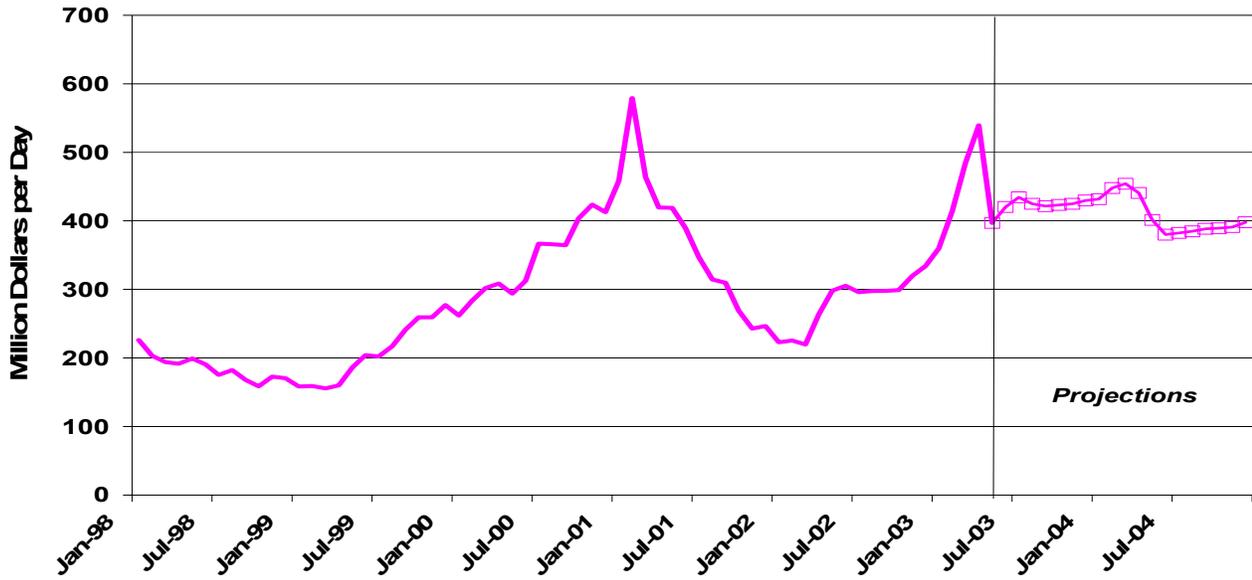


Sources: History: Baker-Hughes and EIA. Projections: Short-Term Energy Outlook, June 2003.

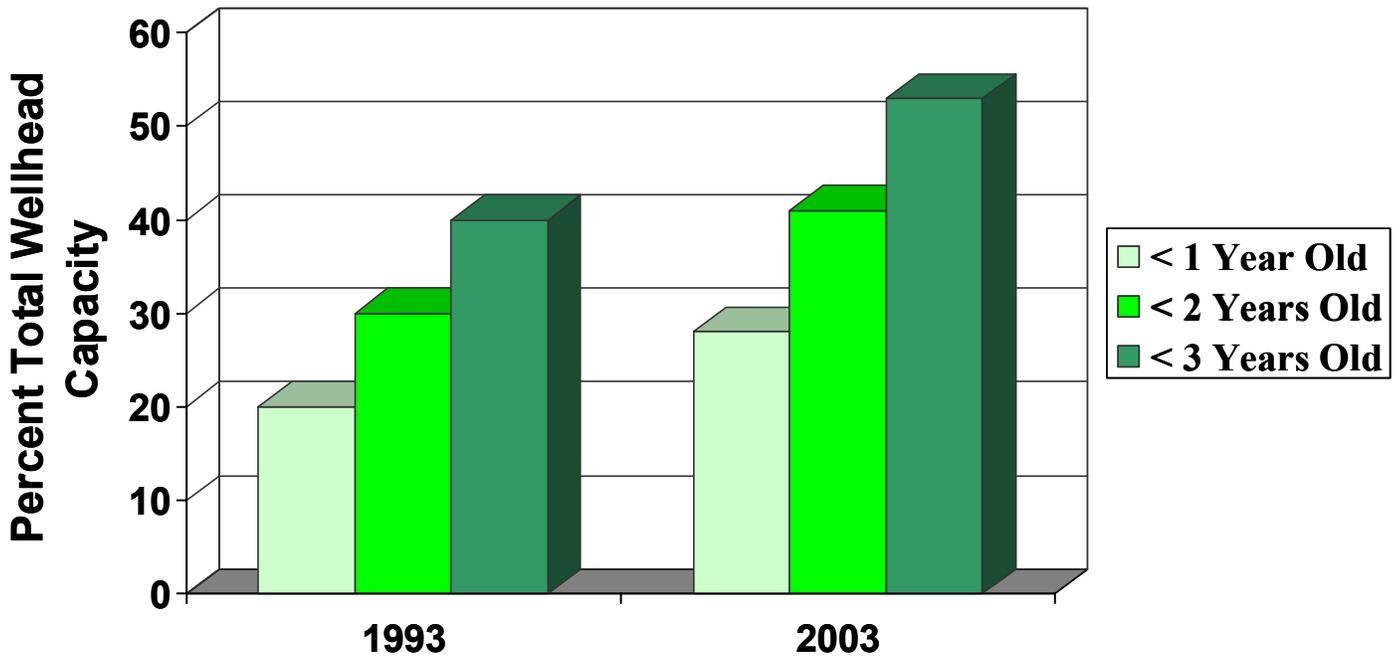
Natural gas production declined in 2002. Part of the loss was due to the effects of hurricane activity in the Gulf of Mexico in September and October. The last significant disruption in gas supply prior to the fall of 2002 was September of 1998. (While hurricanes regularly threaten platforms in the Gulf of Mexico, actual production impacts that are considered significant are not really very frequent and, when they do occur they tend to be short-lived.) Production is expected to increase by 2.2 percent this year. High natural gas prices and sharply higher oil and natural gas field revenues are expected to drive a resurgence in natural gas-directed drilling activity this year following a downturn in 2002. Monthly oil and natural gas field revenues are expected to continue to average close to

\$400 million this year. Domestic production growth should continue in 2004 but, given recent experience, the extra effort might result in increases of less than 2 percent from 2003 levels. The prospects for significant reductions in natural gas wellhead prices over the forecast period from the current high levels hinges in large measure on the productivity of the expected upsurge in drilling in terms of expected output.

### U.S. Oil and Gas Field Revenues



### Lower 48 Gas Well Productive Capacity Share By Well Age



Source: EIA

## Net Imports

Prospects for sharp increases in net imports in 2003 are limited but we do expect to see an overall increase in 2003 of about 2 percent. Substantial increases in LNG imports are possible and we believe that they have made a noticeable contribution already this year. Canadian exports to the United States were up 3-4 percent from year ago in early 2003. Any growth in gross imports is likely to be offset partially by increased exports to Mexico, which have been rising sharply in recent years.

## Prospects for Price Volatility

In light of the current low storage levels, chances of continued price volatility are great. Let me raise some factors that could contribute to volatility and analyze their likely impacts, as summarized in the Table below. To examine these effects, we ran the model under alternative assumptions.

### Volatility Factors

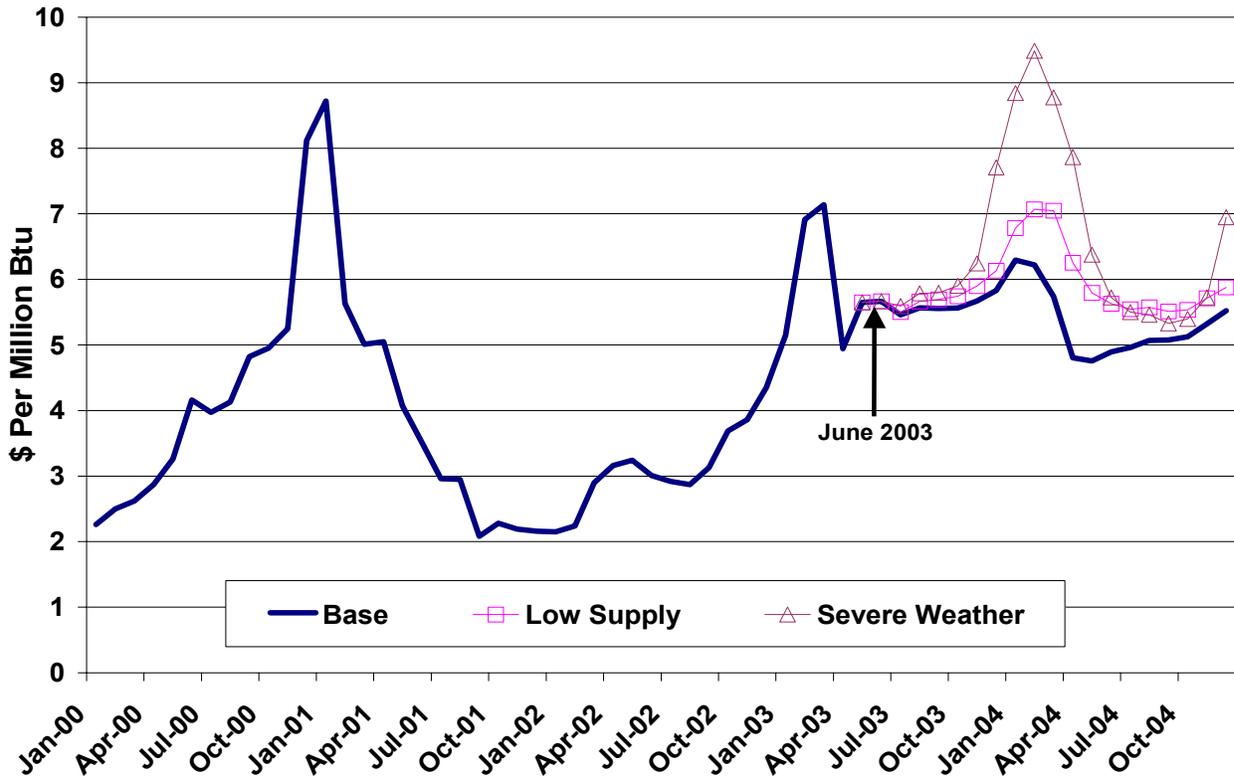
Factor	Assumption	Price Impact
Weather	10% Hotter Summer/Colder Winter Relative to Normal	50%-60% higher peak price this winter
Lower than expected domestic supply	Productive capacity continues to weaken, no production growth in 2003	10%-20% higher peak price this winter

The table shows that a significant tightening of the U.S. natural gas market and much higher prices than expected in our base case are possible under some plausible scenarios. One development that could generate more difficult market conditions than are already in prospect is the weather. An abnormally hot summer followed by a cold winter could push natural gas deliverability to the limit and cause record average prices this winter. The severe weather case considered here is an extreme case but one that merits attention given the lack of storage cushion. It is also apparent that less robust assumptions about natural gas productive capacity and near-term production could shift average prices well above our base case. It appears that for every 1 percent that production falls below our base case assumptions, we can expect 5-10 percent higher peak prices this winter. These estimated average impacts mask the potential for much more dramatic spikes in prices for short periods (a few days to a few weeks). Such spikes are characteristic of net demand surges in the context of low natural gas storage. Thus, current and prospective conditions in the U.S. gas market significantly increase the probability of very sharp short-term spikes on top of generally high levels of natural gas prices.

There are no detailed estimates concerning the extent to which industrial output weakness seen since 2000 is attributable to the recent episodes of natural gas price strength. It is obvious, however, that many industries dependent upon natural gas for basic processes and operations have been hurt by high natural gas prices. Part of the short-term market response to the current imbalance in supplies may be to let high prices back out industrial activity to insure that higher-valued demands, such as heating, are met. While the price volatility described in this section is clearly possible, it is not a foregone conclusion. Normal weather, improved productivity from

newer natural gas wells and other factors could serve to moderate price increases. It is also important to note that recent history illustrates that price volatility is usually short-lived.

### Spot Natural Gas Price Scenarios



Sources: History: EIA; Projections: Short-Term Energy Outlook, June 2003

### Longer-Term Natural Gas Market Analysis

The longer-term natural gas projections provided in this testimony were produced using the National Energy Modeling System (NEMS), a computer-based, energy-economy modeling system of U.S. energy markets through 2025. NEMS projects annual production, imports, consumption, and prices of energy, subject to assumptions on macroeconomic and financial factors, world energy markets, resource availability and costs, behavioral and technological

choice criteria, cost and performance characteristics of energy technologies, and demographics. Two of the key inputs to NEMS are re world oil prices and macroeconomic growth.

World oil prices averaged about \$23.43 per barrel in 2002 in 2001 dollars. Between now and 2025 they are expected to rise to about \$26.60 a barrel in 2001 dollars, as world oil demand increases from 78 million barrels per day to 119 million barrels per day.<sup>1</sup> Real gross domestic product (GDP) is projected to grow at an annual average rate of 3.0 percent between 2001 and 2025.

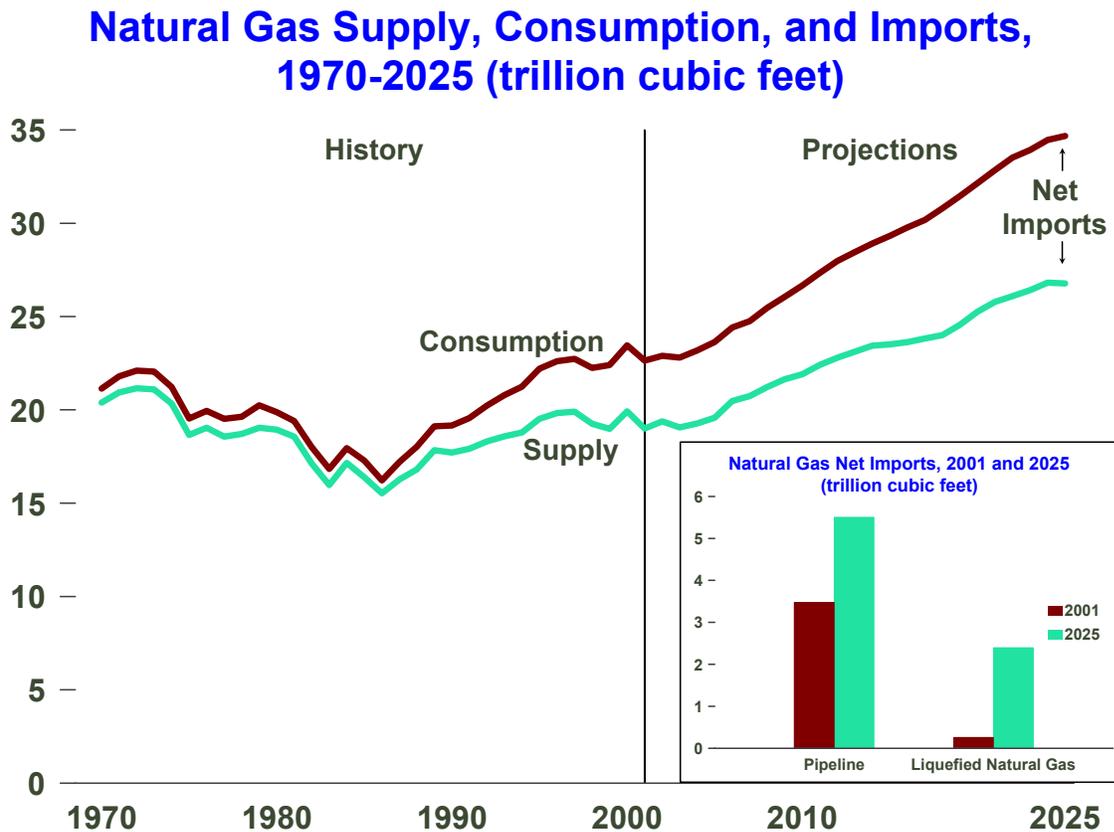
The natural gas projections discussed in this testimony are based on the most current NEMS configuration, which EIA recently used in analyzing a 10 percent renewable portfolio standard, as requested by Senator Bingaman.

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<sup>1</sup> Energy Information Administration, International Energy Outlook 2003, Table A4, page 185.

## Natural Gas Outlook to 2025

By 2025 total natural gas consumption is expected to increase to almost 35 trillion cubic feet (Tcf) or 26 percent of U.S. delivered energy consumption.



Domestic gas production is expected to increase more slowly than consumption over the forecast, rising from 19.5 Tcf in 2001 to 26.4 Tcf in 2025. Growing production reflects increasing natural gas demand and is supported by rising wellhead gas prices, relatively abundant gas resources, and improvements in technologies, particularly for unconventional gas.

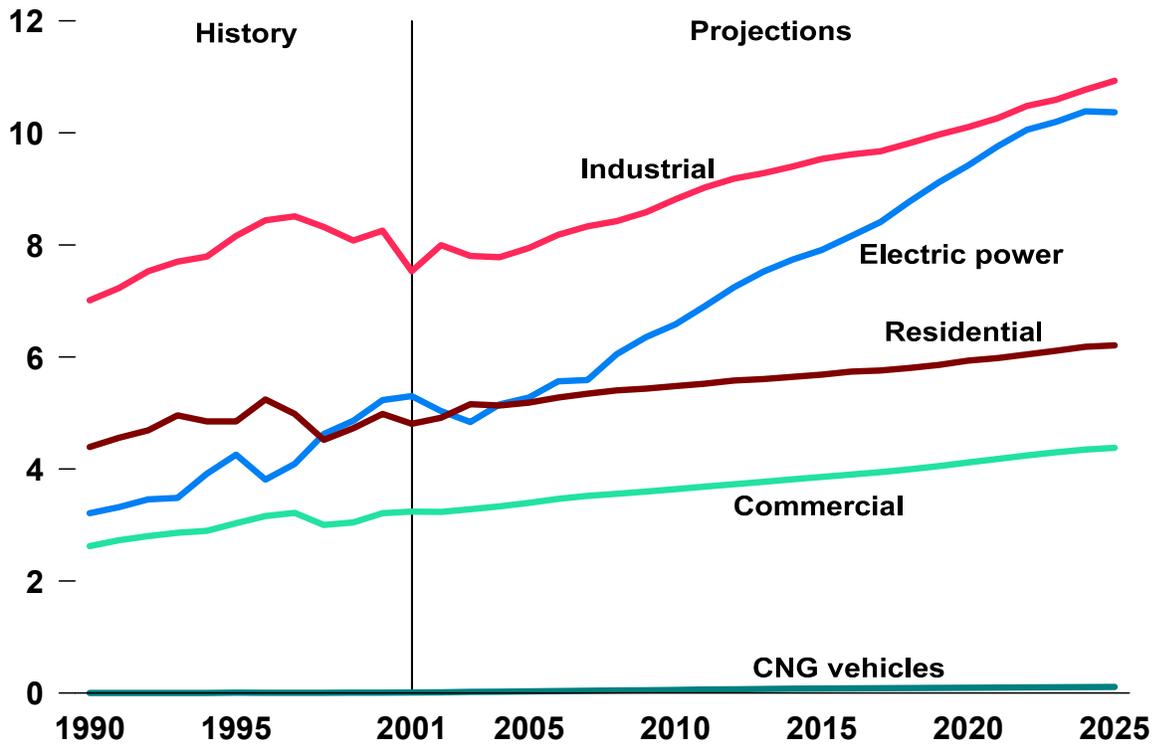
In this forecast, economic conditions allow an Alaskan pipeline to begin moving gas to the lower 48 States in 2020. The national average wellhead price is projected to reach \$3.95 per Mcf in 2001 dollars by 2025.

The difference between consumption and production is made up by increasing use of imports throughout the forecast, particularly from liquefied natural gas (LNG), with a 2.1 Tcf increase expected over 2001 levels. By 2025 we expect expansion at the four existing terminals and construction of three new LNG terminals.

**Consumption.** U.S. natural gas consumption is expected to increase by 1.8 percent annually from 2001 through 2025. Gas consumption by electric generators is expected to double over the forecast, from 5.3 Tcf in 2001 to 10.4 Tcf in 2025, an average annual growth rate of 2.8 percent. Demand by electricity generators is expected to account for 30 percent of total natural gas consumption in 2025.

Most new electricity generation capacity is expected to be fueled by natural gas, so natural gas consumption in the electricity generation sector is projected to grow rapidly throughout the forecast as electricity consumption increases. Although average coal prices to electricity generators are projected to fall throughout the forecast, gas-fired generators are expected to have advantages over coal-fired generators, including lower capital costs, higher fuel efficiencies, shorter construction lead times, and lower emissions.

## Natural Gas Consumption by Sector, 1990-2025 (trillion cubic feet)



Historically the industrial sector, excluding lease and plant fuel, is the largest gas-consuming sector, with significant amounts of gas used in the bulk chemical and refining sectors. Industrial consumption is expected to increase by 3.4 Tcf over the forecast, driven primarily by macroeconomic growth. The chemical and metal durables sectors show the largest growth.

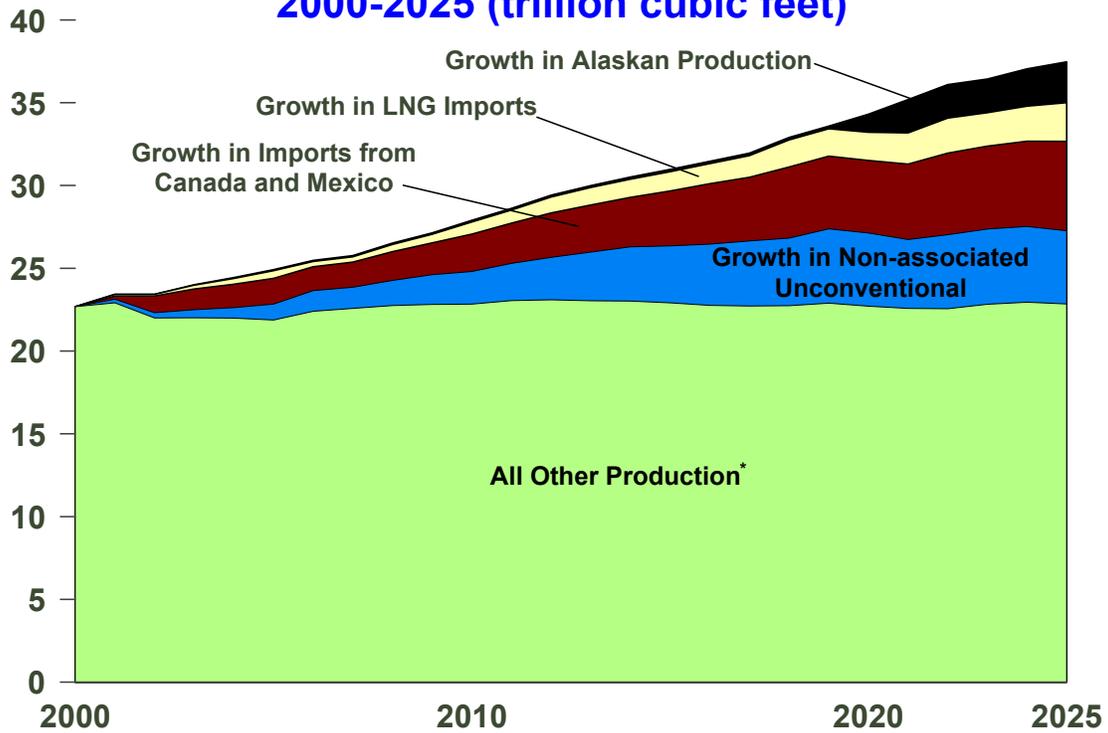
Combined consumption in the residential and commercial sectors is projected to increase by 2.5 Tcf from 2001 to 2025, driven by increasing population, healthy economic growth, and gradually rising prices in real terms. Natural gas remains the overwhelming choice for home heating throughout the forecast period, with the number of natural gas furnaces rising nearly 18 million.

**Production.** The forecast estimate of total technically recoverable natural gas resources as of January 1, 2002, is 1,289 Tcf. These resource assessments come primarily from the assessments done by the U.S. Geological Survey for onshore regions and by the Mineral Management Service for the offshore.

These resources included 183 Tcf of proved reserves (9 years of consumption at 20 Tcf per year), 222 Tcf of inferred reserves, and 269 Tcf of undiscovered nonassociated conventional resources. The largest category was unconventional resources at 445 Tcf, with most of that in tight sandstones at 71 percent. Other unconventional natural gas resources include gas shales and coalbed methane. Alaska gas (32 Tcf) and associated-dissolved natural gas in lower 48 crude oil reservoirs (137 Tcf) round out the resource.

Increased U.S. natural gas production through 2025 comes primarily from unconventional sources and from Alaska. Unconventional gas production increases by 4.2 Tcf over the forecast period—more than any other source, largely because of expanded tight sands gas production in the Rocky Mountain region. Annual production from unconventional sources is expected to account for 36 percent of production in 2025, more than any other source, compared to 28 percent today.

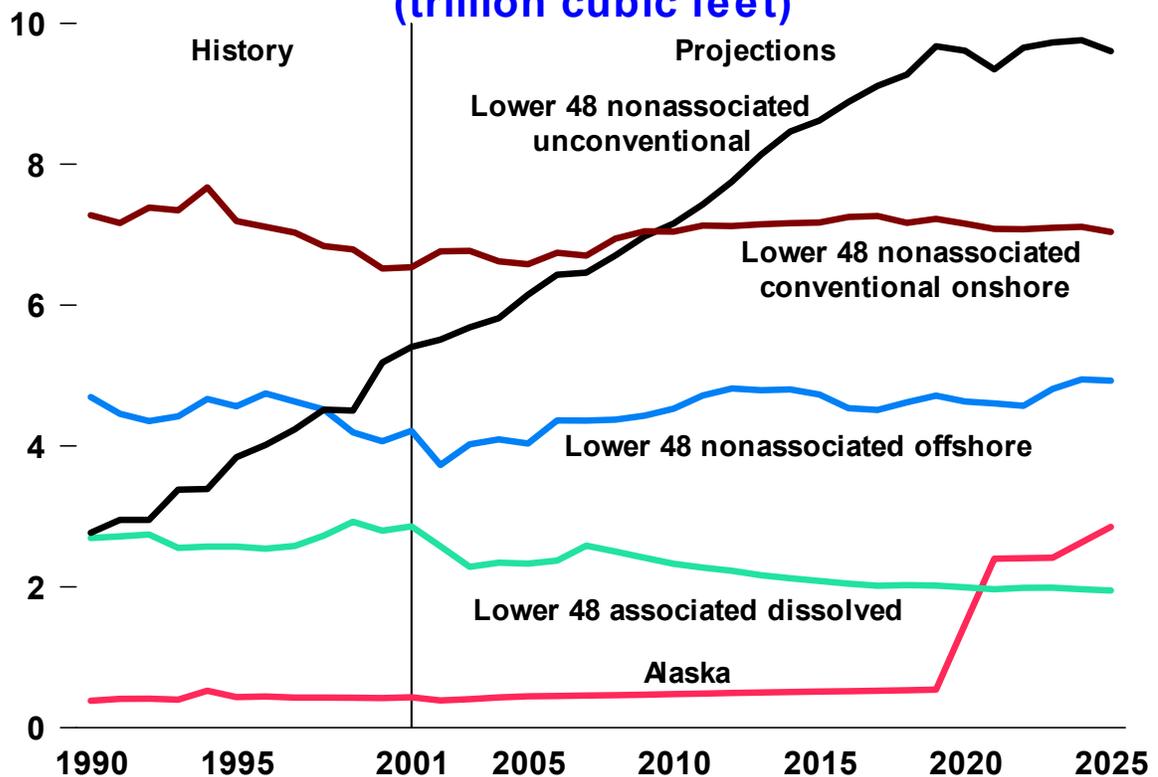
## Major Sources of Incremental Natural Gas Supply, 2000-2025 (trillion cubic feet)



\*Includes total associated-dissolved, non-associated conventional, lower-48 offshore, and Supplemental natural gas production. Also includes 2002 Canadian, Mexican, and LNG imports and Alaskan and non-associated unconventional production.

Conventional onshore non-associated production increases by 500 Bcf over the forecast, driven by technological improvements and rising natural gas prices. However, its share of total production declines from 34 percent in 2001 to 27 percent by 2025. Non-associated offshore production adds 710 Bcf, with increased drilling activity in deep waters; however, its share of total U.S. production declines from 22 percent in 2001 to 19 percent by 2025.

## Natural Gas Production by Source, 1990-2025 (trillion cubic feet)



**Depletion.** A key question facing producers and policymakers today is whether natural gas resources in the mature onshore lower 48 States have been exploited to a point at which more rapid depletion rates eliminate the possibility of increasing—or even maintaining—current production levels at reasonable cost.

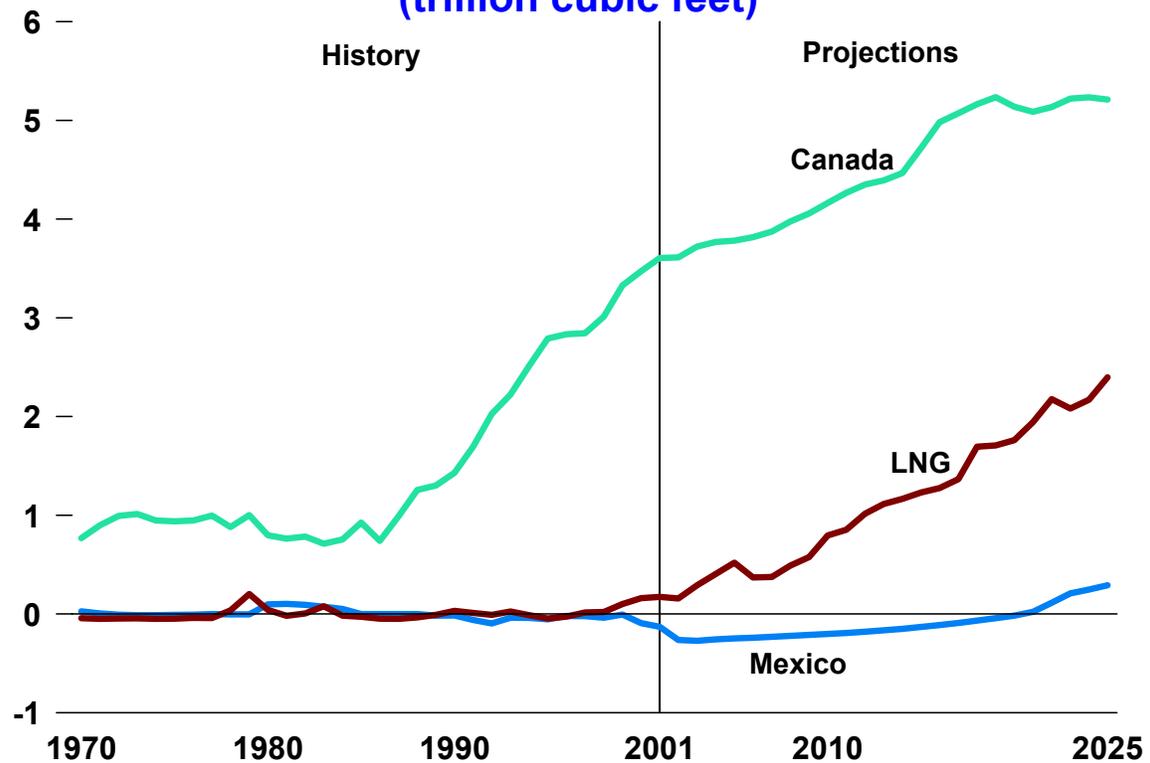
Depletion is a natural phenomenon that accompanies the development of all nonrenewable resources. Physically, depletion is the progressive reduction of the overall volume of a resource over time as the resource is produced. In the petroleum industry, depletion may also more narrowly refer to the decline of production associated with a particular well, reservoir, or field. As existing wells, reservoirs, and fields are depleted, new resources must be developed to replace depleted reservoirs.

Depletion has been counterbalanced historically by improvements in technology that have allowed gas resources to be discovered more efficiently, have extended the economic life of existing fields, and have allowed natural gas to be produced less expensively, making available resources that previously were too costly to develop. In these natural gas projections, technological progress for both conventional and unconventional recovery is expected to continue to enhance exploration, reduce costs, and improve production technology.

The depletion of conventional and unconventional natural gas resources is expected to continue over the projection period as the demand for natural gas increases significantly, continuing the trend that began in the mid-1990s. Nevertheless, with sustained wellhead prices generally over \$3 per thousand cubic feet (in 2001 dollars) and continued technological improvements, lower 48 nonassociated gas production is expected to increase above current levels.

**Imports.** Net imports of natural gas, primarily from Canada, are projected to increase from 3.7 trillion cubic feet in 2001 to 7.9 trillion cubic feet in 2025. Imports contributed 16 percent to total natural gas supply in 2001, compared to an expected 23 percent in 2025.

## Natural Gas Net Imports, 1970-2025 (trillion cubic feet)



Just over half of the increase in U.S. imports is expected to come from LNG. Much of the increase comes from expansion at existing sites, but three additional facilities are also projected. By 2025, LNG imports are expected to equal 7 percent of total U.S. gas supply.

Growth in pipeline imports from Canada partly depends on the completion of the MacKenzie Delta pipeline. The initial full flow rate into Alberta is assumed to be 1.5 Bcf per day. Additional Canadian imports will come from the Scotian Shelf in the offshore Atlantic. The forecast of Canadian imports largely depends on the ability of Canadian producers to economically produce and market their untapped unconventional resources,

particularly coalbed methane. Net imports from Canada are projected to provide 15 percent of total U.S. supply in 2025 in the reference case, about the same as in 2001.

**Wellhead Prices.** In the mid-term, gas prices are projected to move higher as technology improvements and new supply sources prove unable to completely offset the effects of resource depletion and increased demand.

Natural gas prices through 2025 are projected to increase in an uneven fashion as major new, large-volume supply projects temporarily depress prices when initially brought online. Examples include deep and ultra-deep offshore projects in the Gulf of Mexico, unconventional gas (tight sands, coalbed methane, shale), liquefied natural gas facilities (both the expansion of existing and development of new facilities), the MacKenzie Delta pipeline in Canada, and an Alaskan natural gas pipeline that delivers gas supplies to the lower 48 States.

In the reference case, average wellhead natural gas prices are expected to be \$3.95 per thousand cubic feet (2001 dollars) in 2025. The increase reflects rising demand for natural gas and the impact of the progression of discoveries from larger and more profitable fields to smaller, less economical ones. In current dollars, natural gas prices reach \$7.15 in 2025.

**End-Use Prices.** End-use natural gas prices are expected to increase gradually starting in about 2005 as a result of increasing wellhead prices. A portion of the increase in

wellhead prices is expected to be offset by a projected decline in average transmission and distribution margins as a larger proportion of the natural gas delivery infrastructure becomes fully depreciated. The average end-use price is expected to increase by 40 cents per thousand cubic feet between 2005 and 2025 (in constant 2001 dollars), compared with an increase of 72 cents per thousand cubic feet in the average price of domestic and imported natural gas supplies over the same period. Part of this difference is attributable to an increasing share of natural gas sold to electric generators, the sector with the lowest prices.