

Natural Gas Winter Outlook 1999-2000

By James M. Todaro

This article is based on the Winter Fuels Outlook published in the 4th Quarter *Short-Term Energy Outlook* and discusses the supply and demand outlook from October 1999 through March 2000. For a more complete picture of the situation facing other heating fuels (heating oil and propane), see *Short-Term Energy Outlook* (October 1999, pages 1-16).

This winter is expected to have both higher space-heating demand and natural gas prices than those seen during the previous winter season. Prices at the wellhead and on the spot market in October are estimated to be 35 to 60 percent higher than last year, respectively. In addition, compared to last year the NYMEX futures contract for November delivery was trading at prices that were over 40 percent higher this October. Coupled with the prospect of a more normal¹ winter season bringing colder temperatures than last winter, consumers are likely to incur higher natural gas

heating bills this winter compared to their bills in the previous heating season. Nonetheless, supplies of natural gas are expected to be more than adequate to meet winter demand. The incremental requirements of a severe winter should be met without serious difficulty as well, but, in that event, consumer prices could be much higher than those of a normal winter season.²

Mainly because of the likelihood of higher natural gas prices this winter, expenditures by residential consumers for heating (or other energy uses) this winter are likely to be relatively large, especially in comparison to costs seen in the past two winters (1997-1998 and 1998-1999). Table SR1 illustrates the impact of these higher natural gas costs and different weather conditions on winter heating bills for a typical household in the Midwest. It summarizes three scenarios: a base case assuming normal weather; a cold weather (10 percent colder-than-normal) scenario; and a warm weather (10

Table SR1. Illustrative Midwest Consumer Prices² and Expenditures per Household, for Natural Gas in Winter

	1996-1997 Actual	1997-1998 Actual	1998-1999 Actual	1999-2000 Projections		
				Base	Warm Weather	Cold Weather
Natural Gas (Midwest)						
Consumption (Mcf)	91.4	82.4	83.5	90.2	82.5	97.9
Expenditures (\$)	606	546	524	625	568	687
Average Price (\$/Mcf)	6.63	6.62	6.28	6.93	6.89	7.02
\$/Mcf =Dollars per Thousand Cubic Feet						

1 Normal degree-days, as defined for this analysis, are calculated by EIA on a month-to-month basis in such a way as to incorporate temperature trends identified through research done by the National Oceanographic and Atmospheric Administration. The methodology is discussed in an EIA analysis paper titled "The Impact of Temperature Trends on Short-Term Energy Demand," which may be accessed on the EIA web site at www.eia.doe.gov/emeu/steo/pub/special/weather/temptrnd.html. The new methodology for identifying expected degree-days, which replaced the practice of assuming standard 30-year degree-day normals based on 1961-1990 monthly population-weighted averages, has been used as the basis for EIA's *Short-Term Energy Outlook* forecasts since September 1999.

2 These calculations focus on the Midwest region of the country with respect to per-household consumption and projected weather factors (i.e., changes in heating degree-days) but utilize the national average consumer prices for natural gas presented in the 4th Quarter *Short-Term Energy Outlook*. Thus, heating bill calculations are illustrative of the magnitude of the expected changes in natural gas heating bills but are not necessarily indicative of the absolute expenditure levels to be anticipated by individual consumers.

percent warmer-than-normal) scenario case. The higher and lower cases are not particularly likely (the probability of winter weather deviating from normal by at least 10 percent is estimated to be about 5 percent). However, these ranges for weather variation yield realistic upper and lower bounds for energy market behavior over the upcoming heating season.

For Midwest households that primarily use natural gas, heating fuel bills could be about 19 percent higher if the region experiences a more normal winter weather pattern than last year. (For residential consumers in the Midwest who heat with heating oil or propane, the **Short-Term Energy Outlook** (STEO) forecast calls for expenditure increases of 44 and 36 percent, respectively, during the 1999-2000 winter.) On the other hand, the base case for the upcoming winter would not be very different from the experience of the 1996-1997 winter, in terms of fuel demand levels and cost. During that period, winter temperatures were close to normal.

Demand

A return to normal weather will see demand increase

Total natural gas demand is expected to move higher this winter, averaging 70.4 billion cubic feet (Bcf) per day, an increase of 5.9 percent compared with last year's

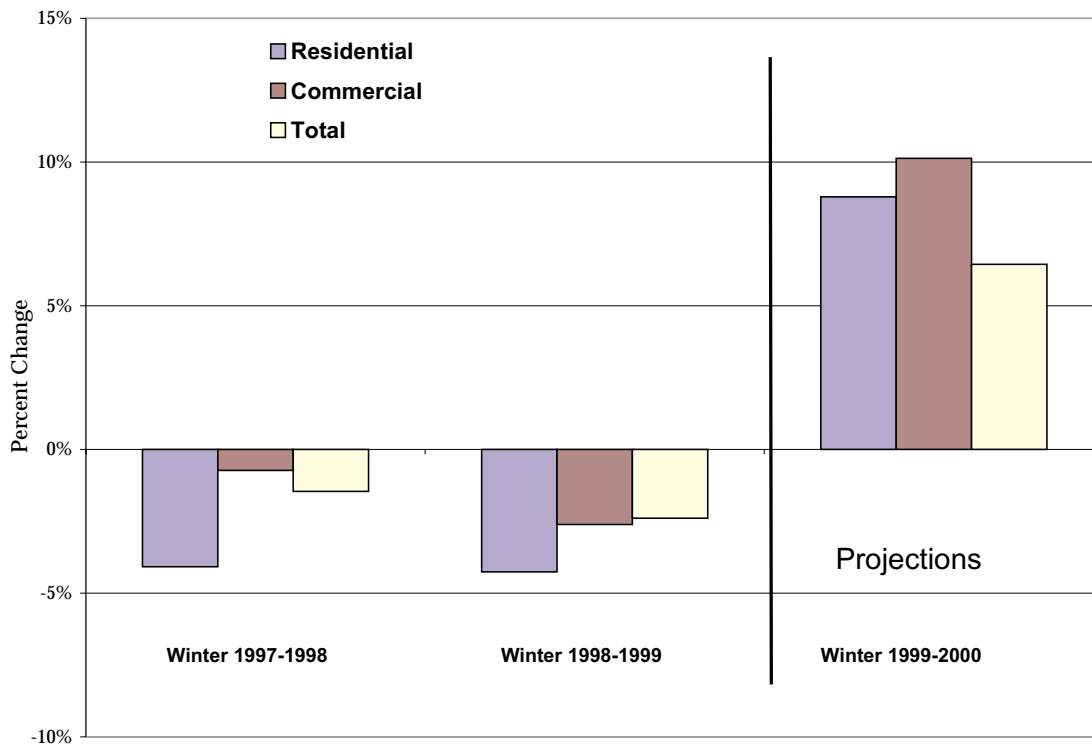
daily average of 66.5 Bcf per day. Contributing to the growth in winter demand is the increase in gas space-heating customers (about 1 percent). Most of the increase is related to assumptions of a return to more normal weather patterns. Milder weather last winter resulted in gas-weighted heating degree-days that were 3.5 percent below normal, although several Midwestern areas experienced weather as much as 6.5 percent warmer than normal. As a result, winter consumption in residential and commercial markets is expected to average 20.7 and 12.6 Bcf per day, respectively, up about 9 percent and 10 percent from the previous winter's consumption (Figure SR1).

Supply

Stock levels are about the same as last year's 5-year high

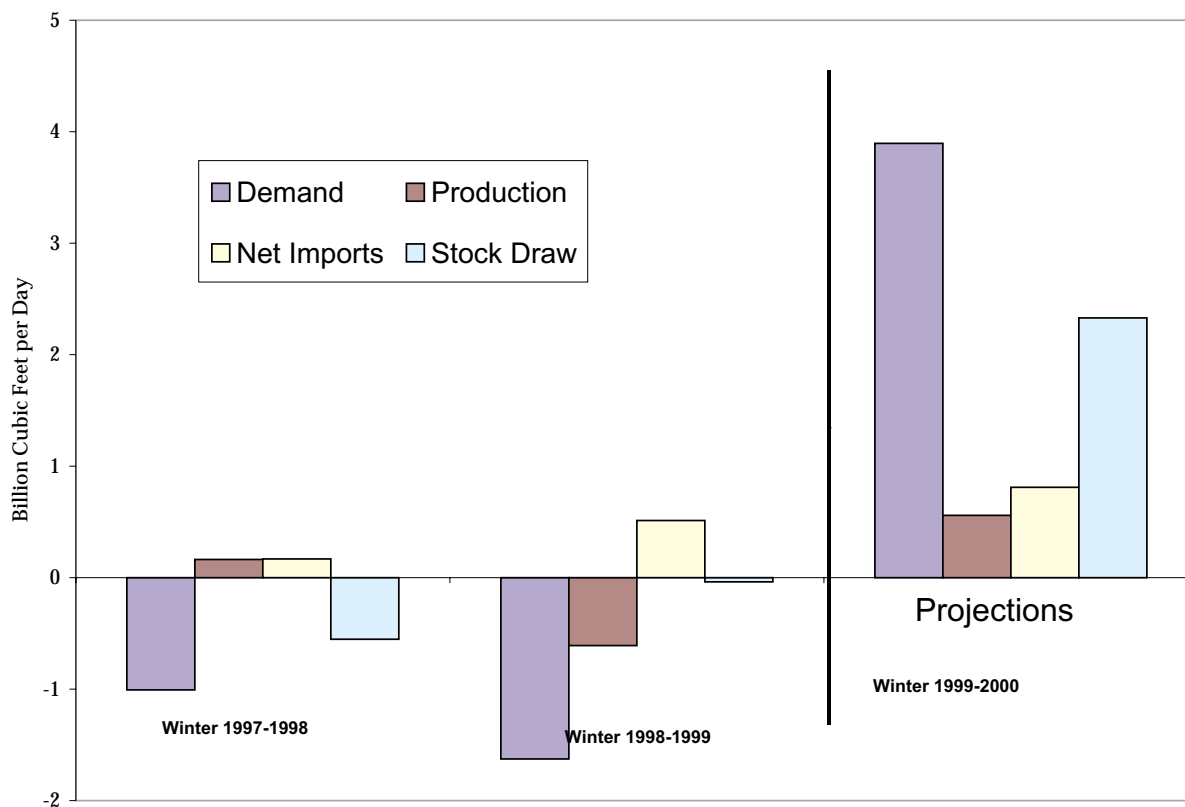
Domestic gas production is expected to average 51.8 Bcf per day during the heating season, up slightly from the 51.2 Bcf per day during the previous winter (Figure SR2). Drilling activity for both oil and gas had dropped sharply in the first quarter of 1999 in reaction to the decline in the price of oil. The total rig count reached a low of 496 in April—44 percent below last April's rig count of 886. Since then, rig counts

Figure SR1. Change in Winter Natural Gas Demand



Sources: Energy Information Administration *Natural Gas Monthly* (September 1999), and the *Short-Term Energy Outlook* (October 1999).

Figure SR2. Change in Natural Gas Supply



Sources: Energy Information Administration *Natural Gas Monthly* (September 1999), and the *Short-Term Energy Outlook* (October 1999).

have recovered with the rise in the price of crude oil. By mid-October, the rig count had reached 740, with 599, or 80 percent, of the rigs dedicated to gas exploration. The sharp drop in drilling early in the year and the lead time needed to bring properties to production has been a concern of many in the industry this past spring and summer. However, the Energy Information Administration (EIA) believes that sufficient production capacity remains to meet the moderate increase in production requirements projected here for the base case and for the severe weather scenario.

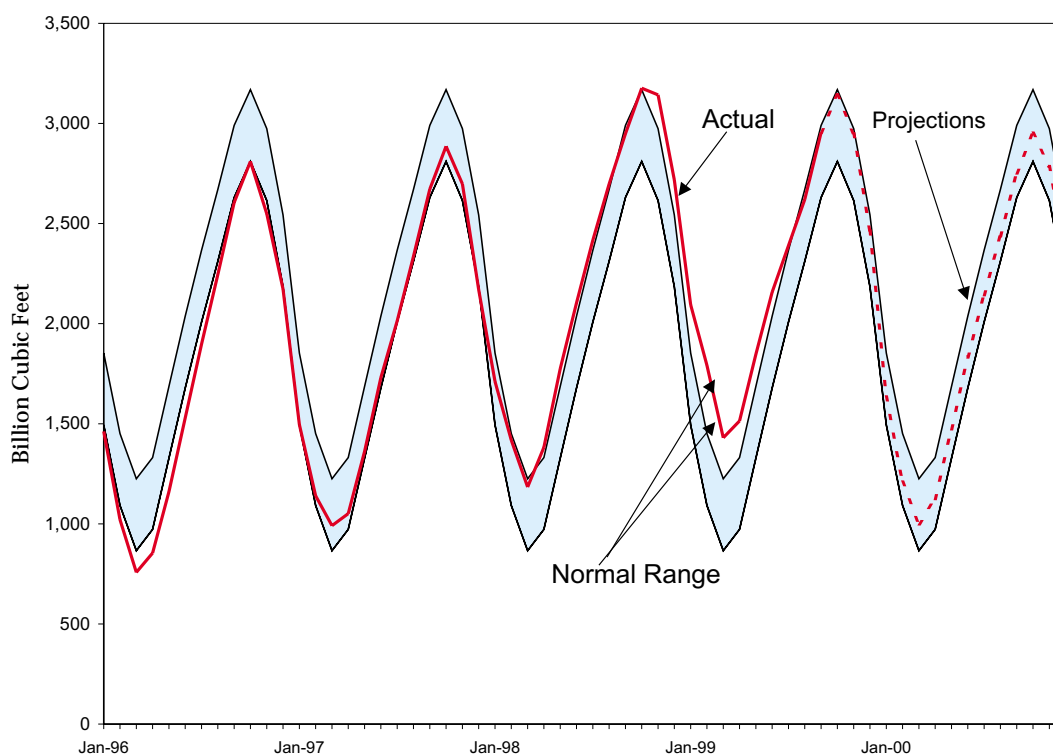
Working gas storage at the beginning of October is estimated to have reached 2,956 Bcf, slightly above last season's 5-year high of 2,949 Bcf but significantly greater than the October 1, 1998 level of 2,672 Bcf and at the high end of the normal range (Figure SR3). Since 1994 the average stock level on October 1, has been 2,786 Bcf. This year's level is estimated to be 170 Bcf or 6 percent above the average for the previous 5 years.

Storage plays an important role in meeting increased seasonal demand. In many areas of the country, it is a

critical supply source for local distribution companies to meet peak demand requirements. During the 1999-2000 heating season, withdrawals are expected to be significantly higher than last year's to meet the additional demand, averaging 10.7 Bcf per day compared to last year's average of 8.4 Bcf per day. Owing to larger projected withdrawals this winter, end-of-season stocks of working gas are projected to be 1,000 Bcf. This level is comparable to the 990 Bcf seen at the end of the 1996-97 heating season with relatively normal weather. Not surprisingly, it is much below the 1,430 Bcf at the end of the last heating season (March 31, 1999) with its warmer than normal temperatures.

The storage refill season, which runs from April through October and may often continue into November, got off to a slow start this year as only 90 Bcf was added to the working gas level in April compared with almost 200 Bcf in April 1998. Net injections returned to a more normal level in May and June as over 300 Bcf was added in each of those months (see NGM, Table 9, on page 21). The refill rate slowed in July and August as record setting summer heat waves affected major gas consuming areas in the

Figure SR3. Working Gas in Storage



Note: The normal range is developed using a seasonal adjustment procedure developed by the Bureau of the Census ("Census X-11"). The procedure uses monthly natural gas stock levels for the 7 most recent years, reported to the EIA on Form EIA-191, "Underground Gas Storage Report," to calculate seasonal factors. These seasonal factors are then applied to the monthly stock levels for the most recent 3 years to compute the average band, or range, for natural gas stocks.

Sources: Energy Information Administration *Natural Gas Monthly* (September 1994, 1997, and 1999), and the *Short-Term Energy Outlook* (October 1999).

Midwest, the Northeast, and the Southwest. The high temperatures increased electric utility use of natural gas in order to meet the demand for air-conditioning. Based on the EIA estimate of 2,956 Bcf in storage on October 1, the industry would need to add only 31 Bcf of gas during October to reach the 5 year average level of 2,987 for November 1. Estimates of weekly injections published by the American Gas Association indicate that over 100 Bcf of gas has already been added to stocks during the first 3 weeks of the month.

Natural gas imports are expected to contribute 14 percent of demand during the period, averaging 9.6 Bcf per day. This is 9 percent above last year's 8.7 Bcf per day. During the winter months, net imports are about 10 percent higher than flows during the rest of the year and usually increase to full pipeline capacity. That capacity, which had remained unchanged for the previous few years, increased in late 1998 as three construction projects were completed, expanding deliverability of Canadian gas by almost 1 Bcf per day. The largest of these projects, the expansion of the Northern Border pipeline system, increased im-

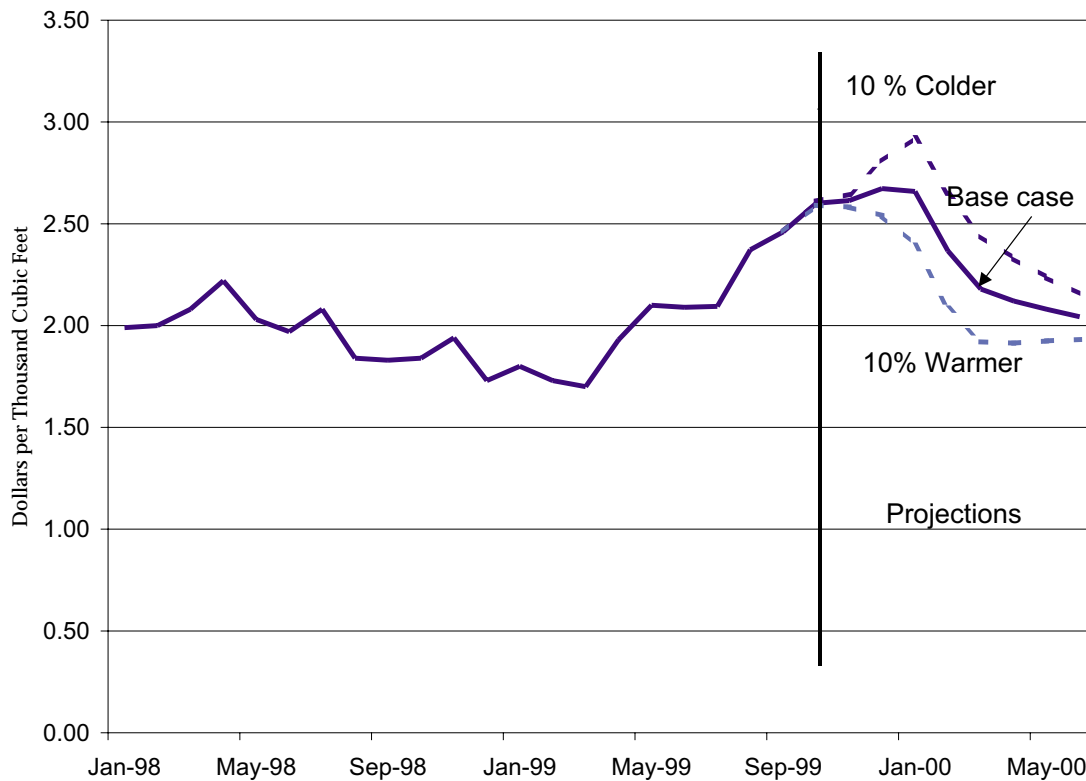
port capacity into the Midwest by 700 million cubic feet per day.

Price and Expenditures

Higher wellhead prices and normal weather will result in higher residential expenditures.

Natural gas wellhead prices are projected to average about \$2.50 per thousand cubic feet (Mcf) this winter, 40 percent above the \$1.79 per Mcf average price seen a year ago. Last winter, the average wellhead price in October was low going into the winter at \$1.83, rose slightly to \$1.94 by November before sliding to \$1.70 by the end of the heating season. This was the lowest price in real terms since October 1995's \$1.54 per Mcf. Contributing to the low price of natural gas last season were the mild temperatures in several major gas-consuming markets (such as the Midwest), elevated stock levels, and collapsing oil prices. This year's higher oil prices and expected higher demand have already brought much higher gas prices than last year's (Figure SR4).

Figure SR4. Natural Gas Wellhead Prices: Weather Scenarios



Sources: Energy Information Administration *Natural Gas Monthly* (September 1999), and the *Short-Term Energy Outlook* (October 1999).

In mid-October of this year, natural gas prices on the NYMEX futures market for the upcoming winter season were trading 20 to 40 percent above those of last year (Figure SR5). Prices paid by residential consumers are also expected to move up, averaging \$6.93 per Mcf, up 10 percent from last winter's average of \$6.28. Consumers could see slightly higher or lower prices during the winter, depending on whether abnormally cold or warm conditions develop (Figure SR6).

Other Weather Scenarios

Under a severe weather pattern, in which heating-degree days are 10 percent colder than normal, gas consumption could increase by an additional 3.6 Bcf per day—or 5.1 percent—from the base case, rising to 74.0 Bcf per day. The additional demand would be met primarily through an almost 25-percent increase in storage withdrawals, which would increase by 2.6 Bcf per day reaching a draw down of 13.3 Bcf

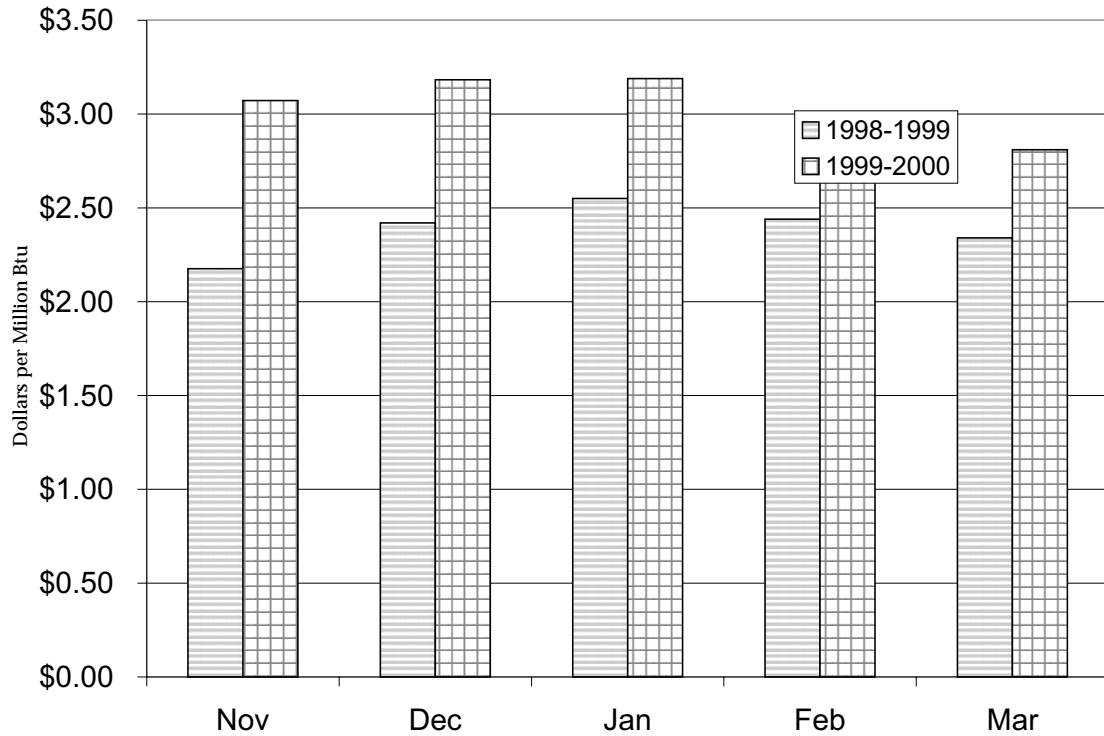
per day. The other two supply sources would also increase, with production growing about 1.0 Bcf per day to reach 52.8 Bcf per day and natural gas imports

from Canada increasing by 0.5 Bcf to exceed 10 Bcf per day. The heavy dependence on stock withdrawals would leave 525 Bcf of working gas in inventory at the end of the heating season, 230 Bcf below 1996's record low of 755 Bcf. The sharp increase in demand would bring about a corresponding price movement, which could provide strong motivation for even larger increases in production and import levels than those contained in the STEO severe weather forecast.

The price reaction to such a severe draw on stocks would be hard to predict and is likely to be quite large. At a minimum, with the increased demand, wellhead prices would move up by at least \$0.20 per Mcf to average \$2.70 or more, and residential prices would increase by \$0.13 to average \$7.06 per Mcf. Residential demand would increase by 1.8 Bcf per day, or 9 percent. The combined impact of higher demand and prices resulting from a severe winter would raise the average space-heating bill by 10 percent above the bill for the base case for the typical gas-heated household (Table SR1).

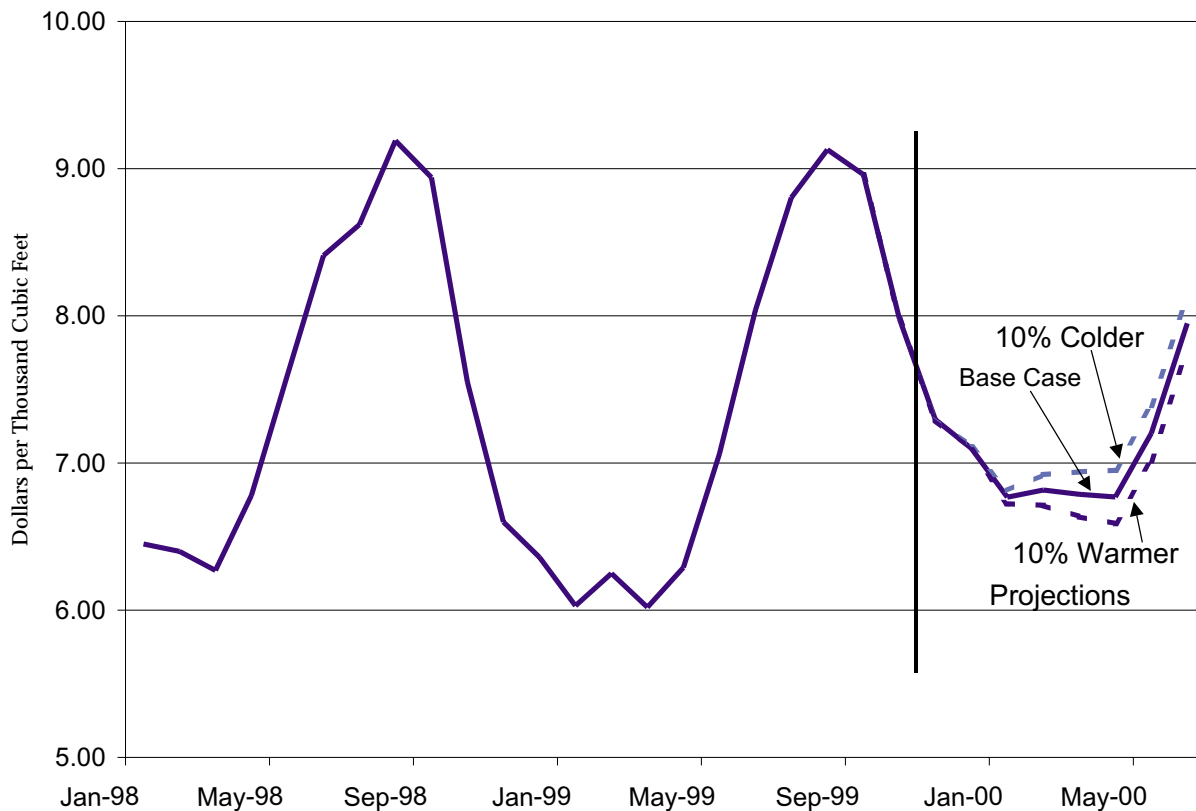
Under a mild weather pattern (10 percent warmer than normal), total natural gas consumption would decline by 4.6 Bcf per day, or 6.5 percent, from that of

Figure SR5. Natural Gas Futures Prices for Winter Months 1998-1999 and 1999-2000, on October 22, 1998 and 1999, Respectively



Source: Futures Prices-Commodity Futures Trading Commission, Division of Economic Analysis.

Figure SR6. Residential Natural Gas Prices: Weather Scenarios



Sources: Energy Information Administration *Natural Gas Monthly* (September 1999), and the *Short-Term Energy Outlook* (October 1999)

the base case reducing consumption to 65.8 Bcf per day. Under this scenario, residential demand would decline by 1.7 Bcf, or 9 percent, averaging 18.9 Bcf per day. The need for withdrawals from storage would also decrease to an average of 7.8 Bcf per day, 2.9 Bcf per day less than under normal weather, leaving end-of-season working gas inventories of 1,536 Bcf. This would be the highest stock level at the end of the heating season since March 1992's 1,574 Bcf. (It should be noted that the working gas stock level on November 1, 1991, was 3,370 Bcf.) The warm weather and reduced demand would see a projected decline in wellhead prices to an average \$2.37 per Mcf, \$0.13 lower than under normal weather conditions. In a warmer-than-normal winter, the price to residential consumers would average \$6.89 per Mcf, \$0.04 less than under the assumptions of a normal winter.

Conclusion

The actual outcome regarding the demand, supply, and price of natural gas for this winter will depend very much on the weather. Natural gas commodity or wellhead prices, particularly spot and futures prices, can show high volatility on a daily basis and are very sensitive to shifts in working gas in storage, which is critical for meeting winter demand peaks. For residential gas customers, increases in wellhead costs are passed on with a lag without the volatility seen in the commodity market because of monthly billing cycles and various state regulatory functions. The result is a more moderate increase in the typical residential gas bill compared to those of other fuel users.