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SHORT-TERM
ENERGY
OUTLOOK

QUARTERLY PROJECTIONS

EIA ENERGY INFORMATION ADMINISTRATION

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Short-Term Energy Outlook

Quarterly Projections

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Preface

The Energy Information Administration (EIA) quarterly forecasts of short-term energy supply, demand, and prices are revised in January, April, July, and October for publication in the *Short-Term Energy Outlook (Outlook)*. An annual supplement analyzes previous forecast errors, compares recent projections by other forecasters, 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 projections in this volume extend through the fourth quarter of 1991.

The forecasts are produced using the Short-Term Integrated Forecasting System (STIFS). The STIFS model is driven principally by the following sets of assumptions or inputs: forecasts of key macroeconomic variables, a particular set of world oil price assumptions, and assumptions about the severity of weather. Macroeconomic forecasts are produced by DRI/McGraw-Hill. EIA's Oil Market Simulation Model is used to project world oil prices. (The EIA models are available on computer tape and diskette from the National Technical Information Service.)

The three featured projections for petroleum supply and demand are based on low, middle, and high economic growth assumptions coupled with high, middle, and low crude oil price trajectories, respectively, and various weather scenarios. The extreme weather cases are designed to replicate, quarter by quarter, the most severe weather conditions witnessed since 1975. The discussion and tables in this volume refer primarily to the middle, or base case, scenario and, unless otherwise noted, to the domestic situation. Table 7 summarizes the petroleum sensitivity cases and indicates the estimated effect of price, macroeconomic conditions, and weather on petroleum demand.

The forecasts 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.

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Highlights

Petroleum demand in the United States is expected to remain virtually flat in 1990. Prospects for recovery in the demand for petrochemical feedstocks and other petroleum products in the industrial sector should offset fundamental weaknesses in motor gasoline and residual fuel oil markets in 1990. Unusual weather patterns throughout 1989 tend to complicate year-to-year comparisons somewhat, but slow economic growth combined with decreased use of oil by electric utilities are expected to limit growth in overall petroleum demand this year. A rebound in the economy and relative stability in residual fuel oil markets should bring renewed petroleum demand growth of about 1.0 percent in 1991. Domestic crude oil production is expected to decline by 4.7 percent in both 1990 and 1991, leading to continued higher levels of oil imports.

Despite Recent Increases, Oil Prices Should Decline in the Near Term

Prices for imported crude oil delivered to refiners recovered from a modest slump this summer to over $19.00 per barrel in December, an increase of about $2.00 per barrel since August. Cold weather in Europe in mid-fall followed by frigid temperatures in the United States in December contributed to strong demand for oil and sparked sharp rises in prices for heating oil and other petroleum products in the fourth quarter of 1989. Fundamentally weak demand and adequate stocks should cause oil prices to decline somewhat in the near term and to remain in the range of $17.00 to $18.00 per barrel through 1991.

Domestic Crude Oil Production Should Exhibit Steady Decline in 1990 and 1991

Domestic crude oil production is expected to decline by 360,000 barrels per day this year and by an additional 340,000 barrels per day in 1991. Continued declines in Alaskan production are projected through 1991. Production in the Lower 48 States is expected to fall by an average of 250,000 barrels per day over the next 2 years. The resulting level of domestic oil production is below 7.3 million barrels per day this year and below 7.0 million barrels per day in 1991.

Sluggish Economy Likely to Limit Oil Demand in the Near Term

A generally weak economy, the expectation that special factors, which increased residual fuel oil use during part of 1989, will not recur, and continued improvements in automobile efficiency help restrain any upward movement in petroleum demand in 1990.

Net Oil Imports Could Increase by 370,000 Barrels per Day in 1990

U.S. net imports of crude oil (including the Strategic Petroleum Reserve) and petroleum products are expected to average 7.5 million barrels per day in 1990, an increase of 370,000 barrels per day over 1989 levels. This reflects the impact of reduced domestic production.

Electricity Demand Remains Strong Through 1991

Given normal weather expectations for 1990 and 1991, growth in total electricity sales should average 3.2 percent. This rate does reflect a slight dip in 1990 in industrial sector growth due to a slowdown in the economy, but the mild weather during key periods in 1989 keeps growth looking strong this year in the residential sector. Overall growth, however, will be led primarily by the commercial sector in both years.

Coal Production Could Exceed 1 Billion Tons Next Year

Coal demand is expected to increase by 1.4 percent this year and by 3.7 percent in 1991. As a result, coal production is expected to exceed 1 billion tons in 1991. Continued growth in the demand for electricity is expected to provide the impetus for this coal growth.

Table 1. Summary of Base Case Assumptions and Projections

Assumptions and Projections	Year				Annual Percentage Change		
	1988	1989	1990	1991	1988-1989	1989-1990	1990-1991
Macroeconomic Indicators							
Real Gross National Product (billion 1982 dollars)	4,024	4,142	4,211	4,322	2.9	1.7	2.6
Index of Industrial Production (Mfg.) (index, 1977 = 1.000)	1.427	1.479	1.497	1.554	3.6	1.2	3.8
Imported Crude Oil Price (nominal dollars per barrel)	14.56	18.05	17.70	18.00	24.0	-1.9	1.7
Retail Prices (nominal) [a]							
Motor Gasoline [b] (dollars per gallon)	.96	1.06	1.10	1.11	10.4	3.8	.9
No. 2 Heating Oil (dollars per gallon)	.81	.89	.95	.92	9.9	6.7	-3.2
Residential Natural Gas (dollars per thousand cubic feet)	5.47	5.69	5.90	6.18	4.0	3.7	4.7
Residential Electricity (cents per kilowatthour)	7.48	7.66	7.80	8.13	2.4	1.8	4.2
Petroleum Supply							
Crude Oil Production [c] (million barrels per day)	8.14	7.65	7.29	6.95	-6.0	-4.7	-4.7
Net Petroleum Imports, Including SPR (million barrels per day)	6.59	7.17	7.54	8.03	8.8	5.2	6.5
Energy Demands							
Total Market Economies Petroleum (million barrels per day)	50.74	51.78	52.83	54.10	2.0	2.0	2.4
Total U.S. Petroleum Consumption (million barrels per day)	17.28	17.19	17.17	17.35	-.5	-.1	1.0
Motor Gasoline	7.34	7.31	7.28	7.32	-.4	-.4	.5
Jet Fuel	1.45	1.50	1.49	1.51	3.4	-.7	1.3
Distillate Fuel Oil	3.12	3.15	3.14	3.23	1.0	-.3	2.9
Residual Fuel Oil	1.38	1.35	1.19	1.15	-2.2	-11.9	-3.4
Other Petroleum [d]	4.00	3.88	4.07	4.14	-3.0	4.9	1.7
Natural Gas Consumption (trillion cubic feet)	18.03	18.85	19.20	19.39	4.5	1.9	1.0
Coal Consumption (million short tons)	884	888	900	933	.5	1.4	3.7
Electricity Sales (billion kilowatthours)	2,578.1	2,630.8	2,713.7	2,797.8	2.0	3.2	3.1
Gross Energy Consumption [e] (quadrillion Btu)	80.09	81.10	82.17	83.59	1.3	1.3	1.7
Thousand Btu/1982 Dollar of GNP	19.90	19.58	19.51	19.34	-1.6	-.4	-.9

[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] The conversion from physical units to Btu is calculated by STIFS using a subset of *Monthly Energy Review* (MER) conversion factors. Consequently, the historical data may not precisely match that published in the MER.
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(89/10); *International Energy Annual 1988* DOE/EIA-0219(88); *Petroleum Marketing Monthly,* DOE/EIA-0380(89/10); *Petroleum Supply Monthly,* DOE/EIA-0109(89/10); *Petroleum Supply Annual 1988,* DOE/EIA-0340(88)/1; *Natural Gas Monthly,* DOE/EIA-0130(89/10); *Electric Power Monthly,* DOE/EIA-0226(89/10); and *Quarterly Coal Report,* DOE/EIA-0121(89/3Q); Organization for Economic Cooperation and Development, Monthly Oil Statistics Database through June 1989. Macroeconomic projections are based on DRI/McGraw-Hill Forecast CONTROL1289.

Assumptions

- International Petroleum

- World Oil Prices

- Energy Product Prices

- Macroeconomic Activity

International Petroleum

Recent Developments

Developments during the fourth quarter of 1989 have complicated the task of analyzing the world oil market situation in 1990. Taken by itself, the OPEC production agreement reached on November 28, 1989, would have confirmed the probability of lower oil prices in 1990 reported in the last *Outlook*. A number of other developments, however, have already delayed the onset of a price decline and may reduce the magnitude of any significant decline in 1990 as well.

In the last *Outlook*, it was reported that world oil prices could decline in the fourth quarter of 1989 if OPEC crude oil production exceeded about 22.5 million barrels per day. EIA now estimates that OPEC crude oil production averaged in excess of 23.4 million barrels per day during that period while world oil prices increased, especially during December. The spot prices of OPEC crude oils, which ranged from about $14.50 to $18.00 per barrel on September 27, increased to a range of about $17.00 to $21.00 on December 29, matching the highest range of prices during 1989.[1] The most obvious factor behind this unexpected price increase was the record cold weather in the United States in December and the unseasonably cold weather in Europe in mid-fall. At least three other factors also appear to have been responsible for higher prices in the fourth quarter and some of them may continue to have an impact in 1990.

First, a continuing drought in Southern Europe has sharply reduced the availability of hydroelectric power in France, Italy, Spain, and Portugal. The drought has also reduced the availability of cooling water for French nuclear reactors, thereby reducing nuclear-generated electricity supplies to France and to a number of neighboring countries that normally import electricity from France. As a result, it now appears possible that European oil consumption in the fourth quarter of 1989 may have exceeded even the high rate for the same quarter in 1988. Should the drought continue, future European oil consumption will be higher than the forecast values, which assume normal weather (Table 2).

Second, initial estimates indicate that oil production from the non-OPEC Market Economies in the fourth quarter may have been more than 500,000 barrels per day less than the rate reported in the last *Outlook*. The shortfalls were largest in the North Sea, where there were continuing delays in restarting production at some of the United Kingdom's Brent fields, and in the United States. It is currently expected that 1990 production from both the United States and the United Kingdom will be lower than the rate reported in the last *Outlook*; moreover, there is considerable uncertainty about how much United Kingdom production will be lost as a result of the installation of subsea valves recommended after the 1988 Piper Alpha explosion.

Finally, concern began to increase during the fourth quarter over reduced availability of Soviet oil exports to the Market Economies, as a result of reports of sharp declines in Soviet oil production. Although it is not yet clear how Soviet oil exports have been affected, currently available data indicate that average Soviet oil production (including crude oil and natural gas plant liquids) was over 340,000 barrels per day lower in the first 10 months of 1989 than in the same period of 1988, and that the decline widened to almost 500,000 barrels per day in October.[2] In 1990, the uncertainty surrounding net exports from Centrally Planned Economies to the Market Economies will probably increase due to continued declines in Soviet oil production, continued debate about future Soviet oil production and oil export policies, and new debates concerning oil and energy policies now surfacing in the Eastern European countries.

Forecast

The demand for petroleum products by the Market Economies is expected to average over 52.8 million barrels per day in 1990, an increase of 1.1 million barrels per day, or 2.0 percent, from the 1989 rate (Table 2). The 1990 rate would be 580,000 barrels per day above the previous record high rate of demand set in 1979. In 1991, demand is expected to increase by 1.3 million barrels per day, or 2.4 percent.

Petroleum demand by the OECD countries is expected to average almost 37.8 million barrels per day in 1990, an increase of 420,000 barrels per day, or 1.1 percent, from the rate for 1989. This increase is based on the assumption that the OECD economies will grow at a 2.5-percent rate in 1990 (Table 3). Japan is expected to account for one-half of the demand increase, while Europe should account for more than two-fifths. In 1991, as OECD economic growth increases to 2.9 percent, OECD petroleum demand is expected to increase by 620,000 barrels per day, or by 1.6 percent. Japan and Europe are each expected to account for about one-third of the demand increase in 1991, while the United States accounts for more than one-fourth.

Petroleum demand in the Other Market Economies, or developing countries, is expected to continue to grow rapidly in both 1990 and 1991 and should continue to account for over 50 percent of the growth in demand by the Market Economies. In 1990, petroleum demand by the Other Market Economies is expected to average more than 15.0 million barrels per day, an increase of 630,000 barrels per day, or 4.4 percent, from the rate for 1989. In 1991, petroleum demand is expected to increase by 660,000 barrels per day, or 4.4 percent.

Figure 1. OPEC Oil Production and Production Capacity

Note: OPEC production includes crude oil, natural gas liquids, and refinery gain.

Sources: **History**: Energy Information Administration, Office of Energy Markets and End Use, International and Contingency Information Division. **Projections**: Table 2.

Oil production from the non-OPEC Market Economies is expected to increase by about 550,000 barrels per day in 1990, and then decrease by 60,000 barrels per day in 1991. In 1990, significant production increases from the United Kingdom (340,000 barrels per day), Norway (210,000 barrels per day), Brazil (120,000 barrels per day), and Australia/New Zealand (85,000 barrels per day) will more than offset decreases from the United States (340,000 barrels per day), Canada (40,000 barrels per day), and Mexico (35,000 barrels per day).[3] In 1991, however, expected production decreases from the United States (330,000 barrels per day) will more than offset increases from the United Kingdom (80,000 barrels per day), South Yemen (60,000 barrels per day), and Colombia (45,000 barrels per day). These comparisons refer to Table 2, which uses a definition of oil production which is different from that in Table 6. (See footnote "a" to Table 2).

Oil exports from Centrally Planned Economies to the Market Economies are expected to decrease throughout the forecast period, declining by 250,000 barrels per day in 1990 and by 200,000 barrels per day in 1991.

The forecast detailed above implies OPEC production in 1990 of almost 24.2 million barrels per day, or 450,000 barrels per day above the average rate for 1989. In 1991, OPEC production will probably increase more sharply as a result of declining oil supplies from non-OPEC sources and the continuing increases in oil consumption. A range of possible aggregate OPEC oil production levels is projected, based on a range of assumed inventory behavior, but these projections are not disaggregated to the country level (Figure 1). Significant excess oil production capacity is expected to exist in the OPEC member nations throughout the forecast period.

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, three different world oil price scenarios are employed (Figure 2). These scenarios are used to develop a base case projection and two alternative projections for domestic supply and demand (Table 4).

In the base oil price scenario, the world oil price decreases from $18.75 per barrel in the fourth quarter of 1989 to $18.00 in the first quarter of 1990, falls to $17.00 in the second quarter of 1990, and then increases to $18.00 for the second half of 1990 and throughout 1991. This scenario is based on the assumption that OPEC oil production will be well in excess of demand (as indicated by the

Figure 2. World 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*, DOE/EIA-0035(89/10) (Washington, DC, 1989); and *Oil and Gas Journal* Energy Database (Tulsa, OK, January 1990). **Projections**: Table 4.

large stock builds in the second and third quarters of 1990), adjusted for normal inventory changes, in the late winter and spring of 1990. Subsequently, OPEC production is assumed to move in balance with demand.

In the low oil price scenario, the world oil price decreases to $15.00 per barrel in the first quarter of 1990 and remains at that level throughout the forecast period. In this scenario, it is assumed that the battle for market share between the Persian Gulf members of OPEC will continue, leading to higher OPEC oil production than in the base scenario. In addition, it is assumed that an even less robust picture emerges for economic growth than in the base case, lowering the growth rate of oil consumption, and that oil supplies from non-OPEC producers, including the Soviet Union, will exceed the rates expected in the base scenario.

In the high oil price scenario, the world oil price increases to $20.00 per barrel in the first quarter of 1990 and remains at that level throughout the forecast period. In this scenario, it is assumed that economic growth will be stronger than in the base case and, that with the extra impetus from abnormally severe weather, growth in oil consumption will be significantly higher. At the same time, it is assumed that Soviet and United Kingdom oil production will fall below the rates expected in the base case and that OPEC production accords will reduce overproduction by the Persian Gulf members.

Energy Product Prices

Small upward movements in most energy product prices are expected between 1989 and 1991 on an annual basis, mostly reflecting gradual increases in production costs (other than raw material costs), distribution costs, and taxes (on some products). Natural gas prices are expected to rise somewhat faster, in reaction to an anticipated tightening of supplies. Extremely cold weather on the East Coast in December 1989 caused sharply higher spot prices for heating oil, which will result in unusually high prices for the first quarter of 1990. Spot prices for other petroleum products and natural gas also gained.

Heating Oil Prices Soar this Winter

Prolonged, record-level cold temperatures in December 1989 caused residential heating oil prices to surge by about 25 cents per gallon over the previous month (Figure 3). (This month-to-month increase was the largest on record for average retail heating oil prices in the United States.) Spot prices for heating oil, which are generally more volatile than retail prices, increased by more than 40 cents per gallon in less than 2 weeks during late December 1989. Certain localities reported retail prices rising by that amount or more. Although the extreme cold was the major cause of the price rise, low inventories and earlier cold weather in Europe were key contributing factors. A fire at an Exxon refinery in Louisiana, along with problems at several other smaller refineries across the Nation further reduced stocks.

Cents per Gallon

Figure 3. Crude Oil and Retail Product Prices

Sources: **History**: Energy Information Administration, *Monthly Energy Review*, DOE/EIA-0035(89/10) (Washington, DC, 1989). **Projections**: Table 5.

Retail heating oil prices are estimated to have remained at high levels through much of the first month of this year, despite the expectation of normal temperatures for the remainder of the winter. Because stocks were purchased at higher prices, retail heating oil prices will remain higher longer. By the end of January, prices had returned well over half way on their road to seasonal norms.

The 1990 average price for heating oil is expected to be 6 cents per gallon higher than last year, with almost all of this increase attributed to the comparatively high level for the first quarter of the year (Table 5). Assuming normal weather, heating oil prices in 1991 should fall by 3 cents per gallon, on average, even though crude oil prices are projected to rise by about 1 cent per gallon. This anticipated decline is the result of normal expectations for the first quarter of 1991, compared to the anomalous first quarter of 1990.

Electricity Prices to Remain Soft

Residential electricity rates have been falling in real terms since 1986, due to both declining fuel and capital costs. Price increases should continue to lag inflation through 1990, as increases in average fossil fuel costs and capital costs generally remain small. In 1991, prices should increase at about the rate of inflation, concurrent with a modest rise in fossil fuel costs.

Fossil Fuel Prices to Utilities Continue to Increase

Coal prices to electric utilities, which have drifted downward over the last several years, should start to pick up slightly (Table 5). This is commensurate with the rise in natural gas and oil prices but at a rate less than inflation. Increasing productivity is expected to keep prices relatively soft. The tentative settlement of the 9-month strike between the Pittston Coal Group and the United Mineworkers of America is not expected to affect the price of coal substantially.

Spot prices for residual fuel oil reacted in much the same manner as those for distillate fuel oil by jumping sharply in the last few weeks of 1989 due to the cold snap.[4] This will tend to raise prices for the first quarter of the year also. The price rise, however, was not as pronounced as that of heating oil, because supply adjustments were easier to

Figure 4. Utility Fossil Fuel Prices

Sources: **History**: Energy Information Administration, *Monthly Energy Review*, DOE/EIA-0035(89/10) (Washington, DC, 1989). **Projections**: Table 5.

make. With normal winter temperatures assumed for the remainder of the forecast period, the rise in residual fuel oil prices should follow that for crude oil prices, aside from seasonal differences between the two series. Residual fuel oil prices for the winter of 1990/1991 (assuming normal weather) are not expected to increase as rapidly as they did during the winter of 1989/1990, because stable crude oil prices and plentiful supplies should hold down large price increases.

The price advantage of natural gas over residual fuel oil at electric utilities should continue over the next 2 years, but the gap should narrow somewhat by 1991, from the average difference seen in 1989 and expected for 1990 (Figure 4). In 1989, natural gas was about 17 percent cheaper than the heavy oil, on an average annual basis. This ratio is expected to drop to 15 percent in 1990 and about 12 percent in 1991, as increasing demand for natural gas in other sectors puts upward pressure on prices.

Gasoline Price Rise Expected for Next Year

Motor gasoline prices settled down early in the summer of 1989 after jumping to $1.15 per gallon in the spring. Wholesale prices increased at the end of last December, the result of refiners increasing distillate fuel production at the expense of gasoline to meet the exceptionally large demand for heating oil. Prices in the forecast period are expected to increase by a few cents per gallon per year, reflecting not only the increase in crude oil costs but also continued higher refiner costs (resulting from regulations requiring reduced vapor emissions) and increases in State and local taxes. State and local taxes have been increasing by about 1 cent per gallon per year on average over the last several years, and this trend is expected to continue.[5] Large sudden increases at the State level, however, have been met with considerable resistance.
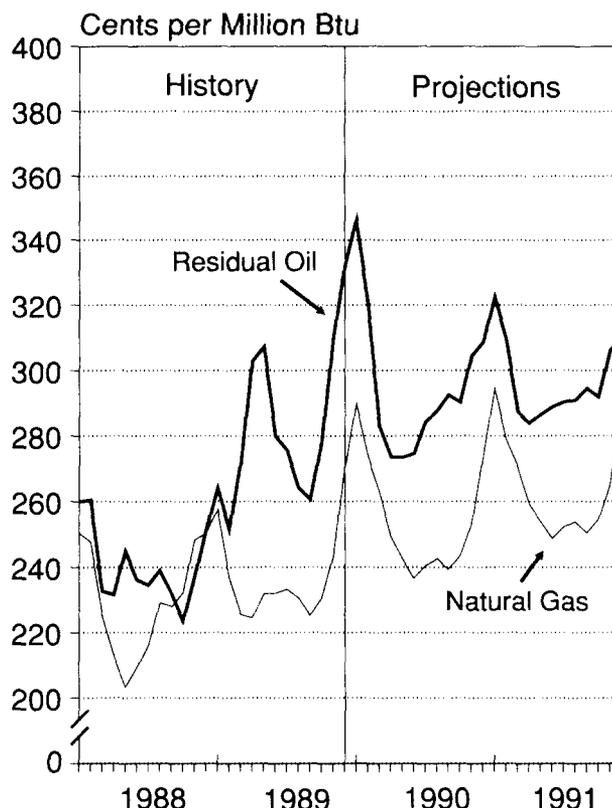
For example, it is uncertain whether voters in California will pass a special referendum in June 1990 that would double the State gasoline tax to pay for earthquake repairs in the San Francisco area. Consumers have also been price sensitive to the more expensive premium blends. Purchases of higher grades fell last spring, when prices for all grades rose abruptly. Conversely, premium blend sales rose when prices abated.[6] This behavior should continue in the future with a trend towards more sales of the premium blends, pushing the weighted average price for all blends higher. Any sudden, large increases in prices, however, should be expected to be met with consumers switching to cheaper blends.

Natural Gas Prices to Rise as Supplies Tighten and Demand Increases

During most of 1989, spot prices for natural gas remained soft, falling below 1988 levels, largely as a result of mild weather. By November, however, spot prices began to climb in California as supplies tightened. By December, the cold weather on the East Coast sent spot prices soaring. As a result, wellhead prices in the first quarter of this year should follow suit.

Over the next 2 years, natural gas prices at the wellhead are expected to grow by about 2 percentage points above the rate of inflation (which is 3.7 percent in 1990 and 4.0 percent in 1991), as supplies tighten generally (Figure 5). Increasing demand, particularly in the industrial sector, will put upward pressure on wellhead prices. These price increases are

Dollars per Thousand Cubic Feet

Figure 5. Natural Gas Wellhead Prices

Sources: **History**: Energy Information Administration. *Monthly Energy Review*, DOE/EIA-0035(89/10) (Washington, DC, 1989). **Projections**: Table 5.

expected to be passed on to the end-use sectors. Thus, residential prices will continue to increase through 1991. Competition with oil prices, however, should prevent any sustained increases in gas prices relative to prices of competing oil products.

Macroeconomic Activity

Real gross national product (GNP) is estimated to have increased by 2.9 percent in 1989, reflecting a reduction in growth from the vigorous 4.4 percent in 1988 (Table 4 and Figure 6). Based on projections from DRI/McGraw-Hill, growth in GNP should continue to decelerate in 1990 to 1.7 percent, reflecting a leveling of growth in consumption, investment, and exports. In 1991, GNP growth rebounds to 2.6 percent. This increased rate in 1991 is due primarily to improvements in investment and in the trade sector.

Slower growth in consumption, investment, and the trade sectors will lead to less robust growth in GNP over the next 2 years than rates in recent years. Increases in interest rates in 1988 and 1989 are expected to cause less growth in residential fixed investment over the next 2 quarters, but recovery is projected for the remaining quarters of the forecast period. The foreign trade balance, a particularly strong stimulus to investment in producers' durable equipment, continues to improve, but less rapidly than was the case during 1987 through 1989. As a result, growth in nonresidential fixed investment will be slower in 1990.

By 1991, improvements in the trade sector and the ultimate effects of lower interest rates cause fixed investment to register higher growth.

Based on projections from DRI/McGraw-Hill, consumption accounts for a larger proportion of real GNP change over the forecast period. In 1988, consumption contributed slightly over 49 percent of GNP growth. For the next 2 years, consumption expenditures explain over 60 percent of GNP growth, as the shares of both government and the net trade balance decline. In 1990, the improvement in residential fixed investment causes the investment share of real GNP change to improve. By 1991, the improvement in investment overshadows the role of consumption in explaining GNP growth. Investment will contribute 45 percent of this growth, while consumption accounts for 43 percent.

Forecasting macroeconomic growth involves uncertainty about the magnitude of change of crucial economic variables affecting the macroeconomy. In addition, economic growth is a major determinant in explaining energy demand. As a result, the high and low demand cases incorporate a band of GNP growth, roughly 1 percent above and below the base growth rate.

Annual GNP Growth Rate

Selected Economic Trends
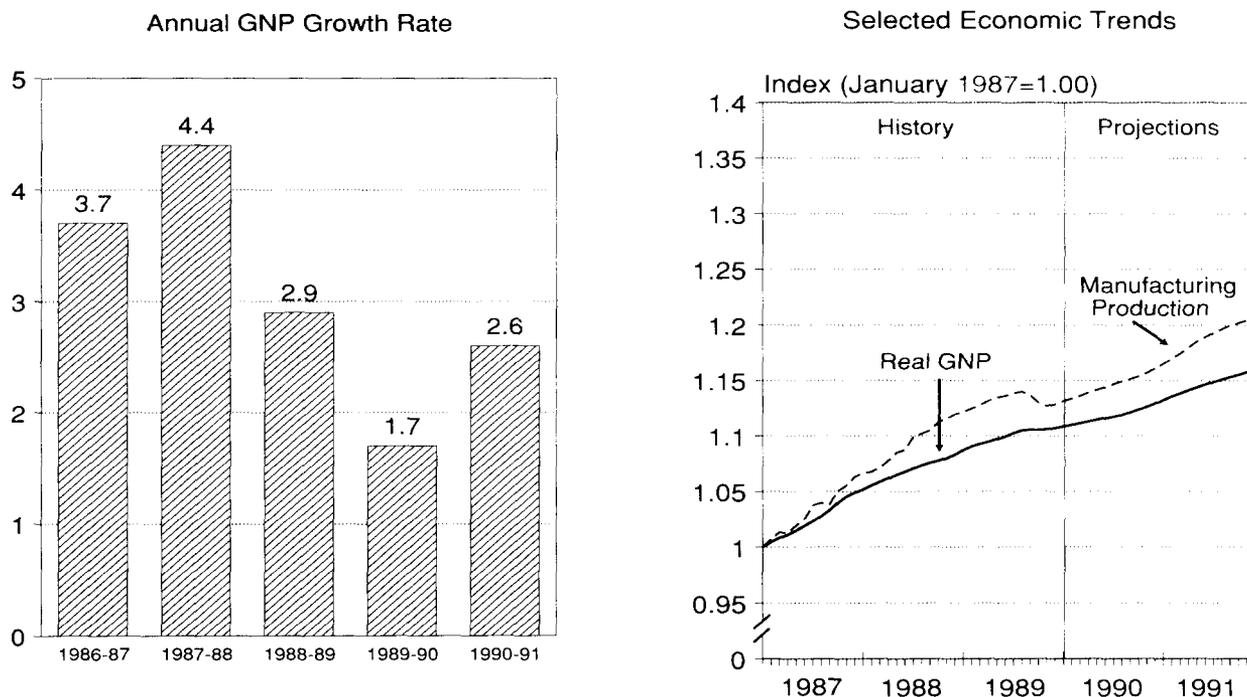
Figure 6. Key Economic Indicators

Sources: **History**: Bureau of Economic Analysis, U.S. Department of Commerce, *Survey of Current Business*, December 1989; Federal Reserve System, *Statistical Release G.12.3*, December 1989. **Projections**: Table 4.

U.S. Petroleum Outlook

- **Petroleum Demand**

- **Petroleum Supply**

- **Motor Gasoline**

- **Distillate Fuel Oil**

- **Residual Fuel Oil**

- **Other Petroleum Products**

- **Jet Fuel**

Petroleum Demand

Overview

Total petroleum demand, which declined slightly during the second half of 1989 compared to the second half of 1988, is expected to be essentially flat in 1990 at 17.2 million barrels per day on an annual basis (Table 6 and Figure 7). In general, a sharp reduction in residual fuel oil consumption in the electric utility sector and continued declines in fuel oil use in other industrial sectors are expected to be counteracted by increases in the demand for petrochemical feedstocks and other products, including road oil and asphalt.[7] For 1991, an overall increase in petroleum demand of about 180,000 barrels per day is expected. By then, far less downward pressure on residual fuel oil demand is expected, and an acceleration in economic growth from the sluggish performance projected for 1990 should bolster demand in most other sectors.

In previous forecasts, expectations of strong oil demand in the transportation sector tended to provide an outlook of strong total petroleum demand in 1990. It now seems that weakness in the demand for motor gasoline will dominate the short-run trends in transportation fuels, despite the likelihood of some continued increases in jet fuel and diesel fuel through 1991. Slower growth in personal travel should characterize 1990 as it did in 1989; a noticeable recovery in this area is not expected until 1991. It now appears that growth in the efficiency of the automobile fleet has been strong (at or above 3 percent per year) since 1987. Significant growth in gasoline demand during the forecast period is unlikely if efficiency improvements continue at or near such rates. (See "Motor Gasoline" p. 21.)

Figure 7. Total Petroleum Demand

Sources: **History**: Energy Information Administration, *Petroleum Supply Monthly*, DOE/EIA-0035(89/10) (Washington, DC, 1989). **Projections**: Tables 6, 8, and 9.

Until the cold weather arrived in December, temperatures in 1989 contrasted noticeably with temperatures in 1988 (and to some extent 1987) in that the first and third quarters were much milder. Year-to-date population-weighted heating degree-days through November 1989 for the entire United States were 4.3 percent below the level recorded in 1988; through December 1989, the difference was 1.1 percent above the 1988 year-to-date level.[8] It is now expected that, as a result of this weather pattern, distillate fuel oil demand will be rather flat in 1990. Heating oil use should subside from the extraordinary levels seen in the fourth quarter of 1989, assuming that normal, or long-term average, temperatures prevail during the forecast period.

Petroleum Demand Sensitivities

Table 7 provides a summary of the estimated sensitivity of domestic petroleum demand to alternative macroeconomic growth assumptions, variations in the world oil price, and weather conditions.

The alternative macroeconomic scenarios are constructed so as to provide a range of real 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.

Two price cases are given in the table. The first shows the price effect on demand stemming from oil price variations from the base case which are coupled with induced shifts in other energy product prices, most notably natural gas. The induced shifts in the prices of products which compete with oil products largely eliminate any incremental substitution of natural gas or other fuels for petroleum in sectors where switching potential is significant. In order to present a price sensitivity band which encompasses a range of demand that can be reasonably characterized as an upper bound on total price sensitivity, a second price case was added which shows the effect on demand when only the prices of oil products change.[9]

The weather sensitivities are based on assumed deviations from normal weather which correspond to the greatest quarterly variances in weather observed over the past 15 years. Combining the information from Table 4 with that in Table 7, the sensitivities of domestic petroleum demand to changes in the three determinants discussed above 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 128,000 barrels per day;

- If all energy product prices increase, for every $1.00 increase in world oil price, petroleum demand can be expected to fall by approximately 32,000 barrels per day;

- If petroleum prices increase, for every $1.00 increase in world oil price, petroleum demand can be expected to fall by approximately 88,000 barrels per day;

- For every 1 percent increase of cooling degree-days above normal levels, petroleum demand is expected to increase by 0.03 percent; for heating degree-days, petroleum demand is expected to increase by 0.08 percent.

Petroleum Supply

In 1990, domestic crude oil production is expected to decline by 360,000 barrels per day, down 4.7 percent from the previous year (Table 1). An additional drop of 340,000 barrels per day is projected for 1991, representing a further 4.7-percent year-to-year decline in domestic output. As a result, dependency on imported sources of oil is expected to increase at a relatively quick pace, despite the weak outlook for demand during the forecast interval. Projections for the first quarter of 1990 suggest that a continued decline in domestic production will contribute to an increase in the dependency on net imports to 42 percent from 39 percent in the same quarter of last year (Figure 8 and Table 6).

In 1989, Lower-48 crude oil production declined by 340,000 barrels per day, or 5.6 percent, from 1988 levels, contributing to the largest recorded year-to-year decline in total domestic crude oil production thus far (Table 6 and Figure 9). Reversing a trend of steady increases which helped offset Lower-48 output declines during the past several years, Alaskan production fell by more than 140,000 barrels per day, accounting for more than one-fourth of the total reduction in domestic output. Although part of that decline can be attributed to the Valdez oil spill and bad weather during the year, the underlying trend was still downward. As a result of the precipitous decline in total domestic production, imports, which averaged 7.2 million barrels per day, represented 42 percent of total demand, up from 38 percent in 1988.

Although crude oil prices rose sharply in the middle of 1989, drilling activity, which typically responds with a lag of several weeks to changes in prices, continued to decline from 841 active rigs in January to 754 in May, but was able to recover to 1,019 rigs by mid-January 1990.[10] Although total drilling activity in 1989 was less than in the previous year, gas well completions actually increased, partly offsetting the substantial decline in oil well completions.

In 1990, Alaskan production is expected to fall by 100,000 barrels per day, somewhat less than the previous year's decline. The projections indicate that anticipated production from new fields is unlikely to offset the natural rate of decline in Alaskan oil production. Moreover, Trans-Alaskan Pipeline System shutdowns and scheduled field maintenance are expected to affect output more than in previous years, contributing

to the decline in North Slope production. Production in the Lower 48 States is projected to fall by 270,000 barrels per day, or slightly more than three-fourths of the decline of the previous year. This projection assumes that the Point Arguello field comes on-stream in the middle of the year, contributing substantially to the slowdown in the decline rate. However, regulatory problems may have an adverse impact on the timing and magnitude of this production. After several years of sharp declines in drilling activity, the stable price environment is expected to keep average drilling rates approximately the same as that of the previous year, also helping to moderate production declines.

The projected year-to-year increase in refinery activity for the first quarter of 1990 reflects a substantial increase in both distillate output and demand. Given normal weather for the first quarter of 1990 compared to milder-than-normal weather for the first quarter of 1989, distillate demand for the first quarter of 1990 is projected to increase by 130,000 barrels per day from last year, with refinery output projected to increase by the same amount. However, net imports are projected to rise by 80,000 barrels per day. That increase in imports is expected to reduce the demand for distillate stocks by a similar amount. As a result, distillate inventories, which were almost 13 million barrels below last year's levels at the start of the current quarter, are expected to be only 6 million barrels less by the end of the quarter, ending the winter season with 91 million barrels. This stock level, however, lies within the historical range for the end of the winter season.

In 1990, total net imports of crude oil and petroleum products are projected to average 7.5 million barrels per day, or 370,000 barrels per day above 1989 levels. This increase reflects falling domestic oil production. As a result, the net import ratio for 1990 is projected to average nearly 44 percent (up from almost 42 percent in 1989).
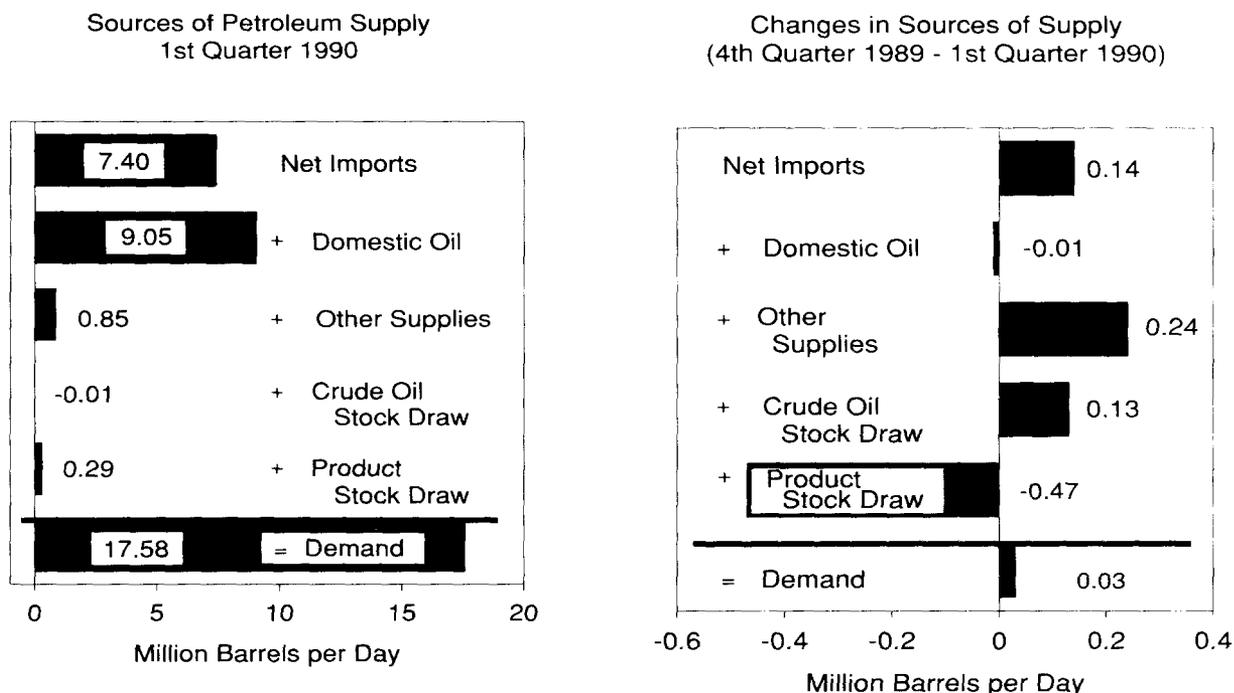
Figure 8. Sources of Petroleum Supply

In 1991, Alaskan production is projected to decline further by 120,000 barrels per day. Although little incremental production from new fields is expected, the implementation of enhanced recovery programs is expected to prevent an even larger decline during the course of the year. Lower-48 production is expected to decline by another 220,000 barrels per day, slightly less than that of the previous year. Additional Point Arguello production as well as liftings from new onshore development wells brought about by continued drilling activity at the previous year's levels are expected to help stabilize the decline rate.

Net imports of crude oil and petroleum in 1991 are projected to increase to 8.0 million barrels per day, or 46 percent of total domestic demand. The increased demand for petroleum products for the year and continued production declines account for the sizeable increase in import dependency in 1991.

Net Petroleum Imports

Lower-48 Crude Oil Production
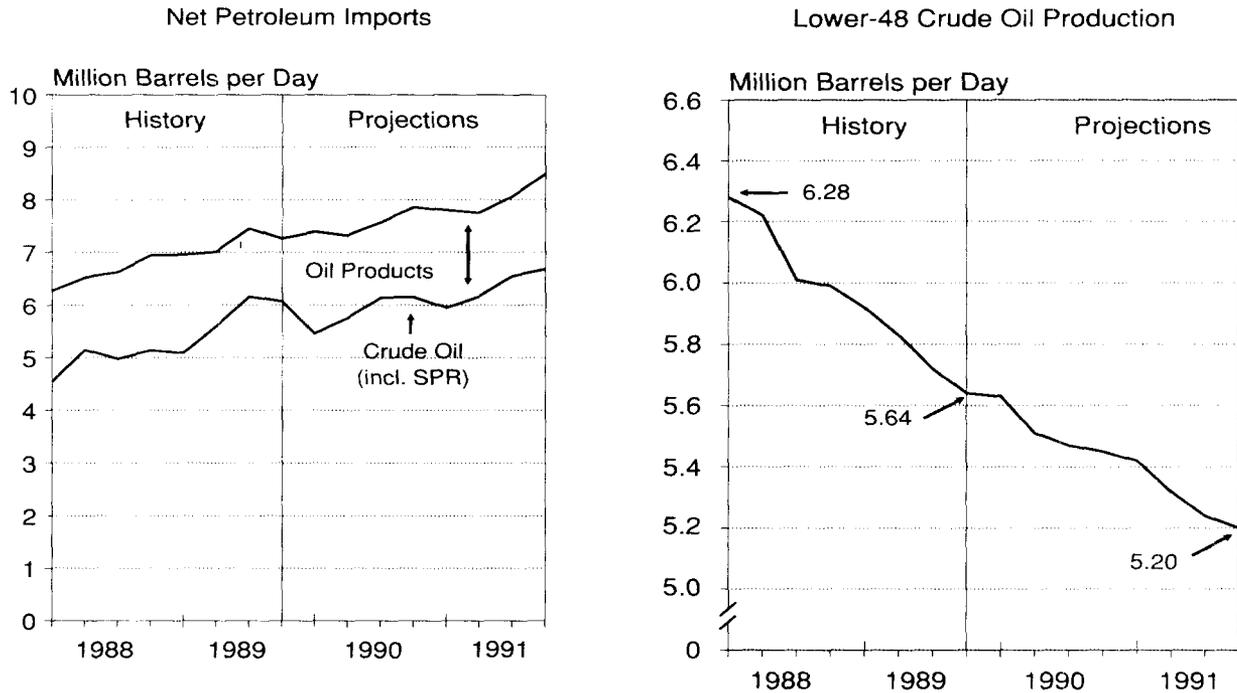
Figure 9. Petroleum Imports and Production

Note: Crude oil production includes lease condensate.

Sources: **History**: Energy Information Administration, Petroleum Supply Annual 1988, DOE/EIA-0340(88)/1; Petroleum Supply Monthly, DOE/EIA-0109, January 1989 to October 1989; and Weekly Petroleum Status Report, DOE/EIA-0208(89-50, 90, 02) (Washington, DC). **Projections**: Table 6.

Motor Gasoline

Motor gasoline demand in 1989 is estimated to have declined by 0.4 percent, the first year-over-year decrease since 1982 (Table 10). This estimate reflects a substantial slowdown in the growth of travel activity from 5.0 percent in 1988 to 2.8 percent in 1989 as a result of the moderation in economic growth and an increase in retail gasoline prices. The 3.1-percent increase in vehicle efficiency, similar to that of the previous year, is brought about by the continual retirement of older, less-efficient vehicles rather than further gains in the efficiency of new vehicles (Figure 10).

The price spike in late March 1989 resulted in temporary, but significant, shifts in gasoline market shares. Between March and July 1989, the market share of regular unleaded increased from 57 to 61 percent, reversing the downward trend of the past several years (Figure 10). By October, that fraction eroded slightly to 60 percent as retail prices retreated from spring peaks. Conversely, the share of premium gasoline, which has been rising steadily, slipped from 25 percent in March to 22 percent in June before recovering to 24 percent in October, as prices began to moderate. Mid-grade gasoline, which claimed 4.8 percent of the market in March, claimed 8.3 percent by October—the first time that this share exceeded that of leaded gasoline, whose share of the market had declined to 7.9 percent. Although much of that rise took place by June—largely at the expense of premium gasoline due to the price hike—the statistics since then indicate that mid-grade sales are continuing to increase, but at a slower pace. Because of the retail price decline during this period, however, these increases are primarily displacing regular unleaded instead of premium gasoline.

In 1990, demand for motor gasoline is projected to decline again by an additional 0.4 percent. Although fuel efficiency is projected to moderate to a 2.6-percent growth rate, travel activity is projected to increase by only 2.2 percent, somewhat less than the previous year's increase, reflecting the slowdown in economic growth. In 1991, the combined effects of continued moderation in fuel efficiency growth to 2.1 percent
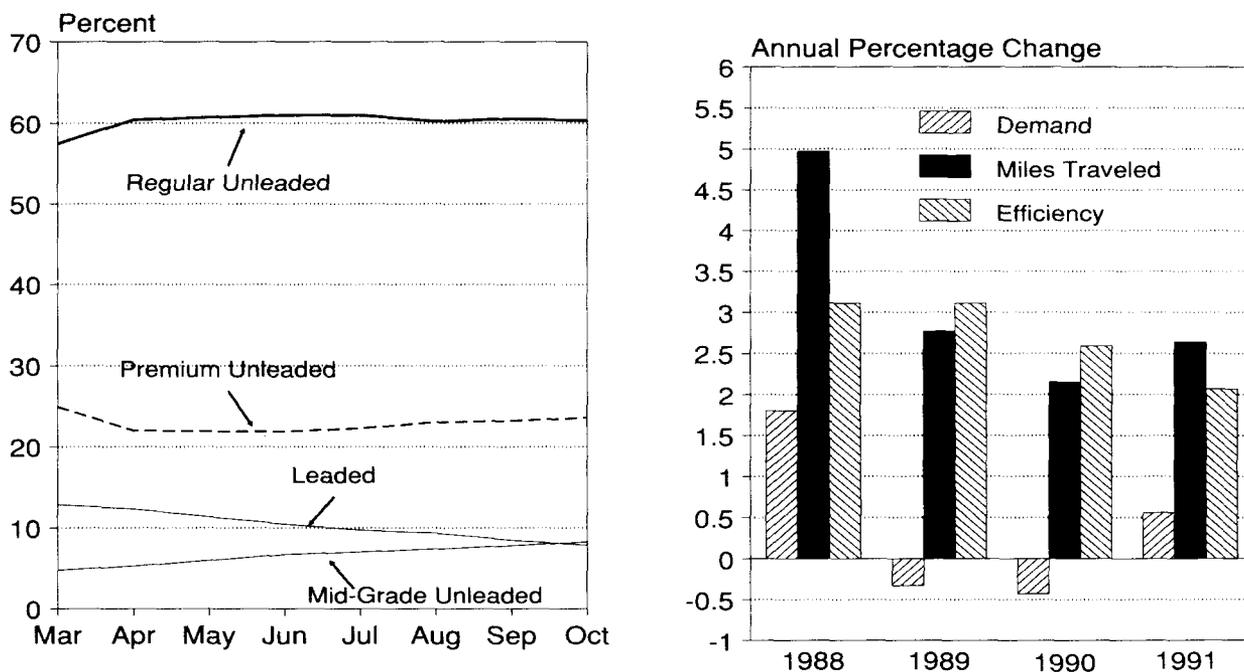
Figure 10. Motor Gasoline Market Shares by Grade for 1989 and Demand Components

Note: Projections begin in the first quarter of 1990.
Sources: **History**: Energy Information Administration, *Petroleum Supply Monthly*, DOE/EIA-0035(89/10) and *Petroleum Marketing Monthly*, DOE/EIA-0380, Table 47, various issues. (Washington, DC, 1989); and U.S. Department of Transportation, Federal Highway Administration, *Traffic Volume Report* (Washington, DC). **Projections**: Table 10.

and a 2.6-percent increase in travel brought about by a recovery in economic activity are expected to increase motor gasoline demand by 0.5 percent. Consumption, however, is expected to average less than in 1988, when demand last peaked. In both years, the slight decline in real motor gasoline prices is expected to result in an increased share of mid-grade gasoline and a decreased share of regular unleaded gasoline. The share of premium gasoline during that period should remain the same or increase slightly as a result of the stable price environment. Leaded gasoline sales are expected to continue to decline, reflecting the retirement of older automobiles.

Distillate Fuel Oil

Demand for distillate fuel oil is projected to decline slightly in 1990 and increase by almost 3.0 percent in 1991 (Table 11 and Figure 11). This projection is based partly on expected growth in manufacturing production of 1.2 percent and 3.8 percent in 1990 and 1991, respectively. Relatively flat demand for distillate in 1990 reflects a strong weather-related increase in demand for heating oil that occurred in the fourth quarter of 1989. Normal weather is assumed for 1990 and 1991. Growth in demand in 1991 reflects a more favorable price expectation for distillate, in addition to the stronger economic activity.

Following manufacturing activity, demand for diesel in the transportation sector is projected to increase at rates of approximately 1 percent in 1990 and 3 percent in 1991. This sector is the most important demand category in determining the magnitude and direction of demand growth, accounting for more than 50 percent of the total demand for distillate. The percentage was 53 percent in 1988 (Figure 11).
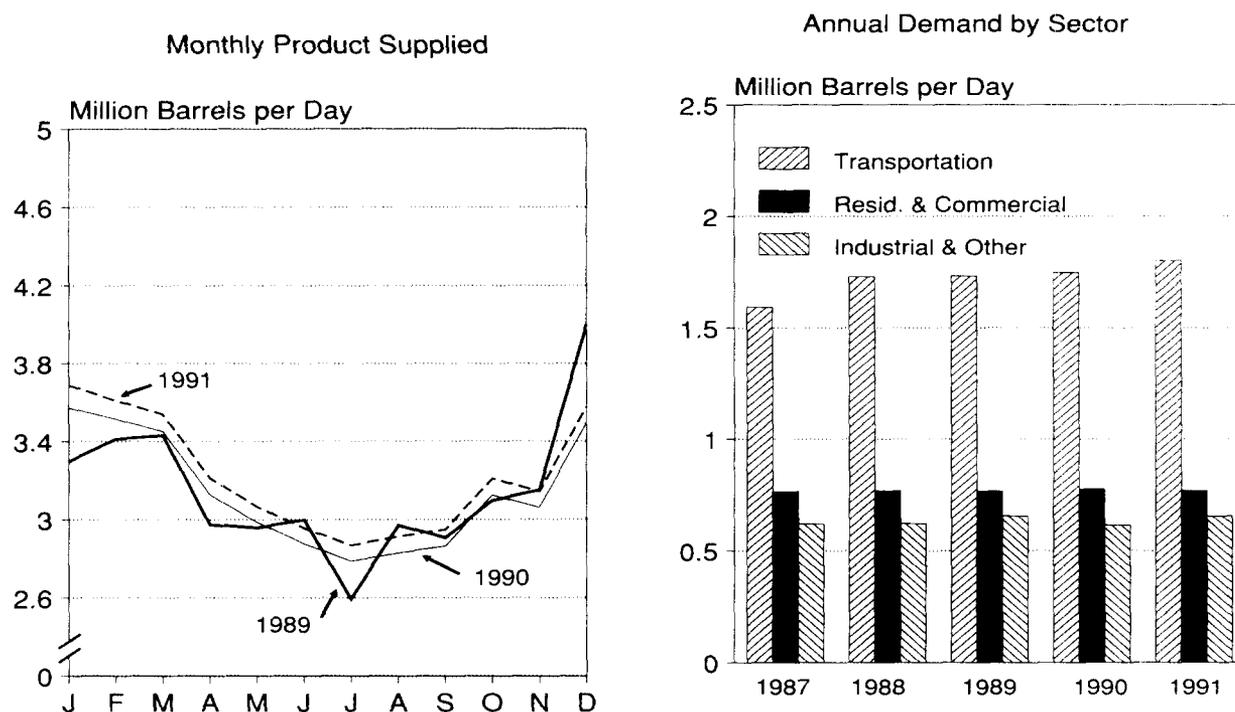
Figure 11. Distillate Fuel Oil Demand

Note: Projections begin with the first quarter of 1990, except for projections of sectoral demand which begin in 1989.

Sources: **History**: Energy Information Administration, *Petroleum Supply Monthly*, DOE/EIA-0035(89/10) (Washington, DC, 1989); and "Annual Report on Sales of Fuel Oil and Kerosene, 1988," in Appendix A of *Petroleum Marketing Annual*, DOE/EIA-0487(88). **Projections**: Table 11.

Demand for heating oil in the residential and commercial sectors is highly dependent on weather. The effects on heating oil deliveries of an increase in heating oil demand due to colder weather that occurred in late 1989 are expected to spill into the first quarter of 1990. Some net restocking by consumers above normal levels is anticipated for early 1990. For the remainder of the year, and through 1991, normal weather and only a slight change in the number of customers is assumed. Thus, demand is expected to remain unchanged on an annual basis. The number of homes converting from fuel oil to natural gas for heat appears to have leveled off. Further, the percentage of new single-family homes in the Northeast heated with fuel oil increased from 16 percent in 1984 to 21 percent in 1988.[11]

Demand for distillate in the industrial, electric utility, and other sectors combined is projected to decrease slightly in 1990 and increase in 1991. One factor that should give demand a boost in 1991 is price. The price of distillate increased in 1989 and the price of natural gas to industrial users decreased. The situation changes somewhat in the forecast period. In 1990, the relative price of distillate to natural gas is projected to change only slightly. The price trends in 1991 are projected to be the reverse of those of 1989—relative distillate prices are expected to decrease. The relative price decline in 1991 is expected to induce some amount of substitution away from natural gas and toward distillate. About 20 percent of natural gas consumed in industrial production can be substituted with distillate fuel oil.[12]

Residual Fuel Oil

The outlook for residual fuel oil demand in 1990 is for a decline from the relatively high consumption levels seen over the last 2 years. Residual fuel oil product supplied is expected to fall by an average of about 160,000 barrels per day in 1990 from an estimated 1.4 million barrels per day in 1989 (Table 12 and Figure 12). The decline in residual fuel oil shipments from the high levels of 1988 was actually evident by the second half of 1989. Total product supplied of residual fuel oil dropped during that period by an estimated 120,000 barrels per day, on average, compared to the same period in 1988. A surge in demand in December 1989 due to the cold weather was apparently not sufficient to keep average residual oil shipments from falling slightly for the year.

Compared to the last quarter of 1988 through the first half of 1989, the current situation in the electric utility sector holds less potential for increased use of residual fuel oil for power generation. This is because the availability of nuclear and hydroelectric power is much improved compared to that earlier period. Beyond 1990, additions to hydroelectric and nuclear plant output are expected to be of

Figure 12. Residual Fuel Oil Demand

Note: Projections begin in the first quarter of 1990.
Sources: **History:** Energy Information Administration, *Petroleum Supply Monthly*, DOE/EIA-0035(89/10), *Petroleum Supply Annual 1988*, DOE/EIA-0340(88)/2, and *Petroleum Supply Monthly*, DOE/EIA-0109, January 1989 to October 1989 (Washington, DC, 1989). **Projections:** Tables 12.

relatively small magnitude, and, with steady growth expected in electricity demand, some increase in fuel oil use at electric utilities is likely.

Despite potential increases in electric utility use of oil past 1990, total residual fuel oil use is expected to decline in 1991, as upward efficiency trends in the industrial sector continue. The tendency for residual fuel oil to remain weak or even decline amid a variety of relative price and economic growth conditions stands in apparent contrast to the situation for distillate fuel oil.

Other Petroleum Products

Reversing an increasing trend of the past few years, demand for other petroleum products (excluding jet fuel) declined by 2.5 percent in 1989 from levels of the previous year (Table 13 and Figure 13). Much of that decrease is attributed to a softening of petrochemical markets after more than 3 years of robust growth, much of which was export-related. Demand for oil-based feedstocks, which fell by 4.3 percent from 1988, led the decline as prices rose sharply during the first half of the year. The resultant changes in relative prices contributed to the 0.6-percent increase in liquefied petroleum gas (LPG) demand, partly offsetting much of the substantial contraction in the demand for heavier feedstocks. Propane demand was also boosted by the cold weather in the fourth quarter. Butane availability also increased as a result of the more stringent volatility requirements for gasoline production, which previously required sizeable quantities of butane as an octane enhancer. Ethane demand, however, was apparently 7.2 percent lower than during the previous year through October.[13] Because it was the most expensive petrochemical feedstock, ethane absorbed a larger share of the total decline in feedstock demand. Miscellaneous products demand fell 4.9 percent. Asphalt and road oil deliveries also fell due to both unusually wet weather (which prevented repairs) and to limited State funds for repairs in several parts of the country. Still gas consumption, however, rose slightly in line with increases in refinery activity.

Figure 13. Other Petroleum Products Demand

Note: Projections begin in the first quarter of 1990.

Sources: **History**: Energy Information Administration, *Petroleum Supply Monthly*, DOE/EIA-0035(89/11), *Petroleum Supply Annual 1988*, DOE/EIA-0340(88)/2, and *Petroleum Supply Monthly*, DOE/EIA-0109, January 1989 to October 1989 (Washington, DC, 1989). **Projections**: Table 13.

In 1990, demand for other petroleum products is projected to increase by 4.9 percent (Table 13). A resumption in export-led growth in petrochemical feedstock demand is expected to account for much of the 1.8-percent growth in LPG deliveries as well as the sharp 4.5-percent recovery in oil-based feedstock demand. Improvements in weather conditions are expected to boost asphalt and road oil demand above levels of the previous year, contributing to the 8.0-percent rise in miscellaneous product demand. In 1991, improving economic conditions are expected to boost the demand for all other petroleum products by 1.7 percent. Most of the products are expected to share in the upturn in demand. In particular, increased refinery runs are expected to bolster the output of still gas. Despite anticipated spikes in oil prices and a slight upward trend in the relative price of natural gas, ethane is expected to continue to lose ground to both the other liquefied petroleum gases and the oil-based feedstocks during both years, but the industrial recovery in 1991 is expected to slow the rate of decline in that year.

Jet Fuel

After increasing by an estimated 3.4 percent in 1989 over 1988, demand for jet fuel is projected to decline slightly in 1990 and grow slowly in 1991 (Table 13 and Figure 14). Slower economic growth and rising ticket prices (adjusted for inflation) contribute to this slowdown.

Compared to the first 3 quarters of 1988, total airline traffic grew by 4.8 percent in the first 3 quarters of 1989, sustained by international and cargo traffic. Over this period, domestic passenger traffic declined slightly. However, international passenger traffic grew by 8.4 percent, and cargo traffic grew at an even faster pace. Rising ticket prices for both international and domestic flights and modest economic growth are expected to keep growth in airline travel down throughout the forecast period. Since 1988, international traffic has remained strong despite price increases. Nevertheless, in recent months demand has been weakening in this sector. Moderate airline traffic in the international markets and soft demand in the domestic market should keep growth in jet fuel demand weak in 1990 and 1991.[14]

Airline ticket prices are expected to rise during the forecast period, due in part to a rise in jet fuel costs. Record low temperatures in December 1989 necessitated a strong shift in the refined product slate toward heating oil, restricting the supply of other refined products including jet fuel and possibly encouraging anticipatory buying from primary stockpiles. As a result, jet fuel prices soared and fuel costs for the airlines are estimated to have been as much as 30 percent higher in the fourth quarter of 1989, compared to a year earlier.[15] Although U.S. spot prices for jet fuel rose in early January, the tightness in supply is not expected to remain past the winter months, assuming normal weather for the remainder of the winter. Several large carriers have announced fare increases in response to the increase in jet fuel costs;[16] however, several airlines have also announced fare cuts in certain markets to try to buoy demand in the

Million Barrels per Day

Figure 14. Jet Fuel Product Supplied

Note: Projections begin with the first quarter of 1990.
Sources: **History**: Energy Information Administration, Petroleum Supply Annual 1988, DOE/EIA-0340(88)/2, and *Petroleum Supply Monthly*, DOE/EIA-0109, January 1989 to October 1989 (Washington, DC, 1989). **Projections**: Table 13.

traditionally slow winter months.[17] Although jet fuel prices are expected to stabilize by spring, airline fares are expected to continue to rise at a moderate pace throughout 1990 and 1991, following the trend of rising ticket prices in recent years.

Outlook for Other Major Energy Sources

- Natural Gas

- Coal

- Electricity

Natural Gas

The projected rates of growth in deliveries of natural gas are 1.9 percent in 1990 and 1.0 percent in 1991 (Table 14 and Figure 15). Despite expected sluggishness in the economy this year, the industrial sector is a major impetus behind increased deliveries in the forecast period. The forecast also reflects growth in the number of customers for the residential and commercial sectors.

Deliveries to the industrial sector are projected to increase at a rate of 1.3 percent in 1990 and 2.5 percent in 1991. Some of the increase in 1989 was the result of fuel switching from petroleum to natural gas as the relative price of natural gas declined sharply compared to its substitutes. Although growth in manufacturing production is expected to slow in 1990, the relative price of natural gas is forecast to remain near its more favorable 1989 level. A rise in the relative price of natural gas to industrial users offsets some of the effects from stronger growth projected for manufacturing in 1991. Growth in deliveries to the electric utility sector is projected to be essentially flat. This is due to an expected increase in nuclear and hydroelectric generation in 1990.

Deliveries of natural gas to the residential and commercial sectors are expected to grow slowly in the 1989 to 1991 period, corresponding roughly to increases in the number of customers. Customer bases are projected to increase at average annual rates of 1.7 percent and 2.0 percent in the residential and commercial sectors, respectively. As a result of lags in the customer billing cycle, increases in heating requirements due to cold weather in late 1989 will increase reported deliveries in early 1990. Because of this latter effect, deliveries to the combined residential and commercial sectors are expected to decline in 1991 from 1990 levels, even though underlying demand growth is expected to be positive.

Figure 15. Annual Change in Natural Gas Demand

Note: Projections begin in the first quarter of 1990.
Sources: **History**: Energy Information Administration, *Monthly Energy Review*, DOE/EIA-0035(89/10) (Washington, DC, 1989). **Projections**: Table 14.

Coal

Following a sluggish year in 1989, growth in coal demand is expected to remain slow in 1990 and then grow faster in 1991 (Table 15). In 1989 and 1990, only the electric utility sector shows growth in coal consumption. By 1991, however, the consumption of coal in the nonutility sectors as well as the utility sector should experience positive growth (Figure 16).

In the electric utility sector, growth in coal demand was quite weak in 1989, registering less than a 1.0-percent pace. This was due primarily to a 20-percent increase in hydroelectric power (Table 16). In 1990, coal use in this sector is expected to grow somewhat faster than in 1989, but should still remain relatively low due to growth and continued increases in output from hydroelectric and nuclear power sources. With electricity demand rebounding in 1991, and with only moderate growth in hydroelectric and nuclear power, coal consumption at electric utilities is expected to gain strength next year.

At coke plants, coal consumption is projected to continue to decline in 1990 following the pattern of iron and steel production, an indicator of metallurgical coal demand. This weakness is due to a slowing of the growth in major components of the economy, the increased use of electric arc furnaces in steel production, and an expected increase in the exchange rate which tends to make foreign-produced steel more competitive. With stronger growth in the economy, the iron and steel industry and coal consumption at coke plants are expected to rebound modestly in 1991.

Because of weakness in some key industrial sectors and a general tendency towards lower intensity of coal use in many manufacturing industries, the consumption of coal in the industrial sector is estimated to have declined in 1989 and is expected to fall further in 1990. Nonetheless, industrial coal use is projected to grow at a modest pace in 1991 due to strong growth in production in coal consuming manufacturing sectors. Consumption at coal gasification plants is expected to stay below 7 million tons through 1991.

Assuming stability in the level of consumer stocks in 1990 and 1991, coal production is expected to grow in rough proportion to the growth in coal consumption. Exports are projected to decline in 1990 due to increased availability of coal from lower priced exporting countries, especially Australia. In 1991, growth in exports remains virtually flat.
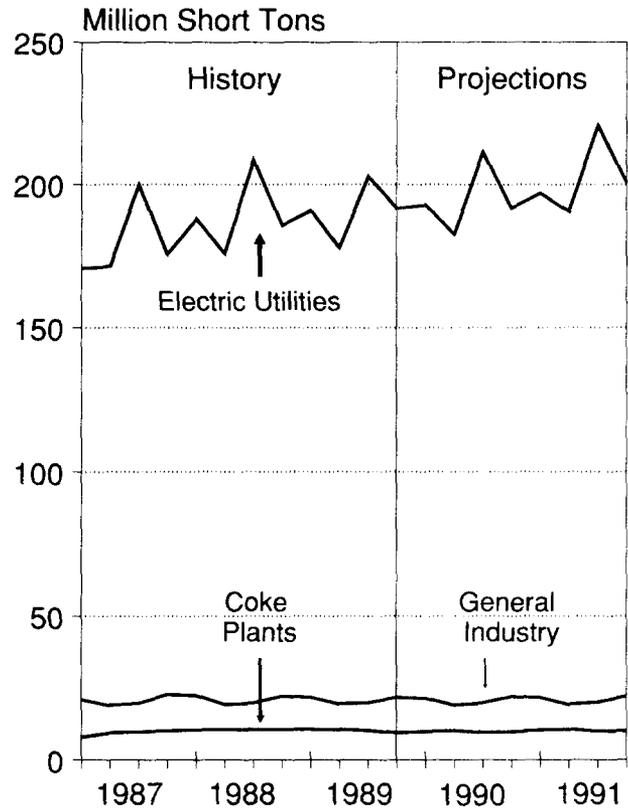
Figure 16. Coal Consumption

Sources: **History**: Energy Information Administration, *Quarterly Coal Report*, DOE/EIA-0121(89/3Q) (Washington, DC, 1989). **Projections**: Table 15.

Electricity

Sales Growth Remains Firm in 1990 Despite Slowing Economy

The residential and commercial sectors should lead growth in total electricity demand in 1990 (Figure 17). Sales to the industrial sector are projected to stagnate, however. Total sales are thus expected to increase by 3.2 percent this year, after growth of 2.0 percent estimated for 1989 (Table 16). Though the residential and commercial sectors are fairly resilient to short-term fluctuations in the economy, the 1990 growth rates for these sectors do moderate in response to the slowdown in the general economy.

Weather Distorts Underlying Demand Growth Rates in 1989 and 1990

Differing weather patterns between years can obscure the relationship between the economy and electricity sales. The mild temperatures in the first and third quarters of 1989 led to below-trend growth rates in electricity sales in that year. Conversely, the 1989 and 1990 growth rates overstate the trend because of the lower values for 1989. (It is estimated that the severe cold in December 1989 did not alter the overall conclusion that, for electricity at least, 1989 was milder than normal and substantially milder than 1988, particularly when both heating and cooling effects are considered.) When weather factors are held constant, total sales follow the overall economic growth scenario more closely, increasing by 3.5 percent in 1989 and 2.6 percent in 1990.[18]

The allocation of growth among sectors changes somewhat when looking at weather-normalized levels. The residential sector is affected most by weather; hence, a good portion of the increase in residential sales in 1990 is due to the assumption that weather in the first and third quarters will be more severe than in 1989. Therefore, the weather-normalized growth rate is somewhat lower for 1990. The commercial sector is thus responsible for the bulk of trend growth next year, because weather does not have a great impact in this sector. The industrial sector reacts more directly to economic swings and is not considered to be affected measurably by weather. Industrial sales are expected to slow considerably in 1990, to 0.4 percent growth, in response to an anticipated slowdown in the economy.

Stronger Economy Boosts Sales in 1991

The economy is expected to pick up in 1991. Manufacturing activity, a key indicator of industrial electricity demand, is expected to lead this improvement in the economy. Sales to the industrial sector should accelerate in 1991 (2.3 percent) in response to the improvement in the manufacturing sector of the economy. Nevertheless, overall electricity growth should be led again by the commercial sector (4.6 percent), followed by the residential sector (2.8 percent). Total sales are projected to increase by 3.1 percent over 1990 levels. These growth rates are independent of weather effects because normal weather patterns are assumed for both 1990 and 1991.

Figure 17. Electricity Sales Growth by Sector

Note: Projections begin in the first quarter of 1990.
Sources: **History**: Energy Information Administration, *Electric Power Monthly*, DOE/EIA-0226(89/10). **Projections**: Table 16.

Coal-Fired Generation Leads Supply Growth

Total domestic electricity generation is expected to increase by 1.8 percent in 1990 and by 2.9 percent in 1991 (Table 16). Coal-fired generation should support the majority of this increased load, followed by generation from nuclear power and hydroelectric sources (Figure 18). Generation from coal should climb by 2.2 percent in 1990, though coal generating capacity is not expected to increase. This growth is due partly to expectations of more normal usage patterns at electric utilities. Weather patterns were somewhat milder in the largest coal consuming regions during the spring and summer of 1989 than for the United States as a whole; hence, coal use at utilities in these regions was relatively low. Normal weather patterns are assumed for 1990 and 1991. Furthermore, significant increases in nuclear generation occurred in some of these key coal consuming regions during the spring and summer of 1989. During 1991, additions to coal capacity of 0.8 percent are expected to increase the share of coal as a percentage of total generation. Thus, capacity growth combined with steady growth in electricity demand should result in a 4.0-percent increase in coal-fired generation next year.

Hydroelectric generation is expected to continue to recover through 1991, though the rate of recovery should slow from the 20-percent increase in 1989 as more normal water levels in the past 2 years are reached. Although watershed conditions improved in many areas of the country last year, dryness still

threatens regions in California and in some of the Mountain and Central States. Recovery from the continued dryness will carry over into the early months of 1990. Normal levels of hydroelectric generation are anticipated by the spring of 1990 and through 1991, barring unusual weather.

The nuclear share of total generation is projected to increase in 1990 and then decline in 1991. Two additional nuclear units are projected to come on-line during the second half of 1990, and no new units are anticipated for 1991. The gradual movement of the industry towards longer fuel cycles and a general improvement in performance are having a positive effect on capacity factors; thus, nuclear generation is projected to increase by 4.2 percent in 1990 and 1.0 percent in 1991.

Though the combined share of generation from petroleum and natural gas relative to total generation rose slightly in 1989, this pattern is not expected to persist over the next 2 years. Further growth in hydroelectric power, the return of nuclear power, and more normal coal use patterns in 1990 will reduce the need for these higher cost sources. With oil prices expected to remain high relative to natural gas prices in 1990, oil use at utilities should drop off, and natural gas use should grow somewhat relative to oil. The amount of switching between oil and gas use at utilities is also sensitive to weather patterns, however. When temperatures hit record lows across the country in December 1989, natural gas deliveries to some utilities were interrupted to

Figure 18. Changes in Electricity Generation by Fuel Source

Sources: **History**: Energy Information Administration, *Electric Power Monthly*, DOE/EIA-0226(89/10) (Washington, DC, 1989). **Projections**: Table 16.

ensure adequate supplies to residential customers. As a result, utilities found it necessary to increase fuel oil consumption. Demand for fossil fuels at utilities should increase somewhat in 1991, as load requirements necessitate tapping all available sources. Net imports of electricity are projected to recover slightly in 1990 from the low 1989 level, but continued low water levels at hydroelectric plants in Canada will keep electricity exports below potential U.S. demand. Imports should pick up in 1991, as new contracts will be initiated in the fall of 1991 and rainfall in Canada is assumed to return to normal and replenish hydroelectric watersheds. Nonutility supplies are expected to increase steadily throughout the next 2 years.

Weather Influences Domestic Supply Availability

A great deal of uncertainty surrounds the forecast for electricity generation in the first quarter of 1990, because weather patterns have been irregular this winter. Normal temperatures across the country are not expected to cause major problems in meeting peak demand requirements. Extreme cold, however, could cause shortages of electric power in particular regions at peak-load times, possibly resulting in brown-outs (reduced power voltage) and customer curtailments. In December 1989, temperatures hit record lows, and peak demands were experienced in several areas across the United States; some record peaks even occurred in traditionally summer peaking areas. Difficulties in meeting peak demands were exacerbated by power plant outages in Texas and Florida, which forced several utilities to impose rolling blackouts. Voltage reductions were also imposed by some utilities in the Northeast and Middle Atlantic States.
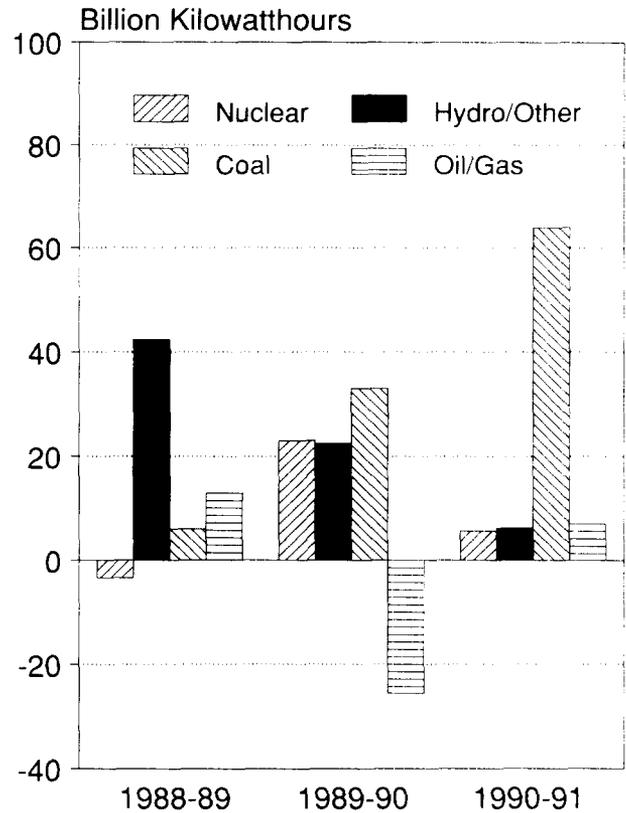
Special Topics

- **Efficiency Change Indices for the Manufacturing Sector**

- **Highway Travel Data: Sources and Trends**

Efficiency Change Indices for the Manufacturing Sector

Data from the 1985 Manufacturing Energy Consumption Survey (MECS) and the 1980 and 1985 Annual Survey of Manufactures have been combined to provide estimates of changes in energy efficiency from 1980 through 1985. EIA expects to publish measures of efficiency change for subsequent time periods as data from further cycles of the triennial MECS survey become available.

The ratio of consumption of fuel produced offsite to constant dollar value of shipments is a measure of energy efficiency for any given year. The difference in these efficiency ratios from one year to another, expressed as a percentage, produces a measure of the change in energy efficiency. The table below shows the energy efficiency changes for each Standard Industrial Classification (SIC) manufacturing industry group between the years 1980 and 1985.

Efficiency Changes in Manufacturing Industry Groups, 1980-1985

SIC Code	Industry Group	Efficiency Change (Percent)
20	Food and Kindred Products	22.9
21	Tobacco Manufacturers	Q[a]
22	Textile Mill Products	16.3
23	Apparel and Other Textile Products	NA[b]
24	Lumber and Wood Products	Q
25	Furniture and Fixtures	17.4
26	Paper and Allied Products	13.0
27	Printing and Publishing	15.2
28	Chemicals and Allied Products	17.6
29	Petroleum and Coal Products	19.8
30	Rubber and Miscellaneous Plastics Products	27.8
31	Leather and Leather Products	Q
32	Stone, Clay and Glass Products	23.0
33	Primary Metal Industries	11.0
34	Fabricated Metal Products	16.4
35	Machinery, Except Electrical	43.6
36	Electrical and Electronic Equipment	26.4
37	Transportation Equipment	25.0
38	Instruments and Related Products	29.3
39	Miscellaneous Manufacturing Industries	23.9
—	**All Manufacturing**	**25.1**

[a]Q = Withheld because relative standard error is greater than or equal to 50 percent.
[b]NA = Not Available.

All of the above indices were calculated by first computing an efficiency ratio of the form $R_j = E_j/S_j$, where R denotes the energy-efficiency ratio indexed to year j (j = 1980, 1985), E is consumption of offsite-produced energy, and S is the constant dollar value of shipments and receipts. The energy efficiency changes were then calculated according to $C_{80,85} = 100[(R_{80} - R_{85})/R_{80}]$, where $C_{80,85}$ is the percent change in efficiency from 1980 to 1985.

The estimates of efficiency change as calculated above account for true changes in energy efficiency between 1980 and 1985 caused by plant modernization, technology advances, application of conservation

techniques, and other actions which directly affected the amount of energy required to manufacture specific products. However, the estimates also reflect changes in product mix within individual industries from 1980 to 1985, as well as changes in production shares of the major (2-digit SIC) industry groups. Such changes do not relate to how efficiently energy is being used, but rather, to the aggregate energy requirements of the current demand for products. Efficiency change as measured above is artificially inflated due to the fact that there was a change between 1980 and 1985 into less energy intensive industries (that is, intersectoral shift). If the greater interest is in the "purer" causes of energy efficiency change found in changing industrial processes and establishing conservation in establishment sites, intersectoral shift would distort the efficiency change estimate.

The MECS data cannot be adjusted in a straight forward manner to account for a shift in product mix within a 2-digit industry. However, an efficiency ratio for all of manufacturing can be obtained that accounts for intersectoral shifts among major 2-digit industry groups. This adjusted efficiency ratio was calculated by reweighting the 1985 efficiency ratio for each 2-digit industry group by its 1980 value of shipments divided by the 1980 value of shipments for all of manufacturing. The reweighted industry ratios were then summed across industries, as follows:

$$R'_{mfg,1985} = \Sigma_i[(V_{i,1980}/V_{mfg,1980})R_{i,1985}]$$

where,

R' = adjusted efficiency ratio,
R = efficiency ratio,
V = value of shipments in constant dollars,
i = subscript denoting two-digit manufacturing SIC,
mfg = subscript denoting total manufacturing.

Once this adjusted efficiency ratio (R') was computed, it was compared to the 1980 efficiency ratio in the same manner as the unadjusted ratio to form an adjusted index of efficiency change.

The adjusted efficiency change index for manufacturing was found to be 18 percent. If the context of analytic interest calls for substantially reducing the effect of intersectoral shift, then this value should be the one cited as opposed to the 25 percent value presented in the table above.

Highway Travel Data: Sources and Trends

Since 1982, when motor fuel use reached a low as a result of the recession as well as increase in vehicle efficiency brought about by earlier price increases, vehicle-miles traveled have increased at an average annual rate of 3.9 percent.[19] This is consistent with the 3.6-percent rate of increase in real disposable personal income, a key indicator of personal highway travel activity. In 1988, however, total vehicle-miles traveled are estimated to have increased by 5.0 percent, more than the 4.4-percent increase in disposable income. Several factors are believed to have contributed to that robust increase. First, the relaxation of speed limits on several interstate highways might have stimulated travel activity. Second, less favorable exchange rates and political uncertainty in foreign countries may have curtailed travel abroad, boosting recreational travel in the United States. For 1989, however, highway travel activity is estimated to have increased by a more moderate 2.8 percent, slightly more than one-half of the previous year's rate of increase. The pronounced rise in retail gasoline prices in the late spring, as well as the recent moderation in economic growth, account for much of that slowdown.

The U.S. Department of Transportation (DOT) aggregates and publishes statistics on vehicle-miles traveled provided by the States. Each year's statistics appear in the following fall. Each State employs its own formula for deriving its estimates of annual highway activity in accordance with the DOT's Traffic Monitoring Guide (TMG). These formulas are used to derive estimates of travel according to type of vehicle (auto, truck, bus, and other), location (urban, rural arterial, and other rural) and class of highway. Most States employ portable traffic counters to estimate highway travel. By moving these counters from one location to another, these devices are able to collect 1- to 3-day samples of traffic activity for approximately 100,000 stretches of highway in any year. Many States incorporate fuel sales data in conjunction with the traffic counts to derive the estimates of vehicle-miles traveled. Some States continue to rely on fuel sales data only to derive estimates of travel on certain types of local roads.

Several years ago, many States relied primarily on wholesale fuel deliveries to estimate travel activity. Since the issuance of the TMG in 1985, however, most of them have adopted methodologies based primarily on traffic counts. Traffic counts were found to be a better indicator of vehicle miles traveled than those based on wholesale fuel deliveries. There has been speculation that some States' procedures in reporting wholesale volumes were unable to distinguish between motor fuel intended for highway use and that which may be used for other purposes. In addition, movements in wholesale volumes did not necessarily correspond to changes in sales at the retail level, which may more closely reflect traffic activity. In contrast to the wholesale deliveries data, highway end-use data, which purportedly reflect direct consumption, are derived by the DOT rather than by the States. Because the estimation procedure used to derive non-highway fuel use is a complex one, there are substantial time lags before highway end-use data can be published. As such, the States would be unable to incorporate these data as parameters even though they may be preferable to wholesale deliveries in estimating travel activity. In any event, the shift towards traffic-count based methodologies is believed to have resulted in improvements in the quality of highway activity data.

In addition, the travel data may reflect certain biases. For example, growth in urban miles traveled, which has accounted for the majority of the increase in total miles traveled, may have been understated between census counts. As a result, the transformation of a rural area into an urban one may result in more rapid increases in driving activity than those indicated by the DOT figures. Second, budget constraints may prevent several States from providing adequate coverage of highway travel activity.

Because of the substantial delay in publishing the State-based data, the DOT also publishes preliminary monthly estimates of vehicle-miles traveled based directly on traffic counts compiled by approximately 4,000 permanent traffic counters. These estimates are released approximately 6 weeks after the reporting month. For each month, the year-to-year percent changes in traffic counts are applied to the revised estimates of traffic activity in the corresponding month of the previous year to derive the current estimate. Most traffic counters, however, are situated on major highways outside urban areas, resulting in preliminary estimates that may understate year-to-year changes in urban traffic activity. In fact, much of the upward revision to the 1988 estimate for vehicle-miles traveled was brought about by a restatement of urban traffic activity; urban traffic activity was undercounted by the permanent traffic counters.

References

1. McGraw-Hill, Inc., *Platt's Oilgram Price Report* (New York, NY, 1989).

2. Energy Information Administration, *International Petroleum Statistics Report*, DOE/EIA-0520(89/12), Tables 1.1 and 1.3 (Washington, DC, 1989).

3. The non-U.S. production changes are based on internal calculations by the International and Contingency Information Division of the Office of Energy Markets and End Use.

4. Energy Information Administration, *Weekly Petroleum Status Report*, DOE/EIA-0208(90-04), Table 13 (Washington, DC, January 12, 1990).

5. Energy Information Administration, *Petroleum Marketing Monthly*, DOE/EIA-0308, various issues, "Federal and State Motor Fuel Taxes" table (Washington, DC, 1990).

6. Energy Information Administration, *Petroleum Marketing Monthly*, DOE/EIA-0308, various issues, Tables 28, 29 and 43 (Washington, DC, 1990).

7. Current estimates of fourth-quarter 1989 product supplied for the combined "Other" category, which included liquefied petroleum gases, petrochemical feedstocks and miscellaneous products (including road oil and asphalt, lubricants, waxes, etc.), indicate surprisingly low figures for the overall "Other" category. A relatively high degree of uncertainty is thus ascribed to these data, and much of the downward implications of them for the forecast is discounted.

8. U.S. Department of Commerce, National Oceanic and Atmospheric Administration, *Monthly State, Regional, and National Heating/Cooling Degree Days Weighted by Population* (Asheville, NC), and Microcomputer Management System (Suitland, MD).

9. The second oil price case is an extreme case in that, in addition to assuming constant prices for nonpetroleum products, maximum and minimum ranges observed for oil-based electricity generation as a percentage of combined oil-based plus gas-based generation, over the period 1983 to 1989, were assumed for the low-price and high-price cases, respectively. The maximum and minimum values for the oil- to- oil-plus gas ratio were applied on a quarter-by-quarter basis.

10. PennWell Publishing Co., *Oil and Gas Journal* (January 22, 1990).

11. U.S. Department of Commerce, Bureau of the Census, Current Construction Reports - Series C25, *Characteristics of New Housing: 1988* (Washington, DC, 1989).

12. Energy Information Administration, *Manufacturing Energy Consumption Survey: Fuel Switching, 1985*, DOE/EIA-0515(85) (Washington, DC, December 1988).

13. Energy Information Administration, *Petroleum Supply Monthly*, DOE/EIA-0109, various issues.

14. All airline traffic statistics are obtained from I.P. Sharp Associates, Limited (Toronto, Canada).

15. Estimated by Airline Economics, Inc., as reported in *The Wall Street Journal* (December 29, 1989).

16. Reuter News Service (New York, January 3, 1990).

17. *The Wall Street Journal* (December 21, 1989).

18. The weather-corrected figures are based on internal calculations by the Demand Analysis and Forecasting Branch of the Office of Energy Markets and End Use, and are available upon request.

19. Federal Highway Administration, *Highway Statistics*, FHWA-PL, various issues.

Detailed Tables

Table 2. International Petroleum Balance
(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)	10.12	10.02	9.77	9.76	9.77	9.56	9.49	9.48	9.41	9.26	9.17	9.13	9.91	9.57	9.24
OPEC	22.20	23.26	24.13	25.36	24.25	24.00	24.00	24.50	24.25	24.50	25.50	25.50	23.74	24.19	24.94
Other Non-OPEC	16.61	16.25	16.75	16.93	17.48	17.26	17.58	17.75	17.89	17.52	17.77	17.95	16.63	17.52	17.79
Total Market Economies	48.93	49.52	50.64	52.04	51.49	50.83	51.07	51.74	51.56	51.29	52.44	52.58	50.29	51.28	51.97
Net Centrally Planned Economies Exports	2.08	2.36	2.49	2.35	1.78	2.05	2.30	2.15	1.58	1.85	2.10	1.95	2.32	2.07	1.87
Total Supply	51.01	51.88	53.14	54.39	53.27	52.88	53.37	53.89	53.14	53.14	54.54	54.53	52.61	53.35	53.84
Net Stock Withdrawals or Additions (-)															
U.S. (50 States Excluding SPR)	.38	-.36	-.61	.65	.33	-.34	-.31	.24	.36	-.30	-.31	.22	.01	-.02	-.01
U.S. SPR	-.07	-.06	-.06	-.03	-.05	-.05	-.05	-.05	-.05	-.05	-.05	-.05	-.06	-.05	-.05
Other Market Economies	.50	-.32	-.73	-.41	-.04	-1.83	-1.39	.32	1.27	-.89	-1.30	1.10	-.24	-.73	.04
Total Stock Withdrawals	.81	-.74	-1.40	.22	.25	-2.22	-1.74	.51	1.58	-1.24	-1.66	1.27	-.28	-.80	-.02
Product Supplied															
U.S. (50 States)	17.62	16.81	16.78	17.55	17.58	16.64	16.82	17.67	17.67	16.81	16.99	17.93	17.19	17.17	17.35
U.S. Territories	.20	.23	.21	.20	.19	.21	.20	.20	.19	.22	.21	.20	.21	.20	.20
Canada	1.61	1.64	1.73	1.82	1.69	1.68	1.75	1.84	1.71	1.71	1.78	1.86	1.70	1.74	1.76
Japan	5.44	4.44	4.55	5.52	5.78	4.59	4.77	5.67	6.00	4.76	4.96	5.89	4.99	5.20	5.40
Australia and New Zealand	.78	.81	.81	.82	.79	.83	.82	.84	.80	.84	.83	.85	.80	.82	.83
OECD Europe	12.57	11.81	12.10	13.40	12.89	12.01	12.53	13.17	13.10	12.20	12.73	13.38	12.47	12.65	12.85
Total OECD	38.22	35.74	36.18	39.31	38.91	35.95	36.90	39.39	39.46	36.53	37.50	40.11	37.36	37.78	38.40
Other Market Economies	14.28	14.37	14.38	14.65	14.90	14.99	15.00	15.29	15.55	15.65	15.66	15.98	14.42	15.05	15.71
Total Market Economies	52.50	50.11	50.56	53.96	53.80	50.94	51.90	54.68	55.01	52.18	53.15	56.08	51.78	52.83	54.10
Statistical Discrepancy	.68	-1.04	-1.18	-.65	.28	.28	.27	.28	.29	.28	.27	.28	-.55	.28	.28
Closing Stocks (billion barrels)	5.16	5.23	5.36	5.34	5.32	5.52	5.68	5.63	5.49	5.60	5.76	5.64	5.34	5.63	5.64

[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(89/12); and *International Energy Annual 1988*, DOE/EIA-0219(88); Organization for Economic Cooperation and Development, Annual and Monthly Oil Statistics Database through June 1989.

Table 3. International Economic Growth
(Percent Change from Previous Period)

	Annual Average 1978-1988	1989	1990	1991
OECD Total [a]	2.7	3.4	2.5	2.9
United States [b]	2.6	2.9	1.7	2.6
Western Europe	2.3	3.3	2.6	2.5
Japan	4.2	5.0	4.3	4.7
Other OECD [c]	3.2	2.7	1.4	3.1

[a] Weighted average of growth in gross national product for the United States and growth in gross domestic product for the other countries of the Organization for Economic Cooperation and Development (OECD).
[b] Gross national product.
[c] Canada, Australia, and New Zealand.

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

Sources: U.S. historical data and forecasts: DRI/McGraw-Hill Forecast CONTROL1289; Non-U.S. historical data and forecasts: The WEFA Group, *World Economic Service: Historical Data*, April 1989, and *World Economic Outlook: Developed Economies Volume*, January 1990.

Table 4. Macroeconomic, Oil Price, and Weather Assumptions

Assumption	1989 1st	2nd	3rd	4th	Case	1990 1st	2nd	3rd	4th	1991 1st	2nd	3rd	4th	Year 1989	1990	1991
Macroeconomic [a]																
Real Gross National Product					High	4,231	4,271	4,301	4,333	4,368	4,400	4,428	4,454		4,284	4,413
(billion 1982 dollars)	4,107	4,133	4,160	4,167	Base	4,182	4,200	4,217	4,243	4,278	4,309	4,337	4,362	4,142	4,211	4,322
					Low	4,134	4,129	4,132	4,154	4,188	4,219	4,246	4,270		4,137	4,231
Percentage Change					High	3.0	3.4	3.4	4.0	3.2	3.0	3.0	2.8		3.4	3.0
from Prior Year	3.3	3.0	2.9	2.4	Base	1.8	1.6	1.4	1.8	2.3	2.6	2.9	2.8	2.9	1.7	2.6
					Low	.7	-.1	-.7	-.3	1.3	2.2	2.8	2.8		-.1	2.3
GNP Implicit Price Deflator					High	1.285	1.297	1.308	1.319	1.332	1.345	1.359	1.373		1.302	1.352
(index, 1982=1.000)	1.245	1.259	1.269	1.279	Base	1.290	1.304	1.316	1.328	1.341	1.354	1.368	1.382	1.263	1.310	1.361
					Low	1.295	1.311	1.324	1.337	1.350	1.363	1.377	1.391		1.317	1.370
Percentage Change					High	3.2	3.0	3.0	3.1	3.6	3.8	3.9	4.1		3.1	3.9
from Prior Year	4.4	4.4	4.1	3.7	Base	3.6	3.5	3.7	3.8	3.9	3.9	3.9	4.1	4.2	3.7	4.0
					Low	4.0	4.1	4.4	4.5	4.3	4.0	4.0	4.1		4.2	4.1
Real Disposable					High	2,972	2,991	3,001	3,017	3,035	3,046	3,055	3,073		2,995	3,052
Personal Income [b]	2,882	2,888	2,921	2,938	Base	2,936	2,938	2,939	2,952	2,969	2,980	2,989	3,007	2,907	2,941	2,986
(billion 1982 dollars)					Low	2,900	2,886	2,877	2,886	2,904	2,914	2,923	2,940		2,887	2,920
Percentage Change					High	3.1	3.6	2.8	2.7	2.1	1.8	1.8	1.9		3.0	1.9
from Prior Year	4.5	4.1	4.1	3.6	Base	1.9	1.7	.6	.5	1.2	1.4	1.7	1.9	4.1	1.2	1.5
					Low	.6	-.1	-1.5	-1.8	.1	1.0	1.6	1.9		-.7	1.1
Index of Industrial					High	1.521	1.549	1.570	1.584	1.601	1.621	1.638	1.649		1.556	1.627
Production (Mfg.)	1.470	1.483	1.488	1.475	Base	1.482	1.492	1.502	1.512	1.529	1.548	1.564	1.575	1.479	1.497	1.554
(index, 1977=1.000)					Low	1.443	1.435	1.435	1.441	1.457	1.475	1.490	1.501		1.439	1.481
Percentage Change					High	3.5	4.5	5.5	7.4	5.3	4.6	4.3	4.1		5.2	4.6
from Prior Year	5.3	4.7	3.3	1.2	Base	.8	.6	1.0	2.5	3.1	3.7	4.1	4.1	3.6	1.2	3.8
					Low	-1.8	-3.2	-3.6	-2.3	.9	2.8	3.8	4.1		-2.7	2.9
Oil Price																
Imported Crude Oil Price [c]					Low	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00		15.00	15.00
(U.S. dollars/barrel)	16.76	18.97	17.60	18.75	Base	18.00	17.00	18.00	18.00	18.00	18.00	18.00	18.00	18.05	17.70	18.00
					High	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00		20.00	20.00
Weather [d]																
Heating Degree Days	2,289	560	107	1,896		2,401	536	88	1,669	2,401	536	88	1,669	4,852	4,694	4,694
Cooling Degree Days	39	317	716	73		28	327	755	63	28	327	755	63	1,145	1,172	1,172

[a] Macroeconomic projections from the Data Resources, Inc., model forecasts are seasonally adjusted at annual rates and modified as appropriate to the base world oil price case. The base macroeconomic projections are then modified by the low and high world oil price cases and by various explicit economic assumptions. Low world oil prices are applied to the high macroeconomic case, and high 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, revised December 1981. A degree day indicates the temperature variation from 65 degrees Farenheit (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(89/10); U.S. Department of Commerce, Bureau of Economic Analysis, *Survey of Current Business,* June 1988; 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.12.3,* June 1988. Macroeconomic projections are based on DRI/McGraw-Hill Forecast CONTROL1289.

Table 5. Energy Product Prices
(Nominal Dollars)

Product	1989 1st	2nd	3rd	4th	Price Case	1990 1st	2nd	3rd	4th	1991 1st	2nd	3rd	4th	Year 1989	1990	1991
Imported Crude Oil Price [a]	16.76	18.97	17.60	18.75	Low	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00		15.00	15.00
(dollars per barrel)					Base	18.00	17.00	18.00	18.00	18.00	18.00	18.00	18.00	18.05	17.70	18.00
					High	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00		20.00	20.00
Natural Gas Wellhead Price																
(dollars per thousand cubic feet)	1.84	1.61	1.65	1.82	Base	1.99	1.69	1.72	1.86	2.11	1.81	1.84	2.00	1.73	1.82	1.94
Petroleum Products																
Gasoline [b]	.96	1.13	1.10	1.05	Low	1.05	1.03	1.03	1.00	.96	1.02	1.05	1.00	1.06	1.03	1.01
(dollars per gallon)					Base	1.09	1.10	1.11	1.09	1.06	1.12	1.16	1.10		1.10	1.11
					High	1.10	1.17	1.20	1.17	1.12	1.19	1.23	1.17		1.16	1.18
No. 2 Diesel Oil, Retail	.94	.99	.95	1.06	Low	1.05	.97	.95	.97	.97	.96	.97	.98	.99	.99	.97
(dollars per gallon)					Base	1.09	1.00	.99	1.02	1.02	1.01	1.01	1.03		1.02	1.02
					High	1.10	1.04	1.03	1.04	1.04	1.03	1.03	1.05		1.05	1.04
No. 2 Heating Oil, Wholesale	.53	.53	.53	.73	Low	.62	.48	.48	.51	.50	.48	.48	.52	.59	.54	.50
(dollars per gallon)					Base	.69	.54	.55	.60	.59	.56	.56	.60		.61	.58
					High	.73	.61	.61	.65	.64	.61	.61	.66		.66	.63
No. 2 Heating Oil, Retail	.86	.86	.82	.97	Low	1.01	.84	.78	.81	.84	.81	.78	.82	.89	.88	.82
(dollars per gallon)					Base	1.07	.90	.86	.90	.94	.90	.87	.92		.95	.92
					High	1.11	.98	.93	.97	1.01	.96	.93	.98		1.01	.98
No. 6 Residual Fuel Oil [c]	15.11	17.10	15.87	18.08	Low	16.11	14.30	14.38	14.80	15.06	14.23	14.42	14.85	16.51	15.00	14.69
(dollars per barrel)					Base	18.55	16.16	16.92	17.58	17.89	16.90	17.12	17.63		17.43	17.45
					High	20.01	18.74	18.92	19.46	19.79	18.70	18.95	19.51		19.37	19.30
Electric Utility Fuels																
Coal	1.44	1.45	1.46	1.46	Low	1.42	1.42	1.39	1.38	1.38	1.40	1.38	1.37	1.45	1.40	1.38
(dollars per million Btu)					Base	1.47	1.49	1.48	1.49	1.51	1.54	1.53	1.53		1.48	1.53
					High	1.50	1.55	1.55	1.57	1.60	1.65	1.64	1.66		1.54	1.64
Heavy Oil [d]	2.62	2.96	2.73	3.11	Low	2.78	2.44	2.47	2.56	2.62	2.44	2.48	2.58	2.83	2.57	2.53
(dollars per million Btu)					Base	3.18	2.74	2.88	3.01	3.08	2.87	2.92	3.03		2.96	2.98
					High	3.41	3.15	3.20	3.31	3.39	3.16	3.21	3.33		3.28	3.28
Natural Gas																
(dollars per million Btu)	2.38	2.30	2.32	2.47	Base	2.75	2.42	2.41	2.57	2.81	2.53	2.52	2.68	2.36	2.52	2.62
Other Residential																
Natural Gas																
(dollars per thousand cubic feet)	5.41	5.83	6.92	5.70	Base	5.62	6.15	7.14	5.90	5.84	6.44	7.50	6.22	5.69	5.90	6.18
Electricity	7.19	7.77	8.07	7.59	Low	7.24	7.74	7.99	7.61	7.32	7.87	8.17	7.82	7.66	7.64	7.79
(cents per kilowatthour)					Base	7.33	7.89	8.18	7.82	7.59	8.20	8.54	8.18		7.80	8.13
					High	7.41	8.03	8.37	8.04	7.83	8.48	8.85	8.51		7.95	8.42

[a] Cost of imported crude oil to U.S. refiners.
[b] Average retail for all grades and services.
[c] Retail residual fuel oil--average, all sulfur contents.
[d] Heavy fuel oil prices include fuel oils No. 4., No. 5, and No. 6, and topped crude fuel oil prices.
Notes: Fourth quarter 1989 is estimated. Prices exclude taxes, except gasoline, residential natural gas, and diesel prices. Historical values are printed in **boldface**, forecasts in *italics*.
Sources: Historical data: Energy Information Administration, *Monthly Energy Review*, DOE/EIA-0035(89/10); and *Petroleum Marketing Monthly*, DOE/EIA-0380(89/10).

Table 6. Supply and Disposition of Petroleum: Base Case
(Million Barrels per Day, Except Stocks)

Supply and Disposition	1989				1990				1991				Year		
	1st	2nd	3rd	4th	1st	2nd	3rd	4th	1st	2nd	3rd	4th	1989	1990	1991
Supply															
Crude Oil Supply															
Domestic Production [a]	7.78	7.74	7.54	7.54	7.47	7.30	7.21	7.18	7.12	6.98	6.88	6.81	7.65	7.29	6.95
Alaska	1.87	1.91	1.82	1.90	1.84	1.78	1.74	1.73	1.70	1.67	1.64	1.61	1.87	1.77	1.65
Lower 48	5.92	5.83	5.72	5.64	5.63	5.51	5.47	5.45	5.42	5.32	5.24	5.20	5.78	5.51	5.29
Net Imports (Including SPR) [b]	5.09	5.60	6.16	6.07	5.46	5.76	6.15	6.15	5.95	6.17	6.55	6.69	5.74	5.88	6.34
Gross Imports															
(Excluding SPR)	5.18	5.71	6.20	6.10	5.59	5.89	6.25	6.26	6.08	6.29	6.65	6.80	5.80	6.00	6.46
SPR Imports	.07	.06	.06	.03	.05	.05	.05	.05	.05	.05	.05	.05	.06	.05	.05
Exports	.17	.17	.09	.07	.18	.17	.15	.16	.18	.17	.15	.16	.12	.16	.16
SPR Stock Withdrawn or Added (-)	-.07	-.06	-.06	-.03	-.05	-.05	-.05	-.05	-.05	-.05	-.05	-.05	-.06	-.05	-.05
Other Stock Withdrawn or Added (-)	.04	-.05	-.04	-.11	.04	.00	.06	.00	-.06	-.02	.05	-.01	-.04	.03	-.01
Products Supplied and Losses	-.05	-.02	-.02	-.02	-.02	-.02	-.02	-.02	-.02	-.02	-.02	-.02	-.03	-.02	-.02
Unaccounted-for Crude	.23	.21	.24	-.10	.13	.13	.12	.13	.14	.13	.12	.13	.14	.13	.13
Crude Oil Input to Refineries	13.03	13.41	13.83	13.36	13.04	13.12	13.47	13.39	13.08	13.20	13.54	13.55	13.41	13.26	13.34
Other Supply															
NGL Production	1.64	1.60	1.51	1.52	1.58	1.55	1.54	1.57	1.58	1.55	1.54	1.57	1.57	1.56	1.56
Other Hydrocarbon and Alcohol Inputs	.05	.05	.07	.06	.06	.06	.06	.06	.06	.06	.06	.07	.06	.06	.06
Crude Oil Product Supplied	.05	.02	.02	.02	.02	.02	.02	.02	.02	.02	.02	.02	.03	.02	.02
Processing Gain	.65	.63	.64	.64	.66	.66	.67	.67	.66	.67	.68	.68	.64	.67	.67
Net Product Imports [c]	1.85	1.40	1.29	1.19	1.94	1.56	1.42	1.72	1.85	1.60	1.51	1.81	1.43	1.66	1.69
Gross Product Imports [c]	2.52	2.09	2.00	1.96	2.52	2.12	1.96	2.31	2.44	2.16	2.04	2.41	2.14	2.23	2.26
Product Exports	.66	.69	.71	.76	.59	.56	.53	.60	.59	.56	.53	.60	.71	.57	.57
Product Stock Withdrawn or Added (-) [d]	.34	-.31	-.57	.76	.29	-.34	-.37	.24	.42	-.28	-.37	.23	.05	-.04	.00
Total Product Supplied, Domestic Use	17.61	16.81	16.78	17.55	17.58	16.64	16.82	17.67	17.67	16.81	16.99	17.93	17.19	17.17	17.35
Disposition															
Motor Gasoline	7.08	7.46	7.42	7.30	6.95	7.43	7.41	7.32	6.98	7.47	7.45	7.37	7.31	7.28	7.32
Jet Fuel	1.50	1.40	1.46	1.65	1.53	1.44	1.48	1.53	1.51	1.44	1.51	1.58	1.50	1.49	1.51
Distillate Fuel Oil	3.38	2.98	2.82	3.42	3.51	3.00	2.83	3.23	3.61	3.08	2.91	3.31	3.15	3.14	3.23
Residual Fuel Oil	1.60	1.24	1.12	1.43	1.44	.99	1.04	1.28	1.38	.95	1.02	1.27	1.35	1.19	1.15
Other Oils Supplied [e]	4.06	3.75	3.96	3.75	4.15	3.78	4.07	4.30	4.18	3.87	4.10	4.39	3.88	4.07	4.14
Total Product Supplied	17.62	16.81	16.78	17.55	17.58	16.64	16.82	17.67	17.67	16.81	16.99	17.93	17.19	17.17	17.35
Total Petroleum Net Imports	6.95	7.01	7.45	7.26	7.40	7.32	7.57	7.86	7.80	7.77	8.06	8.50	7.17	7.54	8.03
Closing Stocks (million barrels)															
Crude Oil (Excluding SPR) [f]	326	331	335	345	341	341	335	335	341	342	338	338	345	335	338
Total Motor Gasoline	230	217	227	214	232	217	224	228	235	219	225	229	214	228	229
Finished Motor Gasoline	189	178	186	177	194	181	186	191	198	183	187	193	177	191	193
Blending Components	41	38	41	37	38	36	38	36	37	35	38	36	37	36	36
Jet Fuel	44	45	49	40	43	46	47	45	45	46	47	44	40	45	44
Distillate Fuel Oil	97	99	122	111	91	102	122	123	91	101	121	124	111	123	124
Residual Fuel Oil	42	45	50	43	41	41	41	45	41	41	41	44	43	45	44
Other Oils [g]	264	300	310	280	254	286	291	263	254	285	290	262	280	263	262
Total Stocks (Excluding SPR)	1003	1036	1092	1032	1002	1033	1062	1039	1007	1034	1063	1043	1032	1039	1043
Crude Oil in SPR	566	572	577	580	584	588	593	597	602	606	611	615	580	597	615
Total Stocks (Including SPR)	1569	1608	1670	1612	1586	1621	1654	1636	1608	1640	1674	1658	1612	1636	1658

[a] Includes lease condensate.
[b] Net imports equals gross imports plus SPR imports minus exports.
[c] Includes finished petroleum products, unfinished oils, gasoline blending components, and natural gas plant liquids for processing.
[d] Includes an estimate of minor product stock change based on monthly data.
[e] Includes crude oil product supplied, natural gas liquids, liquefied refinery gas, other liquids, and all finished petroleum products except motor gasoline, jet fuel, distillate, and residual fuel oil.
[f] Includes crude oil in transit to refineries.
[g] Includes stocks of all other oils such as aviation gasoline, kerosene, natural gas liquids (including ethane), aviation gasoline blending components, naphtha and other oils for petrochemical feedstock use, special naphthas, lube oils, wax, coke, asphalt, road oil, and miscellaneous oils.
SPR: Strategic Petroleum Reserve
NGL: Natural Gas Liquids
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, *Petroleum Supply Annual 1988*, DOE/EIA-0340(88)/1; *Petroleum Supply Monthly*, DOE/EIA-0109, Jan. 1989 to Oct. 1989; *Weekly Petroleum Status Report*, DOE/EIA-0208(89-50,90-01,02).

Table 7. Petroleum Demand Sensitivities

Demand Determinant	1990	1991
	Four Quarters	Four Quarters
Economic Activity		
Level of GNP [a]	4,137 - 4,284	4,231 - 4,413
Resulting Petroleum Demand Difference [b]	0.44	0.56
Energy Prices		
Crude Oil [c]	$15 - $20	$15 - $20
Resulting Petroleum Demand Difference [b]		
All Energy Prices Change	.12	.20
Only Oil Prices Change	.39	.49
Weather		
Heating Degree-Days [d]	3,949 - 5,614	3,949 - 5,614
Cooling Degree-Days [d]	991 - 1,411	991 - 1,411
Resulting Petroleum Demand Difference [b]	.38	.39

[a] Real gross national product, in billions of 1982 dollars per year.
[b] Petroleum demand ranges associated with varying each particular demand determinant (or set of demand determinants), holding other things equal, in million barrels per day.
[c] Imported refiners' acquisition cost of 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 8. Supply and Disposition of Petroleum: High Demand Case
(Million Barrels per Day, Except Stocks)

Supply and Disposition	1989				1990				1991				Year		
	1st	2nd	3rd	4th	1st	2nd	3rd	4th	1st	2nd	3rd	4th	1989	1990	1991
Supply															
Crude Oil Supply															
Domestic Production [a]	**7.78**	**7.74**	**7.54**	*7.54*	*7.34*	*7.10*	*6.94*	*6.92*	*6.79*	*6.63*	*6.50*	*6.42*	*7.65*	*7.07*	*6.58*
Alaska	**1.87**	**1.91**	**1.82**	*1.90*	*1.78*	*1.70*	*1.64*	*1.69*	*1.66*	*1.62*	*1.58*	*1.55*	*1.87*	*1.70*	*1.60*
Lower 48	**5.92**	**5.83**	**5.72**	*5.64*	*5.56*	*5.40*	*5.30*	*5.23*	*5.13*	*5.01*	*4.92*	*4.87*	*5.78*	*5.37*	*4.98*
Net Imports (Including SPR) [b]	**5.09**	**5.60**	**6.16**	*6.07*	*5.85*	*6.14*	*6.69*	*6.75*	*6.59*	*6.78*	*7.26*	*7.47*	*5.74*	*6.36*	*7.03*
Gross Imports															
(Excluding SPR)	**5.18**	**5.71**	**6.20**	*6.10*	*5.99*	*6.26*	*6.79*	*6.86*	*6.72*	*6.90*	*7.35*	*7.58*	*5.80*	*6.48*	*7.14*
SPR Imports	**.07**	**.06**	**.06**	*.03*	*.05*	*.05*	*.05*	*.05*	*.05*	*.05*	*.05*	*.05*	*.06*	*.05*	*.05*
Exports	**.17**	**.17**	**.09**	*.07*	*.18*	*.17*	*.15*	*.16*	*.18*	*.17*	*.15*	*.16*	*.12*	*.16*	*.16*
SPR Stock Withdrawn or Added (-)	**-.07**	**-.06**	**-.06**	*-.03*	*-.05*	*-.05*	*-.05*	*-.05*	*-.05*	*-.05*	*-.05*	*-.05*	*-.06*	*-.05*	*-.05*
Other Stock Withdrawn or Added (-)	**.04**	**-.05**	**-.04**	*-.11*	*-.02*	*.02*	*.05*	*-.03*	*-.04*	*.02*	*.05*	*-.03*	*-.04*	*.01*	*.00*
Products Supplied and Losses	**-.05**	**-.02**	**-.02**	*-.02*	*-.02*	*-.02*	*-.02*	*-.02*	*-.02*	*-.02*	*-.02*	*-.02*	*-.03*	*-.02*	*-.02*
Unaccounted-for Crude	**.23**	**.21**	**.24**	*-.10*	*.13*	*.13*	*.12*	*.13*	*.14*	*.13*	*.12*	*.13*	*.14*	*.13*	*.13*
Crude Oil Input to Refineries	**13.03**	**13.41**	**13.83**	*13.36*	*13.24*	*13.31*	*13.73*	*13.71*	*13.41*	*13.48*	*13.86*	*13.93*	*13.41*	*13.50*	*13.67*
Other Supply															
NGL Production	**1.64**	**1.60**	**1.51**	*1.52*	*1.61*	*1.57*	*1.55*	*1.60*	*1.62*	*1.57*	*1.56*	*1.60*	*1.57*	*1.58*	*1.59*
Other Hydrocarbon and Alcohol Inputs	**.05**	**.05**	**.07**	*.06*	*.06*	*.06*	*.06*	*.06*	*.06*	*.06*	*.06*	*.07*	*.06*	*.06*	*.06*
Crude Oil Product Supplied	**.05**	**.02**	**.02**	*.02*	*.02*	*.02*	*.02*	*.02*	*.02*	*.02*	*.02*	*.02*	*.03*	*.02*	*.02*
Processing Gain	**.65**	**.63**	**.64**	*.64*	*.68*	*.67*	*.69*	*.70*	*.67*	*.68*	*.70*	*.71*	*.64*	*.68*	*.69*
Net Product Imports [c]	**1.85**	**1.40**	**1.29**	*1.19*	*2.38*	*1.68*	*1.62*	*2.09*	*2.07*	*1.76*	*1.71*	*2.16*	*1.43*	*1.94*	*1.93*
Gross Product Imports [c]	**2.52**	**2.09**	**2.00**	*1.96*	*2.97*	*2.24*	*2.15*	*2.68*	*2.65*	*2.32*	*2.25*	*2.76*	*2.14*	*2.51*	*2.50*
Product Exports	**.66**	**.69**	**.71**	*.76*	*.59*	*.56*	*.53*	*.60*	*.59*	*.56*	*.53*	*.60*	*.71*	*.57*	*.57*
Product Stock Withdrawn or Added (-) [d]	**.34**	**-.31**	**-.57**	*.76*	*.08*	*-.31*	*-.43*	*.22*	*.54*	*-.28*	*-.44*	*.21*	*.05*	*-.11*	*.01*
Total Product Supplied, Domestic Use	**17.61**	**16.81**	**16.78**	*17.55*	*18.07*	*17.00*	*17.24*	*18.40*	*18.39*	*17.30*	*17.48*	*18.70*	*17.19*	*17.68*	*17.97*
Disposition															
Motor Gasoline	**7.08**	**7.46**	**7.42**	*7.30*	*6.97*	*7.47*	*7.46*	*7.39*	*7.05*	*7.55*	*7.53*	*7.45*	*7.31*	*7.33*	*7.40*
Jet Fuel	**1.50**	**1.40**	**1.46**	*1.65*	*1.56*	*1.48*	*1.54*	*1.60*	*1.58*	*1.51*	*1.59*	*1.67*	*1.50*	*1.54*	*1.59*
Distillate Fuel Oil	**3.38**	**2.98**	**2.82**	*3.42*	*3.71*	*3.12*	*2.94*	*3.52*	*3.87*	*3.22*	*3.03*	*3.60*	*3.15*	*3.32*	*3.43*
Residual Fuel Oil	**1.60**	**1.24**	**1.12**	*1.43*	*1.59*	*1.09*	*1.18*	*1.47*	*1.56*	*1.07*	*1.16*	*1.45*	*1.35*	*1.33*	*1.31*
Other Oils Supplied [e]	**4.06**	**3.75**	**3.96**	*3.75*	*4.24*	*3.84*	*4.13*	*4.42*	*4.32*	*3.95*	*4.17*	*4.53*	*3.88*	*4.16*	*4.24*
Total Product Supplied	**17.62**	**16.81**	**16.78**	*17.55*	*18.07*	*17.00*	*17.24*	*18.40*	*18.39*	*17.30*	*17.48*	*18.70*	*17.19*	*17.68*	*17.97*
Total Petroleum Net Imports	**6.95**	**7.01**	**7.45**	*7.26*	*8.24*	*7.82*	*8.31*	*8.84*	*8.66*	*8.54*	*8.97*	*9.63*	*7.17*	*8.30*	*8.95*
Closing Stocks (million barrels)															
Crude Oil (Excluding SPR) [f]	**326**	**331**	**335**	*345*	*346*	*345*	*341*	*343*	*347*	*345*	*341*	*343*	*345*	*343*	*343*
Total Motor Gasoline	**230**	**217**	**227**	*214*	*234*	*221*	*227*	*230*	*234*	*221*	*227*	*230*	*214*	*230*	*230*
Finished Motor Gasoline	**189**	**178**	**186**	*177*	*195*	*184*	*188*	*193*	*195*	*184*	*188*	*193*	*177*	*193*	*193*
Blending Components	**41**	**38**	**41**	*37*	*39*	*37*	*39*	*37*	*38*	*37*	*39*	*37*	*37*	*37*	*37*
Jet Fuel	**44**	**45**	**49**	*40*	*46*	*49*	*50*	*47*	*46*	*48*	*50*	*47*	*40*	*47*	*47*
Distillate Fuel Oil	**97**	**99**	**122**	*111*	*92*	*103*	*129*	*130*	*92*	*101*	*128*	*128*	*111*	*130*	*128*
Residual Fuel Oil	**42**	**45**	**50**	*43*	*45*	*43*	*46*	*49*	*45*	*43*	*45*	*49*	*43*	*49*	*49*
Other Oils [g]	**264**	**300**	**310**	*280*	*263*	*292*	*296*	*273*	*263*	*291*	*296*	*272*	*280*	*273*	*272*
Total Stocks (Excluding SPR)	**1003**	**1036**	**1092**	*1032*	*1027*	*1053*	*1089*	*1071*	*1026*	*1050*	*1086*	*1069*	*1032*	*1071*	*1069*
Crude Oil in SPR	**566**	**572**	**577**	*580*	*584*	*588*	*593*	*597*	*602*	*606*	*611*	*615*	*580*	*597*	*615*
Total Stocks (Including SPR)	**1569**	**1608**	**1670**	*1612*	*1611*	*1642*	*1681*	*1669*	*1628*	*1657*	*1697*	*1684*	*1612*	*1669*	*1684*

[a] Includes lease condensate.
[b] Net imports equals gross imports plus SPR imports minus exports.
[c] Includes finished petroleum products, unfinished oils, gasoline blending components, and natural gas plant liquids for processing.
[d] Includes an estimate of minor product stock change based on monthly data.
[e] Includes crude oil product supplied, natural gas liquids, liquefied refinery gas, other liquids, and all finished petroleum products except motor gasoline, jet fuel, distillate, and residual fuel oil.
[f] Includes crude oil in transit to refineries.
[g] Includes stocks of all other oils such as aviation gasoline, kerosene, natural gas liquids (including ethane), aviation gasoline blending components, naphtha and other oils for petrochemical feedstock use, special naphthas, lube oils, wax, coke, asphalt, road oil, and miscellaneous oils.
SPR: Strategic Petroleum Reserve
NGL: Natural Gas Liquids
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, *Petroleum Supply Annual 1988*, DOE/EIA-0340(88)/1; *Petroleum Supply Monthly*, DOE/EIA-0109, Jan. 1989 to Oct. 1989; *Weekly Petroleum Status Report*, DOE/EIA-0208(89-50,90-01,02).

Table 9. Supply and Disposition of Petroleum: Low Demand Case
(Million Barrels per Day, Except Stocks)

Supply and Disposition	1989				1990				1991				Year		
	1st	2nd	3rd	4th	1st	2nd	3rd	4th	1st	2nd	3rd	4th	1989	1990	1991
Supply															
Crude Oil Supply															
Domestic Production [a]	7.78	7.74	7.54	7.54	7.55	7.42	7.35	7.28	7.25	7.11	7.01	6.94	7.65	7.40	7.08
Alaska	1.87	1.91	1.82	1.90	1.87	1.83	1.80	1.76	1.74	1.70	1.67	1.64	1.87	1.82	1.68
Lower 48	5.92	5.83	5.72	5.64	5.68	5.59	5.55	5.52	5.51	5.41	5.34	5.31	5.78	5.58	5.39
Net Imports (Including SPR) [b]	5.09	5.60	6.16	6.07	5.12	5.47	5.79	5.76	5.53	5.82	6.15	6.22	5.74	5.54	5.93
Gross Imports															
(Excluding SPR)	5.18	5.71	6.20	6.10	5.26	5.59	5.89	5.87	5.66	5.94	6.25	6.33	5.80	5.65	6.05
SPR Imports	.07	.06	.06	.03	.05	.05	.05	.05	.05	.05	.05	.05	.06	.05	.05
Exports	.17	.17	.09	.07	.18	.17	.15	.16	.18	.17	.15	.16	.12	.16	.16
SPR Stock Withdrawn or Added (-)	-.07	-.06	-.06	-.03	-.05	-.05	-.05	-.05	-.05	-.05	-.05	-.05	-.06	-.05	-.05
Other Stock Withdrawn or Added (-)	.04	-.05	-.04	-.11	.16	-.03	.06	.03	-.05	-.04	.06	.03	-.04	.06	.00
Products Supplied and Losses	-.05	-.02	-.02	-.02	-.02	-.02	-.02	-.02	-.02	-.02	-.02	-.02	-.03	-.02	-.02
Unaccounted-for Crude	.23	.21	.24	-.10	.11	.14	.12	.12	.14	.14	.12	.12	.14	.12	.13
Crude Oil Input to Refineries	13.03	13.41	13.83	13.36	12.88	12.93	13.25	13.13	12.79	12.96	13.27	13.26	13.41	13.05	13.07
Other Supply															
NGL Production	1.64	1.60	1.51	1.52	1.55	1.53	1.53	1.54	1.54	1.53	1.53	1.54	1.57	1.54	1.53
Other Hydrocarbon and Alcohol Inputs	.05	.05	.07	.06	.06	.06	.06	.06	.06	.06	.06	.06	.06	.06	.06
Crude Oil Product Supplied	.05	.02	.02	.02	.02	.02	.02	.02	.02	.02	.02	.02	.03	.02	.02
Processing Gain	.65	.63	.64	.64	.64	.65	.66	.64	.63	.65	.66	.65	.64	.65	.65
Net Product Imports [c]	1.85	1.40	1.29	1.19	1.63	1.42	1.32	1.42	1.53	1.48	1.41	1.51	1.43	1.45	1.48
Gross Product Imports [c]	2.52	2.09	2.00	1.96	2.22	1.98	1.85	2.02	2.12	2.04	1.94	2.10	2.14	2.02	2.05
Product Exports	.66	.69	.71	.76	.59	.56	.53	.60	.59	.56	.53	.60	.71	.57	.57
Product Stock Withdrawn or Added (-) [d]	.34	-.31	-.57	.76	.39	-.32	-.39	.25	.47	-.31	-.38	.25	.05	-.02	.01
Total Product Supplied, Domestic Use	17.61	16.81	16.78	17.55	17.15	16.29	16.46	17.07	17.03	16.39	16.58	17.29	17.19	16.74	16.82
Disposition															
Motor Gasoline	7.08	7.46	7.42	7.30	6.93	7.40	7.36	7.26	6.92	7.40	7.38	7.30	7.31	7.24	7.25
Jet Fuel	1.50	1.40	1.46	1.65	1.50	1.40	1.43	1.47	1.45	1.38	1.44	1.50	1.50	1.45	1.44
Distillate Fuel Oil	3.38	2.98	2.82	3.42	3.34	2.88	2.73	3.00	3.39	2.95	2.81	3.08	3.15	2.98	3.06
Residual Fuel Oil	1.60	1.24	1.12	1.43	1.33	.90	.93	1.16	1.24	.87	.91	1.14	1.35	1.08	1.04
Other Oils Supplied [e]	4.06	3.75	3.96	3.75	4.06	3.72	4.01	4.17	4.03	3.79	4.04	4.26	3.88	3.99	4.03
Total Product Supplied	17.62	16.81	16.78	17.55	17.15	16.29	16.46	17.07	17.03	16.39	16.58	17.29	17.19	16.74	16.82
Total Petroleum Net Imports	6.95	7.01	7.45	7.26	6.76	6.89	7.11	7.18	7.06	7.29	7.56	7.73	7.17	6.99	7.41
Closing Stocks (million barrels)															
Crude Oil (Excluding SPR) [f]	326	331	335	345	331	333	327	324	329	333	327	324	345	324	324
Total Motor Gasoline	230	217	227	214	230	215	221	225	231	214	220	224	214	225	224
Finished Motor Gasoline	189	178	186	177	193	180	183	189	194	180	183	189	177	189	189
Blending Components	41	38	41	37	37	35	38	36	37	34	37	35	37	36	35
Jet Fuel	44	45	49	40	44	46	47	44	44	46	47	44	40	44	44
Distillate Fuel Oil	97	99	122	111	93	104	128	129	93	103	127	128	111	129	128
Residual Fuel Oil	42	45	50	43	38	38	37	40	38	38	37	40	43	40	40
Other Oils [g]	264	300	310	280	248	280	284	256	248	279	284	255	280	256	255
Total Stocks (Excluding SPR)	1003	1036	1092	1032	983	1015	1045	1018	981	1013	1043	1016	1032	1018	1016
Crude Oil in SPR	566	572	577	580	584	588	593	597	602	606	611	615	580	597	615
Total Stocks (Including SPR)	1569	1608	1670	1612	1567	1603	1638	1616	1583	1619	1653	1632	1612	1616	1632

[a] Includes lease condensate.
[b] Net imports equals gross imports plus SPR imports minus exports.
[c] Includes finished petroleum products, unfinished oils, gasoline blending components, and natural gas plant liquids for processing.
[d] Includes an estimate of minor product stock change based on monthly data.
[e] Includes crude oil product supplied, natural gas liquids, liquefied refinery gas, other liquids, and all finished petroleum products except motor gasoline, jet fuel, distillate, and residual fuel oil.
[f] Includes crude oil in transit to refineries.
[g] Includes stocks of all other oils such as aviation gasoline, kerosene, natural gas liquids (including ethane), aviation gasoline blending components, naphtha and other oils for petrochemical feedstock use, special naphthas, lube oils, wax, coke, asphalt, road oil, and miscellaneous oils.
SPR: Strategic Petroleum Reserve
NGL: Natural Gas Liquids
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, *Petroleum Supply Annual 1988*, DOE/EIA-0340(88)/1; *Petroleum Supply Monthly*, DOE/EIA-0109, Jan. 1989 to Oct. 1989; *Weekly Petroleum Status Report*, DOE/EIA-0208(89-50,90-01,02).

Table 10. Supply and Disposition of Motor Gasoline: Base Case
(Million Barrels per Day, Except Stocks)

Supply and Disposition	1989				1990				1991				Year		
	1st	2nd	3rd	4th	1st	2nd	3rd	4th	1st	2nd	3rd	4th	1989	1990	1991
Supply															
Domestic Production [a]	6.74	7.01	7.19	6.89	6.76	6.92	7.07	7.03	6.73	6.94	7.10	7.07	6.96	6.94	6.96
Imports	.37	.37	.36	.35	.39	.39	.40	.37	.34	.39	.41	.38	.36	.39	.38
Exports	.03	.05	.05	.03	.01	.01	.01	.01	.01	.01	.01	.01	.04	.01	.01
Net Imports	.34	.33	.31	.31	.38	.38	.38	.36	.33	.38	.40	.37	.32	.37	.37
Net Withdrawals	.01	.12	-.08	.09	-.19	.14	-.04	-.06	-.07	.16	-.04	-.07	.03	-.04	-.01
Total Primary Supply	**7.08**	**7.46**	**7.42**	7.30	6.95	7.43	7.41	7.32	6.98	7.47	7.45	7.37	7.32	7.28	7.32
Disposition															
Leaded	1.00	.92	.80	.58	.86	.88	.84	.80	.73	.75	.71	.68	.82	.84	.72
Unleaded	6.08	6.54	6.62	6.72	6.09	6.55	6.57	6.53	6.25	6.73	6.74	6.69	6.49	6.44	6.61
Total Product Supplied	**7.08**	**7.46**	**7.42**	7.30	6.95	7.43	7.41	7.32	6.98	7.47	7.45	7.37	7.31	7.28	7.32
Stocks															
Primary Finished Stock Levels [b] (million barrels)															
Opening	189.9	189.0	178.4	186.0	177.4	194.4	181.4	185.6	191.3	197.9	183.4	187.2	189.9	177.4	191.3
Closing	189.0	178.4	186.0	177.4	194.4	181.4	185.6	191.3	197.9	183.4	187.2	193.4	177.4	191.3	193.4

[a] Refinery Production plus production at natural gas processing plants.

[b] Includes stocks at natural gas processing plants. Excludes stocks of reclassified motor gasoline blending components.

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, *Petroleum Supply Annual 1988,* DOE/EIA-0340(88)/1; *Petroleum Supply Monthly,* DOE/EIA-0109, Jan. 1989 to Oct. 1989; *Weekly Petroleum Status Report,* DOE/EIA-0208(89-50,90-01,02).

Table 11. Supply and Disposition of Distillate Fuel Oil: Base Case
(Million Barrels per Day, Except Stocks)

Supply and Disposition	1989				1990				1991				Year		
	1st	2nd	3rd	4th	1st	2nd	3rd	4th	1st	2nd	3rd	4th	1989	1990	1991
Supply															
Refinery Output	2.83	2.78	2.90	3.12	2.96	2.86	2.84	2.93	2.93	2.90	2.89	3.00	2.91	2.89	2.93
Imports	.37	.27	.28	.27	.43	.32	.28	.38	.41	.35	.31	.41	.30	.35	.37
Exports	.11	.05	.11	.09	.09	.06	.07	.07	.09	.06	.07	.07	.09	.07	.07
Net Imports	.25	.23	.17	.18	.33	.26	.21	.31	.32	.29	.24	.35	.21	.28	.30
Net Withdrawals	.30	-.03	-.25	.13	.22	-.12	-.22	-.01	.36	-.11	-.22	-.03	.04	-.03	.00
Disposition															
Electric Utility Consumption	.08	.05	.06	.05	.05	.04	.05	.05	.05	.04	.05	.05	.06	.05	.05
Utility Stock Additions	-.02	.01	.00	.00	-.01	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
Electric Utility Shipments	.06	.06	.06	.05	.04	.04	.05	.05	.05	.04	.05	.05	.06	.04	.05
Nonutility Shipments	3.32	2.91	2.76	3.37	3.47	2.96	2.78	3.18	3.56	3.04	2.86	3.26	3.09	3.10	3.18
Total Product Supplied	3.38	2.98	2.82	3.42	3.51	3.00	2.83	3.23	3.61	3.08	2.91	3.31	3.15	3.14	3.23
Stocks															
Electric Utility Stock Levels (million barrels)															
Opening	15.1	13.4	14.6	14.8	14.7	14.0	13.8	13.7	13.6	14.0	13.8	13.7	15.1	14.7	13.6
Closing	13.4	14.6	14.8	14.7	14.0	13.8	13.7	13.6	14.0	13.8	13.7	13.6	14.7	13.6	13.6
Primary Stock Levels (million barrels)															
Opening	123.5	96.6	99.4	122.2	110.7	90.9	102.2	122.2	123.4	90.9	101.1	121.4	123.5	110.7	123.4
Closing	96.6	99.4	122.2	110.7	90.9	102.2	122.2	123.4	90.9	101.1	121.4	124.4	110.7	123.4	124.4

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, *Petroleum Supply Annual 1988*, DOE/EIA-0340(88)/1; *Petroleum Supply Monthly*, DOE/EIA-0109, Jan. 1989 to Oct. 1989; *Monthly Energy Review*, DOE/EIA-0035(89/10); *Electric Power Monthly*, DOE/EIA-0226(89/10); *Weekly Petroleum Status Report*, DOE/EIA-0208(89-50,90-01,02).

Table 12. Supply and Disposition of Residual Fuel Oil: Base Case
(Million Barrels per Day, Except Stocks)

Supply and Disposition	1989				1990				1991				Year		
	1st	2nd	3rd	4th	1st	2nd	3rd	4th	1st	2nd	3rd	4th	1989	1990	1991
Supply															
Refinery Output	0.94	0.93	0.87	1.08	0.93	0.78	0.84	0.93	0.91	0.77	0.83	0.92	0.95	0.87	0.86
Imports	.81	.57	.48	.49	.68	.41	.36	.59	.64	.38	.36	.59	.59	.51	.49
Exports	.17	.24	.18	.22	.20	.19	.16	.21	.20	.19	.16	.21	.20	.19	.19
Net Imports	.64	.33	.30	.28	.48	.21	.20	.39	.44	.18	.19	.38	.39	.32	.30
Net Withdrawals	.02	-.03	-.05	.07	.02	.00	-.01	-.03	.04	.00	-.01	-.03	.01	-.01	.00
Disposition															
Electric Utility Consumption	.84	.58	.56	.55	.53	.45	.54	.56	.54	.46	.57	.60	.63	.52	.54
Utility Stock Additions	-.10	.07	.03	-.02	.00	-.01	.00	.01	.00	-.01	.00	.01	.00	.00	.00
Electric Utility Shipments	.74	.65	.59	.54	.53	.44	.54	.57	.53	.45	.57	.61	.63	.52	.54
Nonutility Shipments	.87	.58	.54	.89	.90	.55	.49	.71	.85	.50	.44	.66	.72	.66	.61
Total Product Supplied	1.60	1.24	1.12	1.43	1.44	.99	1.04	1.28	1.38	.95	1.02	1.27	1.35	1.19	1.15
Stocks															
Electric Utility Stock Levels (million barrels)															
Opening	54.2	45.1	51.9	54.3	52.8	52.8	51.5	51.8	53.1	52.8	51.5	51.8	54.2	52.8	53.1
Closing	45.1	51.9	54.3	52.8	52.8	51.5	51.8	53.1	52.8	51.5	51.8	53.1	52.8	53.1	53.1
Primary Stock Levels (million barrels)															
Opening	44.6	42.4	44.8	49.5	42.7	41.1	40.9	41.5	44.5	41.1	40.9	41.4	44.6	42.7	44.5
Closing	42.4	44.8	49.5	42.7	41.1	40.9	41.5	44.5	41.1	40.9	41.4	44.5	42.7	44.5	44.5

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, *Petroleum Supply Annual 1988,* DOE/EIA-0340(88)/1; *Petroleum Supply Monthly,* DOE/EIA-0109, Jan. 1989 to Oct. 1989; *Monthly Energy Review,* DOE/EIA-0035(89/10); *Electric Power Monthly,* DOE/EIA-0226(89/10); *Weekly Petroleum Status Report,* DOE/EIA-0208(89-50,90-01,02).

Table 13. Supply and Disposition of Other Petroleum Products:[a] Base Case
(Million Barrels per Day, Except Stocks)

Supply and Disposition	1989				1990				1991				Year		
	1st	2nd	3rd	4th	1st	2nd	3rd	4th	1st	2nd	3rd	4th	1989	1990	1991
Supply															
Net Refinery Output [b]	3.18	3.32	3.51	2.91	3.04	3.24	3.40	3.17	3.17	3.26	3.40	3.24	3.23	3.21	3.27
Natural Gas Plant Output	1.64	1.60	1.51	1.52	1.58	1.55	1.54	1.57	1.58	1.55	1.54	1.57	1.57	1.56	1.56
Other Domestic [c]	.05	.05	.07	.06	.06	.06	.06	.06	.06	.06	.06	.07	.06	.06	.06
Net Imports	.62	.52	.51	.43	.74	.71	.63	.66	.77	.75	.68	.72	.52	.68	.73
Net Withdrawals	.01	-.37	-.19	.47	.24	-.36	-.10	.35	.10	-.33	-.10	.36	-.02	.03	.01
Total Primary Supply	**5.50**	**5.12**	**5.41**	5.38	5.66	5.19	5.53	5.81	5.67	5.29	5.59	5.95	5.35	5.55	5.63
Disposition															
Jet Fuel	1.50	1.40	1.46	1.65	1.53	1.44	1.48	1.53	1.51	1.44	1.51	1.58	1.50	1.49	1.51
Liquefied Petroleum Gas [d]	1.97	1.42	1.45	1.85	2.03	1.39	1.45	1.94	1.98	1.41	1.47	1.97	1.67	1.70	1.71
Petrochemical Feedstocks [e]	.48	.45	.44	.38	.48	.47	.45	.45	.52	.48	.47	.47	.44	.46	.48
Miscellaneous [f]	1.57	1.85	2.06	1.51	1.62	1.90	2.15	1.89	1.66	1.95	2.14	1.94	1.75	1.89	1.93
Total Product Supplied	**5.52**	**5.12**	**5.41**	5.38	5.66	5.19	5.53	5.81	5.67	5.29	5.59	5.95	5.36	5.55	5.63
Stocks															
Primary Stocks															
(million barrels)															
Opening	**349.4**	**348.9**	**382.4**	399.6	356.7	335.0	367.4	377.0	344.6	335.8	366.3	375.3	349.4	356.7	344.6
Closing	**348.9**	**382.4**	**399.6**	356.7	335.0	367.4	377.0	344.6	335.8	366.3	375.3	342.2	356.7	344.6	342.2

[a] Excludes crude oil product supplied and other components of the crude oil supply/demand balance, all of which are accounted for under the total petroleum supply and disposition table.

[b] Includes refinery production of all other products less natural gas liquids, liquefied refinery gases, and "other liquids" input to refineries.

[c] Field production of other hydrocarbons and alcohol.

[d] Includes ethane, propane, normal butane, and isobutane.

[e] Includes naphthas and other oils designated for petrochemical feedstock use.

[f] Includes all petroleum products supplied except motor gasoline, distillate, residual fuel, liquefied petroleum gases, petrochemical feedstocks, and jet fuel.

Notes: Historical values are printed in **boldface**, forecasts in *italics*. Data for November and December 1989 are preliminary.

Sources: Historical data: Energy Information Administration, *Petroleum Supply Annual 1988*, DOE/EIA-0340(88)/1; *Petroleum Supply Monthly*, DOE/EIA-0109, Jan. 1989 to Oct. 1989; and *Weekly Petroleum Status Report*, DOE/EIA-0208(89-50,90-01,02).

Table 14. Supply and Disposition of Natural Gas
(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	4.41	4.15	4.03	4.62	4.65	4.28	4.26	4.62	4.66	4.32	4.28	4.64	17.21	17.80	17.90
Net Imports	.33	.31	.30	.35	.40	.35	.32	.36	.43	.37	.34	.39	1.29	1.43	1.53
Supplemental Gaseous Fuels	.05	.04	.03	.05	.05	.04	.04	.05	.05	.04	.04	.05	.16	.18	.17
Total New Supply	4.78	4.49	4.37	5.02	5.10	4.67	4.62	5.03	5.13	4.74	4.66	5.07	18.66	19.42	19.60
Underground Working Gas Storage															
Opening	2.85	1.78	2.37	3.18	2.60	1.67	2.25	3.06	2.69	1.66	2.23	3.05	2.85	2.60	2.69
Closing	1.78	2.37	3.18	2.60	1.67	2.25	3.06	2.69	1.66	2.23	3.05	2.67	2.60	2.69	2.67
Net Withdrawals ᵇ	1.09	-.58	-.84	.59	.93	-.57	-.82	.37	1.04	-.57	-.82	.37	.27	-.09	.02
Total Primary Supply ᵃ	5.87	3.92	3.53	5.61	6.02	4.10	3.80	5.40	6.17	4.17	3.84	5.45	18.92	19.32	19.62
Consumption															
Lease and Plant Fuel	.31	.29	.28	.32	.33	.29	.29	.32	.33	.30	.30	.33	1.20	1.23	1.26
Pipeline Use	.15	.13	.15	.15	.16	.14	.14	.15	.16	.14	.14	.16	.57	.59	.60
Residential	2.18	.85	.40	1.37	2.45	.86	.38	1.26	2.36	.87	.38	1.28	4.80	4.95	4.89
Commercial	1.11	.52	.33	.72	1.20	.52	.34	.69	1.18	.53	.34	.70	2.68	2.75	2.76
Industrial	1.79	1.66	1.61	1.75	1.84	1.64	1.61	1.81	1.87	1.70	1.65	1.85	6.81	6.90	7.07
Electric Utilities	.53	.74	.90	.63	.59	.69	.92	.58	.58	.71	.93	.59	2.80	2.78	2.81
Subtotal	6.06	4.19	3.66	4.94	6.57	4.15	3.67	4.81	6.48	4.26	3.75	4.91	18.85	19.20	19.39
Total Disposition	5.87	3.92	3.53	5.61	6.02	4.10	3.80	5.40	6.17	4.17	3.84	5.45	18.92	19.32	19.62
Unaccounted for	-.19	-.28	-.13	.67	-.54	-.05	.13	.59	-.31	-.09	.09	.54	.07	.12	.23

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(89/10); *Natural Gas Monthly*, DOE/EIA-0130(89/10); and *Electric Power Monthly*, DOE/EIA-0226(89/10).

Table 15. Supply and Disposition of Coal
(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	246	244	249	242	255	253	259	251	261	975	989	1024
Primary Stock Levels [a]															
Opening	30	35	30	29	29	28	27	27	27	27	27	27	30	29	27
Closing	35	30	29	29	28	27	27	27	27	27	27	27	29	27	27
Net Withdrawals	-5	5	2	0	1	1	0	0	0	0	0	0	1	2	0
Imports	1	1	1	1	1	1	1	1	1	1	1	1	3	2	3
Exports	21	28	24	24	20	25	25	25	20	25	25	25	98	94	94
Total New Domestic Supply	221	216	221	223	225	226	218	231	234	235	227	237	881	900	933
Secondary Stock Levels [b]															
Opening	158	149	159	147	147	149	163	141	148	153	167	144	158	147	148
Closing	149	159	147	147	149	163	141	148	153	167	144	148	147	148	148
Net Withdrawals	9	-10	12	0	-1	-14	23	-7	-5	-15	24	-5	11	0	0
Total Indicated Consumption	230	206	233	223	224	212	241	223	229	220	251	233	892	900	933
Consumption															
Coke Plants	11	11	10	9	10	10	10	10	10	11	10	10	41	39	41
Electric Utilities	191	178	203	192	193	183	211	192	197	191	221	201	764	779	809
Retail and General Industry [c]	22	19	20	22	21	19	20	22	22	19	20	22	83	82	83
Subtotal	223	208	234	223	224	212	241	223	229	220	251	233	888	900	933
Total Disposition	230	206	233	223	224	212	241	223	229	220	251	233	892	900	933
Discrepancy [d]	7	-1	-1	0	0	0	0	0	0	0	0	0	5	0	0

[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] Includes consumption at coal gasification plants of 6.7 million tons for 1988. Synfuels plant consumption is assumed to be 1.7 million tons per quarter in 1989, 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(89/10); and *Quarterly Coal Report,* DOE/EIA-0121(89/3Q).

Table 16. Supply and Disposition of Electricity
(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	388.4	362.7	406.9	388.3	392.4	372.0	427.2	388.1	400.7	388.8	447.2	407.0	1546.3	1579.7	1643.6
Petroleum	49.4	34.1	33.2	32.8	31.0	26.5	32.1	33.2	31.2	27.2	33.8	35.5	149.5	122.9	127.8
Natural Gas	50.3	70.6	85.1	60.9	56.3	66.4	88.0	55.5	55.2	67.5	89.0	56.4	267.0	266.1	268.2
Nuclear Power	124.7	114.8	152.1	133.0	140.6	126.4	143.7	135.9	143.8	128.5	144.3	135.7	524.6	546.6	552.2
Hydropower	61.2	78.0	61.8	65.9	72.3	80.7	66.8	67.5	77.6	81.0	66.8	67.5	266.9	287.3	292.9
Geothermal Power and Other [a]	2.8	2.8	2.8	3.0	3.0	3.0	3.2	3.2	3.2	3.2	3.4	3.4	11.5	12.5	13.1
Total Utility Generation	676.8	663.0	741.9	684.1	695.6	675.1	761.1	683.4	711.7	696.2	784.5	705.5	2765.8	2815.1	2897.8
Net Imports	3.5	6.5	8.3	7.7	3.6	6.9	8.7	8.1	7.7	7.3	9.3	8.6	25.9	27.4	32.9
Purchases from Nonutilities [b]	19.3	18.7	20.5	18.8	22.4	21.7	23.8	21.8	24.9	24.2	26.5	24.3	77.3	89.6	99.9
Total Supply	699.6	688.2	770.7	710.5	721.6	703.6	793.6	713.3	744.3	727.6	820.3	738.4	2869.1	2932.1	3030.6
Losses and Unaccounted For [c]	45.6	66.8	59.4	66.5	37.5	65.0	58.3	57.6	45.7	67.2	60.3	59.7	238.3	218.4	232.8
Sales															
Residential	241.1	197.2	250.7	216.0	259.4	205.2	263.8	217.3	261.7	212.6	273.0	225.2	905.0	945.8	972.5
Commercial	175.4	173.3	199.8	176.6	184.8	181.5	209.3	186.0	192.6	190.3	218.6	195.3	725.0	761.6	796.8
Industrial	215.4	228.9	237.0	228.6	216.5	229.7	238.4	229.1	220.6	235.0	244.3	234.8	909.9	913.8	934.6
Other	22.1	22.1	23.9	22.8	23.4	22.3	23.8	23.1	23.7	22.6	24.1	23.5	90.9	92.6	93.8
Total	654.0	621.4	711.3	644.0	684.1	638.7	735.3	655.6	698.6	660.4	760.0	678.7	2630.8	2713.7	2797.8

[a] Includes wind, wood, waste, photovoltaic, and solar.
[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 1988. Minor discrepancies with other EIA published historic 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(89/10); and *Electric Power Monthly*, DOE/EIA-0226(89/10).

Appendix A

Annual Energy Outlook 1990: Forecast Summary

Annual Energy Outlook 1990: Forecast Summary

The Energy Information Administration released the *Annual Energy Outlook 1990 (AEO)* in January 1990. The forecasts for the *AEO* extend to 2010. This longer time horizon introduces additional uncertainty into the forecasts for later years. Consequently, it is important to consider the range of possibilities contained in the cases, rather than focus solely on the base case. Five forecast cases are presented: base, low and high world oil price, and low and high economic growth. The base case is the central forecast. The remaining four cases are based on reasonable lower and upper bounds on two key factors that affect energy trends—the world oil price and the rate of macroeconomic growth.

Total energy consumption in the United States continues to grow at about half the rate of GNP

Total domestic consumption of all forms of energy grows by between 25 and 35 percent over the next 20 years, depending on assumptions about future economic growth (Table A1). The relative outlook for the major sources of energy, however, differ. Oil demand grows slowest (but still accounts for a significant absolute increase), and coal demand grows most rapidly (as a consequence of high electricity demand growth).

Oil prices resume long-term increase as OPEC share of market grows

Real oil prices are expected to remain relatively flat for a few more years. But rising demand, limits on future contributions from non-OPEC sources, and the concentration of world oil resources in OPEC nations will lead to more rapid price increases after the mid-1990s. Overall, prices are expected to rise between 2 and 5 percent annually over the forecast, reaching a level between $26 and $47 per barrel in 2010.

Falling U.S. oil output and rising demand lead to higher oil imports

U.S. oil production falls by as much as 4 million barrels per day over the forecast, and demand increases by a comparable amount. Even with more supplies from natural gas liquids and non-petroleum sources, net petroleum imports grow by between 60 (with high oil prices) and 130 percent (with low oil prices) in total.

Transportation, industrial feedstocks lead rising petroleum demand

Motor gasoline demand grows by between 0.6 and 1.8 million barrels per day over the forecast, depending on world oil price assumptions, despite significant increases in fuel economy. High demand growth is also forecast for diesel, jet fuel, and LPGs.

Natural gas demand and prices pushed up by electric utilities

A recent turnaround in U.S. demand for natural gas has resulted in growing domestic production. Its use in this country could expand by between 20 and 30 percent by 2000, before leveling (depending on assumptions about economic growth). Net imports could double. The main source of growing demand is electric utilities.

Coal increases its share of total energy

Pushed by growing electricity demand and a preference by utilities for new coal-fired generating capacity, coal demand (in tons) grows at 2.1 percent annually in the base case through 2010—more than any other fuel. (Coal demand growth ranges between 1.8 percent and 2.3 percent annually, depending on economic growth assumptions.)

Electricity demand follows GNP growth, as coal and gas use rise sharply

Electricity sales rise at approximately the same rate as GNP, and new fossil fuel plants meet most of the Nation's growing demand. New capacity for gas-fired combined-cycle plants is especially significant, but overall growth for coal is greatest. No newly ordered nuclear units are assumed.

Renewable energy use grows

Renewable energy use grows significantly, accounting for about 9 percent of total energy requirements by 2010. Use is concentrated in electric utilities (hydropower), industry (heat from wood waste), and homes (wood).

Table A1. Summary of Projections for 2010

	1988	Base Case	Low Oil Price Case	High Oil Price Case	Low Growth Case	High Growth Case
Primary Production (quadrillion Btu)						
Petroleum	19.5	12.7	11.3	14.5	12.7	12.8
Natural Gas	17.5	20.4	20.0	20.6	19.7	20.9
Coal	20.7	35.2	35.2	34.7	31.4	38.0
Nuclear Power	5.7	6.5	6.5	6.5	6.5	6.5
Renewable Energy[a]	6.0	10.1	10.1	10.1	10.1	10.1
Total Primary Production	**69.4**	**84.9**	**83.0**	**86.4**	**80.4**	**88.3**
Net Imports (quadrillion Btu)						
Petroleum (including SPR)	13.9	26.0	31.8	22.3	24.6	28.1
Natural Gas	1.2	2.9	2.9	2.9	2.7	3.2
Coal/Other (- indicates export)	-2.1	-4.9	-4.8	-4.9	-3.0	-6.5
Total Net Imports	**13.1**	**24.1**	**29.9**	**20.3**	**24.2**	**24.8**
Consumption (quadrillion Btu)						
Petroleum Products	34.2	39.9	44.1	37.6	38.4	42.0
Natural Gas	18.6	22.8	22.5	23.0	21.8	23.7
Coal	18.8	28.9	29.1	28.4	27.0	30.1
Nuclear Power	5.7	6.5	6.5	6.5	6.5	6.5
Renewable Energy/Other[a]	6.1	10.3	10.3	10.3	10.3	10.3
Total Consumption	**83.4**	**108.4**	**112.5**	**105.8**	**104.0**	**112.6**
Prices (1989 dollars)						
World Oil Price (dollars per barrel)	15.27	36.90	25.90	47.40	36.90	47.40
Domestic Natural Gas Wellhead (dollars per thousand cubic feet)	1.76	5.63	4.59	5.51	4.57	6.09
Domestic Coal Minemouth (dollars per short ton)	23.02	28.55	28.66	28.33	26.58	29.76
Average Electricity Price (cents per kilowatthour)	6.62	7.01	6.81	7.03	6.61	7.34
Economic Indicators						
Real Gross National Product (billion 1982 dollars)	4,024	6,799	6,921	6,721	6,297	7,331
(percent change, 1988-2010)	--	2.4%	2.5%	2.4%	2.1%	2.8%
GNP Implicit Price Deflator (index, 1982=1.000)	1.213	3.399	3.416	3.382	3.947	2.853
(percent change, 1988-2010)	--	4.8%	4.8%	4.8%	5.5%	4.0%
Real Disposable Personal Income (billion 1982 dollars)	2,793	4,358	4,408	4,324	4,110	4,617
(percent change, 1988-2010)	--	2.0%	2.1%	2.0%	1.8%	2.3%
Index of Manufacturing Production (index, 1982=1.000)	1.219	2.231	2.285	2.200	1.975	2.502
(percent change, 1988-2010)	--	2.8%	2.9%	2.8%	2.2%	3.3%
Energy Efficiency (thousand Btu per 1982 dollar of GNP)						
Oil and Gas Use	13.12	9.23	9.63	9.01	9.57	8.97
Electricity Use	2.19	2.15	2.15	2.13	2.21	2.11
Total Energy Use	20.72	15.95	16.25	15.74	16.52	15.36

[a]Forecasts of renewable energy production and consumption will vary depending on changes in conventional energy prices and growth in the economy. Current projection methodologies, however, do not distinguish these variations.

Note: Total production, total consumption, and energy efficiency include dispersed renewables (see *Annual Energy Outlook 1990* for details).

Sources: See Table 1 in *Annual Energy Outlook 1990*, DOE/EIA-0383(90) (Washington, DC, 1990).

THE PRESIDENT DOESN'T TAKE AN OATH TO DEFEND THE AMERICAN FLAG OR THE STATUE OF LIBERTY.

The President takes an oath to defend something even more important than a majestic symbol of our country.
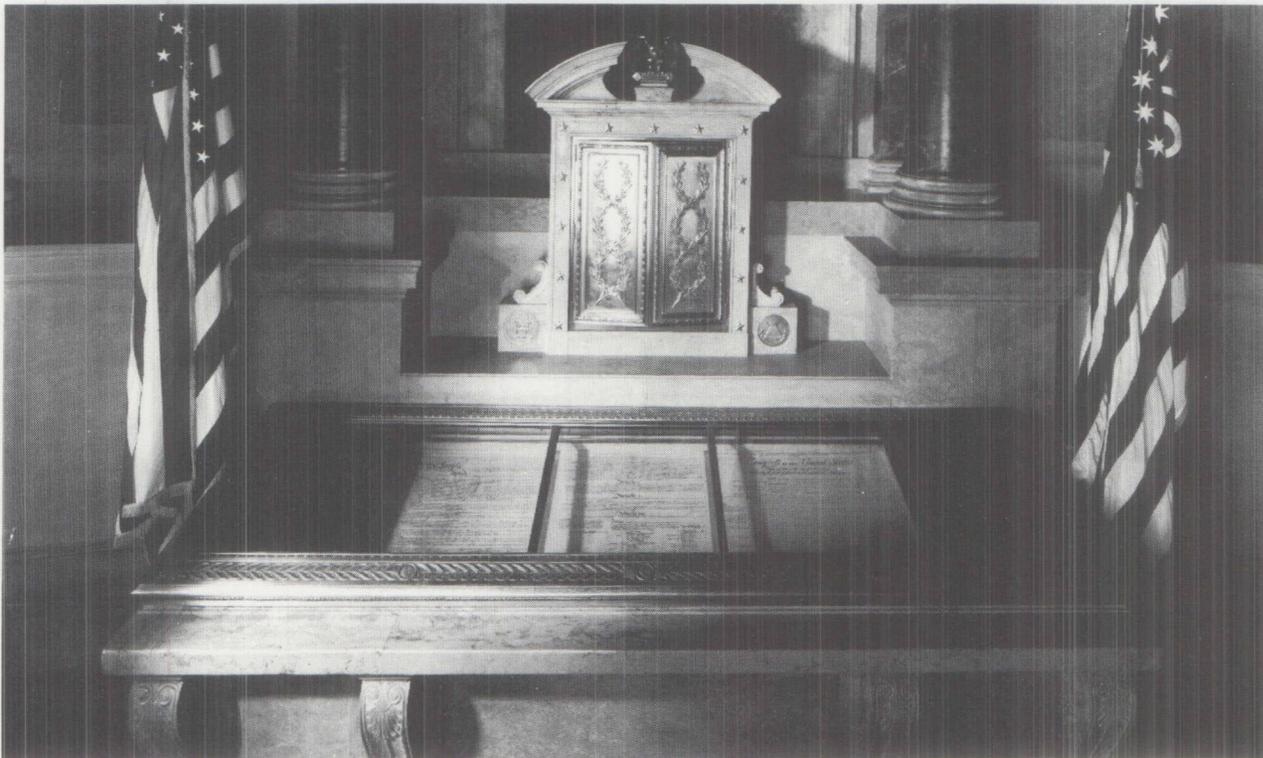
The President takes an oath to defend the Constitution of the United States. A document that has been described as the greatest leap forward for freedom in human history. A document that is the foundation of our country. And the means by which we achieve the rule of law and protect our freedom.

As we commemorate the Bicentennial of the Constitution, there is no better way for you as an American to reaffirm the principles for which our country stands than to learn more about the Constitution.

The words we live by.

THE CONSTITUTION
The words we live by