

ENERGY INFORMATION ADMINISTRATION

QUARTERLY PROJECTIONS

SHORT-TERM
ENERGY
OUTLOOK

QUARTER



1990

DOE/EIA-0202(90/4Q)

This publication may be purchased from the Superintendent of Documents, U.S. Government Printing Office. Purchasing information for this or other Energy Information Administration (EIA) publications may be obtained from the Government Printing Office or EIA's National Energy Information Center. Questions on energy statistics should be directed to the Center by mail, telephone, or telecommunications device for the hearing impaired. Addresses, telephone numbers, and hours are as follows:

National Energy Information Center
Energy Information Administration
Forrestal Building, Room 1F-048
Washington, DC 20585
(202) 586-8800
Telecommunications Device for the
Hearing Impaired Only: (202) 586-1181
8 a.m. - 5 p.m., eastern time, M-F

Superintendent of Documents
U.S. Government Printing Office
Washington, DC 20402
(202) 783-3238
FAX 1-202-275-0019
8 a.m. - 5 p.m., eastern time, M-F

Released for Printing: November 7, 1990

The *Short-Term Energy Outlook* (ISSN 0743-0604) is published quarterly by the Energy Information Administration, 1000 Independence Avenue, SW, Washington, DC 20585, and sells for \$14.00 per year (price subject to change without advance notice). Second-class postage paid at Washington, DC 20066-9998, and additional mailing offices. POSTMASTER: Send address changes to *Short-Term Energy Outlook*, Energy Information Administration, EI-231, 1000 Independence Avenue, SW, Washington, DC 20585.

Short-Term Energy Outlook

Quarterly Projections

Fourth Quarter 1990

Energy Information Administration
Office of Energy Markets and End Use
U.S. Department of Energy
Washington, DC 20585

This report was prepared by the Energy Information Administration, the independent statistical and analytical agency within the Department of Energy. The information contained herein should not be construed as advocating or reflecting any policy position of the Department of Energy or any other organization.

Contacts

The *Short-Term Energy Outlook* is prepared by the Energy Information Administration (EIA), Office of Energy Markets and End Use (EMEU). General questions concerning the content of the report may be addressed to W. Calvin Kilgore (202/586-1617), Director of EMEU; John D. Pearson (202/586-6160), Director of the Energy Analysis and Forecasting Division; Edward Flynn (202/586-5748), Chief of the Demand Analysis and Forecasting Branch; or Gerald Peabody (202/586-1458), Chief of the Supply Analysis and Integration Branch.

Detailed questions may be addressed to David Costello (202/586-1468) or the following analysts, who can be reached at the Energy Analysis and Forecasting Division (202/586-5382):

World Oil Prices/International Petroleum	Michael Grillot
Macroeconomic	Kay A. Smith
Energy Product Prices	Neil Gamson
Petroleum Demands	David Costello
	Michael Morris
	Susan Decker
	Evelyn Amerchih
Petroleum Supply	Paul Kondis
Natural Gas	Karen E. Elwell
Coal	Elias Johnson
Electricity	Karen E. Elwell
Integration	Paul Kondis

Domestic crude oil production figures are provided by the EIA Dallas Field Office, under the supervision of John H. Wood. Nuclear electricity generation is provided by Roger Diedrich; hydroelectric generation, electricity imports, and electricity purchases from nonutilities are provided by Patricia Toner; and coal production, imports, and exports are provided by Frederick Freme—all of the EIA Office of Coal, Nuclear, Electric and Alternate Fuels. World petroleum values are prepared by the International and Contingency Information Division, Mark Rodekoher, Director.

Preface

The Energy Information Administration (EIA) presents future scenarios of quarterly short-term energy supply, demand, and prices for publication in February, May, August, and November in the *Short-Term Energy Outlook (Outlook)*. An annual supplement analyzes previous estimate errors, compares recent scenarios with those of other forecasting services, and discusses current topics of the short-term energy markets. (See *Short-Term Energy Outlook: Annual Supplement, DOE/EIA-0202*.) The principal users of the *Outlook* are managers and energy analysts in private industry and government. The scenario period for this issue of the *Outlook* extends from the fourth quarter of 1990 through the fourth quarter of 1991. Some data for the third quarter of 1990 are preliminary EIA estimates of actual data (for example, some petroleum estimates are based on statistics from the *Weekly Petroleum Status Report*) or are derived from internal model simulations using the latest exogenous information available (for example, some electricity demand estimates are based on recent weather data).

The scenarios are produced using the Short-Term Integrated Forecasting System (STIFS). The STIFS model is driven principally by the following sets of assumptions or inputs: estimates of key macroeconomic variables, world oil price assumptions, and assumptions about the severity of weather. Macroeconomic estimates are produced by DRI/McGraw-Hill, but are adjusted by EIA to reflect EIA assumptions about the world price of crude oil, energy product prices, and other assumptions which may affect the macroeconomic outlook. (The EIA model is available on computer tape from the National Technical Information Service.)

The scenarios and historical data are based on EIA data published in the *Monthly Energy Review, Petroleum Supply Monthly*, and other EIA publications. Minor discrepancies between the data in those publications and the historical data in this *Outlook* are due to independent rounding. All percentage changes are calculated from the values in the tables rather than from any rounded numbers cited in the text.

Contents

Highlights	2
Assumptions	5
World Oil Prices	5
Macroeconomic Activity	5
International Petroleum	5
Energy Product Prices	6
U.S. Petroleum Outlook	9
Petroleum Demand	9
Petroleum Supply	10
Motor Gasoline	11
Jet Fuel	12
Distillate Fuel Oil	12
1990-91 Winter Distillate Outlook	13
Residual Fuel Oil	15
Other Petroleum Products	15
Outlook for Other Major Energy Sources	17
Natural Gas	17
Coal	17
Electricity	18
References and Notes	21

Tables

1.	\$30 World Oil Price Case Summary	3
2.	Macroeconomic, Oil Price, and Weather Assumptions	23
3.	International Petroleum Balance: \$25 World Oil Price Case	24
4.	International Petroleum Balance: \$30 World Oil Price Case	25
5.	International Petroleum Balance: \$35 World Oil Price Case	26
6.	Energy Prices	27
7.	Supply and Disposition of Petroleum: \$25 World Oil Price Case	28
8.	Supply and Disposition of Petroleum: \$30 World Oil Price Case	29
9.	Supply and Disposition of Petroleum: \$35 World Oil Price Case	30
10.	Petroleum Demand Sensitivities	31
11.	Supply and Disposition of Natural Gas: \$30 World Oil Price Case	32
12.	Supply and Disposition of Coal: \$30 World Oil Price Case	33
13.	Supply and Disposition of Electricity: \$30 World Oil Price Case	34

Figures

1.	Crude Oil Prices	5
2.	Retail Heating Oil Prices	7
3.	Total Petroleum Demand	9
4.	U.S. Crude Oil Production	10
5.	Total Net Petroleum Imports	11
6.	Motor Gasoline Market Shares	12
7.	End-of-Period Distillate Fuel Oil Stocks	13
8.	Distillate Demand by Sector, Winter 1990-91	14
9.	Natural Gas Demand	17
10.	Total Coal Consumption	18
11.	Electricity Sales	19

<p>1. Introduction</p> <p>The first part of the report discusses the background and objectives of the study. It highlights the importance of understanding the current market trends and the role of technology in shaping the future of the industry.</p>	<p>The first part of the report discusses the background and objectives of the study. It highlights the importance of understanding the current market trends and the role of technology in shaping the future of the industry.</p>
<p>2. Methodology</p> <p>The methodology section describes the research approach, including the data sources, sampling methods, and the analytical tools used to process the information.</p>	<p>The methodology section describes the research approach, including the data sources, sampling methods, and the analytical tools used to process the information.</p>
<p>3. Results</p> <p>The results section presents the findings of the study, detailing the key trends, challenges, and opportunities identified in the market analysis.</p>	<p>The results section presents the findings of the study, detailing the key trends, challenges, and opportunities identified in the market analysis.</p>
<p>4. Discussion</p> <p>The discussion section provides a critical analysis of the results, comparing them with existing literature and industry practices to draw meaningful conclusions.</p>	<p>The discussion section provides a critical analysis of the results, comparing them with existing literature and industry practices to draw meaningful conclusions.</p>
<p>5. Conclusion</p> <p>The conclusion summarizes the main findings and offers recommendations for stakeholders based on the insights gained from the research.</p>	<p>The conclusion summarizes the main findings and offers recommendations for stakeholders based on the insights gained from the research.</p>
<p>6. References</p> <p>This section lists the academic papers, books, and other sources that were consulted during the research process to support the findings.</p>	<p>This section lists the academic papers, books, and other sources that were consulted during the research process to support the findings.</p>
<p>7. Appendix</p> <p>The appendix contains supplementary data, charts, and tables that provide additional context and detail to the main report.</p>	<p>The appendix contains supplementary data, charts, and tables that provide additional context and detail to the main report.</p>

Highlights

The following highlights summarize the key takeaways from the report:

- Market Growth:** The industry is projected to grow significantly over the next five years, driven by technological advancements and increasing consumer demand.
- Key Challenges:** Rapidly changing market conditions and intense competition pose significant challenges for businesses in the sector.
- Opportunities:** There are several untapped opportunities for innovation and expansion, particularly in the digital and sustainable sectors.
- Recommendations:** Stakeholders should focus on digital transformation, enhance customer experience, and explore new market segments to stay competitive.

Highlights

Heating Oil Prices Higher This Winter

Given a range of world oil prices of \$25 to \$35 per barrel, retail heating oil prices are expected to range from an average of 18 cents to 46 cents per gallon higher this winter compared to last winter. Primary distillate stocks are currently much more plentiful than they were at this time last year, making it somewhat unlikely that average retail price increases would exceed 46 cents unless prolonged, severely cold weather occurred.

Petroleum Consumption Weakened Further by High Prices, Worsening Economy

U.S. petroleum consumption posted weak growth before the August invasion by Iraq into Kuwait. Since that time, higher oil prices and a less optimistic economic scenario resulted in the expectation of total U.S. oil consumption slipping down to near or slightly below 17.0 million barrels per day in 1990. Even with oil prices as low as \$25 through 1991, oil consumption is anticipated to fall well below 17.0 million barrels per day in 1991. These declines are expected to affect all product markets.

Domestic Crude Oil Production Dependent on Crude Oil Price Path

Assuming a \$35 world oil price, domestic crude oil production is expected to rise to 7.4 million barrels per day by 1991, after declining to 7.3 million barrels per day in 1990. Most of the increased production in 1991 would be supplied by Alaska. Under an assumption of a \$25 world oil price, domestic crude oil production is expected to continue declining to below 7.0 million barrels per day by 1991. In this case, however, production declines would be more modest than in recent years.

Net Oil Imports Expected to Decline in 1991

In all three world oil price cases considered in this *Outlook*, total net petroleum imports (including imports for the Strategic Petroleum Reserve) are expected to decline significantly between 1990 and 1991, assuming sluggish economic growth and normal weather. Under the middle economic growth rate used in this *Outlook*, the decline could be between 0.3 and 1.2 million barrels per day. This would be the first decline in total net oil imports since 1985.

Natural Gas Demand Likely to Rise in 1991

Because of the very favorable prices for natural gas relative to those for oil products, industrial and utility gas use is expected to continued rising on an annual basis through 1991 despite the weak economic outlook. Residential and commercial demand, which was depressed in 1990 due to the very warm first quarter, should rebound during the first quarter of 1991. Gas demand could rise by as much as 900 billion cubic feet in 1991 from a relatively weak 1990 total if oil prices average in the \$35-per-barrel range and if a serious recession is avoided.

Growth in Electricity Demand Led by Residential and Commercial Sectors

Despite the mild first quarter weather this year, electricity demand should post growth of 2.7 percent in 1990. Residential and commercial demand will provide most of the growth in electricity sales next year, although demand in these sectors will begin to slow down under the weak economy on a weather-normalized basis.

Note: The data referenced on this page may be found in Tables 1, 2, 6, 7, 8, 9, 11, and 13, on pages 3 and 23 through 34 of this issue of the *Outlook*.

Table 1. \$30 World Oil Price Case Summary

Assumptions and Projections	Year				
	1988	1989	1990	1991	1988-1989 1989-1990 1990-1991

Macroeconomic Indicators									
Real Gross National Product (billion 1982 dollars)	4,017	4,118	4,160	4,192	2.5	1.0	0.8		
Index of Industrial Production (Mfg.) (index, 1977=1,000)	1,058	1,089	1,099	1,099	2.9	.9	.0		
Imported Crude Oil Price (nominal dollars per barrel)	14.56	18.08	22.30	30.00	24.2	23.3	34.5		
Retail Prices (nominal)^a									
Motor Gasoline ^b (dollars per gallon) .....	.96	1.06	1.22	1.46	10.4	15.1	19.7		
No. 2 Heating Oil (dollars per gallon) .....	.81	.90	1.06	1.29	11.1	17.8	21.7		
Residential Natural Gas (dollars per thousand cubic feet)	5.47	5.64	5.83	6.23	3.1	3.4	6.9		
Residential Electricity (cents per kilowatt-hour)	7.49	7.64	7.89	8.24	2.0	3.3	4.4		
Petroleum Supply									
Crude Oil Production ^c (million barrels per day)	8.14	7.61	7.26	7.21	-6.5	-4.6	-7		
Net Petroleum Imports, including SPR (million barrels per day)	6.59	7.20	7.47	6.62	9.3	3.7	-11.4		
Energy Demands									
Total Market Economies Petroleum Consumption (million barrels per day)	51.05	52.37	52.92	51.75	2.6	1.1	-2.2		
Total U.S. Petroleum Consumption (million barrels per day)	17.28	17.33	16.99	16.26	.3	-2.0	-4.3		
Motor Gasoline	7.34	7.33	7.25	7.03	-1	-1.1	-3.0		
Jet Fuel	1.45	1.49	1.52	1.45	2.8	2.0	-4.6		
Distillate Fuel Oil	3.12	3.16	3.01	2.90	1.3	-4.7	-3.7		
Residual Fuel Oil	1.38	1.37	1.24	1.00	-7	-9.5	-19.4		
Other Petroleum ^d	4.00	3.98	3.97	3.88	-5	-3	-2.3		
Natural Gas Consumption (trillion cubic feet)	18.03	18.78	18.49	19.28	4.2	-1.5	4.3		
Coal Consumption (million short tons)	884	889	892	923	.6	.3	3.5		
Electricity Sales ^e (billion kilowatt-hours)	2,578.1	2,633.8	2,705.3	2,775.9	2.2	2.7	2.6		
Gross Energy Consumption ^f (quadrillion Btu)	80.20	81.24	80.89	81.15	1.3	-4	.3		
Thousand Btu/1982 Dollar of GNP	19.97	19.73	19.44	19.36	-1.2	-1.5	-4		

^a All prices include taxes, except prices for No. 2 heating oil and residential electricity.
^b Average for all grades and services.
^c Includes lease condensate.
^d Includes crude oil product supplied, natural gas liquids, liquefied refinery gases, other liquids, and all finished petroleum products except motor gasoline, jet fuel, and distillate and residual fuel oils.
^e Total annual electricity sales for historical periods are derived from the sum of monthly sales figures based on submissions by electric utilities of Form EIA-826, "Monthly Electric Utility Sales and Revenue Report with State Distributions." These historical values differ from annual sales totals based on Form EIA-861, reported in several EIA publications, but match alternate annual totals reported in EIA's *Electric Power Monthly*, DOE/EIA-0226. The conversion from physical units to Btu is calculated using a subset of *Monthly Energy Review* (MER) conversion factors. Consequently, the historical data may not precisely match that published in the MER.
^f SPR: Strategic Petroleum Reserve
 Notes: Minor discrepancies with other published EIA historical data are due to independent rounding. Historical values are printed in **boldface**, forecasts in *italics*.
 Sources: Historical data: Energy Information Administration, *Monthly Energy Review*, DOE/EIA-0035(90/07); *International Petroleum Statistics Report, Monthly*, DOE/EIA-0520(90/09); *International Energy Annual 1988*, DOE/EIA-0219(88); *Petroleum Marketing Monthly*, DOE/EIA-0380(90/07); *Petroleum Supply Monthly*, DOE/EIA-0109(90/07); *Petroleum Supply Annual 1989*, DOE/EIA-0340(89/1); *Natural Gas Monthly*, DOE/EIA-0130(90/07); *Electric Power Monthly*, DOE/EIA-0226(90/07); and *Quarterly Coal Report*, DOE/EIA-0121(90/20); Organization for Economic Cooperation and Development, *Monthly Oil Statistics Database* through June 1990. Macroeconomic projections are based on DRI/McGraw-Hill Forecast CONTROL1090.

Assumptions

Macroeconomic Activity

Broad measures of economic activity in the United States indicate significant slowing in key sectors of the domestic economy in 1990.¹ It now appears likely that gross national product (GNP) will increase by less than 1 percent in 1990. A consensus about likely economic performance over the next year seems to be developing, with average 1990 and 1991 GNP growth rates settling at about 1.0 percent or less (Table 2).²

Forecasting macroeconomic growth involves uncertainty about the magnitude of change of crucial economic variables affecting the economy. In addition, economic growth is a major determinant in explaining energy demand. As a result, high and low demand cases incorporating a band of GNP growth, roughly 1 percent above and below the base case growth rates, were developed. The results of these high and low economic growth cases, in terms of typical effects on total petroleum demand, are summarized in Table 10.

International Petroleum

International petroleum balances based on three world oil price cases in this *Outlook*—\$25, \$30, and \$35—are presented in Tables 3, 4, and 5. In the last quarter of 1990, the largest variations are expected to occur in the demand for petroleum products; oil production is expected to exhibit little sensitivity to the world oil price.

In 1991, petroleum demand by the Market Economies is expected to be about 1.9 million barrels per day lower in the \$35 oil price case than in the \$25 oil price case. The countries that comprise the Organization for Economic Cooperation and Development (OECD) should account for about 1.5 million barrels per day of this difference in demand, with the remainder occurring in the developing countries that are not part of the Organization for Petroleum Exporting Countries (OPEC). Some variation is also expected between cases in oil supplies from non-OPEC sources. Oil production from the non-OPEC Market Economies is expected to be almost 500,000 barrels per day higher in the \$35 oil

World Oil Prices

One of the most uncertain factors affecting the domestic short-term energy outlook is the world oil price, defined here as the nominal price of imported crude oil delivered to U.S. refiners. Because of this uncertainty, which is largely caused by the tense military situation currently existing in the Middle East, three world oil price scenarios are employed (Figure 1) to examine the range of effects that different levels of world oil prices would have on energy supply and demand balances. The three levels chosen, \$25, \$30, and \$35, are not intended to represent actual projections or to define the range of possible price outcomes.

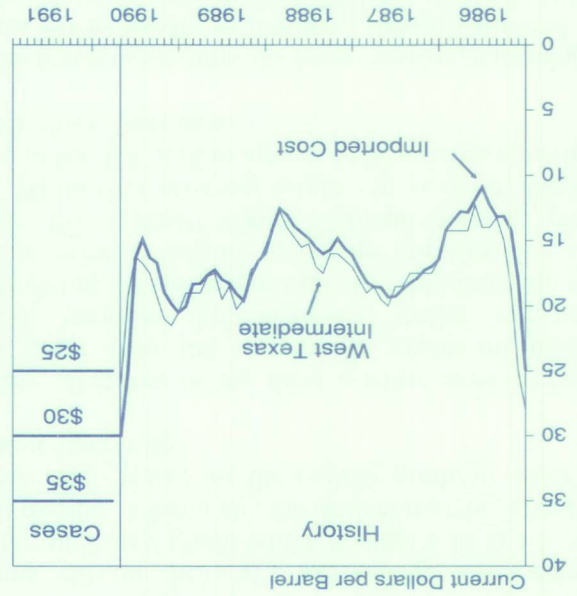


Figure 1. Crude Oil Prices

Note: Imported prices are defined as the cost of imported crude oil to U.S. refiners.
Sources: History: Energy Information Administration, *Monthly Energy Review* (Washington, DC) and *Oil and Gas Journal Energy Database* (Tulsa, OK).
Cases: Table 6.

price case than in the \$25 oil price case. Also, net oil exports from the Centrally Planned Economies to the Market Economies are expected to be about 80,000 barrels per day higher in the \$35 case than in the \$25 case, primarily because of the impact of higher prices on petroleum demand in Eastern Europe.

In the \$25 world oil price case, the OPEC oil production rates assumed for the last 2 quarters of 1990 and the first 2 quarters of 1991 (including crude oil, natural gas liquids, and refinery gain) are based on the most likely surge production estimates published in the October 17, 1990, issue of the EIA *Energy Situation Analysis Report* (Table 3). The rate assumed for the last 2 quarters of 1991 is the same as that for the second quarter of 1991.

In the \$30 and \$35 cases, the OPEC oil production rates for the fourth quarter of 1990 and the first quarter of 1991 are assumed to be the same as those in the \$25 case. In the \$30 case, a rate of OPEC oil production for the last 3 quarters of 1991 was selected that would maintain the commercial oil inventories of the OECD countries at levels equal to about 80 days of forward consumption throughout the period (Table 4).³ Similarly, in the \$35 case, the rate of OPEC production selected for the last 3 quarters of 1991 would maintain OECD commercial oil inventories at levels equal to about 90 days of forward consumption throughout the period (Table 5). In both of these cases, the selected rate of OPEC production for the last 3 quarters of 1991 is less than that assumed in the \$25 case. OECD commercial oil inventories in the \$25 case would be, by comparison, equal to about 67 days of forward consumption at the end of 1991, or about 2 days less coverage than at the end of 1989.

Energy Product Prices

Current Situation

Petroleum product prices continue to be affected by the situation in the Middle East. Spot prices for crude oil and petroleum products rose and fell wildly in response to both actual events and rumors concerning the situation there. The average refiner's acquisition cost of crude oil is estimated to have risen by about 50 percent from the second quarter to the third quarter of 1990. Recent spot prices have been oscillating in the \$30 to \$40 range, and are expected to continue to fluctuate as uncertainty about availability and future prices continues. The following discussion provides

projections for energy product prices, given three assumed crude oil price cases (Table 6). In these projections, there is no judgment that one case is more likely to occur than any other. Despite the assumption of flat crude oil prices in each of the scenarios, price spikes are likely over the forecast period until there is a clear settlement of the Iraqi situation.

Estimated prices for petroleum products in the third quarter 1990, are considerably higher than those of a year ago. Estimated motor gasoline prices averaged \$1.26 per gallon or 16 cents per gallon higher than the previous year, the result of the increase of \$6 per barrel in crude oil prices. There is some indication that refiners have not passed on to consumers the full extent of the cost increase in crude oil, since crude oil prices in September rose by about 30 cents per gallon from the previous year, while retail motor gasoline prices increased by slightly less. Furthermore, about 2 cents of the gasoline price increase is attributed to increases in state and local taxes.⁴

The rapid rise in crude oil prices has left many dealers under a retail margin squeeze, as customers choose the stations with the cheapest prices and the lower priced regular, unleaded grade which is often sold at a lower profit margin. Ultimately, the dealers may be forced to increase their prices for the regular grade in order to continue operating.⁵

Heating oil prices in the third quarter seem to have risen faster than the increase in crude oil prices, possibly because wholesalers and dealers are now accumulating large inventories and bidding up the present price to ensure adequate supplies for the winter. (See "1990-91 Winter Distillate Outlook," page 13.) While this situation might not portend weaker prices in late fall, it does appear to be a cushion against further sharp increases.

For the first 6 weeks after the Iraqi invasion, natural gas futures prices hardly responded. Toward the end of September these prices started climbing, particularly for the upcoming winter months, but fluctuations in the future prices since then give little evidence that worries about future gas supplies abound.

Price Outlook

The product price projections in this report are based on three different world oil price cases—\$25, \$30, and \$35. Pass-throughs of the different crude oil prices account for most of the variation in product prices.

Based on the \$25 world oil price scenario, most energy product prices should rise only slightly above third quarter 1990 levels, with petroleum products the most directly affected. Heating oil and gasoline prices are expected to be about 7 to 10 cents higher in the third quarter of 1991 than prices now. Residual fuel oil prices are expected to increase, but may remain lower than normal relative to crude prices since stocks are projected to be more than adequate.

Natural gas wellhead prices are expected to increase through the rest of this year and for most of next year based on the \$25 world oil price scenario. A sluggish economy and mild weather for most of 1990 led to large underground storage reserves keeping present day prices low. Normal weather and some fuel switching from oil to gas are expected to create enough demand pressure to cause wellhead prices to rise by 6 percent between the third quarter of 1990 and the third quarter of 1991. Natural gas prices to the electric utility sector should increase faster than wellhead prices because electric utility fuel oil prices are expected to increase by 12 percent, over that same period.

Assuming crude oil prices increase by \$7.70 per barrel (about 18 cents per gallon) in 1991, to \$30 per barrel, on average, prices for motor gasoline, heating oil, and diesel fuel are expected to increase by at least this amount, with inflation adding a few more cents per gallon to these fuels over the next year. Also reflected in these prices is an estimated increase of 2 cents per gallon in State and local taxes in 1991 for motor vehicle fuels. Natural gas prices are not expected to increase as fast as petroleum prices due to adequate supplies and a projected weak economy.

Based on the \$35 world oil price, crude oil prices should increase about \$11.60 over average 1990 prices. This increase could be reflected in correspondingly higher petroleum product prices. Also, the high world oil price should spur increases in gas prices, encouraging more exploration and production. Natural gas prices should not rise as rapidly as oil prices because of adequate supplies and a weak economy. The price of coal to electric utilities as well as residential electricity prices would similarly increase.

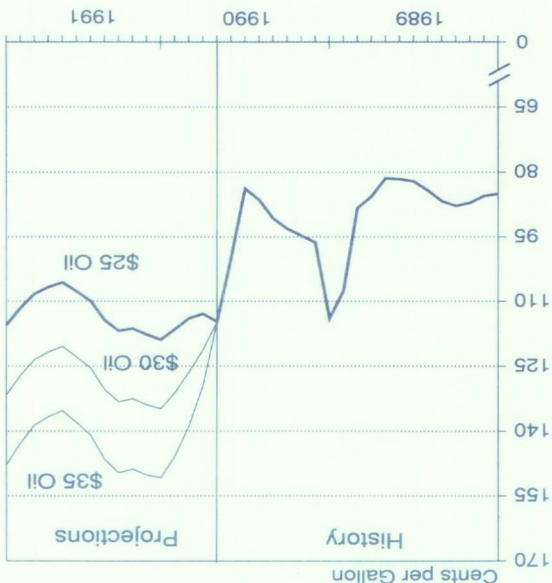
Heating oil prices could possibly increase by larger amounts than shown in Table 6 and Figure 2 if unusually cold weather occurs. However, since distillate stocks are considerably higher than they were at this time last year, the upcoming winter would have to have prolonged cold temperatures or a major

Coal prices to electric utilities have not yet been noticeably affected by the rise in petroleum prices. So far, spot prices for coal have remained soft. Expected weak economic picture should ease, but not entirely negate the upward pressure on coal prices caused by higher diesel freight charges.

Natural gas prices have not been affected by the events in the Middle East as much as petroleum prices. This is primarily because abundant gas supplies have deterred price increases that could have been induced by accelerated switching from oil to gas in the industrial and other sectors. This situation could persist throughout the forecast period, since underlying demand is expected to be relatively weak given a sluggish economy. Although those electric utilities with the capability of fuel switching must shift to oil when additional natural gas is needed for residential customers, price increases should remain moderate unless the winter is unusually cold.

Figure 2. Retail Heating Oil Prices

Sources: History: Energy Information Administration, Monthly Energy Review (Washington, DC). Projections: Table 6.



refinery problem to affect the price further. Weather similar to last winter's cold spell (December 1989 was 31 percent colder than normal) would be somewhat less likely to cause extreme price increases this year.

U.S. Petroleum Outlook

of the estimated sensitivity of domestic petroleum demand to alternative macroeconomic growth assumptions, variations in the world oil price, and weather conditions is presented in Table 10. The table provides upper and lower ranges for key demand determinants, which result in ranges of projected petroleum demand (other variables held constant). The absolute values of these demand ranges are given in million barrels per day) below the ranges for the determinants.

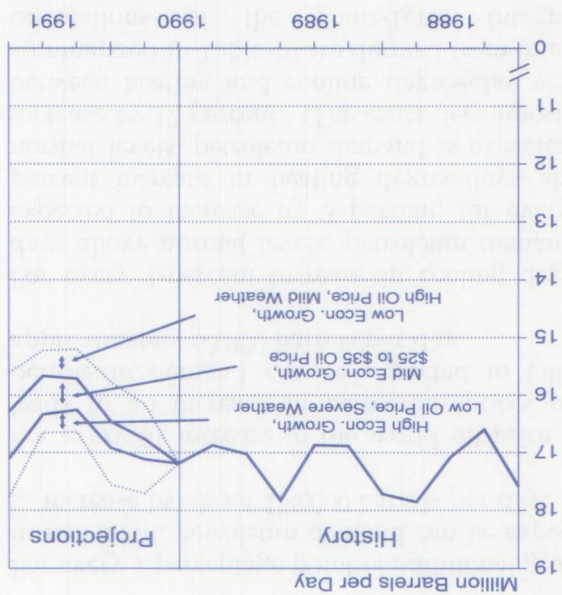


Figure 3. Total Petroleum Demand

Sources: History: Energy Information Administration, Petroleum Supply Monthly (Washington, DC). Projections: Tables 7, 8, and 9; and internal model calculations from the Short-Term Integrated Forecasting System.

The alternative macroeconomic scenarios provide a range of real gross national product (GNP) which extends, by 1991, 2.1 percent above and below the base case. Analysis of macroeconomic forecasts over the last 10 years shows that this range provides at least a two-thirds probability of capturing the actual short-run (1 to 2 years) growth in the economy.⁸

Petroleum Demand

The first half of 1990 brought expectations of relatively weak total petroleum demand for all of 1990. That outlook unfolded under assumptions of much lower prices and more optimistic economic projections than those which now are shaping the market. Reasonable assumptions about the course of petroleum prices through the remainder of 1990 combined with the weak economy may easily push oil demand in the United States to below 17.0 million barrels per day for the year's average (Tables 7, 8, and 9). This would be the lowest level since 1987. Even the relatively strong product supplied estimates for the third quarter of this year may have more to do with anticipatory stockpiling at all levels on the supply chain rather than to fundamental demand forces. To the extent that this is true, fourth quarter demand projections may be high.

Using the range of oil prices and economic assumptions of this Outlook, a decline in domestic petroleum demand is expected in 1991 and could range from 400,000 to nearly 1 million barrels per day (Figure 3). Over one-fourth of this decline is attributable to residual fuel oil demand. Residual fuel oil demand could recover if excess supplies result in a price collapse or if gas deliverability should become a problem during the peak of winter. However, the drop in petroleum demand is still likely to occur, because it affects other markets such as motor gasoline and distillate fuel oil. It is assumed that consumers will take aggressive steps to cut back sharply on highway travel and to maximize vehicle efficiency if motor fuel prices should increase in the 40- to 50-percent range. Similarly, it is assumed that conversions to natural gas or other sources and away from oil for home heating will accelerate where possible, and that additional steps to ensure efficient oil use in home heating will be taken.

Petroleum Demand Sensitivities

The petroleum demand outlook is based on normal temperatures and a particular set of macroeconomic assumptions. In order to widen the usefulness of the basic projections provided in the Outlook, as a summary

Two price sensitivities are given in the table. The first assumes that petroleum and nonpetroleum prices change in response to shifts in the world oil prices. The second sensitivity (which is presented in detail by comparing Tables 7 and 9) holds nonpetroleum prices, most notably natural gas, constant at the level consistent with the \$30 oil price case. Price effects on petroleum demand stemming from oil price variations, which are coupled with induced shifts in other energy product prices, tend to be smaller.

The weather sensitivities are based on assumed deviations from normal temperatures which correspond to the greatest quarterly variances in weather observed over the past 15 years. Combining the information in Table 8 with Table 10, the sensitivities of domestic petroleum demand to changes in the macroeconomic price and weather inputs can be summarized as follows:

- For every 1 percentage point of additional growth in real GNP, petroleum demand can be expected to increase by about 156,000 barrels per day.
- For every \$1 increase in the world oil price that leads to an increase in petroleum prices only, petroleum demand can be expected to fall by approximately 63,000 barrels per day.
- For every 1-percent increase in cooling degree-days above normal levels, petroleum demand is expected to increase by 3 percent; for every 1-percent increase in heating degree-days above normal levels, petroleum demand is expected to increase by 12 percent. (The exact decomposition between heating and cooling degree-day effects summarized in Table 10 are derived from internal calculations of the Short-Term Integrated Forecasting System.)

Petroleum Supply

The outlook for higher crude oil prices is projected to bring about either a substantial slowdown in or a reversal of the decline of domestic crude oil production during the forecast interval. In the \$25 and \$30 cases, crude oil production is projected to continue to decline, but at much slower rates than during the previous 3 years; in the \$35 case, crude oil production is projected to rise in 1991 (Figure 4). In 1989, domestic crude oil production averaged 7.61 million barrels per day, a decline of 530,000 barrels per day, or 6.5 percent, from

1988. Decreases in both Alaskan and Lower-48 production contributed to that decline. The average decline for 1990 is projected to range between 320,000 and 380,000 barrels per day, or 4.2 to 5.0 percent, respectively, from 1989 levels. Average 1990 output is expected to be between 7.23 and 7.29 million barrels per day. Alaskan output is expected to fall by between 11,000 and 12,000 barrels per day as a result of the normal decline rate, pipeline system shutdowns, and temporary disruptions brought about by volcanic activity in southern Alaska.

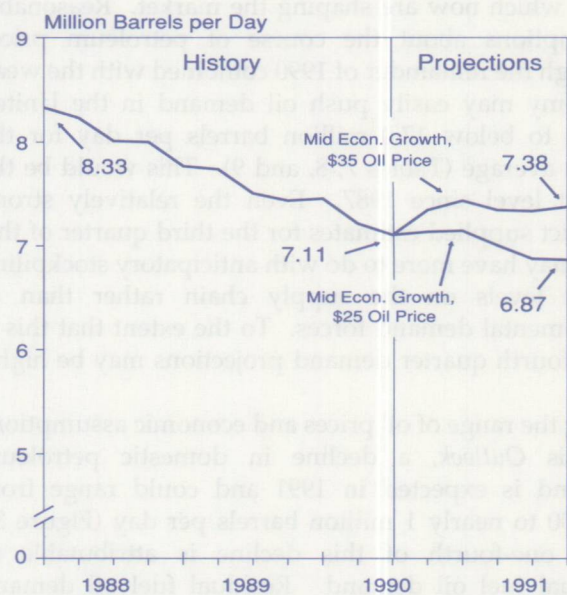


Figure 4. U.S. Crude Oil Production

Sources: **History:** Energy Information Administration, *Petroleum Supply Annual*, *Petroleum Supply Monthly*, and *Weekly Petroleum Status Report* (Washington, DC). **Projections:** Table 7 and 9.

In 1991, the year-to-year change in crude oil production is projected to range from a decline of 250,000 barrels in the \$25 case to an increase of 90,000 barrels per day in the \$35 case, with production from Alaska increasing by 60,000 barrels per day. Average annual production is projected to be from 6.98 to 7.38 million barrels per day.

Net imports of total petroleum, which averaged 7.20 million barrels per day, or approximately 42 percent of petroleum product supplied in 1989, are projected to rise to between 7.41 and 7.61 million barrels per day in 1990, representing between 44 and 45 percent of domestic demand. Continued declines in domestic crude oil production account for the increase in the

stocks will have declined slightly from their mid-year highs in all three scenarios, but remain somewhat higher than the levels of the previous year. The stock projections for 1991 reflect to some extent caution on the part of suppliers in that it is assumed that they will not reduce inventories as fast as demand falls because of heightened uncertainty in world petroleum markets.

Motor Gasoline

Motor gasoline demand is expected to decline substantially in all three price scenarios through the end of 1991, following an expected decline of 1.1 percent in 1990. Demand (as measured by product supplied) was weak for several months prior to the Iraqi invasion of Kuwait in August. For January through July 1990, shipments were down by almost 1.0 percent from the same period in the previous year because of the slowdown in the economy. However, sizable drawdowns in secondary stocks related to changes in volatility requirements are believed to have contributed to lower shipments and may have masked somewhat higher actual consumption. As a result, shipments may have understated actual consumption.

The decline in motor gasoline demand in 1990 also reflects an increase in vehicle-miles traveled of 2.7 percent and an increase in fuel efficiency of 3.8 percent.⁹ Although the continued retirement of older, less fuel-efficient vehicles contributed to the acceleration of fuel efficiencies over the 3.2 percent gain for 1989, it is likely that the unusually high gain in 1990 also reflects the secondary stock drawdowns that may have caused shipments to understate consumption. In 1991, fuel efficiencies are expected to continue to improve in all three price scenarios as driving habits adjust to higher prices, including switching to smaller vehicles. In the \$25 case, a projected slight increase in highway travel activity is insufficient to offset the impact of continued efficiency gains on demand. In the other two price cases, the decline in travel activity reinforces the impact of continued efficiency gains in reducing demand.

The share of leaded gasoline sales recently fell below 5.0 percent, while the share of mid-grade's share rose to above 10 percent for the first time (Figure 6). The trends behind these movements have slowed markedly from those of several months ago. With much higher gasoline prices throughout the forecast period, it seems likely that the share of mid-grade and premium shares will fall noticeably.

share of imports to domestic availability, even though demand is projected to decline by about 2.0 percent in all three price scenarios. In 1991, the level of imports is projected to drop sharply to between 6.21 million barrels per day in the \$35 case to 7.29 million barrels per day in the \$25 case, the first such decline since 1985 (Figure 5). Contributing to this decline is a substantial weakening in demand and a sharp slowdown in the decline rate of (or slight increase in) domestic crude oil production. As a result, the share of imports in the market is projected to decline to between 39 and 44 percent.

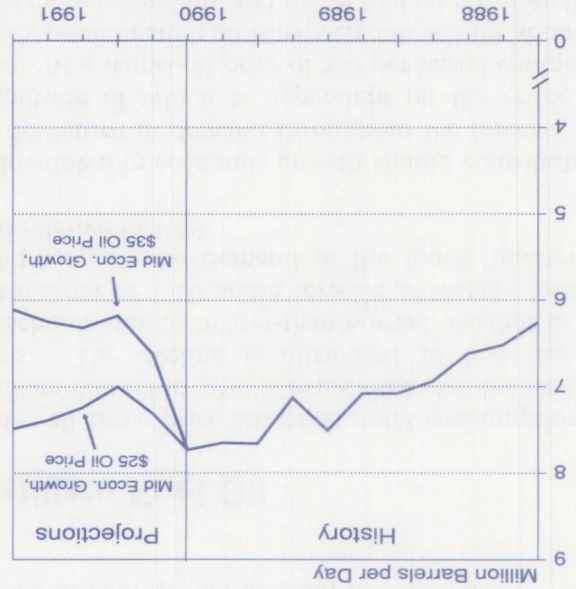


Figure 5. Total Net Petroleum Imports

Note: Crude oil production includes lease condensate. Sources: Energy Information Administration, Petroleum Supply Annual, Petroleum Supply Monthly, and Weekly Petroleum Status Report (Washington, DC). Projections: Table 7 and 9.

Petroleum stocks, especially product stocks, are projected to be slightly higher than normal at the end of 1990, and are expected to remain high relative to demand through 1991 in all three price scenarios. Total inventories (excluding the Strategic Petroleum Reserve) were unusually high by the middle of 1990 as a result of a weakening economy, mild first quarter temperatures, and rapid accumulation of crude oil due to falling prices. High rates of refinery utilization have resulted in sizable stock buildups of distillate and jet fuel despite the spike in jet fuel demand caused by the Persian Gulf activities. By the end of this year, total

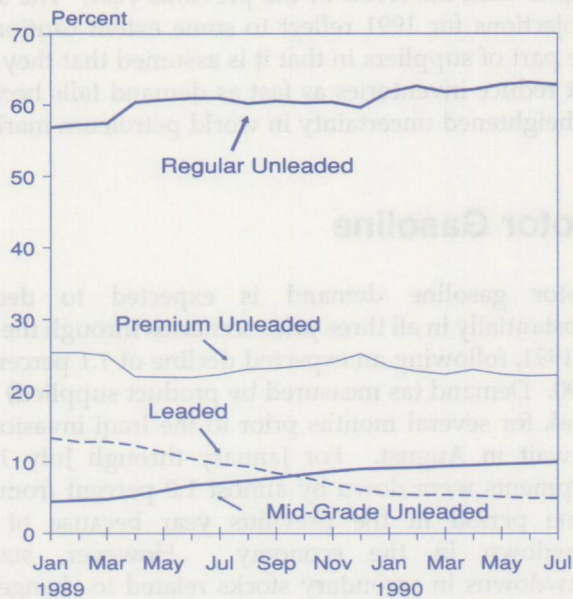


Figure 6. Motor Gasoline Market Shares

Sources: Energy Information Administration, *Petroleum Marketing Monthly* (Washington, DC).

Jet Fuel

Jet fuel demand, temporarily boosted by the military buildup in the Persian Gulf during the second half of this year, is expected to increase in 1990, but at a slower rate than in 1989. In 1991, demand is expected to decline sharply in all three price scenarios.

Following a 2.8-percent increase in 1989, demand growth is expected to slow to a more moderate 2.0 percent in 1990 in the \$25 and \$30 oil price cases and to 1.3 percent in the \$35 oil price case, even with the increase in demand brought about by Persian Gulf activity. During the first half of 1990, jet fuel demand rose 2.6 percent from the same period last year and revenue-ton-miles rose 3.7 percent.¹⁰ Much of that robust growth, however, reflects the weak performance in air travel activity during the first quarter of 1989, when customers reacted strongly to air carriers' attempts to increase profitability by temporarily boosting ticket prices. Second-quarter results reveal more clearly the underlying weakness in the industry: revenue-ton-miles rose by only 2.3 percent from 1989

levels even though ticket prices were lower in inflation-adjusted terms. Demand in the second half of 1990 is expected to increase by 2.3 percent over the same period in 1989. Persian Gulf-related demand is expected to more than offset the impact of declines in demand brought about by stagnating commercial air travel activity.

Further declines in economic activity and substantial increases in ticket prices are expected to result in sizable declines in non-military travel activity and falling commercial demand for jet fuel in all three price scenarios in 1991. In addition, any phasedown in Persian Gulf activity should contribute to the large decline in total jet fuel demand for that year.

Distillate Fuel Oil

Under all three price scenarios, total consumption of distillate fuel oil in 1990 is expected to fall below 1989 levels. The decline is attributed to less use by households due to milder-than-normal weather in the first quarter of 1990 and a forecast of weaker heating and transportation demand in the fourth quarter of 1990 relative to 1989.

A slowdown in economic growth should contribute to the downturn in demand throughout the forecast, the magnitude of which is dependent on the crude oil price. At a world oil price of \$35 per barrel compared to \$25, retail heating oil is expected to sell for about 30 cents more per gallon, and diesel fuel oil for more than 25 cents per gallon. The higher prices would dampen total demand in 1991 by 230,000 barrels per day compared to prices under a \$25 oil price scenario.

For 1991, demand is expected to fall below 1990 levels if crude oil sells at \$30 or more per barrel for a sustained period. In the \$25 case, relatively low prices, an expected upturn in the economy during the fourth quarter of 1991, and normal weather patterns would bring demand for distillate in line with 1990 consumption. During the first quarter of 1991, at the \$25 world oil price, transportation and industrial use should reach 1990 levels, while residential and commercial users may actually increase consumption compared to the weak first quarter of 1990. If economic growth is stronger than assumed or if weather is colder than normal, distillate demand could be much higher than any of the three price cases discussed. (See "1990-91 Winter Distillate Outlook," page 13.)

1990-91 Winter Distillate Outlook

This article discusses the projected demand levels of distillate fuel oil during the winter months, defined here as October through March, given a world oil price of \$30 per barrel. It also discusses demand and supply conditions under both normal and colder-than-normal weather conditions.

Demand for distillate fuel oil for the upcoming winter months is expected to fall by 6 percent compared with last winter, if weather conditions are normal. This represents an average decrease of about 190,000 barrels per day. Although weather conditions for this winter period are assumed to be somewhat more severe than last winter, at over 4 percent more heating degree-days,¹¹ the decline in demand reflects a general slowdown in the economy and higher petroleum prices stemming from the Iraq invasion.

An atypically cold December and a mild January characterized the weather last winter. In terms of heating degree-days, the weather in December was about 31 percent colder than normal, causing stock levels to drop sharply (Figure 7). This year, stocks are running higher than last year's level and are expected to continue this trend throughout the winter months. Therefore, suppliers should be in a better position to respond quickly to extreme weather conditions. If the weather is normal, higher stock levels and the weaker demand for distillate are expected to result in both lower domestic production and lower net imports this winter compared with last year.

Normal weather is the most reasonable weather assumption for forecasting demand, as there is a 68-percent probability that heating degree-days will not deviate by more than 5 percent above or below normal weather patterns.¹² Nonetheless, it is important to consider the supply requirements that could occur under colder-than-normal weather.

The worst case scenario is that heating degree-days will reach historic highs in both the fourth and first quarters. Over the last 15 years, the coldest fourth quarter was in 1976, when heating degree-days were 22 percent above normal. The most severe first quarter was in 1978 at 16 percent more heating degree-days than normal. Based on estimates of weather response coefficients from EIA's Short-Term Integrated

Forecasting System,¹³ demand for distillate fuel oil under these conditions would be about 180,000 more barrels per day on average this winter than in the normal weather case (Table 8). The increase in consumption that would result from colder-than-normal weather would come primarily from the industrial, residential, and commercial sectors. A smaller amount would come from the utility sector (Figure 8).

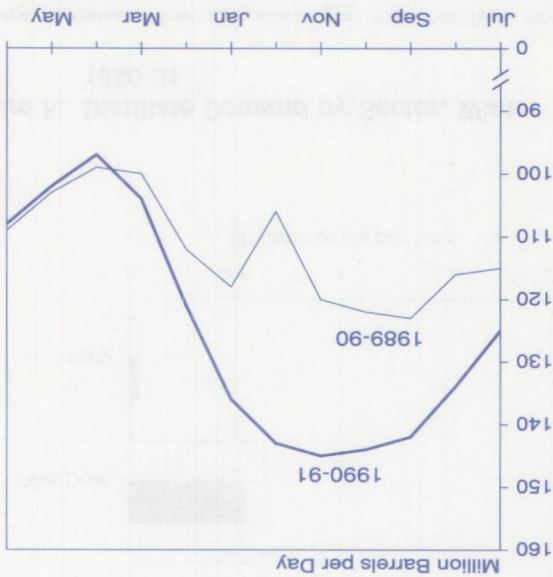


Figure 7. End-of-Period Distillate Fuel Oil Stocks

Note: Projections begin in October 1990. Source: History: Energy Information Administration, Petroleum Supply Monthly (Washington, DC). Projections: Internal model calculations from the Short-Term Integrated Forecasting System.

Stock drawdowns could meet much of the demand in the fourth quarter, but an additional 66,000 barrels per day would still be needed during December assuming the drawdown rate will not be greater than 228,000 barrels per day in the fourth quarter of 1990 and 540,000 in the first quarter of 1991. It is projected that production will be running near capacity at this time, so an increase in imports will be required to close the

gap. The continued drawdown could cause inventories to fall to 85 million barrels, the recognized minimum operating level, by the end of March. With stocks down, an additional 223,000 barrels per day would need to come from domestic production and net imports in February and March.

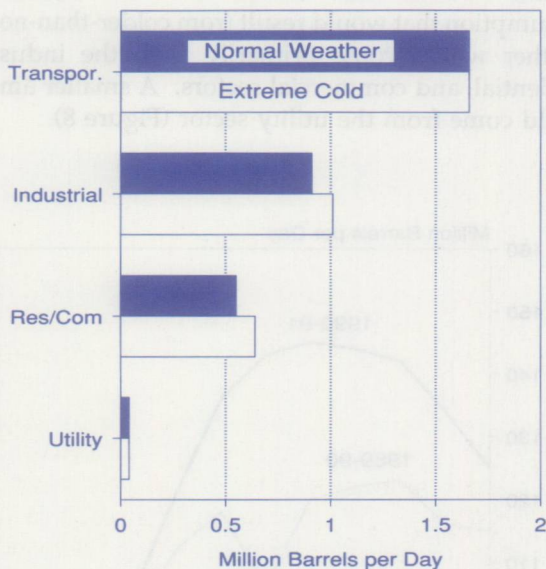


Figure 8. Distillate Demand by Sector, Winter 1990-91

Source: Internal model calculations from the Short-Term Integrated Forecasting System.

If primary stocks are not drawn down to this extent, supply from domestic production and imports would need to be greater. Additionally, the demand for distillate fuel oil may be greater if natural gas is interrupted to industrial, commercial, and utility customers. The residential sector has priority over these other sectors when severe cold temperatures cause tight natural gas supplies. On the other hand, if there is an additional increase in heating oil prices because of greater demand pressures, resulting in cutbacks in consumption, the supply requirements may not be as great.

It is unlikely that such extreme weather conditions would persist for 2 consecutive quarters. A more likely possibility is the case of extreme weather in the fourth quarter and normal weather in the first quarter. Under this scenario, demand increases on average by about 110,000 barrels per day above the level for the normal weather case. An increase in net imports of about 65,000 barrels per day would be required in December, and stock levels could reach 85 million barrels by the end of March, as in the more severe weather scenario, but reliance on domestic production and net imports would not be as great in the first quarter. Only 9,000 more barrels per day would be needed in February and March, compared with 223,000 barrels per day in the extreme weather case. This requirement could be met by domestic production.

Under both normal weather and the colder-than-normal conditions, projected demands can be met. First, less demand is expected this winter compared to last year because of a weaker economy and higher oil prices. Second, the relatively high stock levels in 1990, compared with last fall, could provide most of the supply necessary to meet severe weather conditions in the fourth quarter. Third, additional refining capacity will be available to increase domestic production in the first quarter of 1991, if colder-than-normal weather should persist.

Residual Fuel Oil

Assuming the middle economic growth scenario (Table 2), demand of residual fuel oil by electric utilities is expected to decline in both 1990 and 1991. Less dependence on petroleum products will result from widespread use of coal, expected competitive prices for natural gas, and increased availability of hydroelectric power. Demand for residual fuel oil in the nonutility sector is also expected to decline. These declines will occur whether the price of crude is \$25 or \$35 per barrel. Total demand is projected to fall by an additional 190,000 barrels per day in 1991 if the crude oil price is sustained at \$35 per barrel as opposed to \$25.

Other Petroleum Products

Demand for minor petroleum products ("Other Oils Supplied" in Tables 7, 8, and 9), fell by 0.5 percent in 1989 and is projected to decline by another 0.3 percent in 1990 in all three price scenarios under middle economic growth.¹⁴ Growth in oil-based petroleum feedstocks is expected to average 3.5 percent in 1990, after averaging 0.2 percent in 1989.¹⁵ This robust year-to-year growth results from the combination of unusual strength in demand while oil prices declined in the spring of 1990 and weakness in the first half of 1989 while oil prices rose sharply. Demand for

petrochemical feedstocks in the second half of 1990 is projected to decline from the 1989 second-half level in response to higher oil prices. Demand for miscellaneous products is expected to increase by a robust 3.5 percent in 1990, despite a general slow down in industrial production. Substantial increases in still gas production, reflecting increases in refinery activity, explain a part of this growth. Demand for liquefied petroleum gases (LPG's) is projected to decline by 5.3 percent, more than offsetting increases in demand for the other minor petroleum products. Much of this decline was brought about by the mild first-quarter weather, however, which followed a cold snap that boosted demand in late 1989.

In 1991, demand for total minor petroleum products is projected to decline in all three price scenarios as a result of a slowing economy and substantially higher crude oil prices. Differences in the rates of decline in demand for oil-based feedstocks and miscellaneous products resulting from the varying oil price assumptions, however, are largely offset by differences in the rates of increases in demand for LPG's brought about by corresponding relative price shifts compared to the more expensive oil-based feedstocks. (The assumption of normal weather in 1991 also contributes to the increase in LPG demand.) As a result, both the magnitude of the aggregate decline in demand for minor products and the range of outcomes resulting from differences in price projections are moderate.

Outlook for Other Major Energy Sources

Natural Gas

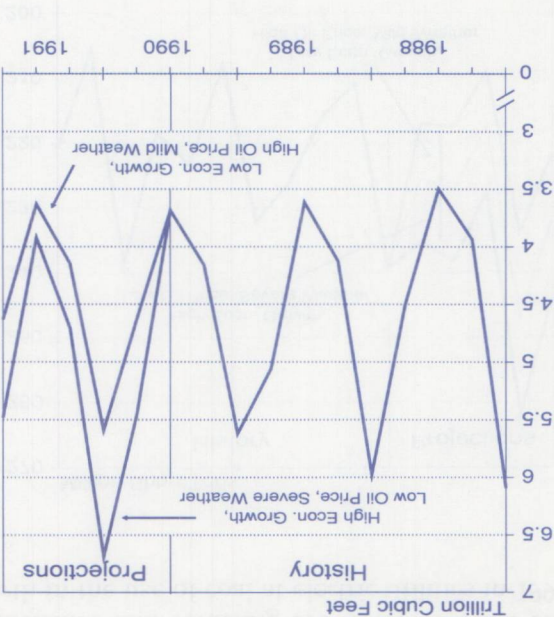
Assuming a range of world oil prices of \$25 to \$35 per barrel, total natural gas demand could either increase or decrease in 1991. Figure 9 illustrates this range of natural gas demand under the widest range of assumptions considered from Table 2. The remainder of this discussion focuses primarily on the \$30 world oil price, middle economic growth, and normal weather (Table 11). Normal weather next year, compared with mild weather during the first and second quarters of 1990, should boost natural gas consumption in the residential and commercial sectors considerably. Furthermore, continued growth in the size of the customer base in each of these sectors should more than offset any anticipated efficiency gains.

Despite sluggish growth in manufacturing output, industrial natural gas use should increase by 4.3 percent in 1991. The expected increase in the price advantage of natural gas over residual fuel oil is likely to prompt some industries to switch from oil to natural gas.

Natural gas is expected to be preferred to oil at electric utilities. Growth has been low this year due to mild weather, but by 1991 gas use by utilities is expected to increase by 5.5 percent. However, this increase may not take place if increases in residual fuel oil prices lag increases in the world oil price or if weather is abnormally cold this winter and natural gas supplies tighten.

Given middle economic growth and normal weather, the range of growth in total natural gas demand by varying the oil price is from 2.2 percent (\$25 world oil price case) to 5.0 percent (\$35 world oil price case) between 1990 and 1991. Only the industrial sector is expected to be significantly impacted by such a price change. If macroeconomic factors are changed as well, growth in total natural gas demand would range from 3.4 percent to 4.3 percent. Adding adverse and mild weather scenarios would provide an even larger range, as the residential and commercial sectors would be measurably affected as well. The total expected range of growth in natural gas demand is from -0.6 percent to 8.9 percent for total consumption in 1991 (Figure 9).

Figure 9. Natural Gas Demand



Note: Projections begin in the fourth quarter of 1990.
 Sources: History: Energy Information Administration, *Monthly Energy Review* (Washington, DC). Projections: Internal model calculations from the Short-Term Integrated Forecasting System.

Coal

Moderate increases in electric utility consumption will keep total coal demand growing in 1990 despite a decline in nonutility coal demand under a \$30 oil price and a middle economic growth scenario as in Table 12.

The projected range of total coal consumption is from 881 to 904 million short tons in 1990. Figure 10 provides an illustration of the range of possible consumption.¹⁶ In 1991, total coal consumption levels are unaffected by a change in the oil price assumptions. Changing the macroeconomic factors, total consumption growth would range from 2.0 percent (low macroeconomic case) to 4.9 percent (high

macroeconomic case). If weather scenarios are included (adverse and mild), the total range of variance would be from -1.1 percent to 8.9 percent for 1991.

Coal demand at electric utilities should continue to be sluggish in 1990 as a result of slow growth in total generation and robust growth in the use of nuclear and hydroelectric power. Normal weather combined with a decline in nuclear generation due to scheduled maintenance and refueling are likely to yield strong growth in the use of coal at electric utilities in 1991.

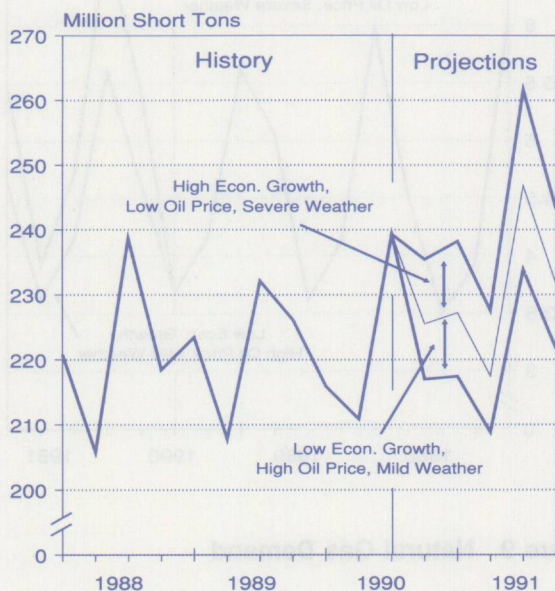


Figure 10. Total Coal Consumption

Sources: **History:** Energy Information Administration, *Quarterly Coal Report* (Washington, DC). **Projections:** Table 12 and internal model calculations from the Short-Term Integrated Forecasting System.

A projected decline in the demand for raw steel in 1990 is expected to result in a decline in coal demand at coke plants.¹⁷ Weakness in the economy, including a soft investment sector and increased business inventories, contribute to the sluggish performance in the steel market. Net coke imports are expected to decline in 1990, keeping domestic coking coal from dropping as fast as demand for raw steel. In 1991, continued declines in net coke imports will keep coal consumption relatively flat at coke plants.

Coal consumption in the retail and general industry sectors is expected to decline slightly in 1990. Due to

a general trend toward lower intensity of coal use in several manufacturing industries and slow growth in several coal consuming sectors, industrial coal use is expected to decline in 1990 and 1991. Coal consumption in the residential and commercial sectors is expected to remain virtually flat in each of the next 2 years.

Annual coal production is expected to exceed 1 billion tons for the first time in 1990 (Table 12). Most of the 136-million-ton difference between projected coal consumption and production in 1990 is accounted for by coal exports (100 million tons) and stock buildups by electric utilities. Coal production is expected to rise again in 1991, although at a slower rate than in 1990.

Electricity

Demand

Electricity sales have been increasing at a moderate pace this year. Total sales are up 2.6 percent year-to-date through July of this year.¹⁸ Mild weather in the early months initially contributed to sluggish sales growth. As summer temperatures turned warmer than last year, electricity demand picked up quickly. Electricity sales are expected to grow by 2.7 percent in 1990 and 2.6 percent in 1991 (Table 13).

The direction and magnitude of growth in electricity demand will depend on weather conditions and the economic environment. If the weather is about 20 percent more severe than normal in the scenario period (fourth quarter 1990 through fourth 1991), total electricity sales are expected to increase by as much as 5.5 percent between 1990 and 1991.¹⁹ On the other hand, if the weather is around 15 percent milder than normal, electricity demand growth could be as low as 0.3 percent in 1991. This range is determined by the response of the residential and commercial sectors.

Economic conditions will also exert a strong influence across all sectors, though primarily in the industrial sector. Thus, if the growth in gross national product is assumed to range from 2.3 percent to -0.8 percent in 1991, then growth in total electricity demand ranges from 3.6 percent to 1.6 percent. Combining the influence of weather and economic variations, the total range of expected demand growth for electricity by all sectors combined ranges from 6.5 percent to -0.8 percent in 1991 (Figure 11).²⁰

Natural gas is expected to gain market share over oil use at utilities because of its price advantage. Some utilities are maintaining high inventories of oil and burning natural gas now in anticipation of higher oil prices during the winter—when gas is typically less available to utilities because it is diverted to higher priority customers, or the residential sector. If temperatures are significantly colder than normal in the fourth quarter of this year or in the first and fourth quarters of next year, utilities may switch from gas and therefore use more oil than indicated in this scenario. Furthermore, stocks of residual fuel oil are currently high and may cause the price of this fuel to drop to levels that are more competitive with utility natural gas and induce oil consumption above levels in the \$30 oil price scenario.

Given a world oil price of \$30 per barrel, a middle economic growth scenario, and normal weather, electricity generation requirements are expected to increase by 2.2 percent in 1991, after growth of 1.3 percent in 1990 (Table 13). The difference in these growth rates is attributed to milder weather during the first and second quarters of 1990 than occurred in 1989. Coal-fired sources are expected to pick up most of the additional generation load in 1991. Nuclear power may decline next year, as no new units are expected to come on line, and capacity factors are assumed to be slightly lower. Hydroelectric power generation should recover further in 1991, returning to levels near normal.

Supply

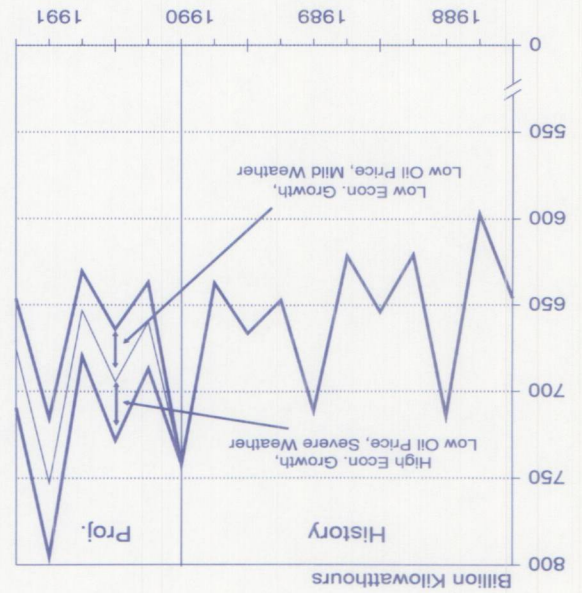


Figure 11. Electricity Sales

Sources: **History:** Energy Information Administration, *Electric Power Monthly* (Washington, DC). **Projections:** Table 13 and internal model calculations from the Short-Term Integrated Forecasting System.

References and Notes

1. The macroeconomic projections discussed in this section, which provide many of the basic assumptions about overall economic activity needed to produce the energy demand and supply forecasts for the *Outlook*, are derived from a particular simulation of the DRI/McGraw-Hill quarterly model of the U.S. economy, in which DRI's October macroeconomic forecast (CONTROL1090) was solved using EIA's basic assumptions about world oil prices and other basic energy prices featured in the \$30 oil price case. The results from this simulation were used in deriving all three of the oil price scenarios discussed in the text. This was done for convenience and because it was desired to provide reasonable oil price cases which would not be obscured by the effects of possible macroeconomic feedbacks relating to higher or lower oil prices. Table 10 on page 29 provides macroeconomic sensitivity information which illustrates the potential effects of alternative macroeconomic assumptions.
2. DRI/McGraw-Hill projects GNP growth between 1990 and 1991 to be 0.6 percent, while WEFA and the Council of Economic Advisers both project 0.8-percent growth.
3. Based on internal calculations from the Energy Information Administration, Office of Energy Markets and End Use, International and Contingency Information Division.
4. The prices in this discussion and in Table 5 do not include the Federal fuel tax proposals that may be included in the 1991 U.S. budget package.
5. In September 1989, retail margins for unleaded regular were estimated to be 17.9 cents per gallon. In September 1990, they fell to 3.4 cents per gallon. Sources: *Weekly Petroleum Status Report* DOE/EIA-0208 (August 3, 1990, and October 17, 1990); Bureau of Labor Statistics *Consumer Price Index* (October 18, 1990). The actual margin calculations are internal model calculations from the Short-Term Integrated Forecasting System.
6. U.S. Department of Commerce, National Oceanic and Atmospheric Administration, *Monthly State, Regional, and National Heating/Cooling Degree Days Weighted by Population* (Asheville, NC).
7. Steam coal spot market prices (FOB) apparently remained unchanged between July and October in major domestic markets, according to McGraw-Hill's *Coal Week* (July 2, 1990, and October 15, 1990, issues).
8. This analysis, which determined historical root mean square error statistics for 1-year-ahead GNP forecasts for the period 1979 to 1988 (and, therefore, applies most directly to historical forecast performance) was performed by the Economics and Statistics Division and is available upon request.
9. Average efficiency statistics cited here are from internal model calculations in the Motor Gasoline Demand Model of the Short-Term Integrated Forecasting System.
10. Revenue ton-miles and ticket price statistics cited here are from internal model calculations in the Jet Fuel Demand Model of the Short-Term Integrated Forecasting System.
11. Detailed severe-weather cases are derived from internal model calculations by the Energy Analysis and Forecasting Division.

12. Energy Information Administration, *Short-Term Energy Outlook, Fourth Quarter 1989*, "Analysis of Winter Weather Variability," DOE/EIA-0202(89/4Q) (Washington, DC, 1989).
13. The weather coefficients in the distillate fuel oil model may understate the effect on distillate demand in very cold weather, because they do not explicitly correct for the most severe interruptions such as occur in the industrial sector.
14. References to particular product categories under "Other Petroleum Products" are based on internal model calculations from the Short-Term Integrated Forecasting System.
15. Statistics on individual products under the minor petroleum products category are not shown in the tables but are based on internal calculations from the Short-Term Integrated Forecasting System.
16. The middle line in Figure 10 is from Table 12. The extreme ranges are based on internal model calculations from the Short-Term Integrated Forecasting System.
17. Steel production forecasts are produced by using the Coking Coal Demand Model of the Short-Term Integrated Forecasting System.
18. Energy Information Administration, *Monthly Energy Review* DOE/EIA-0035(90/07) (Washington, DC).
19. Based on internal calculations from the Electricity Demand Model of the Short-Term Integrated Forecasting System.
20. Figure 11 illustrates alternative paths for electricity sales under various economic, oil price, and weather assumptions, with the middle forecast line relating to the numbers in Table 13.

Table 2. Macroeconomic, Oil Price, and Weather Assumptions

Assumption	1989				1990			Case	1990	1991				Year		
	1st	2nd	3rd	4th	1st	2nd	3rd		4th	1st	2nd	3rd	4th	1989	1990	1991
Macroeconomic ^a																
Real Gross National Product (billion 1982 dollars)	4,096	4,112	4,130	4,133	4,151	4,163	<i>4,171</i>	High	<i>4,224</i>	<i>4,243</i>	<i>4,264</i>	<i>4,290</i>	<i>4,319</i>		<i>4,184</i>	<i>4,279</i>
								Mid	<i>4,155</i>	<i>4,159</i>	<i>4,176</i>	<i>4,201</i>	<i>4,230</i>	4,118	<i>4,160</i>	<i>4,192</i>
								Low	<i>4,085</i>	<i>4,074</i>	<i>4,088</i>	<i>4,113</i>	<i>4,141</i>		<i>4,136</i>	<i>4,104</i>
Percentage Change from Prior Year	3.2	2.6	2.4	1.8	1.3	1.2	<i>1.0</i>	High	<i>2.2</i>	<i>2.2</i>	<i>2.4</i>	<i>2.2</i>	<i>2.2</i>		<i>1.6</i>	<i>2.3</i>
								Mid	<i>.5</i>	<i>.2</i>	<i>.3</i>	<i>.7</i>	<i>1.8</i>	2.5	<i>1.0</i>	<i>.8</i>
								Low	<i>-1.2</i>	<i>-1.9</i>	<i>-1.8</i>	<i>-.7</i>	<i>1.4</i>		<i>.4</i>	<i>-.8</i>
GNP Implicit Price Deflator (index, 1982=1.000)	1.246	1.258	1.268	1.280	1.295	1.310	<i>1.321</i>	High	<i>1.321</i>	<i>1.331</i>	<i>1.344</i>	<i>1.356</i>	<i>1.367</i>		<i>1.311</i>	<i>1.349</i>
								Mid	<i>1.328</i>	<i>1.339</i>	<i>1.353</i>	<i>1.365</i>	<i>1.376</i>	1.263	<i>1.313</i>	<i>1.358</i>
								Low	<i>1.335</i>	<i>1.348</i>	<i>1.362</i>	<i>1.374</i>	<i>1.385</i>		<i>1.316</i>	<i>1.367</i>
Percentage Change from Prior Year	4.4	4.3	3.9	3.7	3.9	4.1	<i>4.2</i>	High	<i>3.2</i>	<i>2.8</i>	<i>2.6</i>	<i>2.8</i>	<i>3.5</i>		<i>3.8</i>	<i>2.9</i>
								Mid	<i>3.8</i>	<i>3.4</i>	<i>3.3</i>	<i>3.3</i>	<i>3.6</i>	4.1	<i>4.0</i>	<i>3.4</i>
								Low	<i>4.3</i>	<i>4.1</i>	<i>4.0</i>	<i>3.8</i>	<i>3.7</i>		<i>4.2</i>	<i>3.9</i>
Real Disposable Personal Income ^b	2,863	2,855	2,874	2,883	2,901	2,907	<i>2,909</i>	High	<i>2,942</i>	<i>2,962</i>	<i>2,955</i>	<i>2,954</i>	<i>2,962</i>		<i>2,920</i>	<i>2,958</i>
								Mid	<i>2,891</i>	<i>2,900</i>	<i>2,891</i>	<i>2,890</i>	<i>2,898</i>	2,869	<i>2,902</i>	<i>2,895</i>
								Low	<i>2,841</i>	<i>2,838</i>	<i>2,827</i>	<i>2,826</i>	<i>2,834</i>		<i>2,884</i>	<i>2,831</i>
Percentage Change from Prior Year	3.5	2.6	2.0	1.7	1.3	1.8	<i>1.2</i>	High	<i>2.0</i>	<i>2.1</i>	<i>1.7</i>	<i>.9</i>	<i>.7</i>		<i>1.8</i>	<i>1.3</i>
								Mid	<i>.3</i>	<i>.0</i>	<i>-.6</i>	<i>-.7</i>	<i>2</i>	2.4	<i>1.2</i>	<i>-.2</i>
								Low	<i>-1.5</i>	<i>-2.2</i>	<i>-2.8</i>	<i>-2.1</i>	<i>-.2</i>		<i>.5</i>	<i>-1.8</i>
Index of Industrial Production (Mfg.)	1.086	1.093	1.089	1.087	1.092	1.101	<i>1.106</i>	High	<i>1.137</i>	<i>1.139</i>	<i>1.144</i>	<i>1.154</i>	<i>1.165</i>		<i>1.113</i>	<i>1.150</i>
								Mid	<i>1.096</i>	<i>1.089</i>	<i>1.092</i>	<i>1.102</i>	<i>1.112</i>	1.089	<i>1.099</i>	<i>1.099</i>
								Low	<i>1.055</i>	<i>1.039</i>	<i>1.040</i>	<i>1.050</i>	<i>1.060</i>		<i>1.084</i>	<i>1.047</i>
Percentage Change from Prior Year	4.7	4.0	2.1	.9	.6	.7	<i>1.6</i>	High	<i>4.6</i>	<i>4.3</i>	<i>3.9</i>	<i>2.9</i>	<i>2.5</i>		<i>2.2</i>	<i>3.3</i>
								Mid	<i>.8</i>	<i>-.3</i>	<i>-.8</i>	<i>-.4</i>	<i>1.5</i>	2.9	<i>.9</i>	<i>.0</i>
								Low	<i>-2.9</i>	<i>-4.9</i>	<i>-5.5</i>	<i>-3.6</i>	<i>.5</i>		<i>-.5</i>	<i>-3.4</i>
Oil Price																
Imported Crude Oil Price ^c (U.S. dollars/barrel)	16.76	18.97	17.60	18.85	19.76	15.87	<i>23.56</i>	Low	<i>25.00</i>	<i>25.00</i>	<i>25.00</i>	<i>25.00</i>	<i>25.00</i>		<i>21.10</i>	<i>25.00</i>
								Mid	<i>30.00</i>	<i>30.00</i>	<i>30.00</i>	<i>30.00</i>	<i>30.00</i>	18.08	<i>22.30</i>	<i>30.00</i>
								High	<i>35.00</i>	<i>35.00</i>	<i>35.00</i>	<i>35.00</i>	<i>35.00</i>		<i>23.40</i>	<i>35.00</i>
Weather ^d																
Heating Degree Days	2,289	560	96	1,930	1,970	546	<i>89</i>		<i>1,669</i>	<i>2,401</i>	<i>536</i>	<i>88</i>	<i>1,669</i>	4,875	<i>4,274</i>	<i>4,694</i>
Cooling Degree Days	39	317	700	60	47	332	<i>782</i>		<i>63</i>	<i>28</i>	<i>327</i>	<i>755</i>	<i>63</i>	1,116	<i>1,224</i>	<i>1,172</i>

^a Macroeconomic projections from the Data Resources, Inc., model forecasts are seasonally adjusted at annual rates and modified as appropriate to the \$30 world oil price case. The mid macroeconomic projections are then modified by the \$25 and \$35 world oil price cases and by various explicit economic assumptions, with \$25 world oil prices are applied to the high macroeconomic case, and \$35 world oil prices are applied to the low macroeconomic case.

^b Seasonally adjusted at annual rates.

^c Cost of imported crude oil to U.S. refiners.

^d Population-weighted average degree days. A degree day indicates the temperature variation from 65 degrees Fahrenheit (calculated as the simple average of the daily minimum and maximum temperatures) weighted by 1980 population.

Note: Historical values are printed in **boldface**, forecasts in *italics*.

Sources: Historical data: Energy Information Administration, *Monthly Energy Review*, DOE/EIA-0035(90/07); U.S. Department of Commerce, Bureau of Economic Analysis, *Survey of Current Business*, September 1990; U.S. Department of Commerce, National Oceanic and Atmospheric Administration, *Monthly State, Regional, and National Heating/Cooling Degree Days Weighted by Population*; Federal Reserve System, *Statistical Release G.17(419)* September 1990. Macroeconomic projections are based on DRI/McGraw-Hill Forecast CONTROL1090.

Table 3. International Petroleum Balance: \$25 World Oil Price Case
(Million Barrels per Day, Except Closing Stocks)

	1989				1990				1991				Year		
	1st	2nd	3rd	4th	1st	2nd	3rd	4th	1st	2nd	3rd	4th	1989	1990	1991
Supply ^a															
Production															
U.S. (50 States)	10.15	10.06	9.75	9.57	9.74	9.42	<i>9.32</i>	<i>9.41</i>	<i>9.41</i>	<i>9.26</i>	<i>9.11</i>	<i>9.14</i>	9.88	<i>9.47</i>	<i>9.23</i>
OPEC	22.20	23.26	24.13	25.35	25.25	25.44	<i>23.82</i>	<i>23.81</i>	<i>23.81</i>	<i>24.01</i>	<i>24.01</i>	<i>24.01</i>	23.74	<i>24.57</i>	<i>23.96</i>
Other Non-OPEC	16.64	16.30	16.79	17.13	17.25	17.24	<i>16.97</i>	<i>17.45</i>	<i>17.53</i>	<i>17.19</i>	<i>17.81</i>	<i>18.16</i>	16.72	<i>17.23</i>	<i>17.68</i>
Total Market Economies	48.99	49.62	50.67	52.04	52.24	52.10	<i>50.11</i>	<i>50.67</i>	<i>50.76</i>	<i>50.45</i>	<i>50.93</i>	<i>51.30</i>	50.34	<i>51.27</i>	<i>50.86</i>
Net Centrally Planned Economies Exports	1.81	1.95	1.96	1.85	1.64	1.82	<i>1.96</i>	<i>1.83</i>	<i>1.51</i>	<i>1.79</i>	<i>1.93</i>	<i>1.77</i>	1.89	<i>1.81</i>	<i>1.75</i>
Total Supply	50.80	51.56	52.63	53.89	53.88	53.91	<i>52.07</i>	<i>52.50</i>	<i>52.27</i>	<i>52.24</i>	<i>52.86</i>	<i>53.08</i>	52.23	<i>53.08</i>	<i>52.61</i>
Net Stock Withdrawals or Additions (-)															
U.S. (50 States Excluding SPR) .....	.39	-.37	-.59	.96	-.66	-.39	<i>-.22</i>	<i>.23</i>	<i>.38</i>	<i>-.37</i>	<i>-.28</i>	<i>.35</i>	.10	<i>-.26</i>	<i>.02</i>
U.S. SPR	-.07	-.06	-.06	-.03	-.03	-.05	<i>-.03</i>	<i>.04</i>	<i>.00</i>	<i>.00</i>	<i>.00</i>	<i>.00</i>	-.06	<i>-.02</i>	<i>.00</i>
Other Market Economies .....	.53	-.27	-1.29	.07	-.50	-.38	<i>.91</i>	<i>1.13</i>	<i>.82</i>	<i>-.96</i>	<i>-1.21</i>	<i>1.03</i>	-.25	<i>.30</i>	<i>-.08</i>
Total Stock Withdrawals .....	.84	-.70	-1.94	1.00	-1.19	-.82	<i>.65</i>	<i>1.41</i>	<i>1.20</i>	<i>-1.33</i>	<i>-1.49</i>	<i>1.39</i>	-.20	<i>.02</i>	<i>-.06</i>
Product Supplied															
U.S. (50 States)	17.72	16.89	16.87	17.83	17.03	16.87	<i>17.19</i>	<i>17.12</i>	<i>16.92</i>	<i>16.26</i>	<i>16.34</i>	<i>17.11</i>	17.33	<i>17.05</i>	<i>16.66</i>
U.S. Territories .....	.20	.23	.19	.16	.20	.17	<i>.20</i>	<i>.18</i>	<i>.18</i>	<i>.21</i>	<i>.19</i>	<i>.18</i>	.19	<i>.19</i>	<i>.19</i>
Canada	1.75	1.70	1.76	1.84	1.75	1.69	<i>1.79</i>	<i>1.82</i>	<i>1.72</i>	<i>1.69</i>	<i>1.75</i>	<i>1.85</i>	1.76	<i>1.76</i>	<i>1.75</i>
Japan	5.46	4.47	4.60	5.41	5.71	4.63	<i>4.94</i>	<i>5.63</i>	<i>5.79</i>	<i>4.64</i>	<i>4.80</i>	<i>5.69</i>	4.98	<i>5.22</i>	<i>5.23</i>
Australia and New Zealand .....	.76	.79	.78	.80	.80	.81	<i>.80</i>	<i>.80</i>	<i>.77</i>	<i>.80</i>	<i>.79</i>	<i>.81</i>	.78	<i>.80</i>	<i>.79</i>
OECD Europe	12.70	12.01	12.22	13.31	12.93	12.24	<i>12.63</i>	<i>13.15</i>	<i>12.72</i>	<i>11.94</i>	<i>12.16</i>	<i>13.00</i>	12.56	<i>12.74</i>	<i>12.45</i>
Total OECD	38.59	36.07	36.42	39.36	38.41	36.42	<i>37.54</i>	<i>38.70</i>	<i>38.10</i>	<i>35.53</i>	<i>36.03</i>	<i>38.62</i>	37.61	<i>37.77</i>	<i>37.07</i>
Other Market Economies	14.69	14.60	14.51	15.26	15.32	15.36	<i>15.28</i>	<i>15.48</i>	<i>15.65</i>	<i>15.66</i>	<i>15.61</i>	<i>16.12</i>	14.76	<i>15.36</i>	<i>15.76</i>
Total Market Economies	53.27	50.67	50.93	54.61	53.74	51.79	<i>52.82</i>	<i>54.18</i>	<i>53.75</i>	<i>51.19</i>	<i>51.64</i>	<i>54.74</i>	52.37	<i>53.13</i>	<i>52.83</i>
Statistical Discrepancy	1.64	-.20	.24	-.27	1.04	-1.31	<i>.10</i>	<i>.27</i>	<i>.28</i>	<i>.28</i>	<i>.27</i>	<i>.28</i>	.35	<i>.02</i>	<i>.28</i>
Closing Stocks (billion barrels)	5.18	5.24	5.42	5.33	5.43	5.51	<i>5.45</i>	<i>5.32</i>	<i>5.21</i>	<i>5.33</i>	<i>5.47</i>	<i>5.34</i>	5.33	<i>5.32</i>	<i>5.34</i>

^a Includes production of crude oil and natural gas liquids, other hydrogen and hydrocarbons for refinery feedstock, refinery gains, alcohol, liquids produced from coal and other sources, and net exports from Communist countries.

SPR: Strategic Petroleum Reserve

Notes: Minor discrepancies with other published EIA historical data are due to rounding. Historical values are printed in **boldface**, forecasts in *italics*.

Sources: Energy Information Administration, *International Petroleum Statistics Report*, DOE/EIA-0520(90/09); and *International Energy Annual 1988*, DOE/EIA-0219(88); Organization for Economic Cooperation and Development, Annual and Monthly Oil Statistics Database through June 1990.

Table 4. International Petroleum Balance: \$30 World Oil Price Case
(Million Barrels per Day, Except Closing Stocks)

	1989				1990				1991				Year		
	1st	2nd	3rd	4th	1st	2nd	3rd	4th	1st	2nd	3rd	4th	1989	1990	1991
Supply ^a															
Production															
U.S. (50 States)	10.15	10.06	9.75	9.57	9.74	9.42	<i>9.32</i>	<i>9.51</i>	<i>9.58</i>	<i>9.46</i>	<i>9.34</i>	<i>9.42</i>	9.88	<i>9.50</i>	<i>9.45</i>
OPEC	22.20	23.26	24.13	25.35	25.25	25.44	<i>23.82</i>	<i>23.81</i>	<i>23.81</i>	<i>23.58</i>	<i>23.58</i>	<i>23.58</i>	23.74	<i>24.57</i>	<i>23.63</i>
Other Non-OPEC	16.64	16.30	16.79	17.13	17.25	17.24	<i>16.97</i>	<i>17.45</i>	<i>17.58</i>	<i>17.24</i>	<i>17.86</i>	<i>18.21</i>	16.72	<i>17.23</i>	<i>17.73</i>
Total Market Economies	48.99	49.62	50.67	52.04	52.24	52.10	<i>50.11</i>	<i>50.77</i>	<i>50.97</i>	<i>50.27</i>	<i>50.78</i>	<i>51.20</i>	50.34	<i>51.30</i>	<i>50.81</i>
Net Centrally Planned Economies Exports	1.81	1.95	1.96	1.85	1.64	1.82	<i>1.96</i>	<i>1.93</i>	<i>1.55</i>	<i>1.83</i>	<i>1.97</i>	<i>1.81</i>	1.89	<i>1.84</i>	<i>1.79</i>
Total Supply	50.80	51.56	52.63	53.89	53.88	53.91	<i>52.07</i>	<i>52.70</i>	<i>52.52</i>	<i>52.10</i>	<i>52.75</i>	<i>53.01</i>	52.23	<i>53.14</i>	<i>52.60</i>
Net Stock Withdrawals or Additions (-)															
U.S. (50 States Excluding SPR) .....	.39	-.37	-.59	.96	-.66	-.39	<i>-.22</i>	<i>.33</i>	<i>.46</i>	<i>-.38</i>	<i>-.27</i>	<i>.39</i>	.10	<i>-.23</i>	<i>.05</i>
U.S. SPR	-.07	-.06	-.06	-.03	-.03	-.05	<i>-.03</i>	<i>.04</i>	<i>.00</i>	<i>.00</i>	<i>.00</i>	<i>.00</i>	-.06	<i>-.02</i>	<i>.00</i>
Other Market Economies .....	.53	-.27	-1.29	.07	-.50	-.38	<i>.91</i>	<i>.02</i>	<i>-.45</i>	<i>-1.78</i>	<i>-2.28</i>	<i>-.21</i>	-.25	<i>.01</i>	<i>-1.18</i>
Total Stock Withdrawals .....	.84	-.70	-1.94	1.00	-1.19	-.82	<i>.65</i>	<i>.40</i>	<i>.01</i>	<i>-2.16</i>	<i>-2.55</i>	<i>.18</i>	-.20	<i>-.23</i>	<i>-1.13</i>
Product Supplied															
U.S. (50 States)	17.72	16.89	16.87	17.83	17.03	16.87	<i>17.19</i>	<i>16.86</i>	<i>16.61</i>	<i>15.95</i>	<i>15.92</i>	<i>16.55</i>	17.33	<i>16.99</i>	<i>16.26</i>
U.S. Territories .....	.20	.23	.19	.16	.20	.17	<i>.20</i>	<i>.17</i>	<i>.18</i>	<i>.20</i>	<i>.19</i>	<i>.17</i>	.19	<i>.18</i>	<i>.18</i>
Canada	1.75	1.70	1.76	1.84	1.75	1.69	<i>1.79</i>	<i>1.79</i>	<i>1.68</i>	<i>1.66</i>	<i>1.71</i>	<i>1.81</i>	1.76	<i>1.76</i>	<i>1.71</i>
Japan	5.46	4.47	4.60	5.41	5.71	4.63	<i>4.94</i>	<i>5.54</i>	<i>5.68</i>	<i>4.54</i>	<i>4.68</i>	<i>5.58</i>	4.98	<i>5.20</i>	<i>5.12</i>
Australia and New Zealand .....	.76	.79	.78	.80	.80	.81	<i>.80</i>	<i>.78</i>	<i>.75</i>	<i>.78</i>	<i>.77</i>	<i>.79</i>	.78	<i>.80</i>	<i>.77</i>
OECD Europe	12.70	12.01	12.22	13.31	12.93	12.24	<i>12.63</i>	<i>12.93</i>	<i>12.48</i>	<i>11.68</i>	<i>11.87</i>	<i>12.71</i>	12.56	<i>12.68</i>	<i>12.18</i>
Total OECD	38.59	36.07	36.42	39.36	38.41	36.42	<i>37.54</i>	<i>38.07</i>	<i>37.38</i>	<i>34.80</i>	<i>35.14</i>	<i>37.61</i>	37.61	<i>37.61</i>	<i>36.23</i>
Other Market Economies	14.69	14.60	14.51	15.26	15.32	15.36	<i>15.28</i>	<i>15.30</i>	<i>15.44</i>	<i>15.43</i>	<i>15.34</i>	<i>15.87</i>	14.76	<i>15.32</i>	<i>15.52</i>
Total Market Economies	53.27	50.67	50.93	54.61	53.74	51.79	<i>52.82</i>	<i>53.37</i>	<i>52.82</i>	<i>50.24</i>	<i>50.48</i>	<i>53.48</i>	52.37	<i>52.92</i>	<i>51.75</i>
Statistical Discrepancy	1.64	-.20	.24	-.27	1.04	-1.31	<i>.10</i>	<i>.27</i>	<i>.29</i>	<i>.29</i>	<i>.28</i>	<i>.28</i>	.35	<i>.02</i>	<i>.28</i>
Closing Stocks (billion barrels)	5.18	5.24	5.42	5.33	5.43	5.51	<i>5.45</i>	<i>5.41</i>	<i>5.41</i>	<i>5.61</i>	<i>5.84</i>	<i>5.83</i>	5.33	<i>5.41</i>	<i>5.83</i>

^a Includes production of crude oil and natural gas liquids, other hydrogen and hydrocarbons for refinery feedstock, refinery gains, alcohol, liquids produced from coal and other sources, and net exports from Communist countries.

SPR: Strategic Petroleum Reserve

Notes: Minor discrepancies with other published EIA historical data are due to rounding. Historical values are printed in **boldface**, forecasts in *italics*.

Sources: Energy Information Administration, *International Petroleum Statistics Report*, DOE/EIA-0520(90/09); and *International Energy Annual 1988*, DOE/EIA-0219(88); Organization for Economic Cooperation and Development, Annual and Monthly Oil Statistics Database through June 1990.

**Table 5. International Petroleum Balance: \$35 World Oil Price Case
(Million Barrels per Day, Except Closing Stocks)**

	1989				1990				1991				Year		
	1st	2nd	3rd	4th	1st	2nd	3rd	4th	1st	2nd	3rd	4th	1989	1990	1991
Supply *															
Production															
U.S. (50 States)	10.15	10.06	9.75	9.57	9.74	9.42	<i>9.32</i>	<i>9.60</i>	<i>9.68</i>	<i>9.58</i>	<i>9.54</i>	<i>9.62</i>	9.88	<i>9.52</i>	<i>9.60</i>
OPEC	22.20	23.26	24.13	25.35	25.25	25.44	<i>23.82</i>	<i>23.81</i>	<i>23.81</i>	<i>22.95</i>	<i>22.95</i>	<i>22.95</i>	23.74	<i>24.57</i>	<i>23.16</i>
Other Non-OPEC	16.64	16.30	16.79	17.13	17.25	17.24	<i>16.97</i>	<i>17.45</i>	<i>17.63</i>	<i>17.29</i>	<i>17.91</i>	<i>18.26</i>	16.72	<i>17.23</i>	<i>17.78</i>
Total Market Economies	48.99	49.62	50.67	52.04	52.24	52.10	<i>50.11</i>	<i>50.86</i>	<i>51.13</i>	<i>49.82</i>	<i>50.40</i>	<i>50.83</i>	50.34	<i>51.32</i>	<i>50.54</i>
Net Centrally Planned Economies Exports	1.81	1.95	1.96	1.85	1.64	1.82	<i>1.96</i>	<i>2.03</i>	<i>1.59</i>	<i>1.87</i>	<i>2.01</i>	<i>1.85</i>	1.89	<i>1.86</i>	<i>1.83</i>
Total Supply	50.80	51.56	52.63	53.89	53.88	53.91	<i>52.07</i>	<i>52.89</i>	<i>52.72</i>	<i>51.68</i>	<i>52.41</i>	<i>52.68</i>	52.23	<i>53.18</i>	<i>52.37</i>
Net Stock Withdrawals or Additions (-)															
U.S. (50 States Excluding SPR) .....	.39	-.37	-.59	.96	-.66	-.39	-.22	.38	.46	-.32	-.24	.42	.10	-.22	.08
U.S. SPR	-.07	-.06	-.06	-.03	-.03	-.05	-.03	.04	.00	.00	.00	.00	-.06	-.02	.00
Other Market Economies .....	.53	-.27	-1.29	.07	-.50	-.38	.91	-.80	-1.36	-2.25	-2.89	-.74	-.25	-.19	-1.81
Total Stock Withdrawals .....	.84	-.70	-1.94	1.00	-1.19	-.82	.65	-.37	-.90	-2.57	-3.13	-.32	-.20	-.43	-1.73
Product Supplied															
U.S. (50 States)	17.72	16.89	16.87	17.83	17.03	16.87	<i>17.19</i>	<i>16.77</i>	<i>16.46</i>	<i>15.71</i>	<i>15.67</i>	<i>16.29</i>	17.33	<i>16.96</i>	<i>16.03</i>
U.S. Territories .....	.20	.23	.19	.16	.20	.17	.20	.18	.18	.20	.18	.17	.19	.19	.18
Canada	1.75	1.70	1.76	1.84	1.75	1.69	<i>1.79</i>	<i>1.76</i>	<i>1.65</i>	<i>1.62</i>	<i>1.67</i>	<i>1.78</i>	1.76	<i>1.75</i>	<i>1.68</i>
Japan	5.46	4.47	4.60	5.41	5.71	4.63	<i>4.94</i>	<i>5.45</i>	<i>5.58</i>	<i>4.45</i>	<i>4.58</i>	<i>5.49</i>	4.98	<i>5.18</i>	<i>5.02</i>
Australia and New Zealand .....	.76	.79	.78	.80	.80	.81	.80	.77	.73	.76	.75	.78	.78	.80	.75
OECD Europe	12.70	12.01	12.22	13.31	12.93	12.24	<i>12.63</i>	<i>12.73</i>	<i>12.26</i>	<i>11.45</i>	<i>11.61</i>	<i>12.48</i>	12.56	<i>12.63</i>	<i>11.95</i>
Total OECD	38.59	36.07	36.42	39.36	38.41	36.42	<i>37.54</i>	<i>37.65</i>	<i>36.86</i>	<i>34.19</i>	<i>34.46</i>	<i>36.97</i>	37.61	<i>37.50</i>	<i>35.62</i>
Other Market Economies	14.69	14.60	14.51	15.26	15.32	15.36	<i>15.28</i>	<i>15.13</i>	<i>15.25</i>	<i>15.21</i>	<i>15.10</i>	<i>15.67</i>	14.76	<i>15.27</i>	<i>15.31</i>
Total Market Economies	53.27	50.67	50.93	54.61	53.74	51.79	<i>52.82</i>	<i>52.78</i>	<i>52.11</i>	<i>49.40</i>	<i>49.56</i>	<i>52.64</i>	52.37	<i>52.78</i>	<i>50.92</i>
Statistical Discrepancy	1.64	-.20	.24	-.27	1.04	-1.31	.10	.27	.29	.29	.28	.28	.35	.02	.28
Closing Stocks (billion barrels)	5.18	5.24	5.42	5.33	5.43	5.51	<i>5.45</i>	<i>5.48</i>	<i>5.57</i>	<i>5.80</i>	<i>6.09</i>	<i>6.12</i>	5.33	<i>5.48</i>	<i>6.12</i>

* Includes production of crude oil and natural gas liquids, other hydrogen and hydrocarbons for refinery feedstock, refinery gains, alcohol, liquids produced from coal and other sources, and net exports from Communist countries.

SPR: Strategic Petroleum Reserve

Notes: Minor discrepancies with other published EIA historical data are due to rounding. Historical values are printed in **boldface**, forecasts in *italics*.

Sources: Energy Information Administration, *International Petroleum Statistics Report*, DOE/EIA-0520(90/09); and *International Energy Annual 1988*, DOE/EIA-0219(88); Organization for Economic Cooperation and Development, Annual and Monthly Oil Statistics Database through June 1990.

Table 10. Petroleum Demand Sensitivities

Demand Determinant	1990	1991
	Fourth Qtr Only	Four Quarters
Economic Activity		
Level of GNP ^a	4,085 - 4,224	4,104 - 4,279
Resulting Petroleum Demand Difference ^b	0.54	0.65
Energy Prices		
Crude Oil ^c	\$25 - \$35	\$25 - \$35
Resulting Petroleum Demand Difference ^b		
All Energy Prices Change .....	.32	.56
Only Oil Prices Change .....	.35	.63
Weather		
Heating Degree Days ^d	1,371 - 2,043	3,949 - 5,614
Cooling Degree Days ^d	49 - 87	991 - 1,411
Resulting Petroleum Demand Difference ^b .....	.65	.43

^a Real gross national product, in billion 1982 dollars per year.

^b Petroleum demand ranges associated with varying each demand determinant (or set of demand determinants), holding other things equal, in million barrels per day.

^c Refiners' acquisition cost of imported oil, in current dollars per barrel.

^d Heating and cooling degree days shown are national population-weighted.

Source: Energy Information Administration, Office of Energy Markets and End Use, Demand Analysis and Forecasting Branch.

**Table 11. Supply and Disposition of Natural Gas: \$30 World Oil Price Case
(Trillion Cubic Feet)**

Supply and Disposition	1989				1990				1991				Year		
	1st	2nd	3rd	4th	1st	2nd	3rd	4th	1st	2nd	3rd	4th	1989	1990	1991
Supply															
Total Dry Gas Production ^a	4.44	4.26	4.14	4.43	4.52	4.24	4.13	4.56	4.57	4.35	4.19	4.57	17.26	17.45	17.68
Net Imports .....	.32	.29	.30	.37	.36	.32	.33	.36	.43	.37	.34	.39	1.28	1.36	1.53
Supplemental Gaseous Fuels .....	.03	.02	.02	.03	.04	.04	.04	.05	.05	.04	.04	.05	.11	.17	.17
Total New Supply	4.78	4.57	4.46	4.82	4.92	4.60	4.49	4.97	5.04	4.77	4.56	5.01	18.64	18.98	19.38
Underground Working Gas Storage															
Opening	2.85	1.78	2.37	3.19	2.51	1.88	2.45	3.17	2.79	1.72	2.32	3.16	2.85	2.51	2.79
Closing	1.78	2.37	3.19	2.51	1.88	2.45	3.17	2.79	1.72	2.32	3.16	2.78	2.51	2.79	2.78
Net Withdrawals ^b	1.22	-.69	-.97	.76	.63	-.57	-.72	.38	1.07	-.60	-.84	.38	.32	-.28	.01
Total Primary Supply ^a	6.00	3.89	3.50	5.58	5.55	4.02	3.78	5.35	6.11	4.17	3.72	5.39	18.93	18.70	19.39
Consumption															
Lease and Plant Fuel .....	.28	.26	.26	.27	.31	.29	.26	.30	.28	.28	.26	.30	1.07	1.17	1.13
Pipeline Use .....	.17	.15	.15	.16	.15	.14	.15	.18	.16	.17	.16	.18	.63	.61	.66
Residential	2.14	.83	.39	1.42	1.96	.80	.36	1.26	2.22	.84	.36	1.28	4.78	4.38	4.69
Commercial	1.10	.51	.33	.77	1.03	.51	.32	.71	1.13	.53	.32	.72	2.72	2.57	2.70
Industrial	1.77	1.64	1.60	1.81	1.71	1.69	1.67	1.91	1.76	1.81	1.69	1.92	6.82	6.97	7.17
Electric Utilities .....	.53	.74	.89	.61	.46	.73	.92	.67	.57	.73	.95	.67	2.77	2.77	2.93
Subtotal	5.98	4.13	3.61	5.06	5.62	4.16	3.68	5.02	6.12	4.36	3.75	5.06	18.78	18.49	19.28
Total Disposition	6.00	3.89	3.50	5.58	5.55	4.02	3.78	5.35	6.11	4.17	3.72	5.39	18.93	18.70	19.39
Unaccounted for .....	.03	-.24	-.12	.53	-.07	-.14	.09	.33	-.01	-.19	-.02	.33	.19	.21	.11

^a Excludes nonhydrocarbon gases removed.

^b Net withdrawals may vary from the difference between opening and closing stocks of gas in working gas storage due to book transfers between base and working gas categories, and other storage operator revisions of working gas inventories.

Notes: Minor discrepancies with other EIA published historical data are due to rounding. Historical values are printed in **boldface**, forecasts in *italics*.

Sources: Historical data: Energy Information Administration, *Monthly Energy Review*, DOE/EIA-0035(90/07); *Natural Gas Monthly*, DOE/EIA-0130(90/07); and *Electric Power Monthly*, DOE/EIA-0226(90/07).

Table 12. Supply and Disposition of Coal: \$30 World Oil Price Case
(Million Short Tons)

Supply and Disposition	1989				1990				1991				Year		
	1st	2nd	3rd	4th	1st	2nd	3rd	4th	1st	2nd	3rd	4th	1989	1990	1991
Supply															
Production	247	239	243	251	264	254	<i>257</i>	<i>252</i>	<i>252</i>	<i>261</i>	<i>257</i>	<i>268</i>	980	<i>1028</i>	<i>1038</i>
Primary Stock Levels ^a															
Opening	30	35	30	29	29	35	<i>37</i>	<i>34</i>	<i>31</i>	<i>31</i>	<i>31</i>	<i>31</i>	30	<i>29</i>	<i>31</i>
Closing	35	30	29	29	35	37	<i>34</i>	<i>31</i>	<i>31</i>	<i>31</i>	<i>31</i>	<i>31</i>	29	<i>31</i>	<i>31</i>
Net Withdrawals	-5	5	2	0	-6	-2	<i>3</i>	<i>3</i>	<i>0</i>	<i>0</i>	<i>0</i>	<i>0</i>	1	<i>-2</i>	<i>0</i>
Imports	1	1	1	1	1	1	<i>1</i>	<i>1</i>	<i>1</i>	<i>1</i>	<i>1</i>	<i>1</i>	3	<i>3</i>	<i>3</i>
Exports	21	28	24	27	22	28	<i>24</i>	<i>25</i>	<i>21</i>	<i>27</i>	<i>28</i>	<i>27</i>	101	<i>100</i>	<i>102</i>
Total New Domestic Supply	221	216	221	225	237	225	<i>237</i>	<i>231</i>	<i>232</i>	<i>236</i>	<i>230</i>	<i>242</i>	883	<i>929</i>	<i>939</i>
Secondary Stock Levels ^b															
Opening	158	149	159	147	146	161	<i>174</i>	<i>171</i>	<i>176</i>	<i>181</i>	<i>199</i>	<i>182</i>	158	<i>146</i>	<i>176</i>
Closing	149	159	147	146	161	174	<i>171</i>	<i>176</i>	<i>181</i>	<i>199</i>	<i>182</i>	<i>192</i>	146	<i>176</i>	<i>192</i>
Net Withdrawals	9	-10	12	1	-15	-12	<i>3</i>	<i>-5</i>	<i>-4</i>	<i>-18</i>	<i>17</i>	<i>-10</i>	12	<i>-30</i>	<i>-16</i>
Total Indicated Consumption	230	206	233	226	221	213	<i>239</i>	<i>226</i>	<i>227</i>	<i>217</i>	<i>247</i>	<i>232</i>	895	<i>899</i>	<i>923</i>
Consumption															
Coke Plants	11	11	10	10	10	10	<i>10</i>	<i>9</i>	<i>10</i>	<i>10</i>	<i>10</i>	<i>10</i>	41	<i>39</i>	<i>40</i>
Electric Utilities	191	178	203	194	185	182	<i>211</i>	<i>194</i>	<i>196</i>	<i>189</i>	<i>219</i>	<i>200</i>	766	<i>771</i>	<i>803</i>
Retail and General Industry ^c	22	19	19	22	22	19	<i>19</i>	<i>22</i>	<i>21</i>	<i>19</i>	<i>18</i>	<i>22</i>	82	<i>81</i>	<i>80</i>
Subtotal	223	208	232	226	216	211	<i>239</i>	<i>226</i>	<i>227</i>	<i>217</i>	<i>247</i>	<i>232</i>	889	<i>892</i>	<i>923</i>
Total Disposition	230	206	233	226	221	213	<i>239</i>	<i>226</i>	<i>227</i>	<i>217</i>	<i>247</i>	<i>232</i>	895	<i>899</i>	<i>923</i>
Discrepancy ^d	7	-2	1	0	5	2	<i>0</i>	<i>0</i>	<i>0</i>	<i>0</i>	<i>0</i>	<i>0</i>	6	<i>8</i>	<i>0</i>

^a Primary stocks are held at the mines, preparation plants, and distribution points.

^b Secondary stocks are held by users. Most of the secondary stocks are held by electric utilities.

^c Synfuels plant consumption in 1989 was 1.7 million tons per quarter, and is assumed to remain at that level in 1990 and 1991.

^d Historical period discrepancy reflects an unaccounted shipper and receiver reporting difference.

Notes: Rows and columns may not add due to independent rounding. Zeros indicate amounts of less than 500,000 tons. Historical values are printed in **boldface**, forecasts in *italics*.

Sources: Historical data: Energy Information Administration, *Monthly Energy Review*, DOE/EIA-0035(90/07); and *Quarterly Coal Report*, DOE/EIA-0121(90/2Q).

**Table 13. Supply and Disposition of Electricity: \$30 World Oil Price Case
(Billion Kilowatthours)**

Supply and Disposition	1989				1990				1991				Year		
	1st	2nd	3rd	4th	1st	2nd	3rd	4th	1st	2nd	3rd	4th	1989	1990	1991
Net Utility Generation															
Coal	388.9	362.7	406.9	393.4	371.4	369.2	<i>427.1</i>	<i>393.3</i>	<i>398.7</i>	<i>384.2</i>	<i>442.9</i>	<i>404.9</i>	1551.9	<i>1560.9</i>	<i>1630.6</i>
Petroleum	49.7	34.1	33.1	41.3	31.1	32.8	<i>33.3</i>	<i>25.8</i>	<i>28.7</i>	<i>22.6</i>	<i>27.8</i>	<i>25.7</i>	158.2	<i>122.9</i>	<i>104.8</i>
Natural Gas	50.4	70.6	85.1	58.9	43.5	69.9	<i>87.5</i>	<i>64.1</i>	<i>54.9</i>	<i>70.3</i>	<i>91.3</i>	<i>64.1</i>	265.0	<i>265.0</i>	<i>280.5</i>
Nuclear	124.7	114.8	152.1	137.7	151.2	127.8	<i>152.9</i>	<i>137.9</i>	<i>144.9</i>	<i>127.4</i>	<i>146.8</i>	<i>137.1</i>	529.4	<i>569.7</i>	<i>556.3</i>
Hydroelectric	62.2	78.0	61.8	63.1	75.6	80.0	<i>66.5</i>	<i>66.0</i>	<i>78.0</i>	<i>81.8</i>	<i>68.1</i>	<i>68.7</i>	265.1	<i>288.2</i>	<i>296.6</i>
Geothermal and Other ^a	2.8	2.8	2.8	2.9	2.7	2.5	<i>3.0</i>	<i>3.2</i>	<i>3.1</i>	<i>3.1</i>	<i>3.3</i>	<i>3.3</i>	11.3	<i>11.4</i>	<i>12.7</i>
Total Utility Generation	678.7	663.0	741.9	697.2	675.5	682.3	<i>770.2</i>	<i>690.2</i>	<i>708.2</i>	<i>689.4</i>	<i>780.1</i>	<i>703.8</i>	2780.8	<i>2818.2</i>	<i>2881.5</i>
Net Imports	3.8	3.8	4.8	-1.4	-2.6	-1.7	<i>4.0</i>	<i>3.8</i>	<i>4.3</i>	<i>5.0</i>	<i>6.8</i>	<i>6.8</i>	11.0	<i>3.5</i>	<i>22.9</i>
Purchases from Nonutilities ^b	<i>21.7</i>	<i>21.2</i>	<i>23.7</i>	<i>22.3</i>	<i>24.4</i>	<i>23.8</i>	<i>26.7</i>	<i>25.1</i>	<i>26.9</i>	<i>26.3</i>	<i>29.4</i>	<i>27.7</i>	<i>89.0</i>	<i>100.0</i>	<i>110.3</i>
Total Supply	<i>704.2</i>	<i>687.9</i>	<i>770.4</i>	<i>718.1</i>	<i>697.3</i>	<i>704.4</i>	<i>801.0</i>	<i>719.0</i>	<i>739.4</i>	<i>720.7</i>	<i>816.4</i>	<i>738.2</i>	2880.8	<i>2921.7</i>	<i>3014.7</i>
Losses and Unaccounted For ^c	<i>50.2</i>	<i>66.5</i>	<i>59.1</i>	<i>71.1</i>	<i>30.9</i>	<i>67.1</i>	<i>59.0</i>	<i>59.4</i>	<i>45.1</i>	<i>67.5</i>	<i>63.4</i>	<i>62.8</i>	<i>246.9</i>	<i>216.3</i>	<i>238.8</i>
Sales															
Residential	241.1	197.2	250.7	215.5	241.2	201.2	<i>267.3</i>	<i>218.2</i>	<i>258.0</i>	<i>208.9</i>	<i>270.9</i>	<i>223.1</i>	904.5	<i>927.9</i>	<i>960.8</i>
Commercial	175.4	173.3	199.8	175.4	176.4	178.7	<i>209.2</i>	<i>181.2</i>	<i>182.9</i>	<i>183.9</i>	<i>214.6</i>	<i>187.5</i>	723.8	<i>745.5</i>	<i>768.8</i>
Industrial	215.4	228.9	237.0	233.5	225.8	234.5	<i>241.7</i>	<i>237.1</i>	<i>229.7</i>	<i>237.7</i>	<i>243.2</i>	<i>241.3</i>	914.8	<i>939.0</i>	<i>951.9</i>
Other	22.1	22.1	23.9	22.6	23.1	22.9	<i>23.8</i>	<i>23.3</i>	<i>23.7</i>	<i>22.7</i>	<i>24.3</i>	<i>23.6</i>	90.7	<i>93.0</i>	<i>94.3</i>
Total	654.0	621.4	711.3	647.0	666.4	637.3	<i>742.0</i>	<i>659.7</i>	<i>694.3</i>	<i>653.2</i>	<i>753.0</i>	<i>675.4</i>	2633.8	<i>2705.3</i>	<i>2775.9</i>

^a Other includes generation from wind, wood, waste, and solar sources.

^b Electricity received from nonutility sources, including cogenerators and small power producers.

^c Balancing item, mainly transmission and distribution losses.

Notes: Values for purchases from nonutilities and losses and unaccounted for are estimated for 1989. Minor discrepancies with other EIA published historical data are due to rounding. Historical values are printed in **boldface**, forecasts in *italics*.

Sources: Historical data: Energy Information Administration, *Monthly Energy Review*, DOE/EIA-0035(90/07); and *Electric Power Monthly*, DOE/EIA-0226(90/07).



**Federal Depository
Library Program**

Information

Information from
the Federal Govern-
ment on subjects
ranging from agricul-
ture to zoology is
available at Depository
Libraries across the
nation.
You can visit these
libraries and use the
Depository collections
without charge.
To find one in your
area, contact your
local library or write:
Federal Depository
Library Program,
Office of the Public
Printer, Washington,
DC 20401.

Energy Information Administration
U.S. Department of Energy
Forrestal Building, EI-231
Washington, DC 20585

SECOND-CLASS MAIL
POSTAGE & FEES PAID
U.S. DEPARTMENT OF ENERGY
ISSN 0743-0604

OFFICIAL BUSINESS
PENALTY FOR PRIVATE USE \$300

