

Winter Fuels Outlook: 2002-2003

Introduction

This report provides a summary of the winter outlook for demand, supply and prices for several key domestic heating fuels, including natural gas, heating oil and propane. The results discussed here are based on the forecast results obtained for the October 2002 Short-Term Energy Outlook plus special scenarios generated for this article. For the purposes of the analysis, winter is defined as the period from October through March.

Highlights

- *Higher expected heating demand this winter, augmented by generally higher fuel prices, strongly suggests the likelihood that household energy expenses during the 2002-2003 heating season will be up noticeably compared to last year's lower-than-average bills. Heating oil customers in particular could see large relative increases this winter (45 percent), due mainly to the impact on fuel oil costs from tighter world oil markets and higher crude oil prices. Nevertheless, expenditures should still be well below the very high levels seen two years ago.*
- *Increases in fuel bills depend heavily on the weather. With normal temperatures as the baseline assumption, heating demand increases could range between 12 and 18 percent, depending on the region.*
- *Heating fuel expenditure increases could range between 19 percent (natural gas) and 45 percent (heating oil). Increases in this range appear likely across most of the country except for the West Region, which could see lesser increases or even declines due to disparate weather patterns.*
- *Heating fuel inventory levels are currently near normal or above normal. This situation should minimize the risk of even higher cost increases that may result from colder-than-normal weather. Natural gas storage is at a 10-year high; propane inventories are the highest for this time of the season in four years, and distillate inventories, while somewhat below average, are still well above the recent minimum for this time of year. Nevertheless, mid-winter stock levels for distillate are expected to deteriorate relative to normal, thus posing a risk of higher prices if weather turns colder than normal.*
- *The National Weather Service has indicated a modest chance of warmer winter temperatures in key heating regions due to El Niño. Thus, the assumption of normal weather for the baseline may overstate demand and expenditure increases slightly. However, the analysis (which excludes explicit consideration of El Niño) suggests that the chances of household winter heating expenditures rising by at least 10 percent this winter are over 90 percent for most of the country.*

Overview

Heating fuel markets are starting the 2002-2003 heating season with near-average or above-average inventory levels. As a result, the risk of extreme price runups this winter is low. However, fuel costs are expected to be up this winter compared to last year, particularly for heating oil. Tight oil markets have generated sharp increases in crude oil costs since last winter, and this situation is expected to last through the heating season. Residential heating oil prices could be up about 22 percent from last winter, if weather is normal for the heating season. Smaller increases in price (6-9 percent) are expected for natural gas and propane. Residential electricity prices, which nationally have remained fairly stable over the last few years, are not expected to change materially.

Increases in heating fuels demand on a year-over-year basis are expected, given the mild weather conditions seen last winter. Nationally, heating degree-days would be up about 12 percent compared to last winter if normal weather conditions prevail. The increase would be about 19 percent in the Northeast, the region in which the preponderance of total U.S. heating oil demand occurs.

Average wholesale and retail prices of the major heating fuels are projected to be higher than those observed last winter. Reasons for the increases include: higher crude oil costs resulting from production control by OPEC; slightly higher refinery marginal costs resulting from the requirements of a normal winter compared to those of last year's very mild season; and higher natural gas wellhead prices resulting from low levels of drilling activity earlier this year, expansion of demand by power-generation facilities, and a recovery of industrial demand projected to accelerate during the winter season.

Both natural gas and propane markets are expected to be well supplied under most circumstances, due primarily to the ample availability of primary inventories. Beginning-of-season (end-of-September) working gas storage is estimated to be 3,058 bcf, 114 bcf higher than last year and the highest in 11 years. Propane stocks at the outset of this winter season are estimated to stand at 71.5 million barrels, 4.5 million barrels higher than last year and the highest level in 4 years. Imports of these fuels play an important, but secondary, role in meeting heating demand. Inventories are projected to accommodate the bulk of additional fuel requirements.

Heating oil supplies, while not extremely low, are less plentiful than those of natural gas and propane, although the supply system for heating oil is more flexible than for other fuels. Beginning-of-season stocks are estimated to be 130 million barrels, 3 million higher than those of the previous winter, but in the lower half of the previous 5-year range. Domestic production and imports are able to respond to distillate demand shifts more easily than other fuels such as natural gas. However, because of the high cost of crude oil this winter, incremental supplies will be costly and price responses to demand surges may be significant. This will be particularly true if distillate inventories slip further below normal during the fourth quarter, a development that appears likely. Thus, a strong upward price risk emerges for heating oil if winter temperatures move well below normal.

Heating Bills

Table WF1 below summarizes historical and base case (normal weather) demand, total expenditure, and price projections for key heating fuels on a per household basis. The calculations focus on particular regions of the country with respect to consumption and projected weather factors (i.e., changes in heating degree-days) however, they assume national average consumer prices for heating fuels presented in the *Short-Term Energy Outlook*. Thus, heating bill calculations illustrate the magnitude of the expected changes in fuel bills rather than the actual expenditures incurred by individual consumers.

Table WF1. Illustrative Consumer Prices and Expenditures for Heating Fuels During the Winter

	1999-2000 Actual	2000-2001 Actual	2001-2002 Actual	2002-2003 Base Forecast
Natural Gas (Midwest)				
Consumption (mcf)	81.7	99.1	81.3	91.3
Avg. Price (\$/mcf)	6.69	9.54	7.33	7.78
Expenditures (\$)	546	945	596	710
Heating Oil (Northeast)				
Consumption (gals)	644	731	584	692
Avg. Price (\$/gal)	1.16	1.37	1.10	1.35
Expenditures (\$)	751	999	643	934
Propane (Midwest)				
Consumption (gals)	807	979	803	902
Avg. Price (\$/gal)	1.02	1.37	1.10	1.20
Expenditures (\$)	824	1344	887	1082

Notes: Consumption based on typical per household use for regions noted.

Prices shown are national average delivered-to-household prices.

As Table WF1 shows, expenditures for this winter are likely to be up noticeably from those of last winter as a result of both higher demand and higher prices. In our base case projections, the expenditure increases for households are: 19 percent for natural gas, 45 percent for heating oil and 22 percent for propane. Although sharp increases in residential heating bills are expected this winter, anticipated expenditures should still be below the level seen during the 2000-2001 winter, the fifth coldest in the last 25 years. During that winter, very low storage levels at the onset of the season and a cumulative slump in new supply capacity due to previous drilling declines caused a sharp spike in natural gas prices. Current high storage levels minimize the risk of a similar run-up this year.

The results shown in Table WF1 appear to be broadly applicable (in relative terms) across all major regions in the United States. An exception to this general conclusion applies to the Western U.S. (i.e., the Census Bureau's Western Region). Based on the observation that winter weather in the West was colder than normal last winter (by about 2 percent overall), the probability of heating demand (and expenditures) actually being lower this year in the West is rather high. Most of the heating demand in

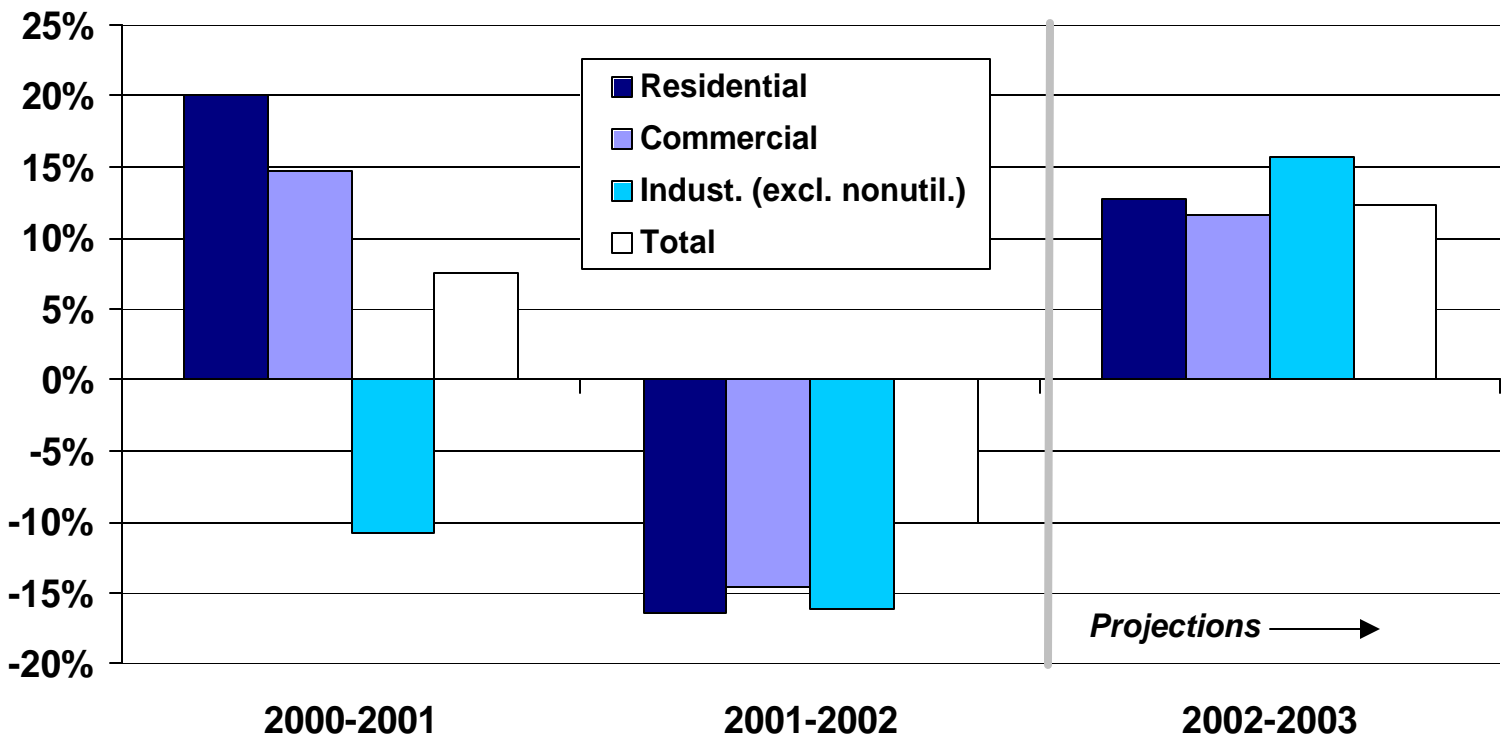
the West is met by natural gas, so about 15 percent of the natural gas heating market may not see demand pressure above last year's level.

Natural Gas

Demand

Total winter natural gas demand is expected to average 73 billion cubic feet (Bcf) per day for the upcoming winter, up about 12 percent from last winter (Figure WF1). This increase largely reflects the assumed return to normal winter temperatures, a sharp contrast to the previous year when the country experienced heating degree-days (HDDs) that were almost 13 percent lower than normal. A typical residential customer in the Midwest is projected to see a more than 12-percent increase in natural gas consumption in the upcoming heating season (October to March) compared to the previous winter (Table WF1). Another factor contributing to increased natural gas demand is the continued recovery in the U.S. industrial economy by the fourth quarter of this year and into the first quarter of 2003.

Figure WF1. U.S. Winter Natural Gas Demand
(Year-to-Year Percent Change)



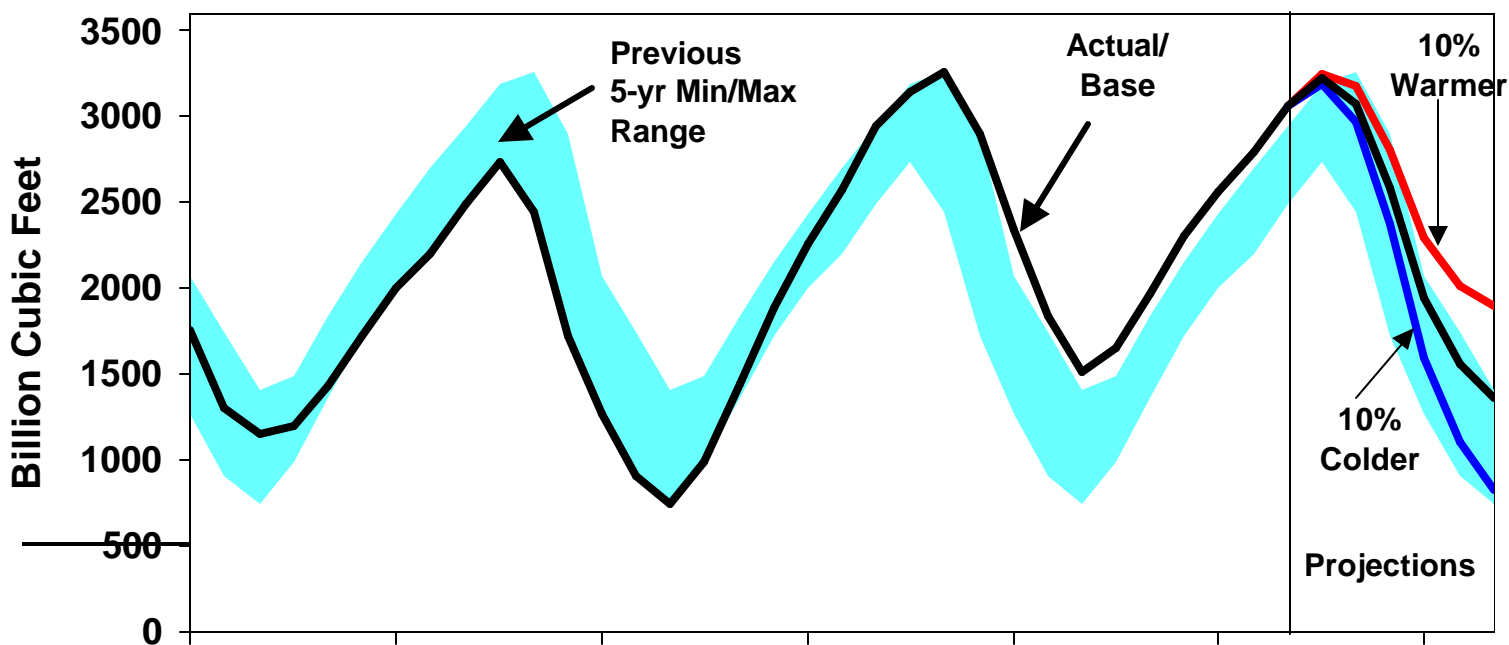
Supply

Domestic natural gas production during the upcoming winter is expected to average 53.0 Bcf per day, 1 percent less than in the previous winter. Contributing to the decline in production is the nearly year-long decline in the number of rigs drilling gas prospects and relatively full working gas in storage. From its all-time high of 1,068 during the week ended July 13, 2001, the natural gas rig count declined

steadily through the early spring of this year. However, after bottoming out at 591 active rigs during the first week of April 2002, the rig count has crept back up to above 700, and has consistently stayed above this level through September, when the average rig count was 736 rigs. Increased production from the steep increase in drilling activity last year, coupled with warmer-than-normal temperatures and slackening of industrial demand last winter, led to relatively low wintertime prices last year, with the composite natural gas wellhead price averaging \$2.42 per Mcf. But the reduced drilling and rising oil prices began to be reflected in higher natural gas prices this spring, when the wellhead price moved up to \$3.01. Nevertheless, despite a very hot summer and high peak electricity demands, natural gas storage levels have remained above normal.

As in previous winters, gas supplies are expected to respond to changes in demand. Net imports and withdrawals of working gas are expected to augment production. Storage withdrawals especially have a key winter supply role. As this heating season approaches, natural gas inventories are well above recent historical averages. Storage levels have been strong all year, with end-of-month levels exceeding the previous 5-year (1997-2001) average by double-digit percentages in every month thus far. Partly because of the unusually warm temperatures last winter, natural gas stocks began the refill season (April-October) at 1,518 Bcf—the highest level in 10 years. Since then, net injections through September are estimated to be 1,540 Bcf, about 5 percent greater than the 5-year average. The resulting working gas stock of 3,058 Bcf exceeds the greatest level for this date over the past 5 years by about 114 Bcf (Figure WF2). On a regional basis, stock levels in the Producing and Consuming West regions are particularly strong, as inventories in these regions are over 19 percent higher than their respective 5-year averages (see EIA’s latest [Weekly Natural Gas Storage Survey Report](#) for details). EIA projects that by November 1 total natural gas stocks will be 3,221 Bcf, or 7 percent greater than the 5-year average. If this level is reached, it would also be a 10-year high. Thus, natural gas inventory levels are likely to be sufficient to handle the projected demand increases for this winter, including weather-related temporary surges. Storage withdrawals are projected to average about 9.3 Bcf per day, about 20 percent greater than during last winter. Despite the high withdrawals, end-of-winter stocks are projected to be 1,364 Bcf, more than 200 Bcf above average for the end of season.

Figure WF2. Working Gas in Storage



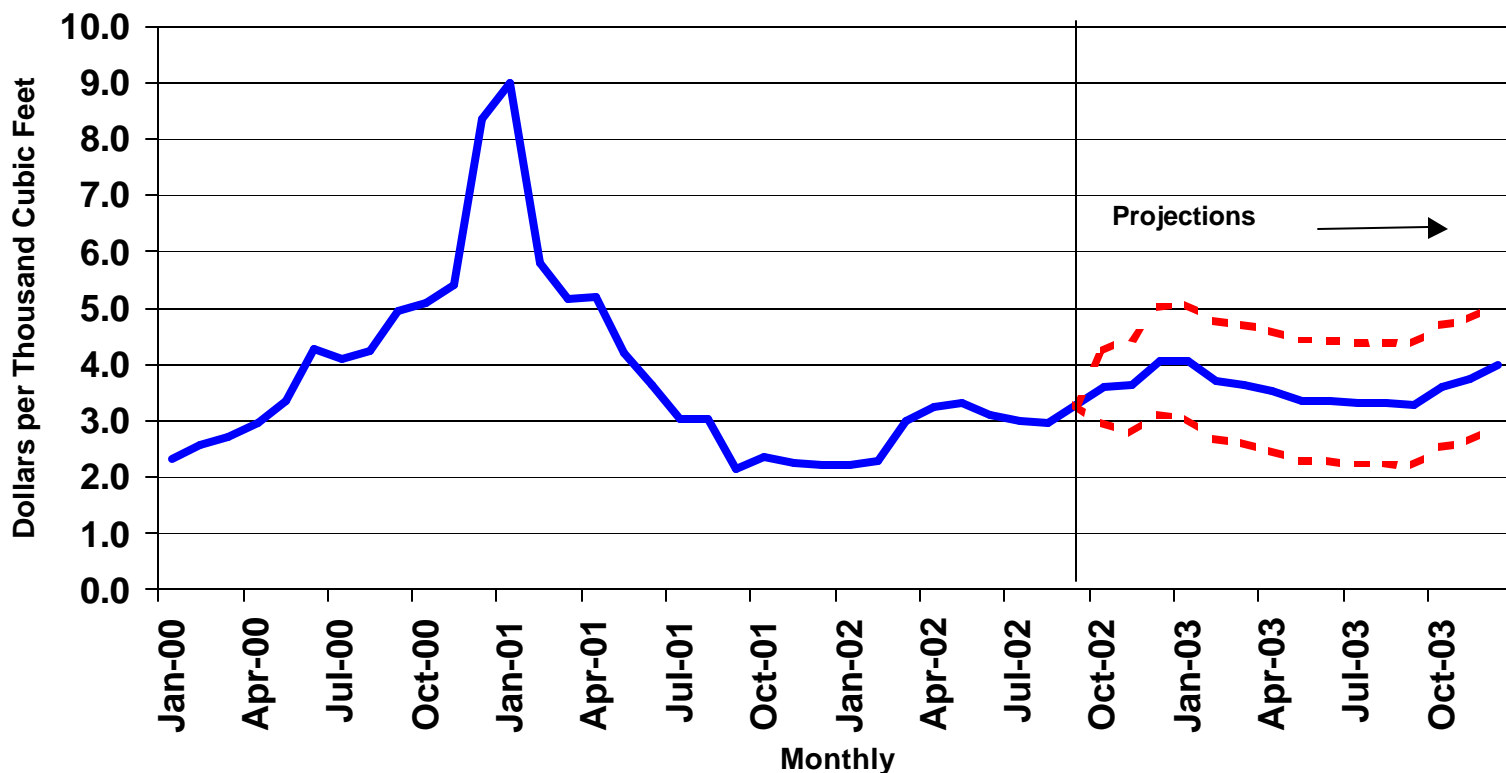
The vast majority of net imports come as natural gas shipped via pipeline from Canada. Since the completion of the Alliance Pipeline in late 2000, which added about 1.35 Bcf per day of import capacity from Western Canada to the Midwest, little new pipeline capacity from Canada has been brought on line. Despite the large incremental flow along the Alliance pipeline, net imports are projected to provide 9.51 Bcf per day of supply this winter, 0.6 percent higher than during the previous winter.

Prices

Mild winter weather, ample supplies and slowing growth in industrial activity reduced demand and minimized upward price pressures for natural gas during the 2001-2002 winter (Figure WF3). With the assumed return of normal temperatures during the 2002-2003 winter season and the expected growth in industrial consumption, the wellhead price for natural gas is projected to move up 38 percent compared to last winter. Wellhead prices are projected to average \$3.34 per thousand cubic feet (Mcf) compared to the previous winter's \$2.42 per Mcf (Table WF2). The higher wellhead prices will raise prices paid by residential consumers but not to the full extent of the increase in wellhead prices. Residential prices are expected to average \$7.75 per Mcf, an increase of 5.7 percent from the winter of 2001-2002. Although higher than last winter, residential prices will be considerably below those of two years ago when U.S. average prices were about \$9.50 per Mcf.

If most parts of the country experience warmer-than-normal winter temperatures, as happened last year, prices may move lower than currently projected as space heating demand would decrease. On the other hand, if tensions in the Middle East increase, causing reductions in oil supply below baseline levels, sharply higher oil prices could result in increased demand for natural gas in the industrial and power sector, driving winter natural gas prices up.

Figure WF3. Natural Gas Spot Wellhead Prices: Base Case and 95% Confidence Intervals



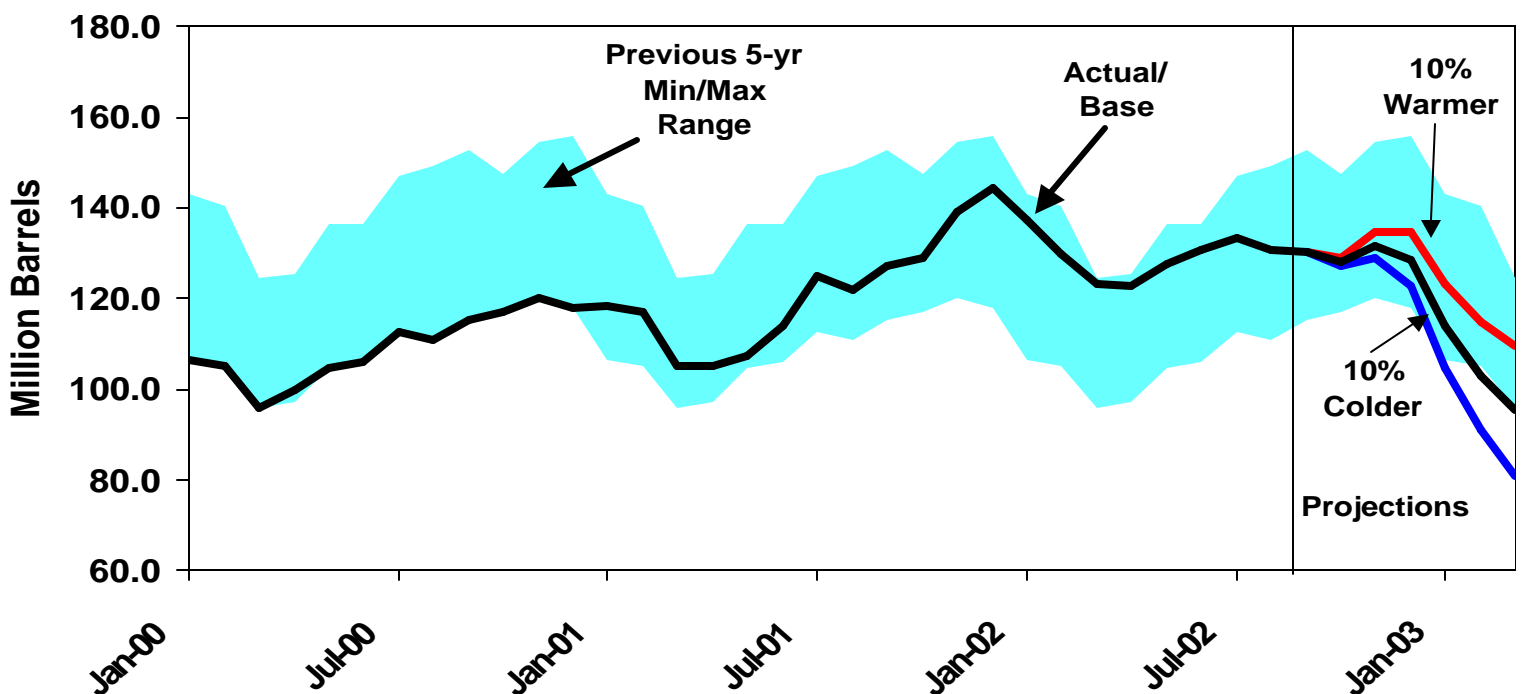
Heating Oil

Supply and Demand

Last winter, heating oil consumers experienced the warmest winter on record and much lower retail prices than the previous year as crude oil prices slumped. The average residential household's consumption of heating oil declined by 20 percent last winter, and the average per-gallon price dropped by a similar amount. As a result, heating bills for that season fell on average by 36 percent. This winter, those developments are expected to be reversed. Heating oil demand is projected to be 19 percent higher than last winter, and prices are projected to rise 22 percent to near levels previously seen two winters ago. The combined effect of greater demand and higher prices is projected to produce residential heating oil bills that, on average, will be about 45 percent higher than last winter.

Total distillate fuel demand is projected to be 4.01 million barrels per day, up 240,000 barrels per day (6.3 percent) from that of the previous winter. Total refinery distillate output is projected to average 3.63 million barrels per day, down slightly from last winter. The average distillate yield is projected to increase by 23.8 percent, with an average refinery utilization of 90.1 percent. Primary inventories are projected to accommodate most of the year-to-year increases in winter distillate demand. With end-September inventories at an estimated 130 million barrels, 3 million barrels higher than at the start of the previous winter, an average inventory draw rate of 190,000 barrels per day is expected, compared to 20,000 barrels per day last year. End-of-season stocks are therefore projected to be 95 million barrels, down substantially from the 123 million barrels recorded at the end of last year. That is at or below the previous 5-year minimum, (see Figure WF4) although it is more than the estimated 85 million barrels needed to avoid disruptions in the distribution of the fuel

Figure WF4. U.S. Distillate Fuel Stocks

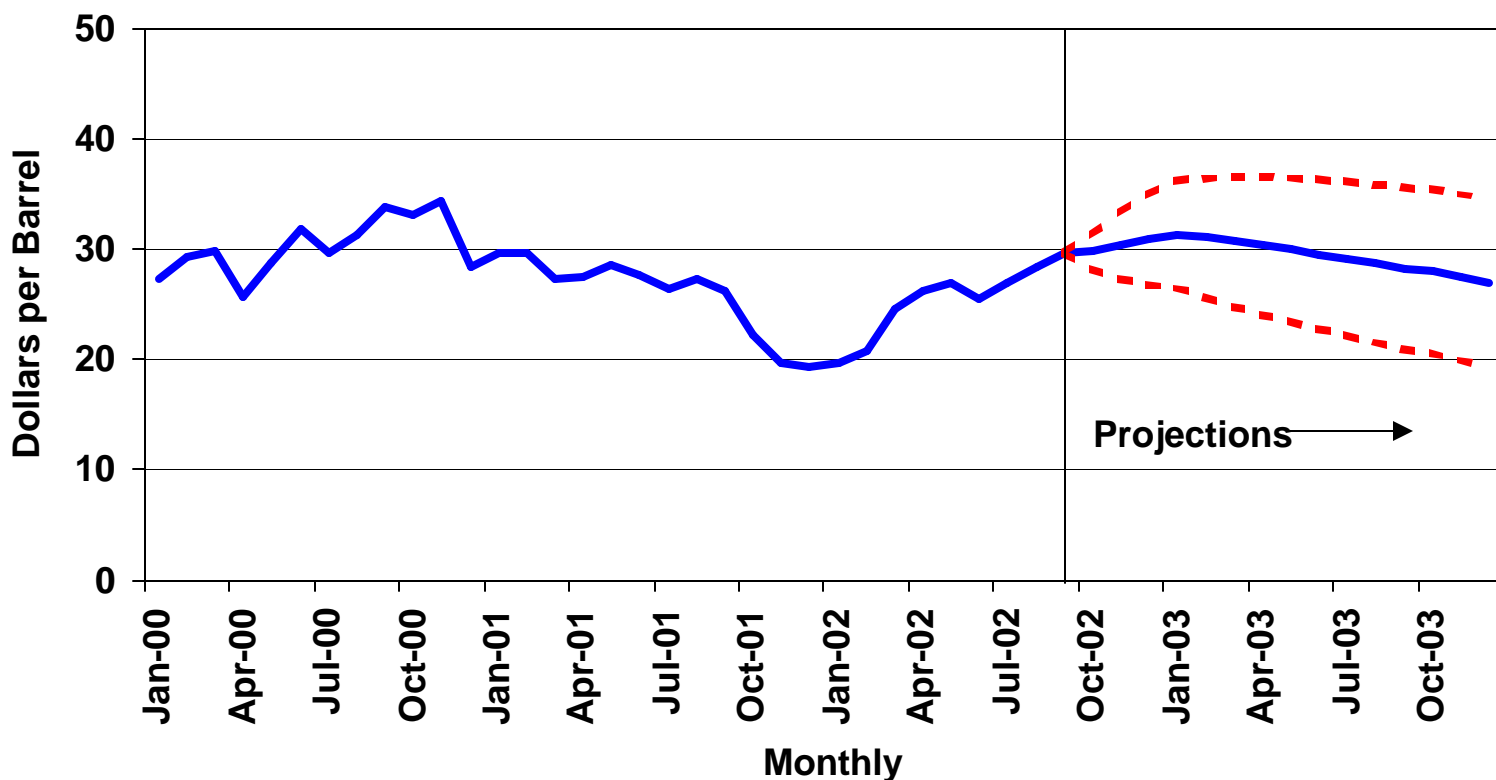


It should be noted that the base case forecast assumes no unusual demand spikes resulting from forced switching or unusual refinery disruptions.

Prices

Crude oil costs to U.S. refineries are projected to average \$28.60 per barrel (68.2 cents per gallon), up \$10.50 per barrel, or 25 cents per gallon, 58 percent above the low levels of the previous winter season. Figure WF5 depicts the base case crude oil price projection. In the near term, strong expected demand growth, enhanced significantly by assumptions of normal weather, are likely to push average prices above \$30 during the winter period. Once the peak demand period is over, prices should ease but remain high (above \$25) until world inventories move toward more comfortable levels (perhaps by 2004). The 95-percent confidence interval reflects uncertainties inherent in projecting oil prices, such as aberrant weather patterns and OPEC's ability to influence prices in the event of continued economic weakness in consuming countries.

Figure WF5. WTI Crude Oil Price: Base Case and 95% Confidence Interval



As mentioned above, for the upcoming winter season, retail heating oil prices are projected to average \$1.35 per gallon in the base case, which is 25 cents more than the previous winter season's average.

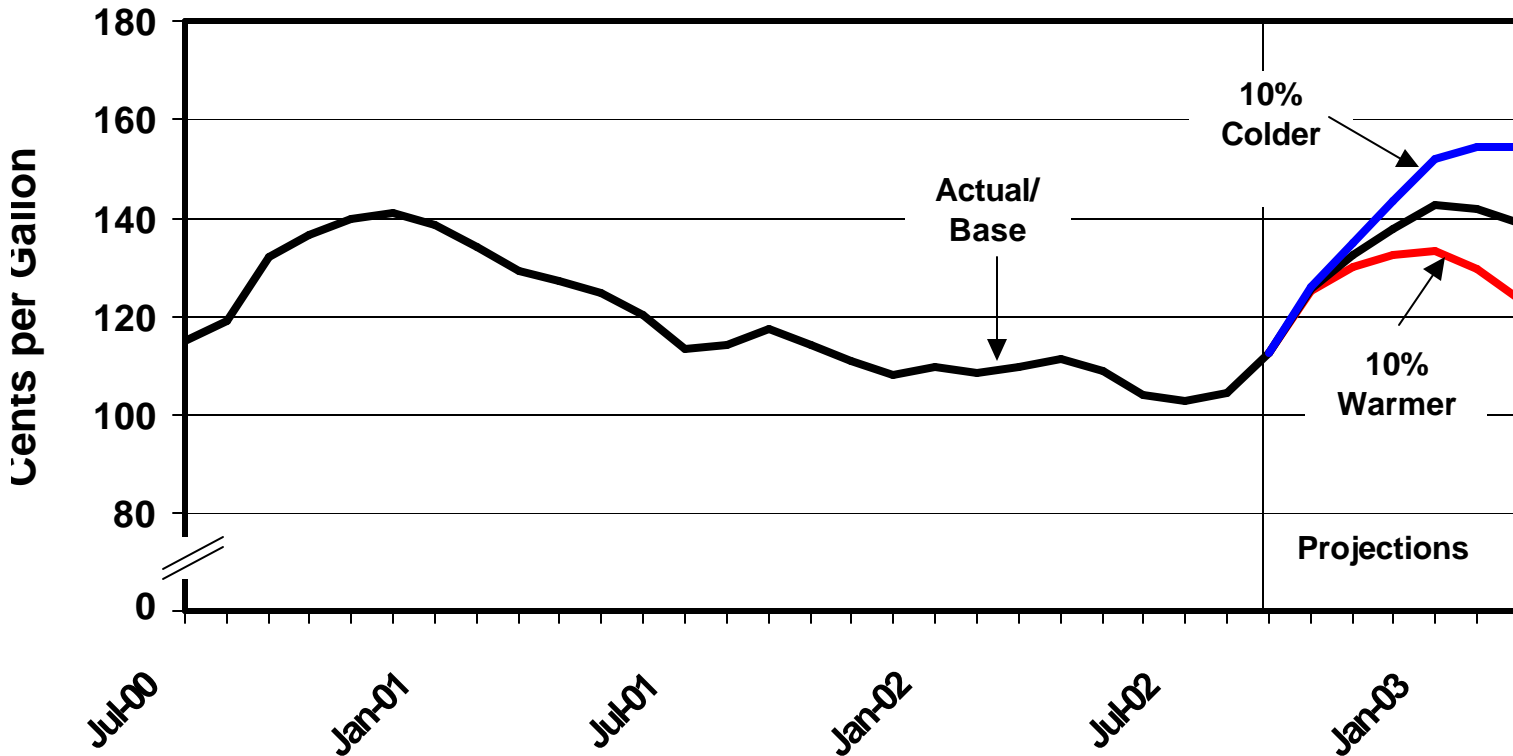
Figure WF6 summarizes the base case and +/- 10-percent weather (heating degree-days) cases for projected residential heating oil prices. The base case assumes normal weather patterns. The price

range reflects not only direct impacts on prices from alternative weather patterns, but also impacts on crude oil prices from higher (or lower) overall petroleum demand.

Because of the potentially precarious position for distillate inventories this winter, the extent of upward price sensitivity of heating oil to demand surges (such as in the cold case described above) is very difficult to anticipate. The price reaction to the cold weather scenario shown in Figure WF6 may be understated, particularly if the availability of imports is low (as might be the case if cold weather conditions extended simultaneously to Europe). In very cold conditions this winter, it is probably best to view the high price case from Figure WF6 as a conservative estimate of higher-price risk.

The discussion of distillate supplies so far has ignored the existence of the Northeast Heating Oil Reserve, which consists of a total of 2 million barrels of heating oil stored in terminals in New Jersey, Connecticut and Rhode Island. The reserve is intended to provide enough additional heating oil into the Northeast in the case of a supply disruption to give suppliers an additional 20 days of coverage if shortages of commercial supplies materialize.

Figure WF6. Residential Heating Oil Prices: Base Case and Weather Cases



Propane

Demand

Last winter's warm weather more than offset the effects of the recovering U.S. economy as demand for propane slipped to 1.39 million barrels per day during the 2001-2002 heating season, a drop of 1

percent from the previous year's heating season. Even the rebound in petrochemical feedstock demand, the largest demand component, did not offset the dampening effects of the mild winter on total demand. If the U.S. economy continues to recover from last year's recession, propane demand would likely follow the same path, with demand continuing to show fairly consistent growth through the end of the year and beyond. However, if we see a repeat of last year's mild winter weather, propane demand would likely be significantly below base case levels and might well show a decrease from the 2001-2002 average level.

Through the first half of 2002, propane demand averaged about 1.27 million barrels per day, more than 12 percent above the same period last year. At least some of the increase in demand this year can be attributed to the recovery in the petrochemical sector, where feedstock demand for propane increased by more than 40 percent. But drought conditions continue to plague many corn-belt States and other corn growing regions, dampening crop-drying demand. The U.S. Department of Agriculture (USDA) forecasted a 7 percent drop in the corn crop this year to the lowest levels since 1995. As a result, lower crop-drying requirements may also lessen the burden on Midwest inventories during the heating season.

Supply

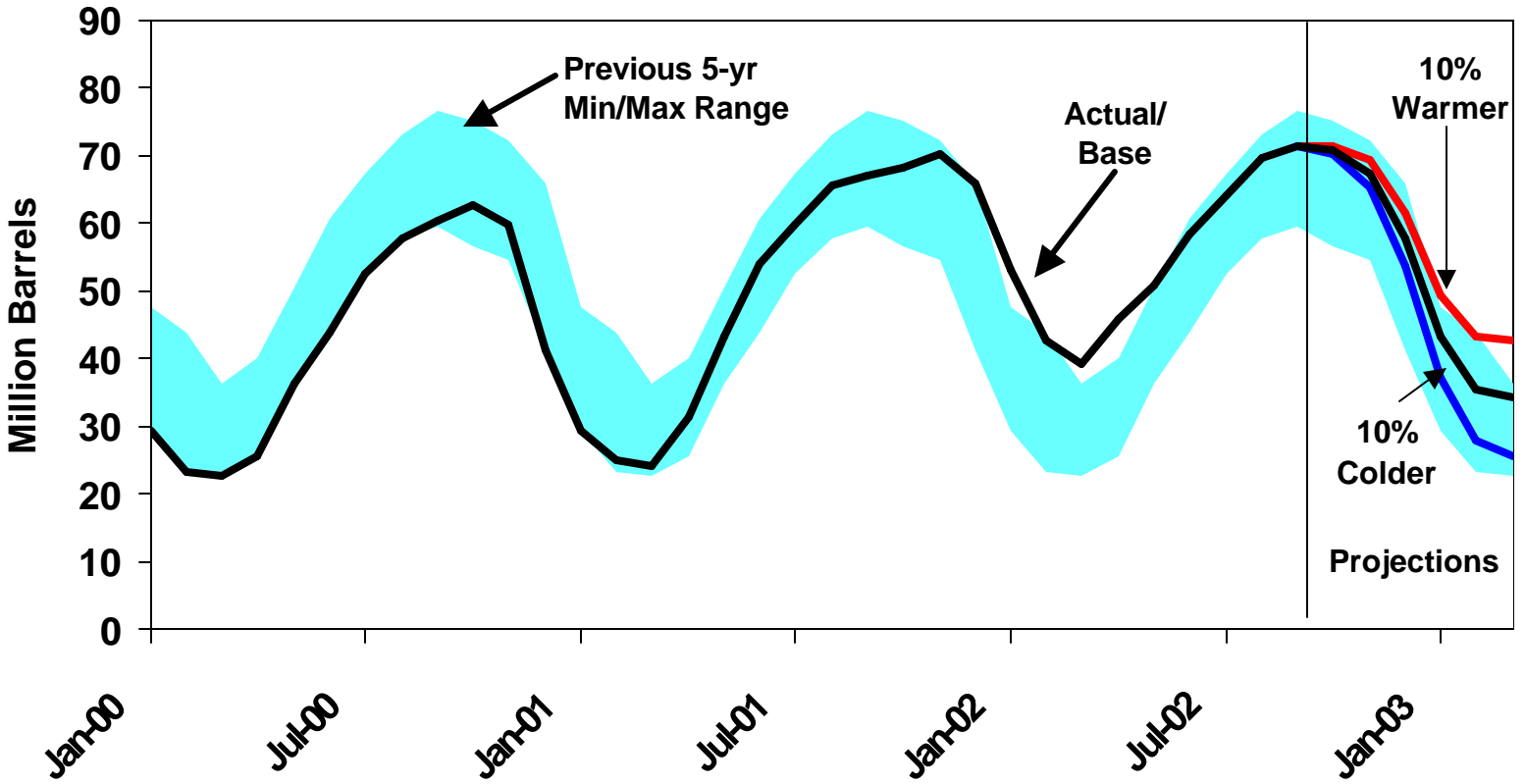
Given current inventory levels and projected supply and demand, adequate propane supplies are expected during the 2002-2003 winter heating season. However, higher prices relative to last year are expected. The projection assumes normal weather and the absence of any major supply disruptions.

Domestic production accounts for the largest share of supply during the heating season, with up to 80 percent of propane supply coming from natural gas processing plants and refineries. For the first half of the year, propane production averaged 1.12 million barrels per day, up more than 5 percent from the comparable period last year. Production from both gas processing plants and refineries were higher this year with gas processing plant production accounting for most of the year-over-year increase. However, the sizable increase stems from the resumption of production from the prior year when soaring natural gas prices caused many gas plants in South Louisiana and Texas to either shut down or significantly reduce their take of propane. Nevertheless, gas processing plant production through June 2002 was more than 8 percent higher compared with the same period last year, while refinery production of propane recorded a nearly 3 percent increase. Expectations for continued growth in supply from both gas processing plants and refineries during the heating season remain strong, contingent on relatively stable natural gas prices and strong refinery runs.

Primary inventory withdrawals are the second largest source of the fuel during the heating season. The draw on U.S. propane inventories last winter measured a below-average 27.8 million barrels as warmer-than-normal weather significantly dampened demand during the period. Consequently, propane inventories ended the 2001-02 heating season at 39.3 million barrels, the highest end-of-season level since 1987. Inventory additions between April and September averaged roughly 37 million barrels during the past five years. However, because inventories were at seasonally high levels, primary stockholders lowered their summer stock build by a below-average 32.2 million barrels. Despite these measures, U.S. inventories stood at an estimated 71.5 million barrels as of September 30, 2002, the highest September level since 1998. As a result, propane inventories are near the upper limits of the average range for the start of the 2002-03 heating season (Figure WF7). Under the base

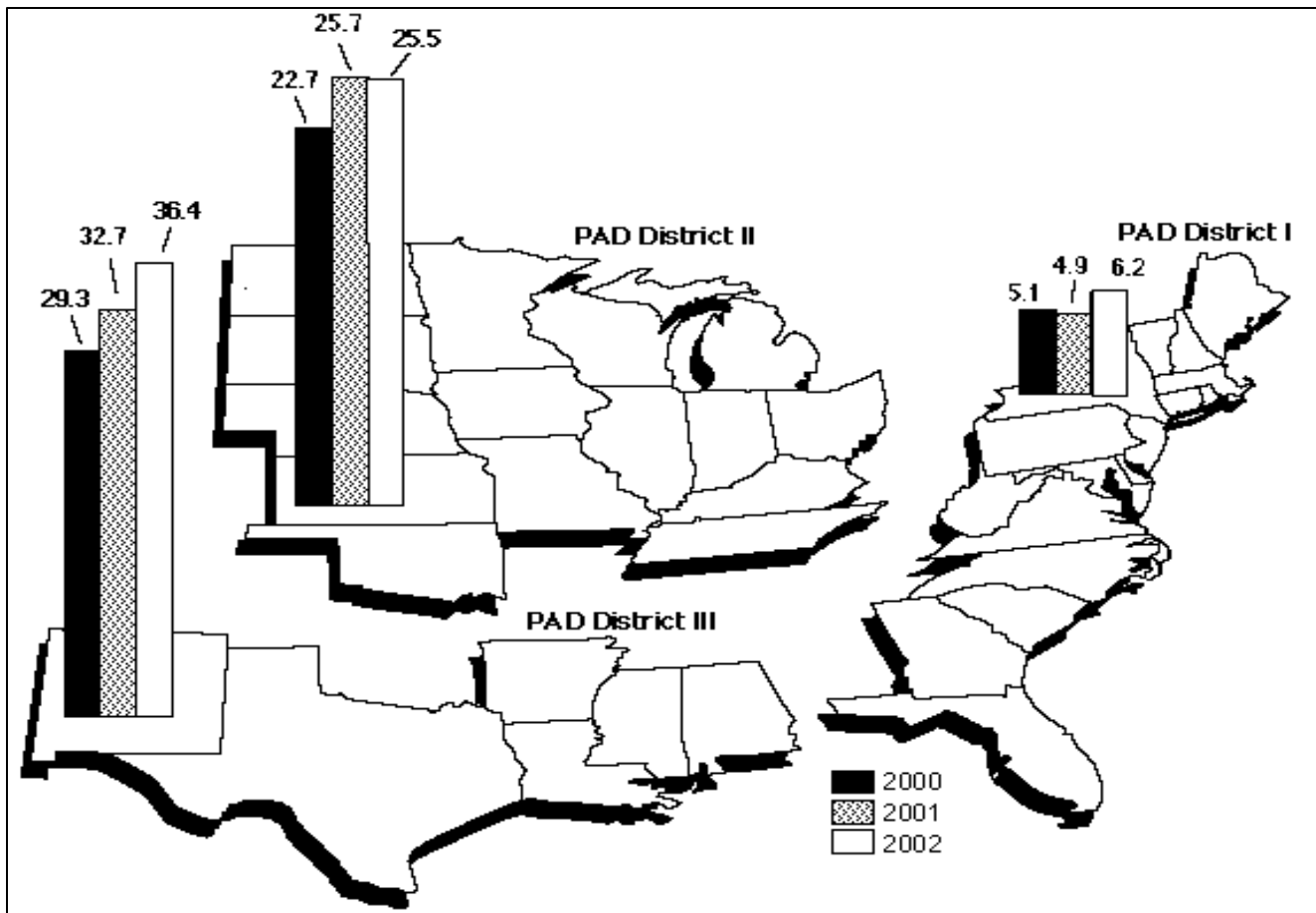
case scenario, inventories are projected to gradually decline, reaching a level of 34.2 million barrels by the end of March 2003, or 5.1 million barrels lower than last year.

Figure WF7. U.S. Propane Stocks



On a regional basis, propane inventories began the heating season either within or above their respective average ranges for this time of year (Figure WF8). The East Coast, a region with limited storage capacity, began the heating season at 6.1 million barrels, a level just above the average range. But, with limited storage capacity, net imports play an important role in conjunction with current inventories.

Figure WF8. U.S. Propane Inventories by PAD District as of September 30, 2002 (Million Barrels)



The Midwest region started the current year heating season at 25.5 million barrels, near the lower limit of the normal range. However, given the prospect of lower demand this year for crop-drying, concerns about Midwest propane inventories appear less likely this year compared with prior years. The Gulf Coast region, an area with abundant storage capacity, continued to track significantly above the average range with inventories of 36.4 million barrels at the start of the heating season. While the Gulf Coast region is not overly dependent on propane for heating, the region continues to be a major supplier of propane to the major heating areas in the East Coast and Midwest.

While small in volume, net imports nevertheless supply a crucial source of propane during unanticipated weather-related demand surges. Through the first half of 2002, propane imports averaged 143,000 barrels per day, down more than 11 percent from about 162,000 barrels per day averaged during the first half of 2001. Although Canada, the largest supplier of propane imports, increased its share to about 85 percent from 70 percent compared with the same 6-month period last year, the increase was not sufficient to offset the overall decline in waterborne imports from traditional major exporting regions from the North Sea, North Africa and the Middle East. The only exception was Algeria, which maintained about the same level of imports as last year. Expectations are for continued strong imports from Canada, with only marginal waterborne imports for the rest of 2002.

Prices

The balance between supply and demand remains the primary determinant of spot propane prices, which vary by region. Retail propane prices are influenced by price movements of other heating fuels, such as heating oil and natural gas, during the winter months. Moreover, these prices are also influenced by crude oil prices, the prices of alternative petrochemical feedstocks, and intangible factors such as uncertainty about future supply/demand balances. Both spot and residential propane prices have remained below prior year levels. However, rising tensions in the Middle East have caused these prices to escalate in recent weeks.

Residential propane prices for the upcoming winter heating season are expected to remain above the prior year's heating season. Under the base case scenario, residential prices are expected to average \$1.20 per gallon compared to \$1.10 last winter (Figure WF9).

Figure WF9. Residential Propane Prices: Base Case and Weather Cases

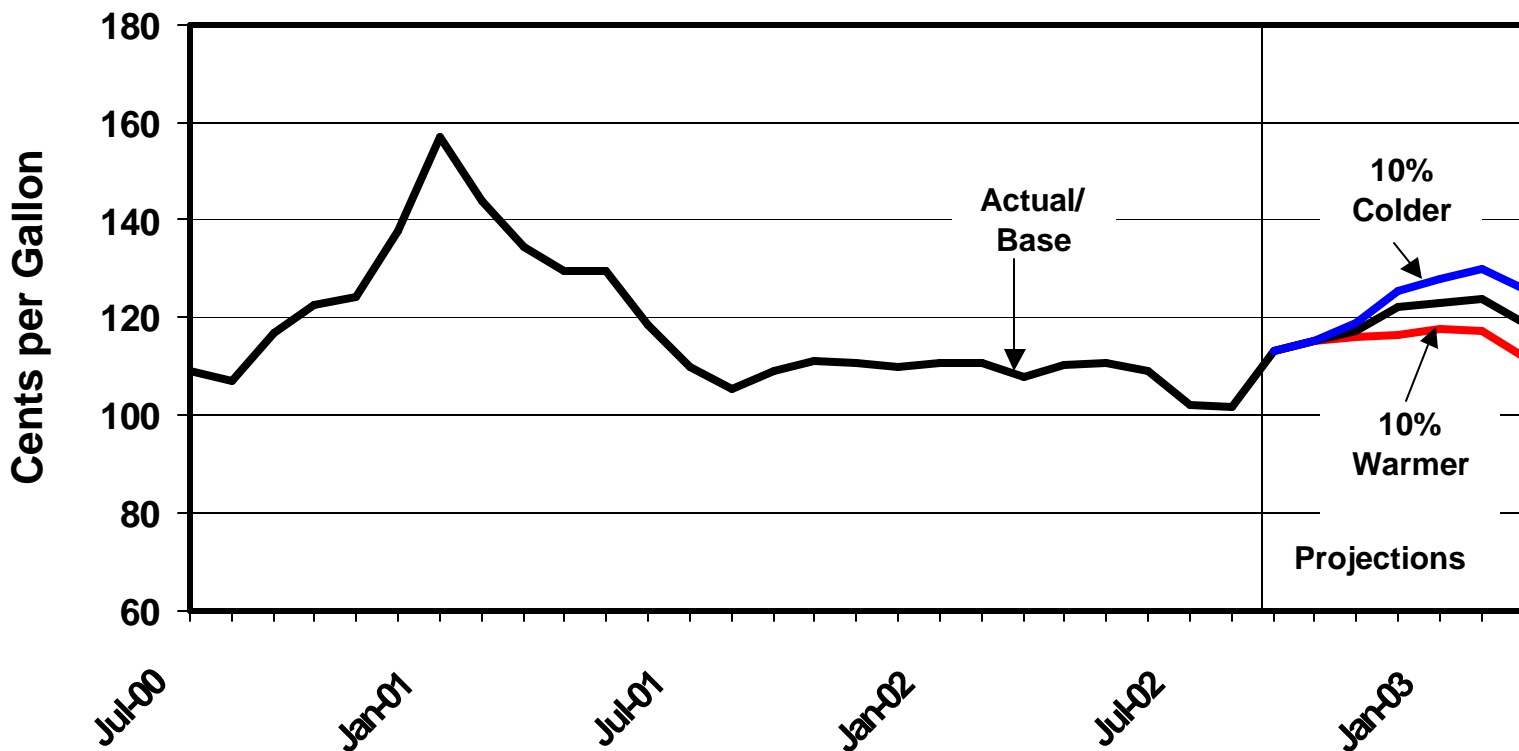


Table WF2. U.S. Winter Fuels Outlook: Base Case and Weather Cases

	History			Base Case					
	2001-2002			2002-2003			Percent Change		
	Q4	Q1	Winter	Q4	Q1	Winter	Q4	Q1	Winter
Demand/Supply									
Distillate Fuel (mill. barrels per day)									
Total Demand.....	3.75	3.79	3.77	3.90	4.11	4.01	4.2%	8.5%	6.3%
Refinery Output.....	3.83	3.45	3.64	3.73	3.53	3.63	-2.6%	2.5%	-0.2%
Net Stock.....	-0.19	0.24	0.02	0.02	0.37	0.19	-109.9%	57.6%	806.9%
Withdrawal.....	0.10	0.11	0.11	0.15	0.21	0.18	47.8%	91.7%	70.4%
Imports.....									
Refinery Utilization (percent).....	91.5%	87.1%	89.3%	90.6%	89.6%	90.1%			
Natural Gas (bill. cubic feet per day)									
Total Demand.....	56.74	73.38	65.01	65.03	81.06	72.96	14.6%	10.5%	12.2%
Production.....	53.15	53.97	53.56	52.05	54.00	53.02	-2.1%	0.1%	-1.0%
Net Stock.....	0.44	15.23	7.79	5.10	13.61	9.31	1050.8%	-10.6%	19.4%
Withdrawal.....	8.97	9.93	9.45	9.32	9.70	9.51	3.9%	-2.3%	0.6%
Imports.....									
Propane (mill. barrels per day)									
Total Demand.....	1.27	1.50	1.39	1.35	1.44	1.40	6.3%	-4.0%	0.8%
Net Stock.....	0.01	0.29	0.15	0.15	0.26	0.20	960.7%	-10.3%	34.9%
Withdrawal.....									
Stocks (ending period)									
Distillate Fuel (MMB) - Beg. ^a	127	145	127	130	129	130	2.7%	-11.0%	2.7%
- End. ^a	145	123	123	129	95	95	-11.0%	-22.6%	-22.6%
Working Gas (BCF) - Beg. ^b	2944	2904	2944	3058	2589	3058	3.9%	-10.8%	3.9%
- End. ^b	2904	1518	1518	2589	1364	1364	-10.8%	-10.1%	-10.1%
Propane (MMB) - Beg. ^a	67.1	65.8	67.1	71.5	57.7	71.5	6.6%	-12.3%	6.6%
- End. ^a	65.8	39.3	39.3	57.7	34.2	34.2	-12.3%	-12.9%	-12.9%
Prices									
Imported Crude Oil (c/g) ^c	40.3	46.0	43.1	67.3	69.0	68.2	66.9%	49.9%	58.1%
Retail Heating Oil (c/g).....	110.7	109.4	110.1	130.8	138.6	134.8	18.2%	26.7%	22.4%
Wellhead Gas (\$/mcf).....	2.50	2.34	2.42	3.17	3.52	3.34	26.5%	50.1%	38.0%
Resid. Gas (\$/mcf).....	7.69	7.14	7.34	7.71	7.77	7.75	0.3%	8.9%	5.7%
Resid. Propane (c/g).....	110.4	109.7	110.1	118.3	121.7	120.0	7.2%	10.9%	9.0%
Market Indicators									
Manuf. Output (index, 1996=1.0).....	1.167	1.176	1.172	1.204	1.216	1.210	3.1%	3.4%	3.3%
Northeast HDDs per day.....	18.3	28.1	23.2	22.4	32.9	27.6	22.6%	17.0%	19.1%
Gas-Weighted HDDs per day.....	15.6	24.0	19.8	18.6	26.1	22.3	19.2%	8.9%	12.9%

^ammb = million barrels.

^bbcf = billion cubic feet.

^cRefiner acquisition cost (RAC) of imported crude oil.

Notes: Minor discrepancies with other EIA published historical data are due to rounding. Historical data are printed in bold; forecasts are in italic. The forecasts were generated by simulation of the Short-Term Integrated Forecasting System. Sources: Historical data: Energy Information Administration, *Petroleum Supply Monthly*, DOE/EIA-0109; *Monthly Energy Review*, DOE/EIA-0035. Macroeconomic projections are based on DRI/McGraw-Hill Forecast CONTROL0902.

Extreme Weather Cases

Our extreme weather cases incorporate various demand and price scenarios in response to extreme cold and warm weather conditions. These extreme weather cases also include the usual uncertainties about key fuel supplies and prices, which in turn derive from the inherently unknown rate of future economic growth and the nature of estimating relationships, among other factors. In each extreme weather case we have focused on the likely consequences of overall deviations (higher or lower) of 10 percent from normal weather, measured in terms of aggregate heating degree-days.

Table WF3. 2002-2003 Winter Weather Scenarios: Warm, Normal (Base) and Cold Cases
(Illustrative Household Heating Demand and Costs)

	Warm	Base	Cold	% Diff. From Warm	Base Cold
Natural Gas (Midwest)					
Consumption (mcf)	82.1	91.3	100.4	-10.0%	10.0%
Avg. Price (\$/mcf)	7.68	7.78	7.87	-1.2%	1.2%
Expenditures (\$)	631	710	790	-11.1%	11.3%
Heating Oil (Northeast)					
Consumption (gals)	623	692	761	-10.0%	10.0%
Avg. Price (\$/gal)	1.27	1.35	1.43	-5.6%	5.6%
Expenditures (\$)	793	934	1085	-15.0%	16.2%
Propane (Midwest)					
Consumption (gals)	811	902	992	-10.0%	10.0%
Avg. Price (\$/gal)	1.16	1.20	1.24	-3.6%	3.2%
Expenditures (\$)	939	1082	1228	-13.2%	13.5%

Note: Scenarios involve assumptions of 10% greater and 10% lower heating degree-days in all regions.

Based on winter-season (October-March) data on heating degree-days from 1975 to 2001, we estimate that the nation faces a 10-percent chance that this winter's total heating degree-days will be either 10 percent above or below the normal range. But the distribution of the incremental degree-days can be far from even. To simplify the analysis, we assume that the 10-percent deviations in either direction are proportionally distributed over the winter based on the "normal" heating degree-day pattern. We did not investigate how this added assumption affects the probabilities associated with the event, but a more typical pattern is admittedly one that is at least somewhat uneven.

A winter that is 10 percent colder throughout the season is assumed to result in an additional 10 percent in heating-related demand across fuels. A unit elasticity for the heating component of fuel demand with respect to heating degree-days conforms well with analytical estimates across fuels. Retail heating oil prices, in a cold weather scenario, would average \$1.43 per gallon, 5.6 percent above the base case average (Table WF3). As a result, the average residential cost of heating would be about 16 percent above that of the base case and 69 percent above the average cost of the preceding winter.

Because of the high levels of natural gas and propane inventories going into the heating season, cold weather impacts on prices and expenditures are likely to be somewhat less pronounced.

Residential natural gas prices may vary under those circumstances by only about 1 percent from the base case during the heating period itself. For gas customers, much of the increased cost of gas that would stem from colder weather would be rolled into future gas bills extending (perhaps) through much of the rest of the year beyond the heating season. If the cumulative total effects on consumer expenditures is taken into account, percent changes in average residential natural gas prices for the weather scenarios are about 3-4 times that indicated in Table WF3, which looks only at the heating season. In terms of household heating bills, we estimate that expenditures may vary between 11 and 16 percent above or below the base case, depending on the fuel.