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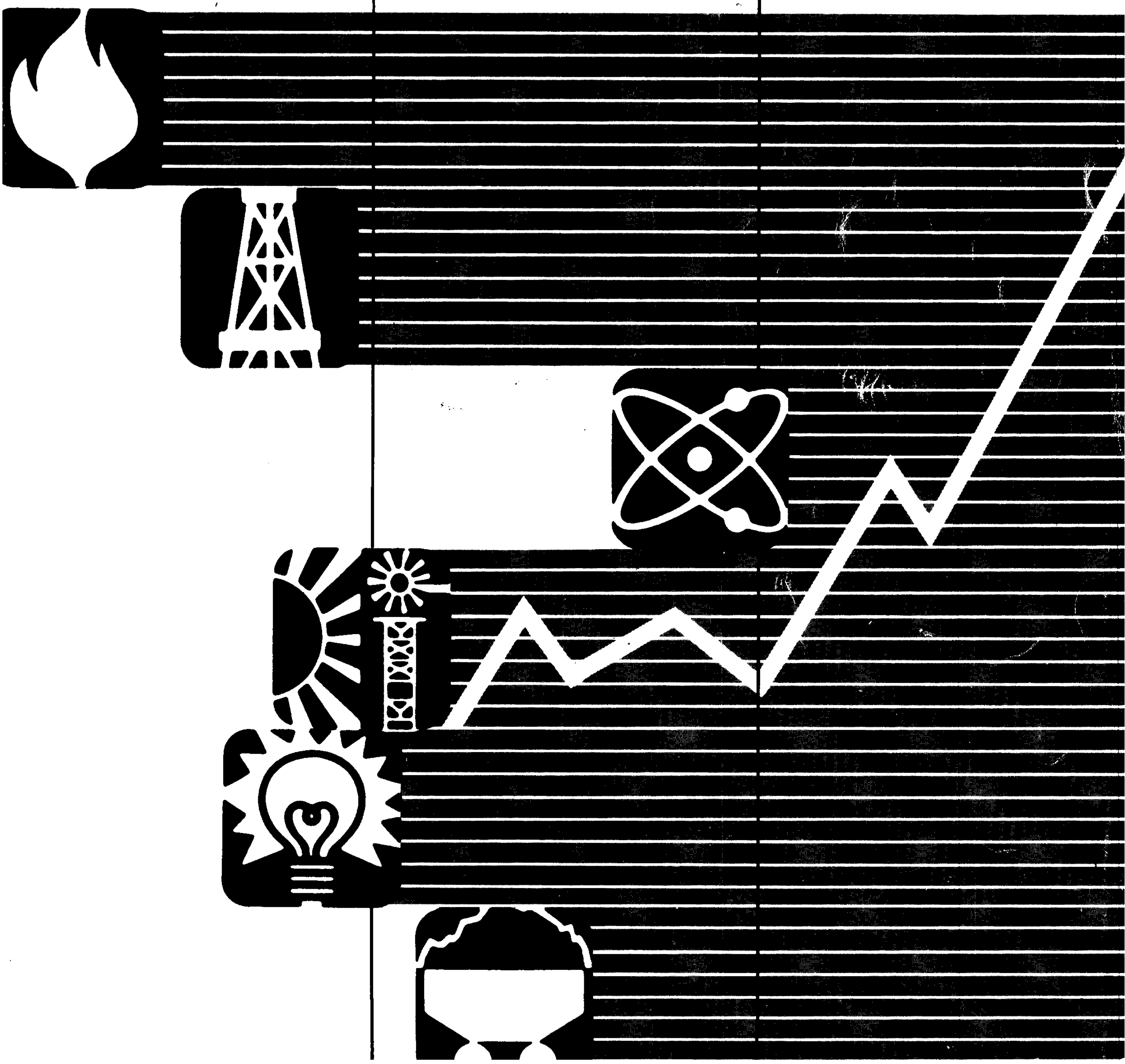
1982 ANNUAL ENERGY OUTLOOK

With Projections to 1990

Energy Information Administration
Washington D.C.
April 1983



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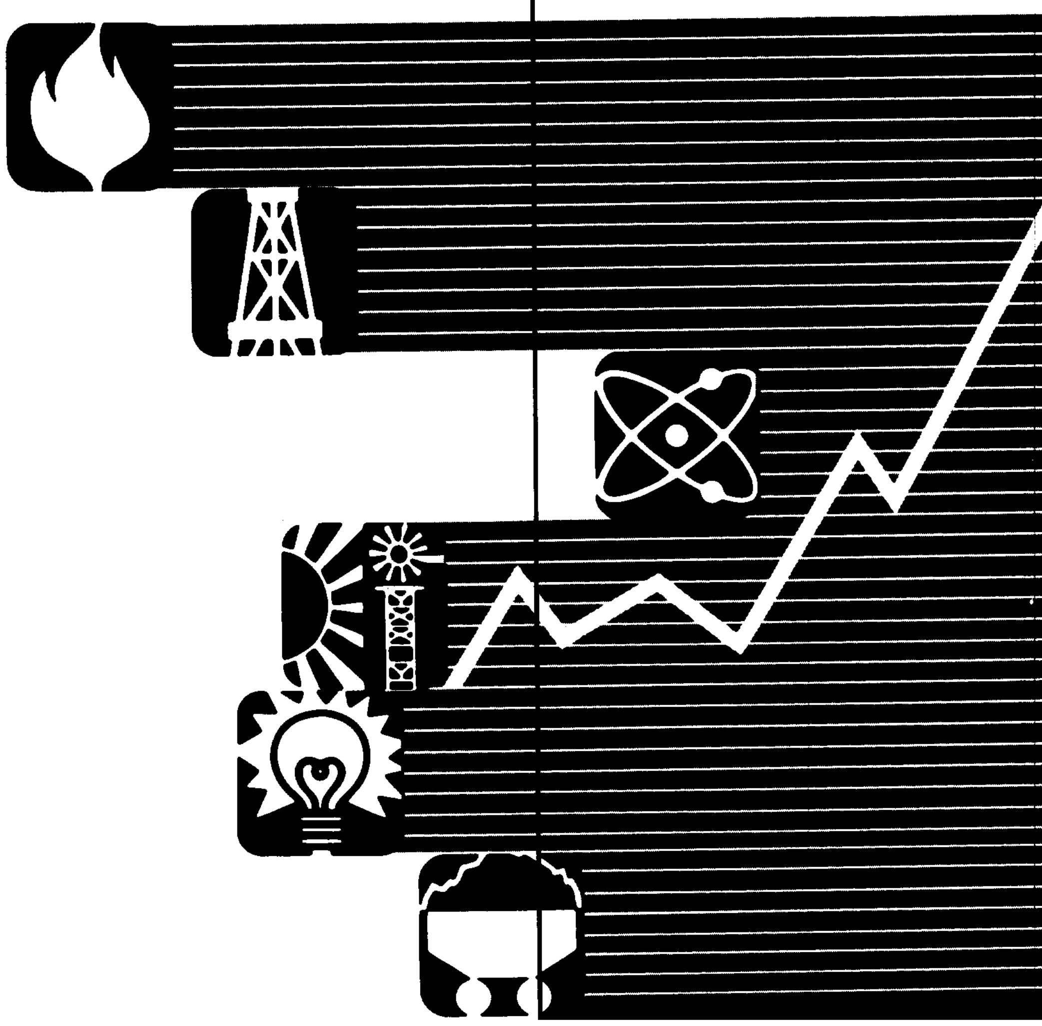

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Released for printing May 10, 1983

Preface

Since 1976, the Energy Information Administration (EIA) has provided projections of energy production, supplies, and prices. This year, these projections were produced using a new model, the Intermediate Future Forecasting System (IFFS). This volume, the first issue of the Annual Energy Outlook, replaces Volume 3 of the Annual Report to Congress. (The 1982 Annual Report, describing the activities of the EIA, was published in April of this year.)

EIA is now able to provide yearly projections to 1990, representing individual fuels and end-use sectors, to members of Congress and the public. (Projections for the short term are provided in EIA's quarterly Short-Term Energy Outlook, issued each February, May, August, and November. Each Outlook presents updated energy production, consumption, and price projections for the next 6 quarters.) The 1982 Annual Energy Outlook, like its predecessor, will continue to reflect high professional standards in analyzing the issues, technologies, policies, and economic events that affect the Nation's energy future.

The report was produced by the Longer Term Division in the Office of Energy Markets and End Use.

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Executive Summary

This report presents an analysis of energy trends and projections for the 1980's, both international and domestic. These forecasts are part of a series of Energy Information Administration analyses dating from 1976.

The report is characterized by two major themes. First, the higher energy prices that occurred in the 1970's result in a projection of lower per capita energy use and greater energy efficiency during the 1980's. Although some energy prices may fall over the next few years, end-use prices are not projected to return to the levels of the early 1970's. Projected consumption levels reflect continued adjustment to the higher general level of energy prices.

Against this background, however, a second important theme involving the relative prices of oil and natural gas emerges. While there has been a substantial movement from oil to (cheaper) natural gas, the projections suggest a reversal of this trend as natural gas becomes more expensive and oil prices fall.

The Oil Market

Trends in the oil market over the first few years of this decade have been dominated by two factors. One is the delayed but inevitable reduction in consumption, which has occurred in response to the sharp increase in the price of international crude oil since 1978. The second is the prolonged worldwide economic recession.

By the end of 1980, the world oil price was over $39 per barrel, up from $8 (1982 dollars) in 1973. The oil-importing countries have responded to this oil price increase with increases in general energy efficiency and substitution, where possible, of alternative fuels for oil. For example, in the major industrial countries, the total-primary-energy to gross-domestic-product (GDP) ratio declined 13 percent between 1973 and 1980, even while GDP itself rose 19 percent in real terms. The oil to GDP ratio fell 20 percent over the same period. These declines reflect basic structural changes in the economies of the countries and will affect energy consumption patterns in the future.

World energy markets in 1982 were characterized by a slack oil market and a decline in world oil prices. At year's end, world oil production capacity exceeded consumption by about 9 to 10 million barrels per day. Substantial liquidation of world oil inventories in 1982 helped further soften world oil prices, which drifted downward from just over $34 per barrel in January to about $33 per barrel in December.

The world oil price, in real terms, is projected to fall through the mid 1980's before increasing in the latter half of the decade. Continued slow economic growth in the industrialized world and growing difficulties in international financial markets, particularly with respect to certain key oil-exporting countries, are expected to help keep oil markets soft over the next few years.

Three alternative oil price projections are developed in this report and are shown in Table E1. The midprice projection, made by analyzing international oil supplies and demands, shows oil prices declining in real terms to a low of $25 a barrel in 1985 before increasing to $37 a barrel in 1990. The high and low price cases result from an assessment of higher and lower growth in demand and less and more optimistic supply assumptions.

Table E1. World Oil Price: History and Projections
(1982 dollars per Barrel)

Price	1982	1983	1984	1985	1986	1987	1988	1989	1990
Low	34	28	23	21	21	22	24	26	28
Mid	34	30	26	25	28	32	34	36	37
High	34	32	30	34	38	41	43	45	48

Domestic oil prices peaked in 1981. This, together with the gathering recession in the United States, caused a rapid decline in the consumption of residual fuel oil and gasoline. Also contributing to the decline was a reduction in distillate oil use as industrial production declined and consumers reacted to prices. By the end of 1982, the prices of all petroleum products were well below the prices 1 year earlier.

Macroeconomic Assumptions

Macroeconomic assumptions are shown in Table E2. Rates of growth in GNP are consistent with these observed during the 1970s, while the GNP price deflator reflects recent reductions in the rate of inflation.

Table E2. Historical and Projected Growth Rates for Selected Economic Aggregates and Population, Middle World Oil Price Case
(Growth Rates per Year, Percent)

	1970-1980	1980-1990	1982-1990
Real Gross National Product	3.1	2.5	3.2
Real Disposable Income	3.1	2.6	2.8
GNP Price Deflator	6.9	6.4	6.1
Population	1.1	0.9	0.9

Source: Historical data: Council of Economic Advisors, Economic Report of the President, transmitted to Congress February 1983, (Washington, D.C., 1983)

The Natural Gas Market

Unlike oil prices, natural gas prices have risen rapidly in the early 1980's. These increases have occurred despite declines in consumption caused by the recent recession. The recent price increases result from the long history of natural gas regulation, certain types of contractual relationships developed under those regulations, and traditional contracting practices.

The Natural Gas Policy Act (NGPA) of 1978 (P.L. 95-621) established a pricing structure which put most gas under price ceilings based on the geology, distance from other wells, location, depth, vintage, and existing contractual arrangements for the gas. The act also created a category of high cost gas free from price ceilings. Price ceilings for new gas were allowed to increase somewhat faster than inflation, but the Act limited increases in the price of old gas. Pipeline companies which had been previously unable to obtain sufficient supplies bid for the uncontrolled gas and signed "take-or-pay" contracts which required most of the gas to be paid for even if not taken by the pipeline.

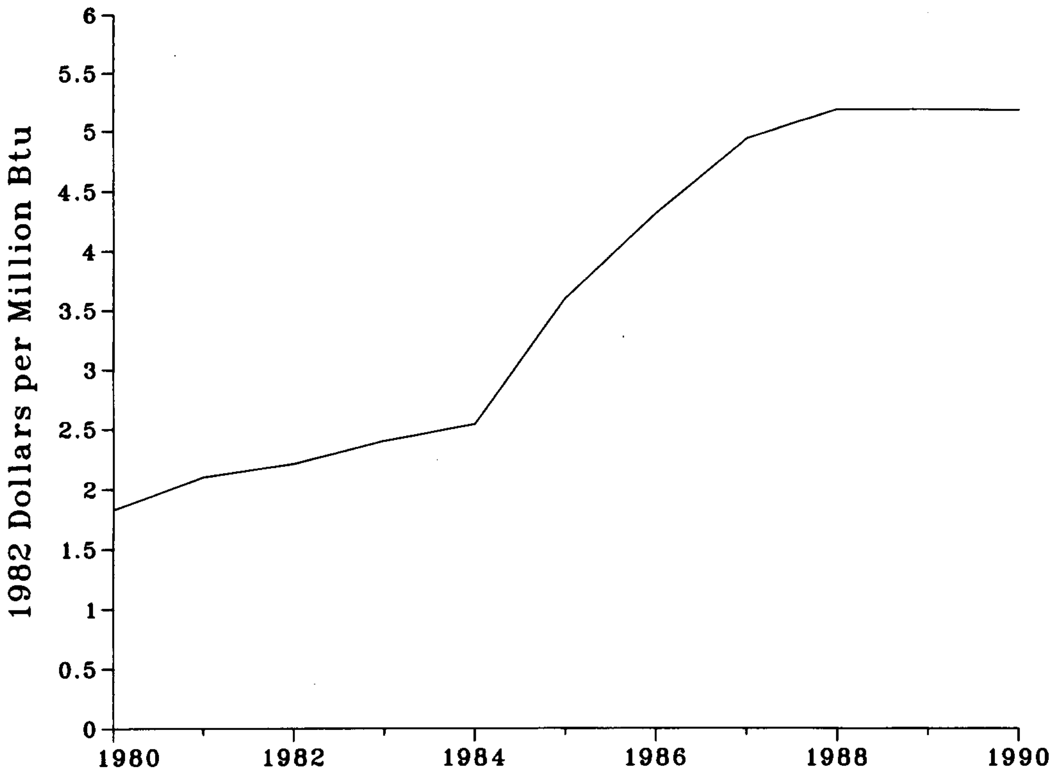
Pipeline companies wholesale most gas to distribution companies. The distribution companies buy gas at the average of all gas contract prices available to that pipeline plus a tariff regulated by the Federal Energy Regulatory Commission. Thus consumers, buying at the average price, did not initially see the higher prices bid by pipelines for unregulated gas. As more high cost gas was included in the mix, prices rose.

In 1985 about half the domestic natural gas production will be free of price controls. The effect of decontrol on prices will probably depend as much on existing contract provisions as upon underlying supply and demand conditions. Some contracts contain provisions providing that, in the event of decontrol, the wellhead price of gas will be established at a price equivalent to distillate fuel oil. A large number of contracts (about 46 percent) contain "most-favored nation" clauses and require that the gas covered by the contract receive a price as high as other producers in the area receive. The extent to which these contract provisions will raise gas prices to artificially high levels is very much uncertain at this point. Nor is it clear that these contracts can survive in a market in which pipelines cannot sell the gas to distributors at the resulting prices. There is some evidence that contracts are being renegotiated.

The prices of natural gas reported in this document reflect the assumption that consumers in many parts of the country will move from natural gas to oil as some petroleum products become less expensive than natural gas. This occurs because gas prices rise in the projections while oil prices are projected to fall. There are, however, significant regional differences in the prices of both natural gas and petroleum products, and these are difficult to completely capture in projections at the national level. The natural gas prices reported here do, however, agree very closely with price projections obtained from more detailed analyses of natural gas markets.

The national average natural gas wellhead price resulting from detailed analysis of the natural gas market is presented in Figure ES1. Through

Figure ES1. U.S. Average Wellhead Price of Natural Gas, Midprice Scenario, 1980 to 1990 (1982 Dollars per Million Btu)



Note: Prices for 1982 through 1990 are projections.

Source: Historical data: Energy Information Administration, 1981 Annual Report to Congress, Volume 2, DOE/EIA-0173(81)/2 (Washington, D.C., 1982).

1984, the average wellhead price of natural gas rises with the legal ceilings for the categories of gas defined by the NGPA and due to changes in the composition of supply towards the higher priced tiers.

By 1985, however, the price of low-sulfur residual fuel oil dips below gas prices in the industrial and electric utility sectors in some regions of the country. While projected natural gas prices continue to rise, the increases are moderated by competition with petroleum products.

Natural gas prices to major industrial and electric utility customers will be competitive in some areas of the countries. Because of differences in transportation costs and relative use in different parts of the country, however, national average prices of the fuels are unlikely to be equal.

The Relative Prices of Gas and Oil

Since World War II, the price of natural gas has remained below the price of oil at the burner tip. In spite of this, much of the energy legislation of the 1970's was predicated on the assumption that natural gas prices would rise to the equivalent of oil prices in an unregulated environment. In the middle oil price projections, the price of low-sulfur residual fuel oil and gas appear to be equalizing in the industrial and utility markets in some areas.

Electric Utilities. Relative prices will determine to a large extent utility consumption of gas and oil. Many large industrial and utility plants are designed to consume both gas and oil and will in fact switch between them depending on the season and market conditions. (In other sectors, the initial capital investment in, for example, a home heating system limits the choice to a single fuel until the system is replaced.)

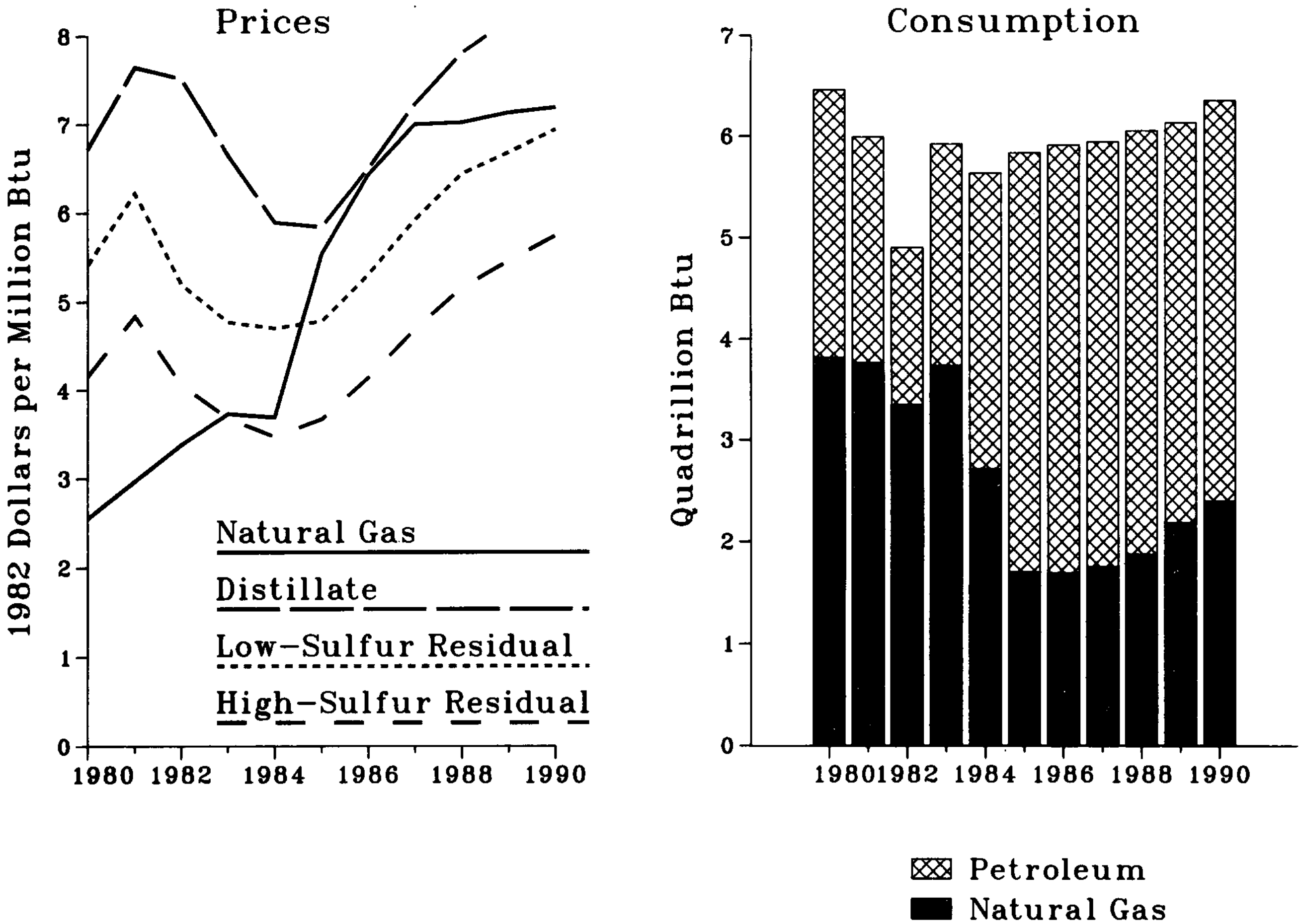
Figure ES2 illustrates the relative average prices of natural gas and low-sulfur residual fuel oil in the utility sector and the resulting decline in gas consumption nationwide.

Electric utilities can respond quickly to relative price changes in two ways: by switching fuels in dual-fired plants that can utilize both gas and residual fuel oil and by using equipment designed to burn a single fuel such as oil or gas more or less intensively.

The effect of lower or higher oil prices is to lower or raise low-sulfur residual fuel oil prices relative to natural gas prices. As low-sulfur residual fuel oil prices decline, utility consumption of fuel oil increases rapidly, by about 2 quadrillion Btu a year (or 1 million barrels of oil a day). The shift can occur because of the large stock of equipment already in existence and able to burn oil.

About three-quarters of the 2 quadrillion Btu shift from gas to oil results from shifting fuels in dual-fired plants mostly located in the West and Southwest. The rest of the change results from using gas-fired plants at lower rates of capacity utilization and oil plants at higher utilization rates.

Figure ES2. Utility Natural Gas and Petroleum Prices and Consumption, Midprice Scenario, 1980 to 1990 (1982 Dollars per Million Btu) (Quadrillion Btu)



Source: Historical data: Energy Information Administration, State Energy Data Report, 1960 through 1980, DOE/EIA–0214(80) (Washington, D.C., 1982), Monthly Energy Review, DOE/EIA–0035(83/2) (Washington, D.C., 1983), and 1981 Annual Report to Congress, Volume 2, DOE/EIA–0173(81)/2 (Washington, D.C., 1982).

Oil capacity exists and is not currently in use largely due to the response of electric utilities to past oil and gas increases and the slow growth in electricity consumption. The utilities have responded to the general increase in gas and oil prices by the construction of coal and nuclear generation capacity. By 1990 the share of nuclear generation is projected to rise to 19 percent of the total, while the total of oil and gas becomes less important.

Industrial Fuel Use. The industrial sector is the other consuming sector in which there is significant dual-fired capability, which can swing with variations in relative oil and gas prices. A recent EIA survey (DOE/EIA/0358) identified about 1 quadrillion Btu (or a half million barrels of oil per day) of existing capacity in large combustors which could burn both oil and gas. There may also be smaller units with similar capability. In 1979 oil prices were substantially above gas prices and about 80 percent of the energy consumed in these units was gas. More than a one-half quadrillion Btu swing is possible within the range of the price forecasts presented here.

Residential, Commercial, Transportation Fuel Use. While utility and industrial consumption can respond rapidly to differences in the relative prices of gas and low-sulfur residual fuel oil, the situation is different in residential, commercial, and transportation uses.

Since dual-fired capability does not exist to the same degree, changing fuels implies a change in capital equipment as well. Also, these sectors largely use distillate fuel oil rather than residual fuel oil, and this remains more expensive than gas in all the projections. As a result, these sectors exhibit a continuing adjustment to higher gas, oil, and electricity prices, largely by increasing efficiency of use.

Oil Imports

Oil imports may be expected to increase as the economy recovers. In addition, the greater attractiveness of oil relative to natural gas in the industrial and utilities sectors would cause a significant increase in the projected quantity of imported oil. A significant number of utilities are projected to switch from natural gas to low-sulfur residual fuels. This may happen as early as 1984.

In the middle oil price case, projected net imports of crude oil and petroleum products rise from 4.2 million barrels a day in 1982 to 7.6 million barrels a day in 1985 and then fall to 7.1 million barrels a day in 1990 (see Table E3). Some increase in imports is to be expected with economic recovery. However, a large part (about 1.5 million barrels a day in 1985) of the increase is due to switching from natural gas to low-sulfur residual fuel oil in utilities and the industrial sector. If less switching occurs than anticipated, the level of imports could be considerably lower.

Table E3. Net Imports of Crude Oil and Petroleum Products (million barrels per day)

Case	1975	1980	1982	1985	1990
Middle World Oil Price	5.9	6.4	4.2	7.6	7.1
High World Oil Price	5.9	6.4	4.2	6.0	5.0
Low World Oil Price	5.9	6.4	4.2	8.7	9.5

The General Level of Energy Prices

Despite the decline in the world oil price, the general level of energy prices does not decline in the projections. As Table E4 shows, even in the transportation sector, where petroleum products dominate, prices rise by the end of the period.

Table E4. Average End Use Energy Prices (1982 dollars per million Btu)

Sector	1975	1980	1985	1990
Residential	5.95	8.33	9.52	11.74
Commercial	6.27	8.38	10.07	12.44
Industrial	3.37	5.44	6.44	8.27
Transportation	6.72	9.91	7.75	10.21

End-Use Consumption

Dramatic changes in energy consumption occurred between 1973 and 1975 and after 1979, as large energy price increases led domestic consumers to use less energy. Because population has increased more rapidly than energy consumption since 1973, per capita use had declined by 14 percent by 1982. To some degree the recent decline in industrial activity contributed to the decrease.

Although energy use on a per capita basis is projected to continue to decline, total energy use is projected to rise modestly through 1990. In the early years, growth is based on economic recovery and relatively stable world oil prices; in the later years, modest growth in personal income, industrial activity, population, and diminished conservation activities contribute to the increase in total energy use.

Table E5. Selected Energy Prices, Middle World Oil Price Case
(1982 Dollars per Million Btu)

Sector/Fuel	1975	1980	1985	1990
Residential				
Natural Gas	2.75	4.16	6.65	8.53
Distillate	4.75	8.59	6.27	9.02
Electricity	15.61	16.78	17.11	18.36
Commercial				
Natural Gas	2.17	3.84	6.42	8.48
Distillate	4.30	8.06	5.94	8.54
Industrial				
Natural Gas	1.49	2.90	5.62	7.23
Low Sulfur Residual Oil ...	4.11	5.14	4.70	6.95
Transportation				
Distillate	5.85	8.39	6.21	8.95
Gasoline	7.57	11.32	8.69	11.41

Table E5 shows the changes in selected energy prices that explain the modest growth in consumption. Even though oil product prices are projected to decline from 1980 levels, they are projected to remain well above the 1975 values. Other energy prices (natural gas and electricity) continue to rise in the projections.

The shares of total energy consumed by each sector are projected to change somewhat over the decade. In particular, the industrial sector is projected to account for a greater relative share of energy use, largely because energy inputs are used both as heat and power and as direct raw materials (e.g., petrochemical feedstocks), and because of the strong relationships between economic growth and industrial energy use.

Supply of Energy

Except for oil imports, the United States is essentially self sufficient in fossil fuels. A major coal exporter, the United States produced almost all of the natural gas used in 1982, while 68 percent of U.S. oil consumption was domestically produced.

As shown in Table E6, coal production is projected to rise throughout the remainder of the 1980's, from about 830 million tons (19.2 quadrillion Btu) in 1980 to 1080 million tons (23.9 quadrillion Btu) by 1990. In contrast, domestic oil production is projected to remain relatively stable, and then decrease slightly at the of the period. Imports of oil would be expected to rise substantially from 1982 levels with economic recovery. Increased oil consumption is met by increased net imports,

Table E6. Supply and Disposition of Energy
Middle World Oil Price Case

	1975	1980	1982	1985	1990
Supply					
Coal (million tons)					
Domestic Production	655	830	833	914	1080
Stock Withdrawals[a]	-27	-36	-19	0	0
Net Imports	-65	-91	-106	-109	-144
Total Consumption	563	703	708	805	936
Petroleum (million barrels per day)					
Domestic Production	10.0	10.2	10.3	10.0	9.5
Stock Withdrawals[a]	0.5	0.5	0.8	0.4	0.4
Net Imports	5.8	6.4	4.2	7.6	7.1
Total Consumption	16.3	17.1	15.3	18.0	17.0
Natural Gas (trillion cubic feet)					
Domestic Production	19.2	19.4	17.5	14.8	15.9
Stock Withdrawals[a]	-0.6	-0.4	-0.6	0	0
Net Imports	0.9	0.9	0.9	1.2	1.2
Total Consumption	19.5	19.9	17.8	16.0	17.1
Other (quadrillion Btu)					
Domestic Production	5.1	5.7	6.3	7.2	9.5
Net Imports	0.1	0.2	0.2	0.3	0.4
Total Consumption	5.2	5.9	6.5	7.5	9.9
Total Supply (quadrillion Btu)	70.7	75.9	70.9	77.6	81.7
Consumption (quadrillion Btu)					
Residential	9.6	9.3	9.2	9.2	9.3
Commercial	5.5	5.9	5.9	6.6	6.9
Industrial	22.8	24.0	19.9	23.3	25.3
Transportation	18.3	20.3	18.7	19.2	17.5
Generation Losses/Discrep	14.5	16.4	17.2	19.3	22.7
Total Consumption (quadrillion Btu)	70.7	75.9	70.9	77.6	81.7

[a]Balancing item, includes stock withdrawals and processing gains and losses, the Strategic Petroleum Reserve, production and transmission losses.

which rise from 4.2 million barrels a day in 1982 to 7.1 million barrels a day by 1990 in the midprice projection. Projected natural gas production declines through the middle years of the decade, rising at the end of the period.

Longer Term Projections

This report does not contain independent long-term projections beyond the year 1990, but does review four recent forecasts (1981 vintage).

These forecasts, which reflect higher world oil price assumptions, provide the basis for a discussion of synthetic fuels and industry trends to the year 2000.

Forecast Uncertainties

As is true of all forecasts, many assumptions underlie the analysis. In some cases, where these assumptions have been identified as particularly likely causes of uncertainty in the projections, sensitivity analyses have been performed. The world oil price is one example.

The projections, however, do treat current statutes as given. In particular, this analysis rests on the twin assumptions that the pricing provisions of the NGPA are not modified and that significant renegotiation of natural gas contracts does not occur. The projections also depend upon assumptions regarding the degree of fuel switching possible in the utilities sector and the rate of growth in industrial production. In the midprice case, fairly robust industrial production and a high degree of switching capability has been assumed. The results of modifications of some of these assumptions may be found in Chapter 3 of this report and in the Appendix.

1. Introduction

This edition of the Energy Information Administration (EIA) Annual Energy Outlook presents projections of energy production, consumption, and prices. The report examines both domestic and international energy markets and describes how changes in these markets are likely to evolve through 1990 and beyond. Explicit projections and analysis of the domestic and international markets are presented through 1990. A separate discussion of the more remote future is also included.

This volume differs from EIA's previous intermediate forecasts, presented in the EIA Annual Report to Congress, in that annual projections are provided through 1990. Short-term forecasts are not, however, included in the discussion. The Short-Term Energy Outlook, published each February, May, August, and November, presents and explains projections of energy production, consumption, and prices for the next six quarters.

Organization of the Report

The projections and associated analyses presented in the report are organized in three chapters.

- Chapter 2 - International Energy Markets
- Chapter 3 - Domestic Energy Projections through 1990
- Chapter 4 - Domestic Energy Markets in the Longer Term.

Each of these chapters is self-contained and can be read independently. However, the international chapter contains the analysis that lies behind the world oil prices used as assumptions in Chapter 3.

The analysis presented in this volume rests on a wide variety of assumptions, which, taken together, represent a reasonable assessment of future world prices, economic conditions, and Federal energy programs. The energy projections presented here are therefore conditional: their accuracy depends upon the reliability of the underlying assumptions. The projections are not statements about what will happen in energy markets, but rather descriptions of likely futures based on what was known in February 1983.

In a number of cases the analysis is especially sensitive to a particular assumption or the assumption is itself subject to great uncertainty. Domestic energy projections are, for example, relatively sensitive to the world oil price. Where the projections appear to be particularly affected by an assumption, or where the assumption itself is particularly uncertain, alternative projections have been prepared. Thus the projections to 1990 in Chapter 3 have been made using three different world oil price paths. Similarly, the international chapter attempts to bound world oil price uncertainty by examining its sensitivity to world economic conditions. More alternate cases have been constructed than are discussed in this volume. These additional projections can be found in the Supplement to the volume.

2. International Energy Markets

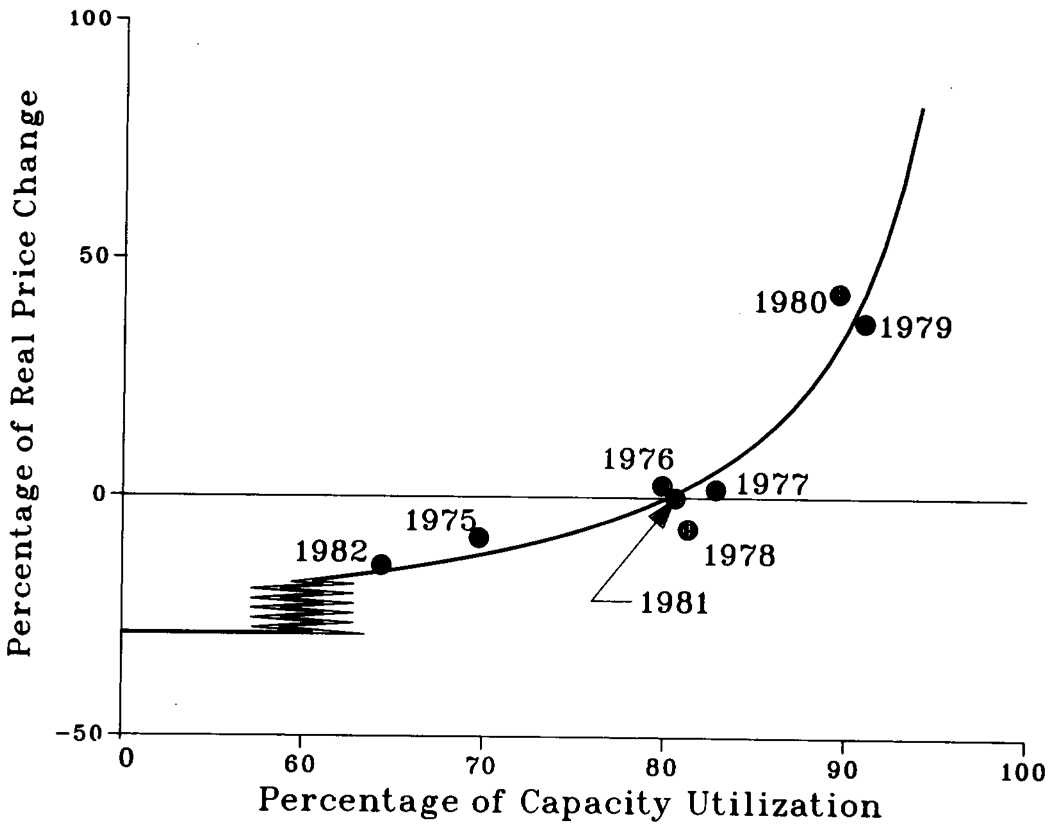
After a decade of relative oil scarcity and rising oil prices, the world appears to be entering a period of oil surplus and falling oil prices. The base case world oil supply and demand situation projected for the rest of the decade implies that the price for world oil, in real terms, could fall through the mid-1980's before beginning to rise again in the latter half of the decade. This means that nominal oil prices could remain relatively stable for the next few years. However, this would still result in a decline in the inflation-adjusted price to roughly $25 per barrel (in constant 1982 dollars) by 1985. The projections of world oil prices discussed here are based on events as of February 1983.

Since 1974, the Organization of Petroleum Exporting Countries (OPEC) has tended to raise prices when the world oil demand for OPEC oil reached roughly 80 percent of its production capacity.[1] The curve in Figure 1 shows OPEC's historical price response to changing demands on its production capacity. OPEC has tended to raise prices sharply whenever demands approach production capacity and allow real prices to drift lower when demands fall. The data points shown in the figure are year-to-year changes in the real price (adjusted for inflation) of oil and the associated utilization rates of OPEC production capacity during the 1974 to 1982 period.

The two major oil price shocks of the 1970's are illustrated in Figure 2. The price increases of 1973-1974 resulted from the oil embargo imposed by the Arab oil-producing countries. The price increases in 1979-1980 followed the Iranian revolution and subsequent reductions in Iranian oil exports. A third shock in oil prices following the outbreak of hostilities between Iran and Iraq in late 1980 was averted by high oil stocks, high levels of unused production capacity within OPEC, and slow economic activity in the industrialized world. The nominal price of world oil, which stood roughly at $4 per barrel in 1973, exceeded $35 per barrel by the end of 1980.

The two major oil price hikes of the 1970's helped initiate the current surplus situation by providing an incentive among the oil-importing countries to initiate programs to increase general energy efficiency and to substitute, where possible, alternative fuels for oil. The ratio measuring the amount of energy needed to produce a given amount of goods and services provides a useful indicator as to the success of these efforts. For the industrialized countries that comprise the Organization for Economic Cooperation and Development (OECD), the total-primary-energy to gross-domestic-product ratio (TPE/GDP) has declined 13 percent between 1973 and 1980, even while GDP itself rose 19 percent, in real terms.[2] The oil/GDP ratio has diminished 20 percent over the same period.[3] Reductions in these ratios undoubtedly reflect basic changes in the economies of the OECD countries that will affect energy consumption patterns for a considerable time. Additional cyclical factors, such as stock withdrawals, weather conditions, and business activity, have acted to reduce oil consumption in 1982 even further than might have been the case given only the influence of more basic structural changes. These effects of short-term market conditions must be accounted for when considering the success of basic changes towards energy efficiency.

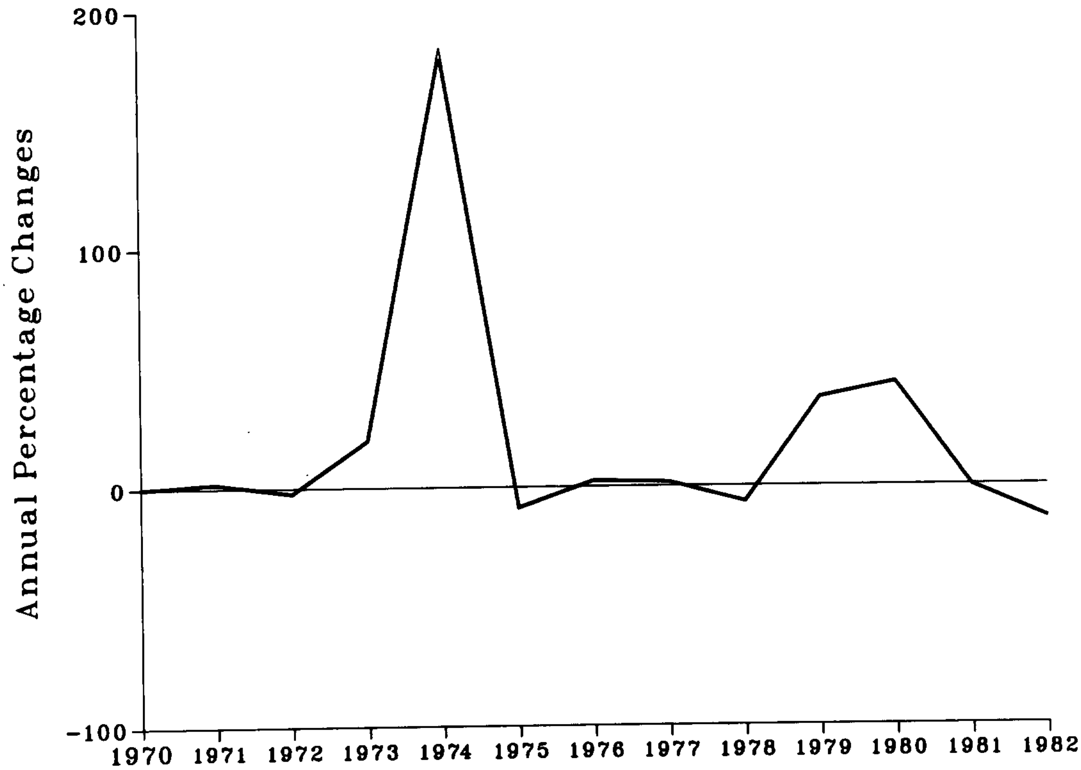
Figure 1. OPEC Pricing Behavior (Percentage Real Price Change from Previous Year vs. Percent of Capacity Utilized)



Note: Production capacity is defined as the maximum production rate that can be sustained for several months. The curve was fitted to historical data using least squares regression.

Sources: Energy Information Administration, Monthly Energy Review, DOE/EIA-0035 (83/02) (Washington,D.C., 1983), International Energy Indicators (Washington, D.C., May 1979); and Central Intelligence Agency, International Energy Statistical Review, selected issues, (Washington, D.C.).

Figure 2. Changes in Real World Oil Prices, 1970 to 1982 (Percentage Change from Previous Year)



Sources: Calculated using 1970-1978 data from: Energy Information Administration, World Oil Market Outlook, unpublished memorandum, February 1981. Data for 1979-1982 from: Short Term Energy Outlook, Volume 1, DOE/EIA-0202, selected issues (Washington, D.C.).

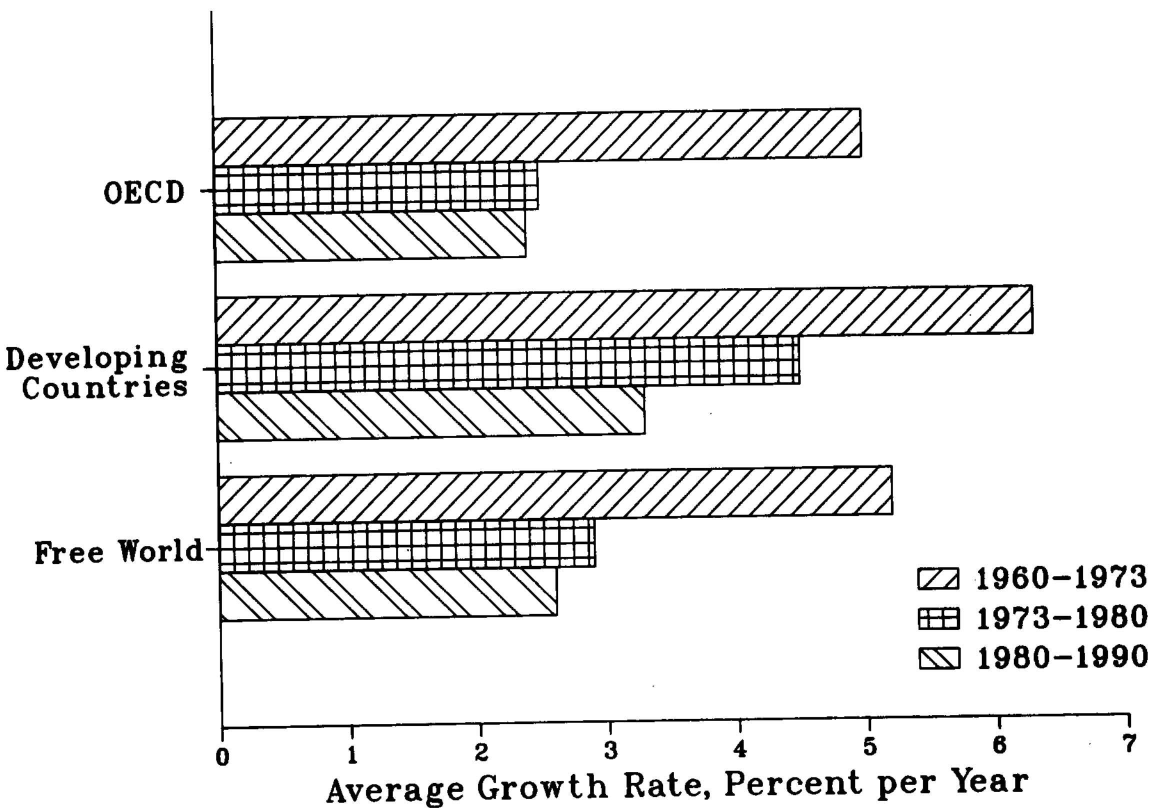
World energy markets in 1982 were dominated by a slack oil market and an associated decline in world oil prices. At year's end, world oil production capacity exceeded consumption by an estimated 9 to 10 million barrels per day. Substantial liquidation of world oil inventories in 1982 helped soften world oil prices, which drifted downward from just over $34 per barrel in January to about $33 per barrel in December.[4] Primary inventories were estimated to be at about 4.8 billion barrels by the end of 1982, or about 102 days' supply compared to 85 days' supply at the outbreak of the Iranian revolution in 1978.[5]

Continued slow economic growth in the industrialized world and growing difficulties in international financial markets, particularly with respect to certain key developing countries, are expected to help keep oil markets soft, at least over the near term. In an economic survey, the International Monetary Fund (IMF) estimates that real economic growth in the industrial world in 1982 will have been less than 1 percent, virtually no growth for the 3rd year in a row. Relatively slow economic growth has also been experienced by the oil-importing developing countries, and actual reductions in economic output in each of the last 3 years have encumbered the oil-exporting countries.[6] Past and projected economic growth rates for industrialized and developing countries are compared in Figure 3.

The tremendous expansion of loans in international financial markets during the 1970's and into the 1980's was in large part fueled by the surplus of funds injected into banking systems by the OPEC nations, funds which were then recycled to developing countries. Problems arose when conservation and recession reduced OPEC surpluses and, additionally, demands for developing country exports needed for repayment of loans. Mexico's difficulties in particular resulted from a combination of rapid expansion of development efforts financed through international loans followed by falling prices for oil and loss of expected revenues. Going into 1983, international financial trends were characterized by dwindling OPEC surpluses linked to falling oil demands, heavy deficits in most of the smaller industrial countries, and rising deficits in the oil-importing developing countries. After years of continuous growth, oil consumption in the oil-importing developing countries of the free world is estimated to have actually declined in 1982.

Changes in world oil prices reflect these changes in world oil market conditions. Three different price paths reflecting different assumptions about future oil market conditions are presented in Table 1. The midprice case was made on the basis of analysis of international oil markets. The projection for 1983 is the base case developed for the February 1983 Short-Term Energy Outlook. The high and low price paths can be considered as an uncertainty range around the midprice case. Uncertainty ranges are estimated to be $21-$34 per barrel in 1985 and $28-$48 per barrel in 1990. The annual price paths shown in Figure 4 do not reflect the additional uncertainty of an oil supply disruption but only general supply and demand pressures generated in the market place. Prediction of any future price shock, its timing, depth, or duration, is considered impossible, and the effects of such an event are discussed separately below.

Figure 3. Free World Economic Growth Rates (Average Growth Rate, Percent Per Year)



Sources: Calculated using data from: Wharton Econometric Forecasting Associates, World Model Historical Data (Philadelphia, Pennsylvania, 1982); and International Bank of Reconstruction and Development, World Tables, Second Edition (Baltimore, Maryland, 1980).

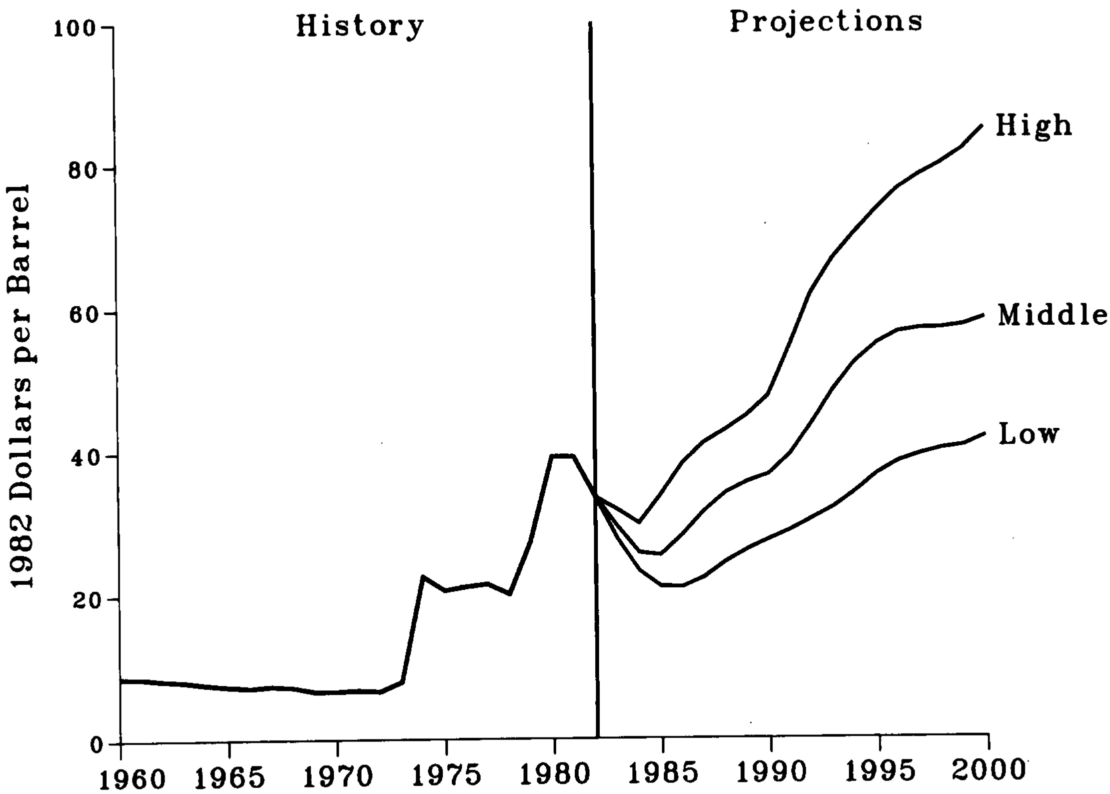
Table 1. World Oil Prices, 1979-1990

Year	Price Case: Low	Middle	High
	Real 1982 Dollars per Barrel		
1979	27.48	27.48	27.48
1980	39.32	39.32	39.32
1981	39.27	39.27	39.27
1982	33.59	33.59	33.59
1983	28.00	30.00	32.00
1984	23.00	26.00	30.00
1985	21.00	25.00	34.00
1986	21.00	28.00	38.00
1987	22.00	32.00	41.00
1988	24.00	34.00	43.00
1989	26.00	36.00	45.00
1990	28.00	37.00	48.00
	Nominal Dollars per Barrel[a]		
1979	21.67	21.67	21.67
1980	33.89	33.89	33.89
1981	37.05	37.05	37.05
1982	33.59	33.59	33.59
1983	29.00	31.00	33.00
1984	25.00	29.00	33.00
1985	24.00	29.00	40.00
1986	26.00	34.00	47.00
1987	29.00	42.00	54.00
1988	34.00	48.00	60.00
1989	39.00	54.00	67.00
1990	45.00	59.00	77.00

[a]Inflation rates used to estimate nominal prices are given in Chapter 3.

Source: Historical data: Energy Information Administration, Monthly Energy Review, DOE/EIA-0035 (82/12) (Washington, D.C., 1982), and Short-Term Energy Outlook, Volume 1, DOE/EIA, 0202 (83/1Q) (Washington, D.C., 1983).

Figure 4. World Oil Price Projections, High, Middle, and Low World Oil Price Scenarios, 1960 to 2000 (1982 Dollars per Barrel)



Note: All prices reflect the average landed price of crude oil in the United States.

Sources: Historical data for 1960–1978: Energy Information Administration, World Oil Market Outlook, unpublished memorandum, February 1981. Data for 1979–1982 from: Energy Information Administration, Short-Term Energy Outlook, Volume 1, DOE/EIA-0202, selected issues (Washington, D.C.).

The midprice case projection has prices falling in real terms (1982 dollars) from $34 per barrel in 1982 to $25 per barrel in 1985 and then rebounding to $37 per barrel by 1990. The projected continuation of falling prices for the next few years is caused by the current 9 to 10 million barrel per day excess in world oil production capacity and the outlook for relatively weak economic growth for the remainder of the decade. Prices are projected to climb steadily after 1985, as available supplies constrain growing demands. Given projected inflation rates, prices in nominal dollars under the midprice case would be $29 in 1985 and $59 in 1990.

As stated above, the price paths in Figure 4 do not include any sudden disruptions in the supply of oil over the next 18 years and are, therefore, relatively smooth over time. This pattern is in contrast to the sharp price increases--followed by price declines--experienced in the past. Future prices might also not follow such a smooth course over time. The possible reaction of prices to a hypothetical supply disruption in 1984 equivalent to a closure of the Straits of Hormuz is illustrated in Figure 5. This reduces world oil production capacity by 16 million barrels per day and actual production by 5 million barrels per day below its 1983 level. The reduction results in a hypothetical market-clearing price of $76 per barrel in 1984, but prices fall steadily when supplies are restored. Prices then oscillate around the no-disruption midprice case price path until they settle back to the long-term equilibrium trajectory.

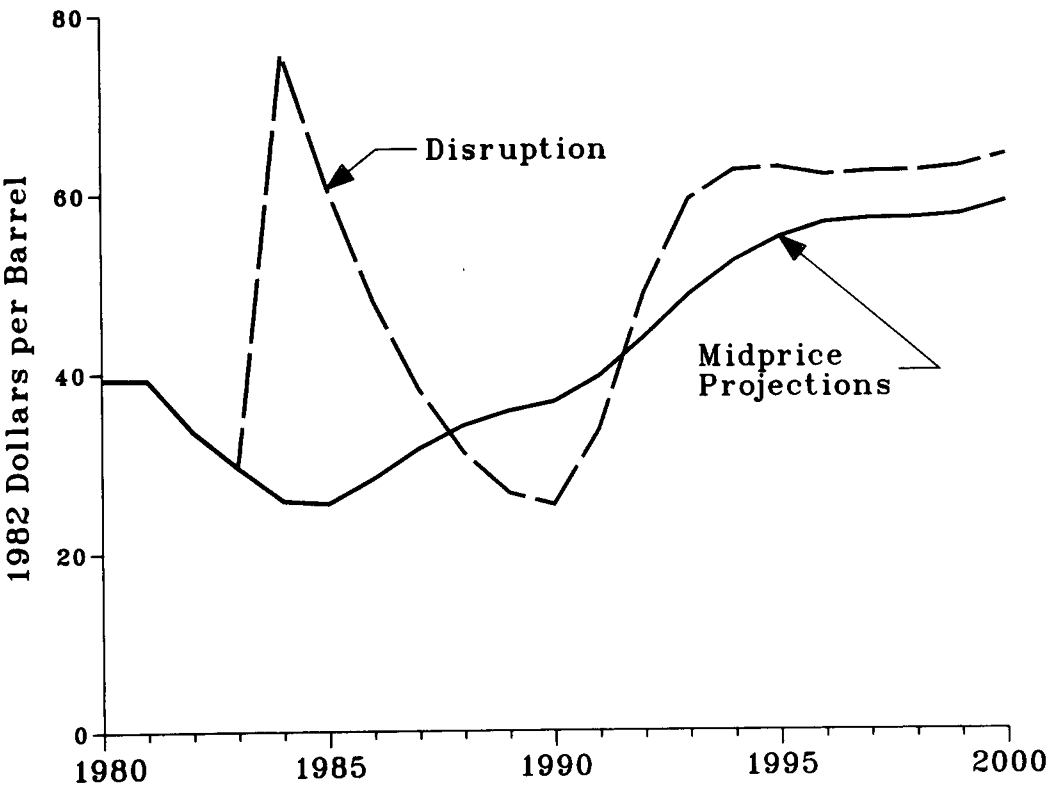
Oil Demand and Supply

Table 2 shows projected oil consumption and production under the midprice case. Oil consumption in the industrialized countries of the OECD, excluding Australia and New Zealand, grows at an annual rate of 1.5 percent between 1981 and 1985 but then slows to an annual rate of about 0.2 percent between 1985 and 1990. Lower world oil prices encourage consumption through 1985, with the fastest rate of growth occurring between 1983 and 1985. Increasing oil prices and continued efforts at energy efficiency and fuel switching discourage growth in oil consumption in these countries after 1985, with consumption in the United States projected to actually decline through 1990.

Oil consumption in the developing countries of the free world is projected to remain virtually flat through 1983 and then to grow steadily for the rest of the projection period. The OPEC countries, with abundant supplies, are projected to increase their level of oil consumption by more than a third between 1981 and 1990. Oil consumption in the non-OPEC developing countries is projected to increase by about 20 percent between 1981 and 1990. A problem for many of these countries will be their inability to generate the capital needed to develop alternative energy sources. Oil consumption in the developing countries is projected to exceed that of Western Europe by 1983. Projected oil consumption in the free world is illustrated in Figure 6.

Oil production in the free world, at a level of about 42.8 million barrels per day in 1982, is projected to rise steadily to about 53 million barrels per day by 1990 (see Figure 7). Production in the OPEC countries is also

Figure 5. World Oil Prices With Hypothetical Disruption in Supply, 1980 to 2000 (1982 Dollars per Barrel)



Note: Data for 1983 through 1990 are projections.

Note: The disruption price path is based on a hypothetical disruption occurring in 1984 that reduces world oil production capacity by 16 million barrels per day and actual production by 5 million barrels per day below the 1983 level.

Table 2. Free World Oil Consumption and Production,[a] History and Midprice Case Projections (Million Barrels per Day)

	1980	1982	1985	1990
Consumption				
United States[b]	17.5	15.6	18.4	17.4
Canada	1.9	1.7	1.9	2.0
Japan	5.0	4.5	4.9	5.3
OECD Europe	13.5	11.9	12.8	13.5
OPEC	2.6	2.9	3.2	3.9
Other Countries[c]	9.0	8.8	9.7	10.7
Total Consumption	49.6	45.4	50.8	52.8
Production				
United States	10.8	10.8	10.6	10.0
Canada	1.8	1.6	1.5	1.7
OECD Europe	2.6	3.0	3.4	3.0
OPEC	27.6	19.8	25.8	27.7
Other Countries	6.4	7.6	8.8	10.2
Total Production	49.1	42.8	50.1	52.6
Net Exports from Centrally Planned Economies	1.2	1.5	1.0	0.5
Stock Change and Discrepancies	-0.7	-1.1	0.3	0.3

[a]Includes crude oil, natural gas liquids, refinery gains, hydrogen, and other hydrocarbons.

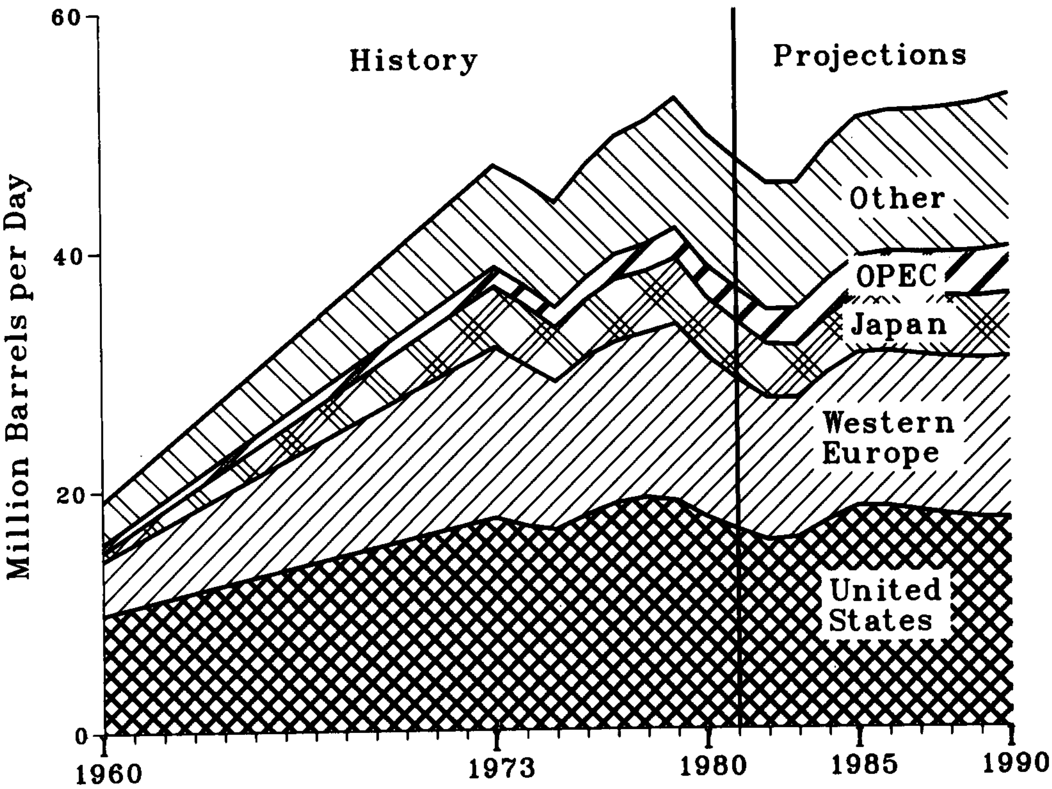
[b]Includes Puerto Rico and Virgin Islands.

[c]Excludes Centrally Planned Economies.

Note: Numbers may not add to total because of rounding.

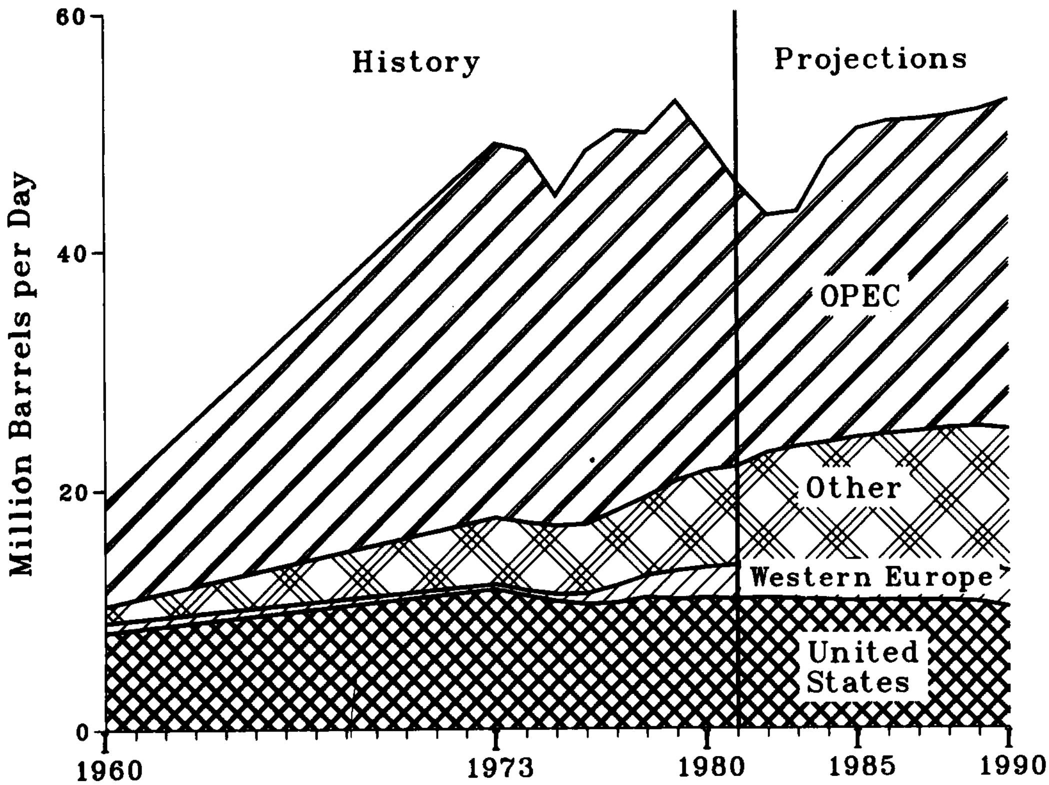
Source: Historical Data: Energy Information Administration, 1981 Annual Report to Congress, DOE/EIA-173(81)/3 (Washington, D.C., 1982); Monthly Energy Review, DOE/EIA-0035 (82/11),and 1981 International Energy Annual, DOE/EIA-01219(82); Organization for Economic Cooperation and Development/International Energy Agency, Quarterly Oil Statistics, Second Quarter 1982, (Paris, France, 1982); and Petroleum Economics Limited, Quarterly Supply/Demand Outlook, (London, England, 1982).

Figure 6. Free World Oil Consumption, Midprice Scenario, 1960 to 1990 (Million Barrels per Day)



Source: Historical data: Energy Information Administration, 1981 Annual Report to Congress, Volume 2, DOE/EIA-0173(81)/2, Monthly Energy Review DOE/EIA-0035(82/11), International Petroleum Annual DOE/EIA-0042(78), and 1981 International Energy Annual DOE/EIA-0219(81) (Washington, D.C., 1982); and Organization for Economic Cooperation and Development, Quarterly Oil Statistics, Second Quarter 1982 (Paris, France 1982).

Figure 7. Free World Oil Production, Midprice Scenario, 1960 to 1990 (Million Barrels per Day)



Note: Includes natural gas liquids and synthetic liquids.

Source: Historical data: Energy Information Administration, 1981 Annual Report to Congress, Volume 2, DOE/EIA-0173(81)/2, Monthly Energy Review DOE/EIA-0035(82/11), and 1981 International Energy Annual DOE/EIA-0219(81) (Washington, D.C., 1982); and Organization for Economic Cooperation and Development, Quarterly Oil Statistics, Second Quarter 1982 (Paris, France 1982).

expected to be at its lowest level in 1982, at about 20 million barrels per day. Production is then projected to rise to about 28 million barrels per day by 1990, which is still well below the 1977 peak of 31 million barrels per day.

Other than from OPEC, a large share of the increase in oil production through 1990 is projected to come from the developing countries. Mexico is by far the largest producer among these countries and should remain a major contributor to world oil supplies. Other countries in this group that are currently producing 100,000 barrels per day or more include Argentina, Brazil, Columbia, Peru, Trinidad and Tobago, Oman, Syria, Angola, Egypt, Tunisia, Brunei, India, and Malayia. In addition, ethyl alcohol is expected to become an important source of liquid fuels for Brazil. Oil production from the developing countries is projected to rise about 34 percent between 1982 and 1990.

Oil production from the OECD countries is expected to remain relatively flat over the projection period. Declining supplies from mature fields will be replaced by new oil supplies coming primarily from the North Sea and offshore areas of the United States and Canada. Additional gains to liquid fuel supplies are expected from enhanced oil recovery, shale oil, and synthetic liquids.

World Energy Consumption

Though total oil consumption in the free world is projected to remain below its 1979 level of about 52.5 million barrels per day until 1990, total energy consumption is projected to continue to grow. Fuels expected to contribute a growing share of world energy consumption include coal, nuclear power, hydroelectric power, synthetics, solar power, geothermal heat, and biomass.

Total energy consumption in the free world is projected to increase from about 200 quadrillion Btu in 1980 to about 229 quadrillion Btu by 1990 (see Table 3). All regions of the free world contribute to the projected increase, but the OECD Pacific region and the developing countries (including the OPEC countries) are projected to experience the fastest rates of growth over the decade. By 1990, energy consumption in these areas is projected to be about 20 percent and 36 percent above 1980 levels, respectively. For the free world as a whole, total energy consumption in 1990 is projected to be 15 percent higher than it was in 1980.

Though energy consumption in North America is expected to grow at a slower rate than total free world consumption throughout the projection period, it will continue to account for a large share of free world energy consumption (see Figure 8). Its share of total energy consumption goes from 43 percent in 1980 to 40 percent by 1990.

OECD Europe's share of total energy consumption is also projected to decline steadily over the projection period, going from 27 percent of total consumption in 1980 to about 26 percent in 1990. In contrast,

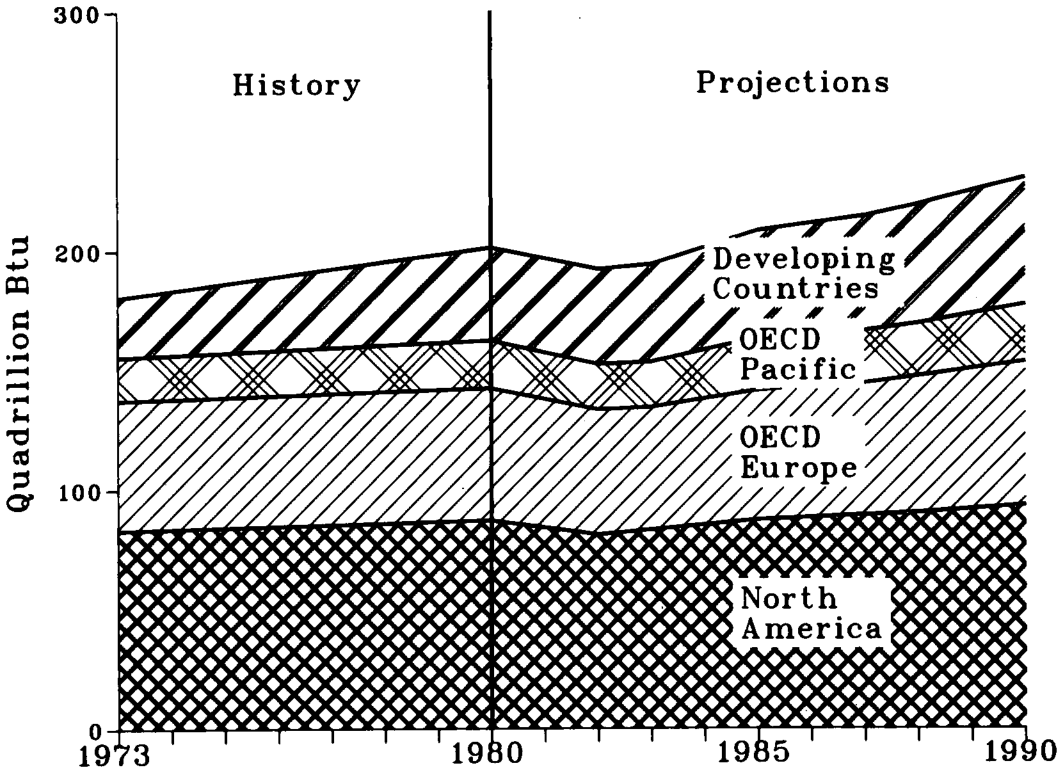
Table 3. Free World Apparent Energy Consumption, History and Midprice Case Projections (Quadrillion Btu)

Region	1980	1985	1990
Total OECD	161	162	176
North America	87	87	92
OECD Europe	55	54	60
OECD Pacific	20	21	24
Developing Countries	39	45	53
Total Free World	200	207	229
Fuel			
Oil	103	104	109
Natural Gas	38	35	37
Coal	38	43	51
Nuclear	6	9	14
Other	15	16	18
Total	200	207	229

Note: Numbers may not add to totals because of rounding.

Sources: Historical data: Derived from Energy Information Administration, 1981 International Energy Annual DOE/EIA-0219(81) (Washington, D.C., 1982), and Monthly Energy Review DOE/EIA-0035 (83/01) (Washington, D.C., 1983).

Figure 8. Free World Consumption of Energy, by Regions, Midprice Scenario, 1973 to 1990 (Quadrillion Btu)



Source: Historical data: Energy Information Administration, 1981 Annual Report to Congress, Volume 2, DOE/EIA-0173(81)/2 (Washington, D.C., 1982), and 1981 International Energy Annual DOE/EIA-0219(81) (Washington, D.C., 1982).

energy consumption in the developing countries is projected to rise from about 20 percent to about 23 percent by 1990. The OECD Pacific share remains around 10 percent over the projection period.

Expectations about growth in energy consumption are influenced primarily by expectations about economic growth. Relatively high rates of growth are anticipated for certain developing countries. Many of the oil exporters among these countries are attempting to use their energy resources as a base for industrial growth. Relatively rapid growth is also anticipated in other semi or newly industrialized countries such as Mexico, Brazil, South Africa, and Hong Kong. However, many of these countries must overcome difficult economic problems in the near term to reach their potential. Export growth will be a key ingredient to economic growth in many areas, such as South Korea, Taiwan, and Singapore. Economic growth is expected to be more moderate in the industrialized countries. Consumption in these regions is also expected to be held down by efforts to increase energy efficiency and conservation.

Fuel Shares

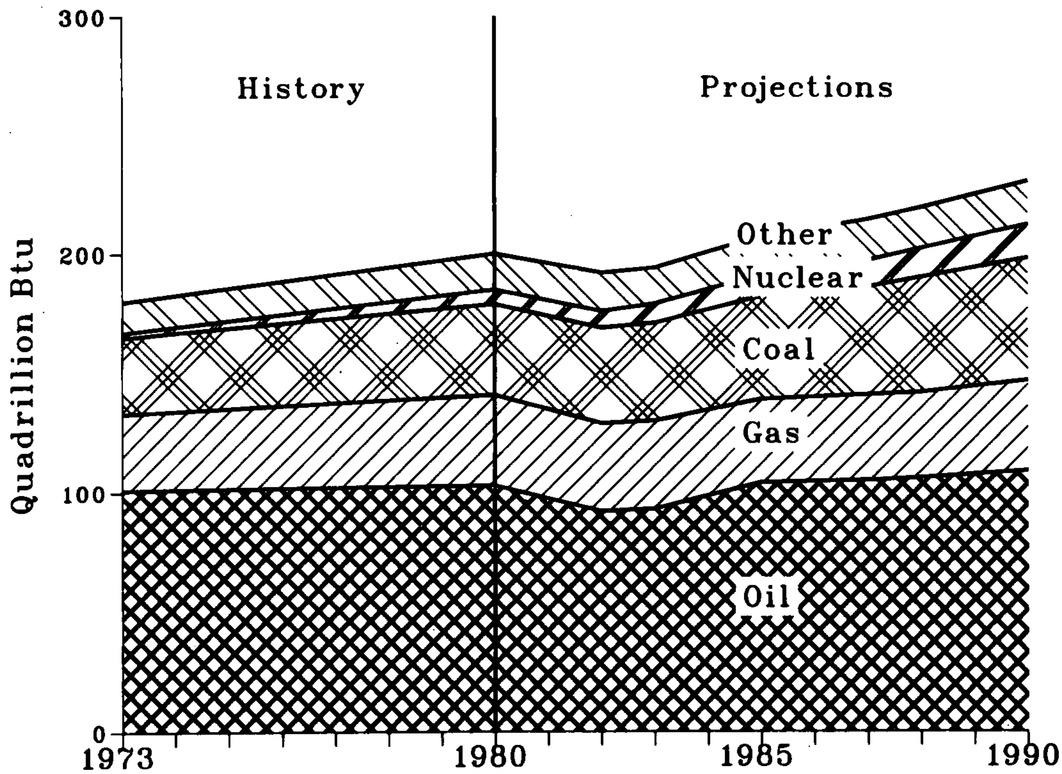
Though consumption of oil is projected to begin to grow again in absolute terms in 1984, its share of total energy consumed is projected to continue to decline during the 1980's. Accounting for over half of all energy consumed in 1980, oil's share is projected to slip to 48 percent by 1990 (see Figure 9). Oil's declining share of total energy consumption reflects its growing scarcity and rising price relative to other energy sources. Like oil, the share of energy coming from natural gas is expected to decline over the next decade, going from about 19 percent of total consumption in 1980 to about 16 percent in 1990.

An increasing share of energy consumed is projected to come from coal, nuclear power, and other energy sources such as hydroelectric power. Coal is projected to increase its share steadily over the decade, going from 19 percent of the total in 1980 to about 22 percent by 1990. The share of energy from nuclear power is projected to double between 1980 and 1990, going from 3 percent to 6 percent of the total. The share of energy derived from all other sources remains around 8 percent through the projection period.

Coal consumption is projected to increase from about 38 quadrillion Btu in 1980 to about 51 quadrillion Btu by 1990. Unlike oil, coal is abundant in many industrialized countries and, as a result, its price should remain relatively low. Major producers and exporters of coal include the United States, Australia, South Africa, India, Poland, the Soviet Union, and China. Increased use of coal is expected as it displaces large quantities of oil as fuel for electric power generation and for industrial use. It will also serve to fuel economic growth in the newly industrialized countries of the world. Another growing use for this resource is expected to be coal liquification.

Consumption of natural gas is projected to decline from 38 to 35 quadrillion Btu between 1980 and 1985 and then to climb back up to 37 quadrillion Btu by 1990. Most natural gas consumption is projected to occur in the regions in which it is produced. Growth in natural gas

Figure 9. Free World Consumption of Energy, by Type of Energy, Midprice Scenario, 1973 to 1990 (Quadrillion Btu)



Source: Historical data: Energy Information Administration, 1981 Annual Report to Congress, Volume 2, DOE/EIA-0173(81)/2 (Washington, D.C., 1982), and 1981 International Energy Annual DOE/EIA-0219(81) (Washington, D.C., 1982).

Table 4. Free World Nuclear Generating Capacity, 1981-1990 (Gigawatts-electric)

Year	United States	Other OECD	Non-OECD	Total
1981	55	79	5	139
1985	72-90	107-115	10-13	189-218
1990	112-121	145-170	21-31	278-322

Source: Energy Information Administration, Nuclear and Alternate Fuels Division (Washington, D.C., 1983).

exports will depend upon the development of long-distance pipelines and liquefied natural gas (LNG) facilities, both of which require large investment commitments.

Nuclear energy consumption is projected to grow from about 6 quadrillion Btu in 1980 to about 14 quadrillion Btu in 1990, a growth rate of almost 9 percent per year. By comparison, coal is projected to grow at an average annual rate of about 3 percent per year and oil at under 1 percent per year. Total energy consumption is projected to grow somewhat over 1 percent per year in the 1980's.

Projections of free world nuclear generating capacity are presented in Table 4. Nuclear power is expected to play an important part in meeting future growth in electricity demands in the industrialized world, particularly in Canada, France, West Germany, Japan, and the United States. Countries outside the OECD with significant nuclear plans include Argentina, Brazil, India, South Korea, South Africa, and Taiwan. Factors that will influence future nuclear development include growth in overall demand for electricity, the cost of plant and equipment, and the ability to confront waste management and other safety related problems.

The projections of energy consumption presented here are based on the assumption that the Centrally Planned Economies (CPE) will continue to be net exporters of energy. In 1981, the Soviet Union was the world's largest producer of oil, with an output of about 12.3 million barrels per day. This amount compares with 1981 output levels of 10.2 million barrels per day for the United States and for Saudi Arabia. In addition to production for domestic use, the Soviet Union is expected to provide important amounts of natural gas to Western Europe by the late 1980's. The Soviet Union and People's Republic of China are also major world producers of coal.

Comparison of International Energy Projections

The EIA midprice projections of energy consumption and oil consumption and production by region for 1990 from the EIA 1977 Annual Report to Congress through the current edition of the Annual Energy Outlook are presented in Table 5. Projections of 1990 energy consumption and production have dropped considerably and consistently since the 1977 Annual Report, including those for this year. Energy projections for the Annual Energy Outlook are lower than those in the 1981 Annual Report for all regions except for OECD Europe. The projection for total free world energy consumption is down about 4 percent. Projections of energy consumption for the United States and Japan have been reduced considerably this year. Lower energy projections in these countries reflect lower expectations about future economic growth and greater expectations about future energy savings.

Though total energy consumption for 1990 in the United States has been lowered this year, projected 1990 consumption of oil in the United States has been increased by about 6 percent. Projected 1990 oil consumption for the rest of the OECD countries, excluding Japan, has also been increased, up 14 percent. Total projected free world 1990 oil consumption is up 5 percent. An important reason for the higher estimates this year is the difference in the outlook for world oil prices. The projected 1990 world oil price, in 1982 dollars, is currently $37 per barrel, which is $14 per barrel below last year's projection.

Higher 1990 oil consumption in the Annual Energy Outlook is coupled with higher oil production. OPEC provides the bulk of the difference in production levels. Also of interest is the assumption of a net export of oil from the Centrally Planned Economies (CPE). In previous years, the midprice case carried the assumption of a balance in CPE oil exports by 1990, except for the 1977 Annual Report which assumed net imports by the CPE countries of 2.5 million barrels per day.

Other International Energy Projections

Table 6 compares EIA projections with recent projections published by other organizations. The projections are, of course, based on different assumptions about such factors as energy resources, economic growth rates, and world oil prices. Important differences in underlying assumptions are noted to help explain differences in the respective projections.

The range for projected total 1985 energy consumption in the free world is 8 million barrels per day of oil equivalent, and the range for 1990 is 11 million barrels per day. The range for oil consumption is 4 million barrels per day for 1990. The International Energy Agency (IEA) in Paris (under its high oil demand case) projected oil consumption as high as 56 million barrels per day for 1990, but this amount assumes an excess of demand over available supplies of 4 million barrels per day. Such an excess would have to be eliminated by accelerating world oil prices.

Projections of oil and energy consumption are lowest in the Tenneco study. Their projections are based on economic growth rates for the free world of 3.5 percent between 1980 and 1985 and 2.7 percent between 1985 and 1990. Tenneco assumes that rising energy prices, conservation, and technological advances will significantly lower energy consumption per unit of gross output.

Table 5. Comparison of Projections from 1977 through 1981 EIA Annual Report to Congress and 1982 Annual Energy Outlook: Middle Price Scenario, 1990

Element of Comparison	United States	Japan	OECD Europe	Other Countries	Free World
Energy Consumption (quadrillion Btu)					
1977 Annual Report	109	33	82	97	321
1978 Annual Report	103	26	67	85	280
1979 Annual Report	90	24	57	76	247
1980 Annual Report	88	24	59	74	246
1981 Annual Report	87	23	59	70	238
1982 Annual Energy Outlook	82	19	60	69	229

	United States[a]	Japan	Other OECD	Other Countries	Free World
Oil Consumption (million barrels per day)					
1977 Annual Report	24.2	11.5	26.5	21.0	83.2
1978 Annual Report	19.9	7.9	21.1	19.8	68.7
1979 Annual Report	16.0	6.3	15.0	15.3	52.6
1980 Annual Report	16.0	5.5	14.3	14.4	50.4
1981 Annual Report	16.2	5.5	14.3	14.4	50.4
1982 Annual Energy Outlook	17.4	5.3	16.3	13.8	52.8

	United States[a]	OPEC	Other Non-OPEC	Imports from CPE[b] Countries	Free World
Oil Production (million barrels per day)					
1977 Annual Report	10.1	61.0	14.6	-2.5	83.2
1978 Annual Report	11.5	39.7	17.5	0	68.7
1979 Annual Report	9.9	26.3	16.4	0	52.6
1980 Annual Report	10.1	26.1	16.3	0	52.5
1981 Annual Report	10.1	25.7	14.5	0	50.4
1982 Annual Energy Outlook	10.0	27.7	14.9	0.5	53.1

[a]Includes Puerto Rico, the Virgin Islands, and refinery gains.
[b]CPE = Centrally Planned Economies.

Note: Rows may not add to totals because of rounding. In 1982 dollars, the world oil price of a barrel of oil was reported as $19 in the 1977 Annual Report, $23 in the 1978 Annual Report, $42 in the 1979 Annual Report, $46 in the 1980 Annual Report, $51 in the 1981 Annual Report, and $37 in the 1982 Annual Energy Outlook.

Table 6. Free World Energy Projections: Comparison of EIA Midprice Projections with Other Projections for 1985-1990 (Million Barrels per Day of Crude Oil Equivalent[a])

	Consumption		Oil Production		CPE Net
	Energy	Oil	OPEC	Other	Oil Exports
1980 Actual	94	50	28	21	1.2
1985 Projections					
EIA	98	51	26	24	1.0
Gulf (February 1982)	101	48	25[b]	24[b]	(1.3)
Socal (June 1982)	105	48	22[b]	21[b]	NA
PPA/DOE (August 1982)	104	50[c]	26	24	0.1
Tenneco (August 1982)	97	47	NA	NA	NA
IEA, Paris (October 1982)	NA	48-50	23-26	24-25	1.0-(1.0)
Conoco (February 1983)	100	47	21	25	0.8
1990 Projections					
EIA	109	53	28	25	0.5
Gulf (February 1982)	116	51	28[b]	25[b]	(2.0)
Socal (June 1982)	118	49	22[b]	22[b]	NA
PPA/DOE (August 1982)	115	52[c]	29	24	(1.0)
Tenneco (August 1982)	107	49	NA	NA	NA
IEA, Paris (October 1982)	NA	50-56[d]	27-29	23-25	0-(2.0)
Conoco (February 1983)	112	49	23	25	0.5

NA = not available.

[a]Crude oil equivalent = 5.8×10^6 Btu/bbl. Conoco uses the factor 5.7.
[b]Excludes 4.1 and 4.5 million barrels per day oil equivalent of natural gas liquids for 1985 and 1990, respectively.
[c]Includes coal and biomass liquids.
[d]Includes 0-4 million barrels per day of excess demand.

Note: Numbers in parentheses are net imports. Rows may not add to totals because of rounding.

Sources: Gulf, Non-Communist World Energy Consumption, (Pittsburgh, Pa., 1982); Standard Oil Company of California, World Energy Outlook (San Francisco, Ca., 1982); Office of Policy, Planning and Analysis, Energy Projections to the year 2000: July 1982 Update (Washington, D.C., 1982); Tenneco, Energy 1982-2000 (Houston, Texas, 1982); International Energy Agency, World Energy Outlook (Paris, France, 1982); Conoco, World Energy Outlook through 2000 (Stamford, Ct., 1983).

The highest levels of 1985 and 1990 energy consumption are those projected by Socal. Their assumptions about economic growth are high relative to the other studies. Economic growth for the free world is assumed to be 3.5 percent per year between 1980 and 1990. The comparable rates assumed by EIA are 2.0 percent between 1980 and 1985 and 3.2 percent between 1985 and 1990. The highest oil consumption projections, other than those by EIA, are those by the Department of Energy's Office of Policy, Planning and Analysis. Free world growth rates underlying those projections are 3.0 percent between 1980 and 1985 and 3.6 percent between 1985 and 1990. In terms of production, OPEC is projected to remain the major supplier of internationally traded oil throughout the decade in all the projections.

Footnotes to Chapter 2

[1]The OPEC members are Algeria, Ecuador, Gabon, Indonesia, Iran, Iraq, Kuwait, Libya, Nigeria, Qatar, Saudi Arabia, the United Arab Emirates, and Venezuela.

[2]The OECD members are Australia, Austria, Belgium, Canada, Denmark, Finland, France, West Germany, Greece, Iceland, Ireland, Italy, Japan, Luxembourg, the Netherlands, New Zealand, Norway, Portugal, Spain, Sweden, Switzerland, Turkey, the United Kingdom, and the United States.

[3]International Energy Agency, World Energy Outlook, April 1982. (Paris, France, 1982).

[4]Average Prices (FOB) weighted by estimated export volume. U.S. Department of Energy, Energy Information Administration, Weekly Petroleum Status Report, December 10, 1982. DOE/EIA-0208(82-49) (Washington, D.C., 1982).

[5]U.S. Department of Energy, Energy Information Administration, Short-term Energy Outlook, DOE/EIA-0202(83/1Q), February 1983. (Washington, D.C., 1983).

[6]International Monetary Fund, World Economic Outlook, April 1982. (Washington, D.C., 1982).

3. The Outlook for Domestic Energy Markets Through 1990

Energy markets in the United States have undergone dramatic changes since the end of World War II. During the postwar period the Nation shifted from a general dependence on coal as the primary fuel to increasing reliance on natural gas and oil. Supplies of these fuels were abundant and inexpensive. Consumers preferred them to other fuels because they were clean, convenient, and economical. By the end of the 1960's, however, domestic production of oil and gas began to level off and the Nation was becoming more and more dependent upon imported energy. The significance of that reliance and the vulnerability of the United States to disruptions of supply and abrupt changes in price became apparent in 1973 when the Arab members of OPEC embargoed oil shipments to the United States. The embargo and accompanying price changes caused oil consumption and imports to decline during the next 2 years. Although domestic oil consumption had again begun to grow in 1976, the growth ceased in 1979 when oil prices doubled.

Although the future price of oil is very uncertain, it has become clear that a return to the energy prices that prevailed in the 1960's and before is not likely. Individuals and firms have long since begun to make appropriate adjustments in response to higher energy prices. At first short-term changes (reductions in the amount of driving, for example) began to be made. More gradually, changes toward more energy-efficient houses, cars, and factories, and adjustments towards less expensive fuels occurred.

These changes do not take place instantaneously, however, but are spread over a number of years. Nor do they take place in isolation. Many variables affect the rate at which adjustments are made.

For example, the level of investment influences the rate at which new (and presumably more energy-efficient) industrial plants are built. Interest rate levels influence the rate of new home construction and new car sales, and hence the degree to which the stock of homes and autos reflect more recent energy prices. The speed at which adjustments to the higher energy prices can be expected to take place is thus affected by the more general economic environment. Some of these relationships will be explored in this chapter.

Against this background of continuing adjustment to higher prices, consumption decisions are also made based upon the relative prices of oil and of natural gas. While oil prices are projected to fall over the next few years, the prices of gas are projected to increase. While individuals and firms have been moving from oil to gas in the recent past, a new pattern of oil and gas consumption may be emerging.

This chapter describes the changes in energy consumption and production underway in domestic energy markets, the forces behind these changes, and projections of the way in which these forces will affect energy production and use over the rest of the decade. The discussion is organized into five parts:

- Three key assumptions
- End-use consumption of energy
- Electric utilities and the production of electricity
- Primary energy (oil, natural gas, and coal) production
- An essay on the relationship between the energy sector and the more general economy.

A concluding section provides a comparison of the forecasts in this chapter with other recent projections.

Assumptions

A great many specific assumptions about behavior and the state of the world underlie the forecasts presented in this chapter. A description of most of these specific assumptions may be found in the Supplement to this volume. Three assumptions, however, are of central importance in determining the general shape of the projections--assumptions about the world oil price, the state of the economy, and the general state of Federal regulation.

World Oil Price

The world oil price trajectories underlying the base (or middle world oil price) projections are shown in Table 7, together with high and low world oil price trajectories. Events in the world oil market over the past two years (and even the past few months) have led to a projection of world oil price that is 35 percent lower in 1990 than the assumption employed in the 1981 Annual Report to Congress. More generally, the year to year swings in the real price of oil since 1970 demonstrate the extreme degree of uncertainty surrounding world oil prices.

The bands of uncertainty around the price paths and the underlying assumptions are discussed in Chapter 2, International Energy Markets. It is important to note that the paths employed here reflect smoothly varying supply and demand pressures and changes from one year to the next. Future prices may not rise in such a smooth fashion. As in the past, prices may rocket upward suddenly (perhaps due to a supply interruption or conflict in a major supply region) followed by periods of gradually declining prices (in real terms) during the slack markets that have followed disruptions.

Macroeconomic Assumptions

The macroeconomic assumptions underlying the projections in this volume also differ from those employed in previous years. In the past, a particular forecast obtained from a single forecaster (e.g., Data Resources, Inc., Chase Econometrics) was used. This year two different forecasts, one

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Table 7. World Oil Price Projections
(1982 Dollars per Barrel)

Price	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990
Low	39	34	28	23	21	21	22	24	26	28
Middle	39	34	30	26	25	28	32	34	36	37
High	39	34	32	30	34	38	41	43	45	48

from Data Resources, Inc., and one from Dale Jorgenson Associates were employed to generate macroeconomic assumptions. These assumptions constitute input data for projections of energy markets and are not, in any sense, an independent EIA forecast of the economic future.

Table 8 presents values of important economic variables. Basically the macroeconomic assumptions are straightforward. Gross National Product--the total value of goods and services produced by the economy in a year--increases over the forecast period (1982-1990) at a rate of 3.2 percent a year, more rapidly during the initial years as the economy recovers. The overall rate of increase is somewhat below the rate of 3.5 percent that prevailed during the period between 1947 and 1980, but about the same as the overall rate of 3.2 percent that occurred during the 1970's. It is considerably above the rate of 1.8 percent observed between 1973 and 1982. The rate of growth assumed is in keeping with the recent trends in the economy.

The energy and economic values used in this report are expressed in constant 1982 dollars. In other words, the projected value of energy services in some future year is expressed in terms of the number of 1982 dollars required to purchase the services. The index used to convert current prices to constant dollar prices is the "implicit price deflator" for GNP--the ratio of GNP in current dollars to GNP in constant dollars.

The GNP deflator is only one of a number of measures of inflation; others include the Producer Price Index and the Consumer Price Index. The GNP deflator is employed here because of its broad base and the ubiquity of energy use in the economy. Over the 1980 to 1990 period, the GNP deflator is assumed to increase relatively smoothly at a rate of 6.4 percent. This rate is somewhat below the rate of 7.8 percent experienced since 1973 and reflects recent decreases in inflation.

Disposable income and interest rates are other variables that play important roles in determining energy demands in different sectors of the economy. The level of disposable income is an important determinant of personal energy use. Historical and projected values for these variables are shown in Table 8.

Table 8. Assumed Values of Macroeconomic Variables

Variable	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990
Real GNP (billions of 1982 dollars)	3,054.4	3,113.8	3,057.6	3,111.0	3,253.4	3,394.4	3,505.5	3,614.3	3,705.7	3,804.5	3,920.4
Percentage Change	-0.4	1.9	-1.8	1.7	4.6	4.3	3.3	3.1	2.5	2.7	3.0
Disposable Income (billions of 1982 dollars)	2,109.7	2,161.5	2,185.1	2,228.2	2,332.9	2,420.5	2,495.3	2,551.5	2,592.7	2,653.1	2,719.2
Percentage Change	0.2	2.5	1.1	2.0	4.7	3.8	3.1	2.3	1.6	2.3	2.5
GNP Deflator (1972 = 100)	178.6	195.5	207.2	216.7	227.8	240.3	254.4	271.1	290.5	310.7	331.7
Percentage Change	9.3	9.4	6.0	4.6	5.1	5.5	5.9	6.6	7.1	7.0	6.8
Yield of Triple A Bonds	11.9	14.2	13.8	11.1	10.4	10.3	10.4	10.4	10.4	10.1	9.8

Note: Historic values from Council of Economic Advisors Economic Report of the President, (Washington, D.C., 1983).

Date of Forecast Assumptions

The forecasts presented in this volume are based upon assumptions made in February 1983. Unanticipated events, new legislative enactments, or other major changes in the state of the world would clearly modify the assumptions and result in somewhat different forecasts.

Federal Regulation

It is the policy of the Energy Information Administration to base its projections on the statutes and regulations that exist at the time the projections are made. As a general rule, changes in programs that affect energy industries are not included in the forecasts until the changes have actually occurred. Thus, for example, the forecasts included in this volume are based on the assumption that the wellhead price controls on certain types of natural gas imposed by the Natural Gas Policy Act of 1978 (NGPA) will be removed according to the schedule contained in the Act, despite the large number of recent proposals and lengthy discussions concerning modification of the Act.

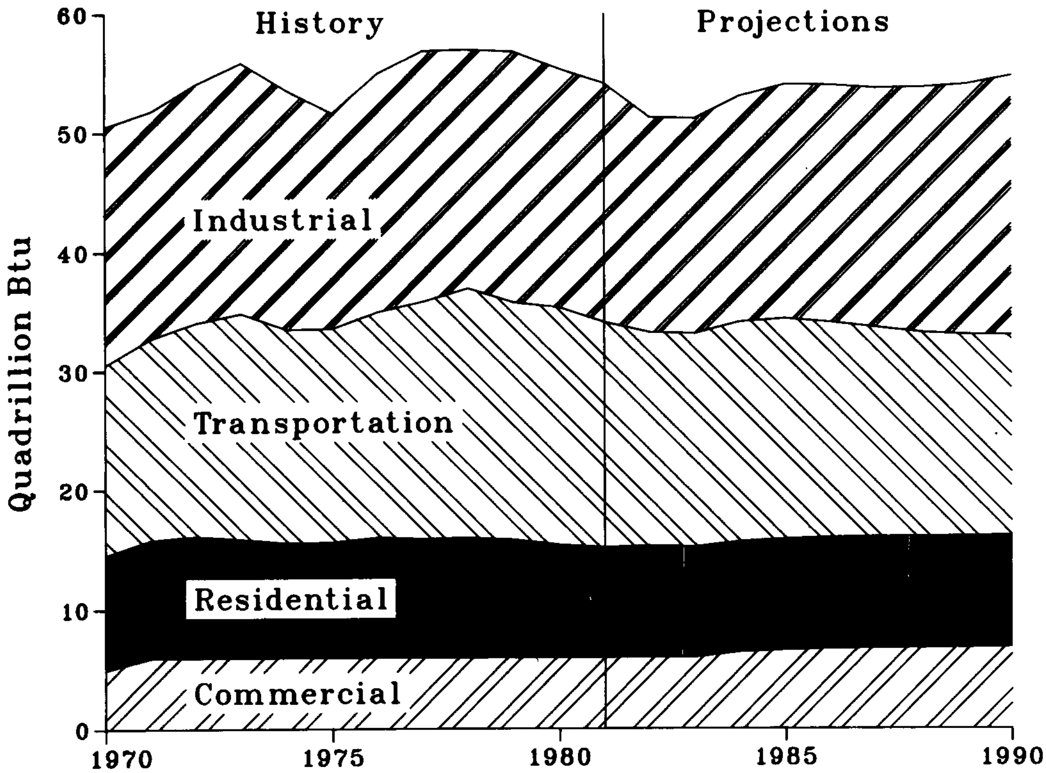
A similar approach is followed with respect to proposed changes in the Clean Air Act which would require retrofitting of existing powerplant to meet new emissions standards. The projections contained here assume that the current standards will be enforced. The projections would change in response to new requirements.

Two significant changes to the tax code are included in the projections presented in this chapter. The macroeconomic assumptions include the third of the reductions in personal income tax rates scheduled in the Economic Recovery Act of 1981, as well as the tax bracket indexation specified by that law. The effects of increased taxes on transportation fuel schedules to go into effect in April 1983 under the terms of the Surface Transportation Assistance Act of 1982 (P.L. 97-424) are also included.

End-Use Consumption

Energy consumption in the end-use sectors (residential, commercial, transportation, and industrial) is shown in Figure 10 and Appendix Table A.1.3. Dramatic changes in energy consumption occurred between 1973 and 1975 and after 1979, as large energy price increases led domestic consumers to use less energy. Because population has increased more

Figure 10. Energy Consumption by Industrial, Transportation, Residential, and Commercial Sectors, Midprice Scenario, 1970 to 1990 (Quadrillion Btu)



Source: Historical data: Energy Information Administration, State Energy Data Report, 1960 through 1980, DOE/EIA-0214(80) (Washington, D.C., 1982), and Monthly Energy Review, DOE/EIA-0035(83/2) (Washington, D.C., 1983).

rapidly than energy consumption since 1973, per capita use had declined by 14 percent by 1982. To some degree the recent decline in industrial activity contributed to the decrease.

Although energy use on a per capita basis is projected to continue to decline, total energy use is projected to rise modestly through 1990. In the early years, growth is based on economic recovery and relatively stable world oil prices; in the later years, modest growth in personal income, industrial activity, population, and diminished conservation activities contribute to the increase in total energy use.

The shares of total energy consumed by each sector are projected to change somewhat over the decade. In particular, the industrial sector is projected to account for a greater relative share of energy use, largely because energy inputs are used both as heat and power and as direct raw materials (e.g., petrochemical feedstocks) and because of the strong relationships between economic growth and industrial energy use.

Residential Demand

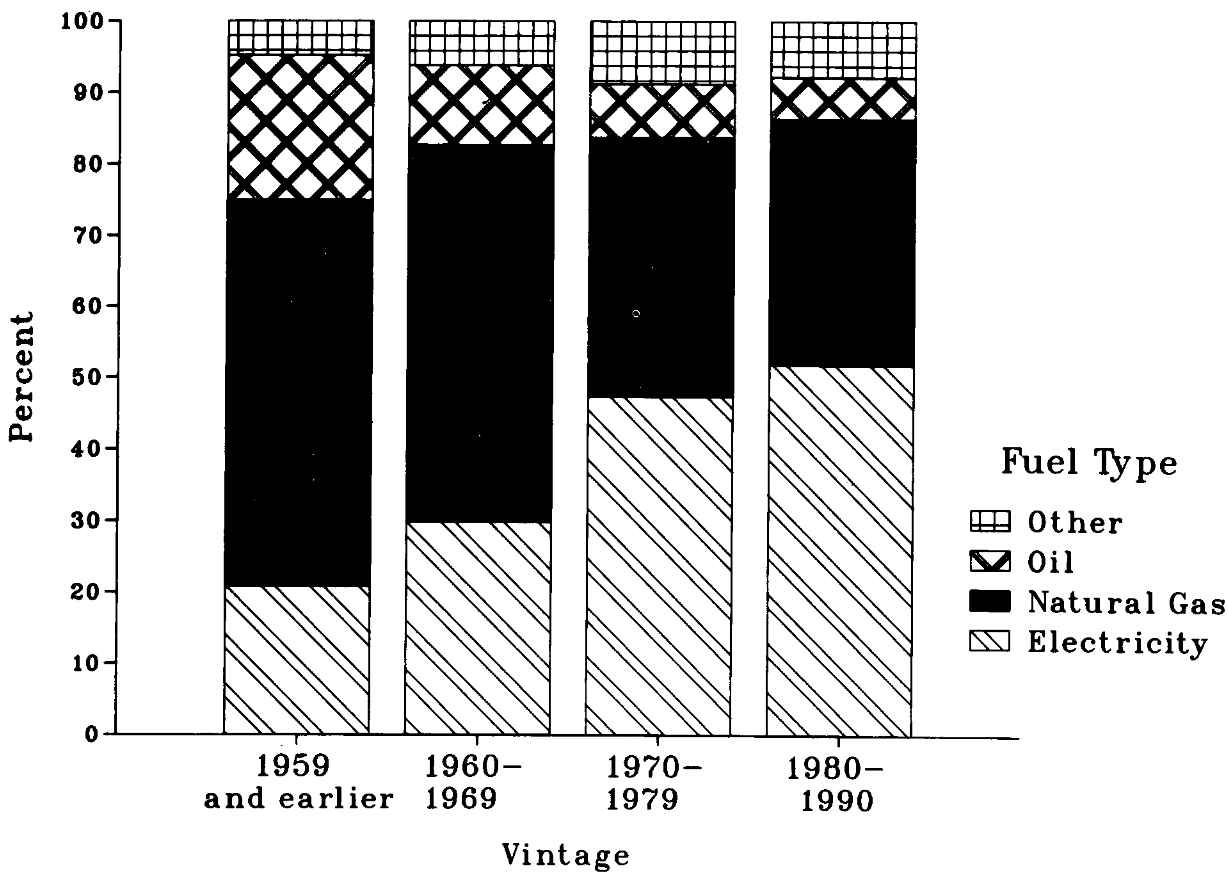
Patterns of residential energy consumption change slowly. These changes in energy consumption are largely determined by the long useful life of homes (much less than 1 percent of all homes are removed from use each year[1]) and the long lifetime of major heating equipment. Since most of the housing stock that will be present in 1990 already exists, that stock will generally reflect choices already made which were based upon prices and fuel availabilities at the time of construction (see Figure 11 and Appendix Table A.4.1).

The residential sector consisted of 80 million households in 1980 (up from 63 million in 1970).[2] These households occupied 55 million single unit structures, 21 million multi-unit structures, and 4 million mobile homes. The number of households is projected to increase to 95 million units in 1990. Of the 80 million occupied structures in 1980, 77 percent had been constructed before 1970. Of the 95 million occupied structures projected in 1990, 78 percent are projected to have been constructed before 1980.

Heating Uses. Fifty-four percent of 1980 residential energy consumption was for heating homes and 19 percent for heating water (a total of 73 percent).[3] The share of energy used for space heating is projected to decline to 49 percent by 1990 while that for water heating is projected to increase slightly to 20 percent (a total of 69 percent). The reasons for this change are varied: switching to more efficient heating fuels (using current technology); construction (and retrofitting) of more thermally efficient houses; installation of more efficient equipment; changes in energy consumption behavior such as turning back a thermostat; and continued migration of population to warmer regions requiring less space heating.

Natural gas is the major fuel consumed in the residential sector because it has been the fuel of choice for space heating. In 1980, residential natural gas consumption was 4.9 quadrillion Btu, which was 52 percent of total residential energy use. About 66 percent of all residential natural

Figure 11. Projected 1990 Residential Energy Consumption by Fuel and Vintage of Structure, Midprice Scenario (Percent vs. Vintage)



gas in 1980 was used for space heating and, in turn, 64 percent of all space heating was performed with natural gas. The choice of natural gas for space heating has been due to its low relative cost, ease of use, clean burning, and general availability (with some exceptions). An additional 22 percent of natural gas was used for water heating and, in turn, it accounted for 61 percent of water heating consumption.

Natural gas is projected to remain the major residential fuel consumed through 1990. By 1990 the level of natural gas consumption is projected to fall to 4.3 quadrillion Btu and its share is projected to decline to 47 percent (see Figure 12). There are several reasons for this decline. Natural gas, as the dominant fuel in space heating, declines in use more rapidly than other fuels since space heating declines in intensity of use. Natural gas use also declines because of an erosion in its price advantage. Although it remains the lowest priced fuel, its price is forecasted to increase from about 25 percent of the price of electricity in 1980 to about 46 percent in 1990 (see Figure 13). These price changes induce changes in consumer conservation behavior along with increased structure and equipment efficiency.

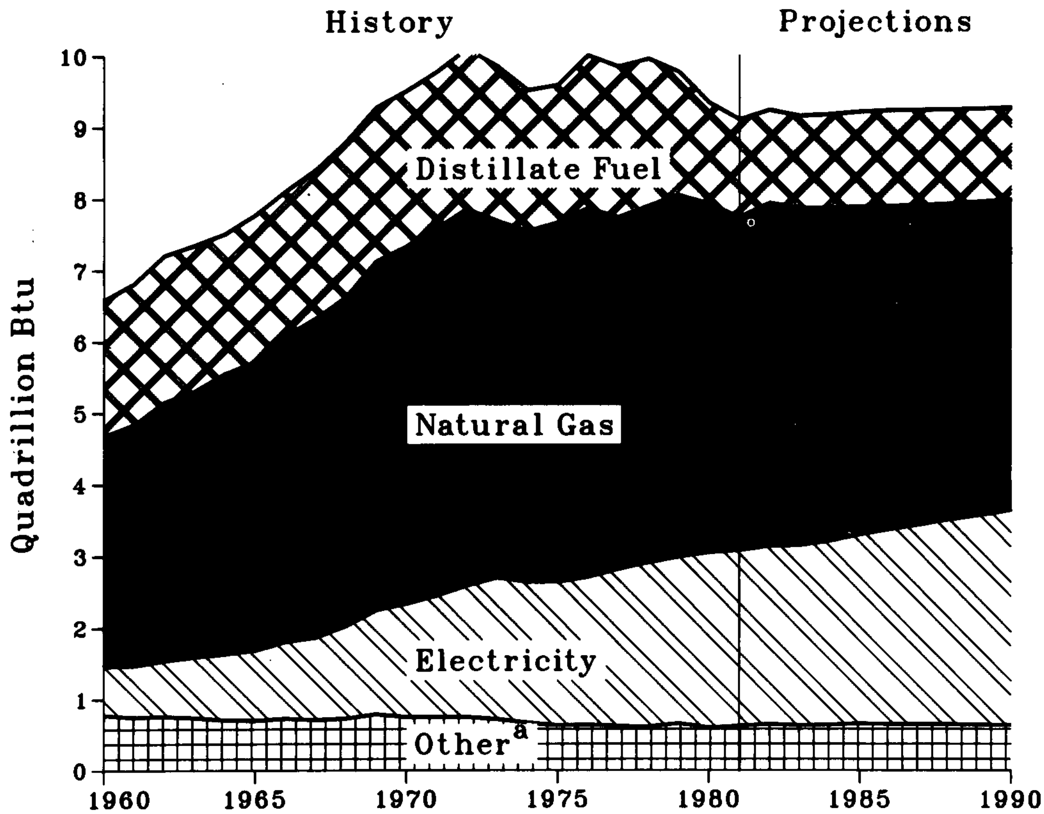
In 1980, residential oil consumption was 1.4 quadrillion Btu, or only 15 percent of total residential energy use. Oil was used largely for space heating in 1980 (83 percent of all oil use) but it was only 23 percent of space heating energy use. Oil consumption in the residential sector decreases slightly over the forecast period, declining to 1.3 quadrillion Btu in 1990 or 14 percent of residential consumption.

Other Uses. Twenty-seven percent of 1980 residential energy consumption was used for nonheating uses such as air conditioning, cooking, lighting, refrigeration, washing, drying, and various other primarily electricity-using services. The share of energy used for nonheating uses is projected to increase to 31 percent by 1990.

Electricity consumption is second to natural gas in the residential sector, despite its relatively unimportant role in space heating--only about 4 percent of residential space heating fuel consumption in 1980 was with electricity. In 1980, residential electricity consumption was 2.4 quadrillion Btu, or 26 percent of total residential energy use. The importance of electricity is due to its role in uses other than space heating and water heating, where alternative fuels often cannot easily be substituted. About 80 percent of all residential electricity in 1980 was used for nonheating uses and, in turn, about 77 percent of energy consumed for nonheating uses was performed with electricity.

Electricity consumption increases over the projection period to 3.0 quadrillion Btu in 1990, about 32 percent of residential energy consumption. This increase in electricity use is due to the dominance of electricity in the nonheating services, increasingly used in both new and existing housing. Also, since electricity is such a small part of space and water heating, widespread conservation in these uses has little impact on electricity consumption. (The share of electricity in space heating remains small--it is projected to increase from 4 percent in 1980 to about 7 percent in 1990.)

Figure 12. Residential Fuel Consumption, Midprice Scenario, 1960 to 1990 (Quadrillion Btu)

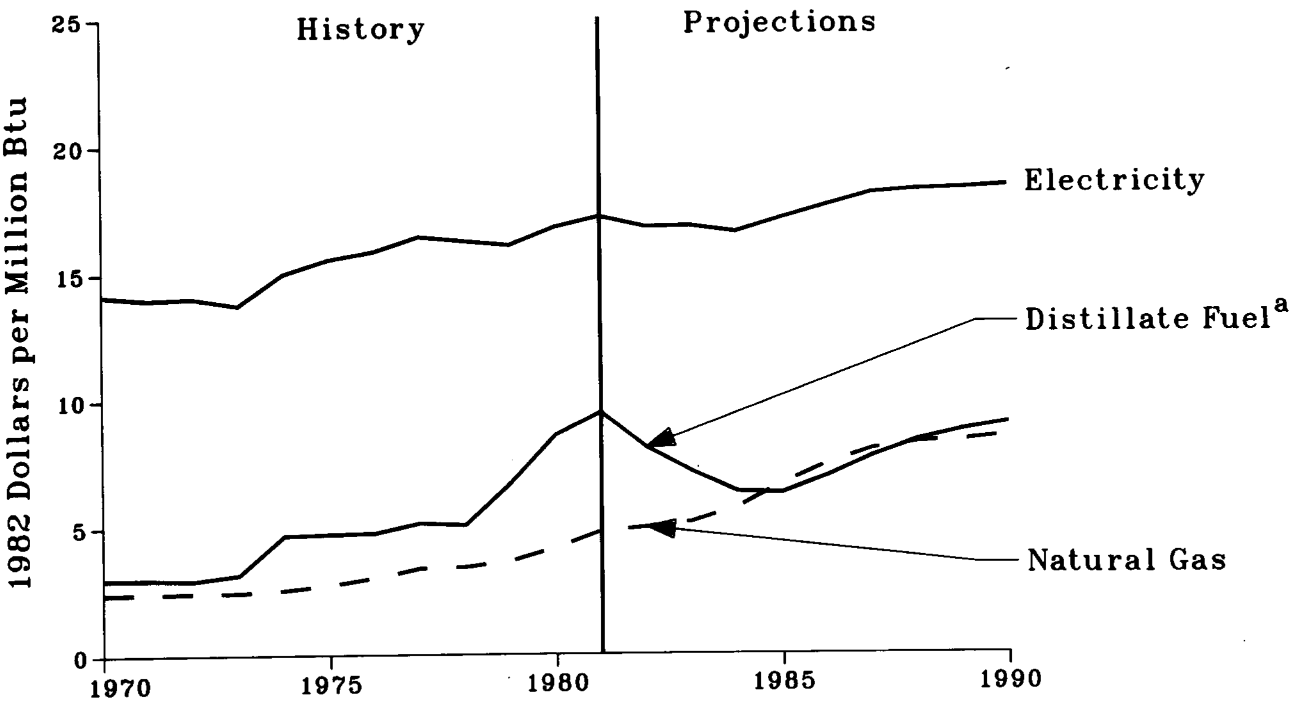


[a]Other includes liquid gas and coal consumption.

Note: Residential consumption of wood is not shown.

Source: Historical data: Energy Information Administration, State Energy Data Report, 1960 through 1980, DOE/EIA-0214(80) (Washington, D.C., 1982), and Estimates of U.S. Wood Energy Consumption from 1949 to 1981, DOE/EIA-0314 (Washington, D.C., 1982).

Figure 13. Average Residential Energy Prices, Midprice Scenario, 1970 to 1990 (1982 Dollars per Million Btu)



[a]Weighted average price of distillate fuel and kerosene.

Note: Weights used through 1980 are volumes of consumption as reported in Energy Information Administration, State Energy Data Report, 1960 through 1980, DOE/EIA-0214(80) (Washington, D.C., 1982).

Source: Historical data: Energy Information Administration, State Energy Price System, Volume 1: Overview and Technical Documentation, DOE/NBB-0029(1/2) (Washington, D.C., 1982).

Wood Consumption

Since most wood is not a marketed fuel with a meaningful price, wood is not included in the residential consumption totals and averages discussed. Wood energy consumption in the residential sector has dramatically increased in the last few years. Wood has been used increasingly to supplement and, in some cases, to substitute for other fuels in space heating, due to the rapid increase in prices of conventional fuels. Wood consumption had been declining steadily until 1973 when it was 0.3 quadrillion Btu. Since 1973 its consumption has increased to 0.8 quadrillion Btu in 1980.[6] Wood consumption is projected to increase to 1.2 quadrillion Btu in 1990.

Overall Use. The average household in 1980 consumed 117 million Btu of energy in all activities. This average energy use has declined in each year since 1976 when it was 136 million Btu per household.[4] Increases in average energy use in earlier periods were due to larger average house size, falling or steady real fuel prices, and increased use of various energy consuming services in the household. The average energy use per household is projected to fall to 98 million Btu per household in 1990 for an average annual decrease (from 1980) of 1.8 percent. The reasons for this decrease are varied, but the overriding cause is the substantial increase in real energy prices over the projection period. Residential fuel prices are projected to increase from an average of $8.33 in 1980 to $11.74 in 1990 (in 1982 dollars per million Btu), for an average annual increase of 3.5 percent. These price increases induce changes which include more efficient houses, more efficient equipment, and household conservation.

Regional differences can have a strong impact on residential energy use. Some major regional effects on residential energy use include generally higher prices in the Northeast, migration of populations to the Southwest, and greater average space heating loads in the Northeast. In 1980, the average energy use for all residential uses was 128 million Btu per household in the Northeast Census region, 154 million Btu in North Central, 95 million Btu in the South, and 90 million Btu in the West.

Commercial Energy Demand

Like the residential sector, 1990 energy use by the commercial sector will be largely determined by the stock of buildings already in existence. These buildings will account for roughly 70 percent of commercial energy use in 1990. Commercial energy consumption has grown more rapidly than that of any other sector and reflects the trend toward the increasing service orientation of the economy. Total energy use is projected to

New Technologies in Residential and Commercial Buildings

The equipment used to convert energy into various services constantly undergoes substantial improvement. In recent years, however, these "new technologies" have been emerging rapidly and usually with a particular purpose: to increase efficiency in energy use. The major driving force behind emerging technologies over the last several years (and into the future) has been rapidly increasing real energy prices. In many cases, the introduction of these new technologies leads to dramatic energy savings.

In the residential sector, there are a large number of continuing innovations, but those centering around space heating entertain the most potential for fuel conservation. The electric heat pump has been an established technology for several years and was installed in 24 percent of all newly constructed single-family homes in 1980. This technology can provide substantial savings over conventional resistance electric heating in moderate climates (savings on the order of 25 to 50 percent). The future promises even more significant advance on this technology with "water-to-air" transfer heat pumps, advanced heat pumps (such as variable-speed heat pumps with a potential for 15 to 25 percent further energy savings), and thermally activated heat pumps using natural gas (up to 40 percent energy savings). Recently entering the residential market have been pulse combustion furnaces for oil and natural gas. These natural gas furnaces claim conversion efficiency ratings of 90 to 95 percent (compared to a 60 to 65 percent efficiency for a conventional furnace). Another technology for gas furnaces, claiming similar efficiencies, extracts exhaust heat for space heating. These furnaces have substantially higher capital costs, but should provide significant savings on operating costs.

In the commercial sector, the range of new technologies available depends on building size. In small commercial establishments, which are the majority of commercial buildings, the relevant new technologies will be similar to those available to the residential sector. For larger commercial buildings, such as offices, shopping malls, and institutions, energy management systems and cogeneration are alternatives that can reduce energy consumption and improve efficiency. Energy management systems already enjoy wide use among larger establishments. With these systems, automated mechanisms direct energy services to the various users in large buildings in efficient patterns. Cogeneration is an attractive alternative for buildings that use steam for space heating. In this process, what would normally be waste heat is used to provide further energy services. While cogeneration can achieve substantial energy savings, its penetration will likely be limited because of its highly capital-intensive nature.

increase by nearly 17 percent from 1980 to 1990. During the same period, energy use per square foot is expected to decline while electricity replaces natural gas as the primary fuel. These and other trends in energy use can be seen in Figure 14 and Appendix Table A.4.2.

By 1990, commercial energy demand is forecast to reach 6.9 quadrillion Btu, an average annual rate of increase of 1.5 percent throughout the 1980's. Over the same period, the real prices of the major fuels used by this sector increase steadily. However, the continuing growth of commercial floorspace at 2.6 percent annually overcomes what would otherwise be a trend of decreasing total energy use.

Electricity consumption is forecast to increase from 1.9 quadrillion Btu[6] in 1980 to 2.8 quadrillion Btu in 1990. This robust growth in electricity usage can be attributed to several factors, some of which have parallels in the residential sector.

An important reason for the strong performance of electricity has to do with the projected growth of floorspace by type of building. Over the next decade, roughly 70 percent of all floorspace growth is forecast to occur in the office and retail/wholesale categories. The historical importance of these two categories is witnessed by Figure 15, which shows that they accounted for 60 percent of total energy demand in 1979. These categories were also relatively intensive users of electricity in 1979, as illustrated in Figure 16, and this leads to increasing utilization of electricity for the entire commercial sector. Other reasons for electricity's rapid growth include:

- Most floorspace growth is concentrated in the South and West Census Regions which rely heavily on electricity.

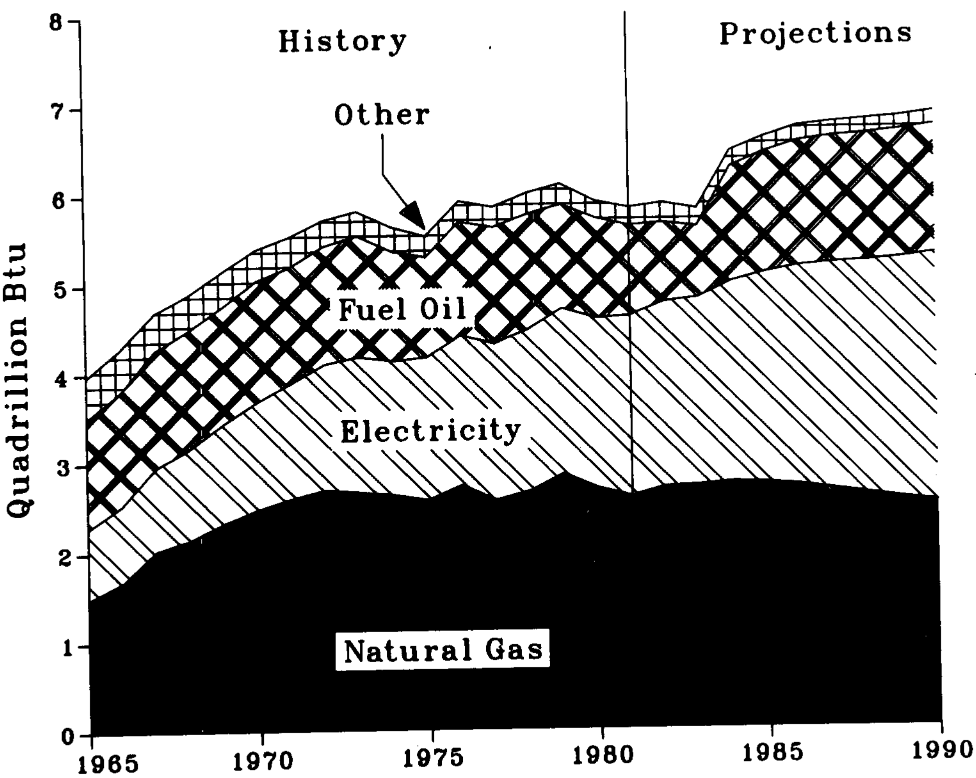
- Natural gas and fuel oil are used mainly for space heating, which accounts for a declining proportion of energy use.

- New end uses for electricity will continue to be developed.

- Electricity prices are projected to increase less rapidly than the prices of other fuels, although they remain higher.

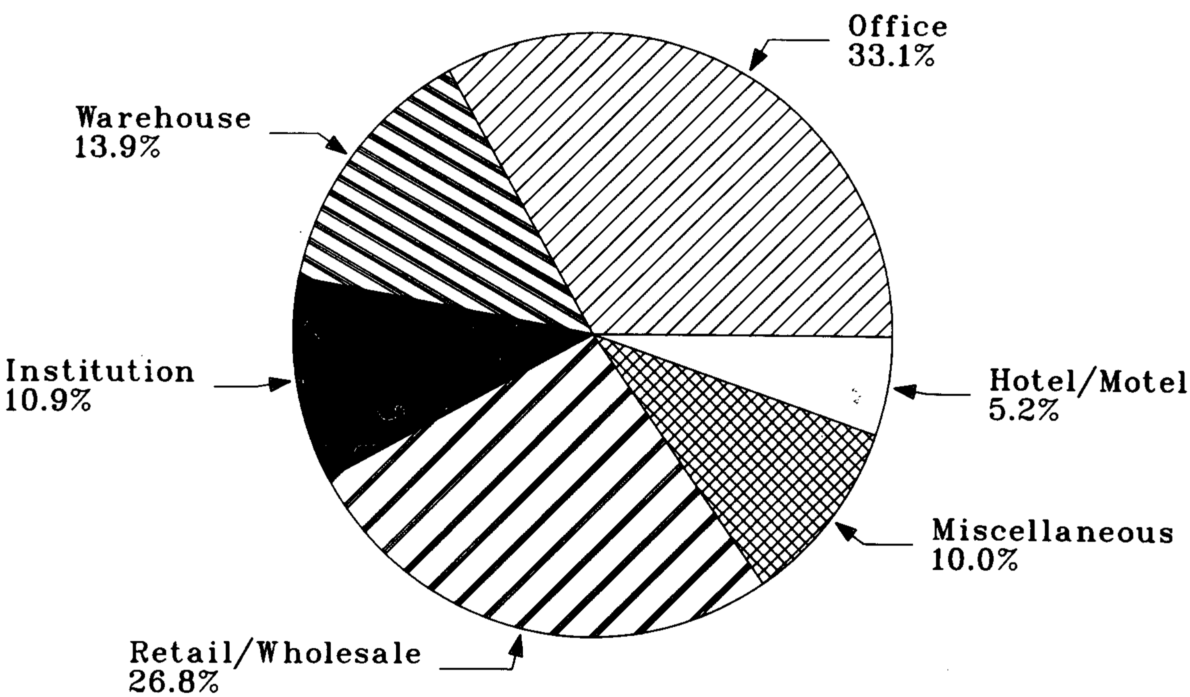
From 1960 to 1972 commercial natural gas consumption increased steadily. During the 1960's, it grew at an average annual rate of nearly 9 percent a year. However, in the 1970's, this rate dropped to .8 percent annually and consumption no longer grew steadily. From 1973 to 1980, natural gas consumption fluctuated with the general level of economic activity. During the 1980's, natural gas consumption is forecast to decline slightly. While this decline represents a reversal of the past growth trend, it occurs during a period when commercial natural gas prices are projected to rise in excess of 8 percent annually. The price of natural gas increases substantially relative to both electricity and fuel oil, decreasing use. Finally, distillate and residual fuel oil usage is

Figure 14. Total Commercial Energy Use By Fuel, Midprice Scenario, 1965 to 1990 (Quadrillion Btu)



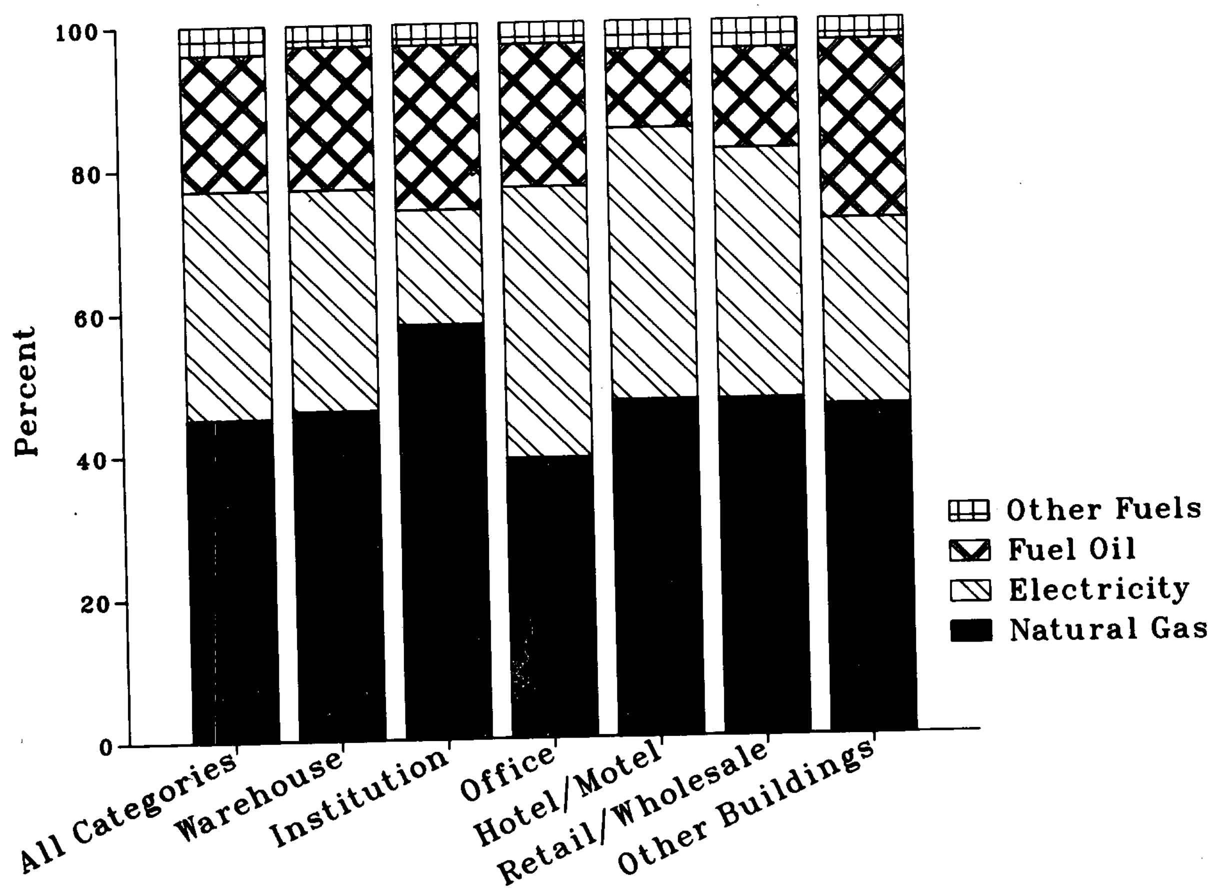
Source: Historical data: Energy Information Administration, State Energy Data Report, 1960 through 1980, DOE/EIA-0214(80) (Washington, D.C., 1982), and Monthly Energy Review, DOE/EIA-0035(83/2) (Washington, D.C., 1983).

Figure 15. Percentage of Total Energy Consumed by Nonresidential Building Category in 1979 (Percent)



Source: Historical data: Estimated by the Energy Information Administration, from a computer tape of disaggregated data underlying its publication Nonresidential Buildings Energy Consumption Survey: Fuel Characteristics and Conservation Practices, DOE/EIA-0278 (Washington, D.C., 1981).

Figure 16. Percentage of Energy Consumption by Fuel and Nonresidential Building Category in 1979 (Percent)



Source: Historical data: Estimated by the Energy Information Administration, from a computer tape of disaggregated data underlying its publication Nonresidential Buildings Energy Consumption Survey: Fuel Characteristics and Conservation Practices, DOE/EIA-0278 (Washington, D.C., 1981).

forecast to increase throughout the 1980's. In 1980, demand for fuel oil was 1.1 quadrillion Btu. By 1990, it is projected to rise to 1.4 quadrillion Btu. The real price of fuel oil increases at only 0.4 percent annually during the 1980's. Increased efficiency results in a 0.1 percent decline in fuel oil consumption per square foot over the projection period. This effect is mitigated by continuing floorspace growth resulting in an increasing level of fuel oil use over the decade.

Industrial Demand

The industrial sector[7] is the largest end-use consumer of energy in the economy, using fuels both for heat and power and as a raw material. In 1980, this sector accounted for 35 percent of the energy consumed in the United States by end-use sectors.

Energy plays a more important role with some classes of manufacturers than with others, and both the cost incentives and the potential for energy savings vary accordingly. Many industrial plants were able to obtain substantial increases in energy efficiency (measured by the decrease in the amount of purchased energy per unit of output) quickly and at relatively low cost by such devices as employee energy awareness programs, control of plant lighting and heating, equipment insulation, and improved maintenance of steam systems. Much of the early increase in energy efficiency after the 1974 to 1975 price rise can be attributed to such programs.

The ability of the manufacturing industries to offset future fuel price rises by additional reductions in energy consumption depends, at least in part, upon the technical sophistication of the industry and upon the availability and cost of capital for equipment replacement and upgrading. Further decreases in a plant's energy use, after initial conservation efforts, usually entail some modification of the capital equipment, such as reconfiguration of kilns and ovens or installation of more efficient boilers and heat recovery systems. Although such changes can be effective in reducing energy costs, their implementation is in competition with other plant needs for the required capital. Thus, actions to upgrade energy efficiency are sometimes deferred until the occurrence of other capital expenditures or await the scheduled replacement of an obsolescent process unit with a more energy efficient one. That such a delayed response to energy cost can be significant is shown by analysis of the industrial energy efficiency data reported by corporations in compliance with the National Energy Conservation Policy Act.[8] It was observed that those manufacturing industries that exhibited a comparatively high increase in energy efficiency during the 1972 to 1979 interval tended also be those industries with a comparatively high post-1973 change in capital stock.

The bulk of manufacturers' energy consumption is concentrated in five broad groups of manufacturers: Chemicals and Allied Products (Standard Industrial Code (SIC) 28); Primary Metal Industries (SIC 33); Paper and Allied Products (SIC 26); Stone, Clay, and Glass Products (SIC 32); and

Food and Kindred Products (SIC 20). In 1980, manufacturers in these five SIC groups consume about 65 percent of total industrial purchased energy for heat and power and essentially all fuels used as raw materials. Consumption for these uses is shown in Figure 17.

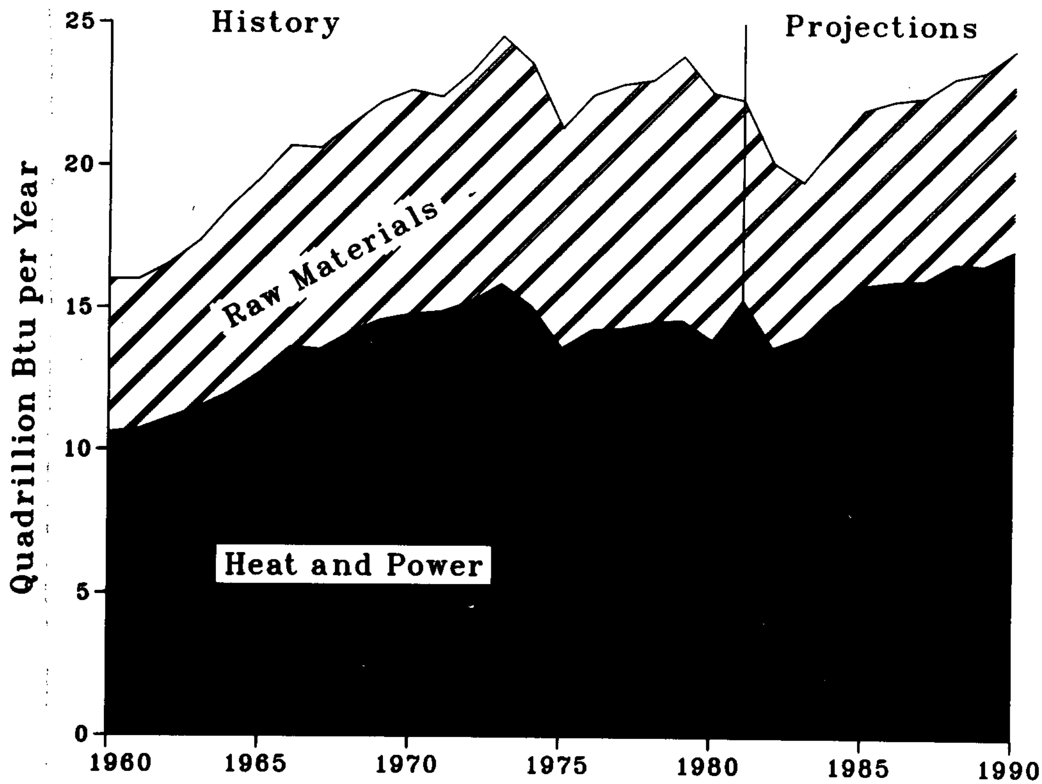
The major industrial energy consumers differed considerably in their ability to reduce energy consumption after the fuel shortages and price shocks of the mid-1970's. Two of these groups (Chemicals and Paper) were comparatively successful in reducing the amounts of purchased energy needed to manufacture their products. The chemical industry (characterized by relatively high investment rates, rapid equipment replacement, and plant turnover) experienced frequent opportunities to upgrade process equipment and retrofit plants. By 1979, the required number of Btu of purchased energy per unit of output was less than 80 percent of the energy requirement of 1972. The paper industry reduced its purchased fuel needs by a comparable percentage, but in the case of this industry a major part of the reduction was accomplished by a trend toward greater use of byproduct and nonpurchased fuels. This trend began before the oil price shocks of the 1970's. The energy obtained by the paper industry from consumption of waste wood, bark, and pulping liquor grew from 41 percent of total energy use in 1972 to 45 percent in 1976 and 48 percent in 1980. In 1979 and 1980, the chemical industry's consumption of nonpurchased fuels, in thermal units, has averaged 23 percent of purchased fuels for heat and power.

The iron and steel industry (SIC-331) provides a contrast to the above. This industry's long-standing difficulties in maintaining profitability and capacity utilization have reduced the availability of capital for replacement of inefficient production equipment. As a result of the low-asset turnover rate, the existing equipment tends to be old and comparatively energy inefficient. Most large energy conservation opportunities in the iron and steel industry involve capital-intensive modernization of facilities (for example, replacement of open hearth furnaces and use of continuous casting), and, until the industry's capital-formation problems are resolved, increases in energy efficiency can be expected to remain modest.

The choice of fuel has responded very strongly to relative prices. Since 1974, natural gas has replaced much of the oil used both in boilers and in other process heat applications. Although much of this change was due to a continuation of long-term trends, shifts in the relative prices of oil and gas had a large effect on their relative market shares. Electricity, like gas, continued to increase its market share throughout the seventies; most of this increase was due to long-term technological trends.

Although the late 1970's witnessed the leveling off of a long historical decline in manufacturers' use of coal for heat and power (from 129 million tons in 1951 to 61 million tons in 1977), coal has shown relatively little penetration of the industrial uses now dominated by oil and gas. One reason for the failure of coal to increase its share of manufacturing energy has been the sluggish performance of the iron and steel industry, one of the major consumers of coal for heat and power uses. Projections

Figure 17. Industrial Energy Consumption by End Use, Midprice Scenario, 1960 to 1990 (Quadrillion Btu)



Note: Heat and Power includes refinery fuel use. Raw Materials includes natural gas feedstocks, petrochemical feedstocks, oil raw materials, and metallurgical coal.

Source: Historical data: Energy Information Administration, 1981 Annual Report to Congress, Volume 2, DOE/EIA-0173(81)/2 (Washington, D.C., 1982), Coke and Coal Chemicals in 1980, DOE/EIA-0120(80) (Washington, D.C., 1981), Crude Petroleum, Petroleum Products, and Natural Gas Liquids: 1980 Final Summary, DOE/EIA-0108(80) (Washington, D.C., 1981), and Petroleum Supply Monthly, DOE/EIA-0109(82/3 to 83/2) (Washington D.C., 1982 and 1983).

of future industrial coal demand, then, will depend on the health of this key industry. In general, the rate of coal use has been less than expected on the basis of its price advantage over oil and natural gas.

Projections. Figure 18 and Appendix Table A.4.3 show the midprice projections for the consumption of various fuels through 1990 in the industrial sector. Total energy consumption grows at .7 percent per year, largely because of recovery and economic growth. Electricity use grows at a rate of 3.2 percent annually. Total coal use increases at a rate of approximately 1.3 percent annually, due to offsetting trends in heat and power use and coking coal use.

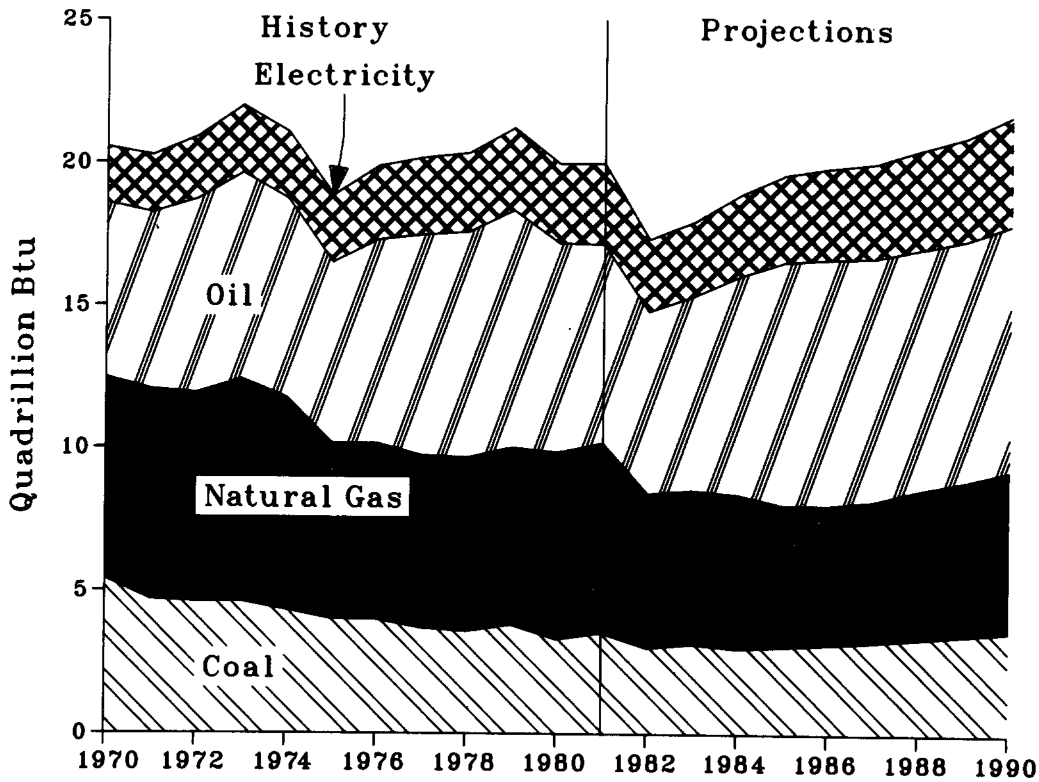
The large projected increases in gas prices lead to shifts in consumption from gas to oil. However, when oil prices increase in the late 1980's, the share of gas increases. Coal (in heat and power uses) grows more rapidly than any other fuel, because it remains cheaper than oil and gas as a fuel for boilers. In these applications, coal grows at an average annual rate of 5.0 percent a year. The projected decline in coking coal use, approximately 2.6 percent a year, reflects technological trends in steel making, increased use of electric arc furnaces, continuous casting, and a projected slower rate of steel output growth (reflecting lighter weight steel and increased competition from other products). Petrochemical feedstocks are projected to increase at a rate of 1.7 percent a year due to the availability of cheaper feedstocks overseas, but output mix changes resulting from a projected shift from bulk to speciality chemicals may also play a role.[10]

Growth in Electricity Demand in the Industrial Sector. The forecast of growth in industrial electricity used in the midprice case reflects both a recovery of the economy and a positive trend in industrial consumption of electric power. As the economic recovery proceeds, manufacturing activity is projected to expand more rapidly than the general economy, increasing the rate of consumption of inputs into the industrial sector. In addition, because heavy industrial electricity uses have encountered disproportionally large declines in output levels as a result of the recession, growth in electricity consumption during the recovery is high.

The trend toward increased electrification of industrial processes has been observed over many years. The rate at which electricity can be economically substituted for other energy sources in industrial processes changes with both technology and relative energy prices. In this forecast, this trend is assumed to replicate the experience of the economy during the 1963 to 1973 interval, a period of similar expansion of industrial activity. As a result of this combination of forces, growth in industrial electricity consumption exceeds the projected growth in the overall economy.

Sources of Uncertainty. Economic growth, productivity growth, and the availability of capital through 1990 are central to these projections and are uncertain. Imports are also a major source of uncertainty. If the U.S. imports more steel, metal products, and petrochemicals, domestic energy consumption in these industries will grow more slowly.

Figure 18. Industrial Energy Use[a] by Fuel, Midprice Scenario, 1970 to 1990 (Quadrillion Btu)



[a]Excludes refinery fuel use.

Source: Historical data: Energy Information Administration, State Energy Data Report, 1960 through 1980, DOE/EIA-0214(80) (Washington, D.C., 1982), and Monthly Energy Review, DOE/EIA-0035(83/2) (Washington, D.C., 1983).

Historical energy consumption trends, which furnish the basis for the projections of future consumption, might also be changed by technical innovation or by accelerated reconfiguration of equipment in response to foreign competition. Thus, for example, the introduction into iron and steel production of the direct "coal reduction" technology (which permits replacement of metallurgical coal by relatively inexpensive steam coal) might shift energy consumption from electric furnaces towards coal.[11]

There is substantial uncertainty about the amount of electricity needed to power the U.S. industrial sector throughout the projection period. This uncertainty stems from two different causes. First, cycles in the overall level of economic activity make it difficult to predict accurately which industrial activities will experience the most growth through 1990. Each type of activity uses a particular mix of energy and energy intensity levels also differ across industries. Changes in the growth of individual industrial activities will change the overall demand for energy and electricity.

The second cause of uncertainty in the industrial electricity demand projections can be characterized as uncertainty with respect to the availability and rate of implementation of energy conservation measures by industrial concerns. Because trend variables are used in forecasting to capture these changes, an alternative specification of the rate at which they can be expected to occur was developed to show the implications of variations in these trends for industrial energy consumption. A "Low Industrial Electricity Demand" sensitivity case shows industrial electricity consumption may be as much as 300 trillion Btu's lower in 1990. This would imply an alternative rate of growth in electricity of 4.2 percent between 1982 and 1990. The full results of this and other sensitivity analyses may be found in the Appendix.

Transportation Demand

In the transportation sector, greater energy efficiency is being built into the capital stock as more fuel-efficient cars, trucks, and aircraft join the national fleets and replace older equipment. A rapid increase in average fleet efficiency is expected through 1990 over a wide range of fuel prices. A number of factors (current and past high fuel prices, legislated design standards, general technical progress, manufacturers' production plans, and consumer taste changes) have resulted in a situation that almost guarantees that new-vehicle fuel efficiency will continue to surpass fleet fuel efficiency. Consequently, total transportation fuel use is projected to decline by 1.5 percent annually between 1980 and 1990.

Light Vehicles. Automobiles and light-duty trucks (less than 8,500 lbs. gross vehicle weight) offer the most dramatic example of the momentum toward increased fuel efficiency. Projected new-vehicle miles per gallon (mpg) in each year is considerably above the projected fleet average in the same years, thus promoting higher fleet fuel efficiency through the forecast period. Even if manufacturer average mpg performance should fall below the mandated legislative standard in any given year or even below the performance of the previous year, mpg will almost certainly exceed the mpg of scrapped units by a wide margin. Higher fuel prices would be expected to induce some increase in fleet mpg should they occur, but this induced increase is small compared to the trend projected to push fleet mpg up about 5.1 percent anually over the 1983 to 1990 period.

Total fuel consumed by light vehicles (or any class of vehicles) can be factored into vehicle-miles traveled times average gallons per mile (the reciprocal of average mpg). Vehicle-miles traveled are forecasted to rise, along with the economy, by 2.3 percent annually from 1980 to 1990 (midprice scenario). If average fleet fuel efficiency remains constant, total fuel consumption would increase by the same percentage. In fact, light-vehicle fuel consumption is projected to decline from 98.6 to 79.5 million gallons. The effects of increased fuel efficiency are larger than the effects of increased driving induced by increased economic activity.

The major sources of increased fleet fuel efficiency in the period up to 1990 will be the familiar ones that have increased new-car fuel economy in the recent past: improved engine efficiency, reduced vehicle weight, downsizing, lowered average vehicle power, and diesel engine use. As the fleet turns over during the 1980's, these features will progressively be incorporated in the fleet. Fleet average mpg, however, is not projected to reach the 1982 new-vehicle average mpg until 1989 under the midprice scenario.

New-car mpg is projected to improve over the period due to continued improvements currently incorporated in manufacturers' production plans. Depending somewhat on consumer response, these plans will govern auto technology through 1987. In the 1988 to 1990 period, electronic combustion control and the use of advanced light-weight materials in major vehicle components are likely to become economic for manufacturers to introduce into large-scale production. Rapid introduction of diesel vehicles in the fleet is not projected, nor are turbochargers expected to be a major feature of moderately priced diesel vehicles in the pre-1990 period.

It is always possible that manufacturers may cancel previously programmed new initiatives. A number of such cancellations have been announced in recent months. However, the reverse action is not possible. Manufacturers are not generally able to develop major new production plans, however, without a lead time of 4 or 5 years.

Heavy Trucks. Projected heavy truck fuel consumption parallels the light vehicles' fuel use. An increase in fuel efficiency (arising in part from increased diesel engine use) of 3.5 percent annually is projected from 1982 to 1990. Variations in the amount of driving, in turn dependent upon the demand for goods transportation, is a substantial factor also. The demand for transportation services is projected to grow with the level of economic activity through the 1980's. Heavy truck fuel consumption is projected to remain nearly constant through 1990.

Aircraft. In the airline industry, average fuel consumption per passenger-mile is affected not only by technical aircraft efficiency but by the economic choices airlines make about flight frequency, load factor, seating density, and relative utilization rates of different-size aircraft. Even fleet composition can be altered rapidly due to an active international secondary market in aircraft and due to the rapid expansion of the industry in all but recession periods.

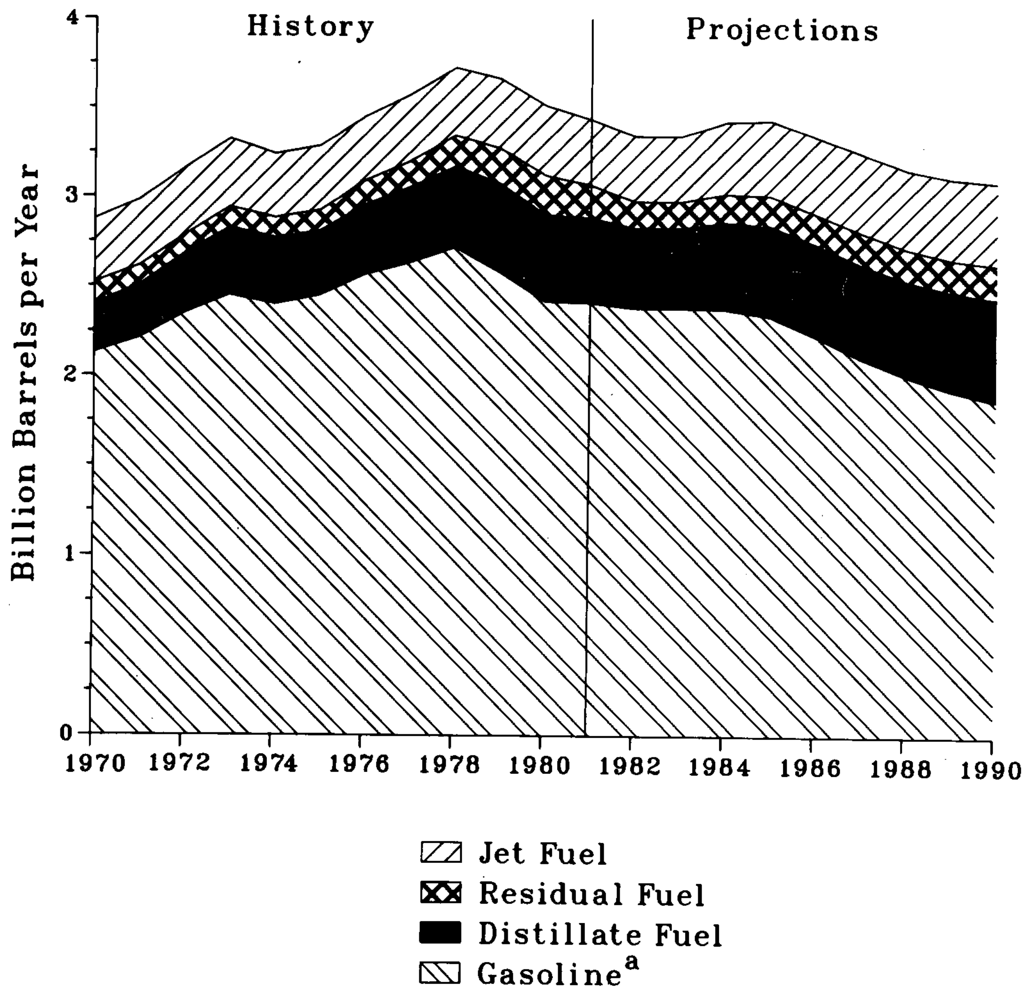
The experience of the 1970's illustrates the complexity of airline fuel economics. Airlines reduced fuel consumption per passenger-mile so rapidly in response to higher fuel prices that jet fuel consumption was no higher in 1980 than in 1973 despite an increase in activity (revenue passenger-miles) of 57 percent over the period.[12] Unlike highway transport, however, the airlines achieved this primarily by increasing operating efficiency, that is, by increasing load factor, seating density, and average flight size. They were able to do so by altering flight scheduling, aircraft assignment, and fleet mix. A Department of Energy study estimates that technical efficiency improvements (including aircraft design, taxiing practices, and angle of descent) were responsible for only 15 percent of fuel-efficiency improvement in the 1973 to 1980 period.[13]

The 1990 forecast is for substantial increase in airline activity (revenue passenger-miles increase by 4.6 percent annually percent from 1980) and for further increases in load factor and average flight size. Consequently, jet fuel consumption increases at an average annual rate of 2.4 percent from 1980 to 1990.

Total Transportation Fuel Consumption. Figure 19 and Appendix Table A.4.4 present the forecasts of total transportation fuel consumption for the midprice case. Total gasoline consumption, primarily used in light vehicles, is forecast to decline by 22 percent from 1982 to 1990. At the same time, increased economic activity and growth in the stock of diesel cars and trucks lead to a 3.2 percent average annual rate of increase in diesel fuel.

Residual fuel oil, primarily used in marine transportation (i.e., as ships bunker fuel), also increases because of the general growth of the economy over time, hence increased demand for transportation services. Between 1982 and 1990, transportation fuel demand declines at an average annual rate of .8 percent.

Figure 19. Transportation Petroleum Use, Midprice Scenario, 1970 to 1990 (Billion Barrels per Year)



[a]Motor and aviation gasoline.

Note: Transportation use of liquified petroleum gases does not exceed 0.01 billion barrels per year and is not shown in the figure.

Source: Historical data: Energy Information Administration, State Energy Data Report, 1960 through 1980, DOE/EIA-0214(80) (Washington, D.C., 1982), and Monthly Energy Review, DOE/EIA-0035(83/2) (Washington, D.C., 1983).

Electric Utilities

Electricity demand in the United States has grown slowly since the oil embargo in 1973. Since 1979, the annual growth rate has remained below 2 percent[14] and has declined steadily, whereas the pre-embargo growth rate averaged about 7 percent per year.[15] During 1982, domestic electricity demand actually declined by about 3 percent, resulting in the first absolute decrease in generation since 1945.

The current decline in domestic electricity generation resulted from a decrease in industrial electricity demand that was significant enough to lower overall electricity consumption despite slight increases in residential and commercial usage (see Figure 20). The overall departure from the pre-embargo demand growth is due, in large part, to rising fossil fuel prices. Since 1973, the prices of coal, residual fuel oil, and natural gas delivered to steam plants have more than doubled, tripled, and quadrupled, respectively.[16] On a Btu-equivalent basis, the price of coal in 1982 was about one-third the price of residual oil and one-half the price of natural gas.

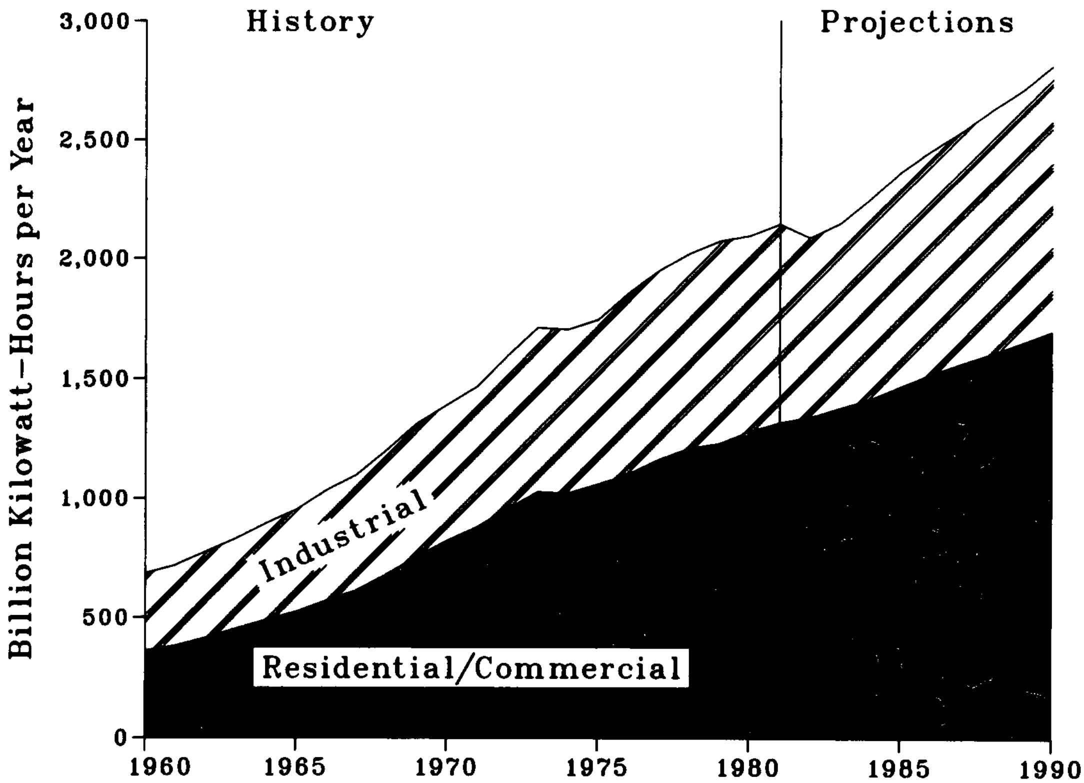
In the midprice case, electricity demand is projected to grow at an average annual rate of about 3 percent between 1980 and 1990. Based on this growth rate, the incremental demand would exceed the expected production from planned capacity additions, which consist primarily of coal and nuclear plants and total 171 gigawatts between January 1, 1980, and January 1, 1990.

Earlier EIA forecasts contained more optimistic estimates of new powerplant construction. For instance, EIA's 1981 Annual Report to Congress included 187 gigawatts of new capacity during the 1980's.[17] However, many scheduled plants have been postponed or cancelled in recent years because of lower-than-anticipated electricity demand, which reduced the immediate need for additional capacity, and higher capital costs, which increased the cost of financing construction. This has a considerable effect on utility fuel consumption, particularly oil and natural gas. The impacts of low demand growth and utility financial difficulties on fuel consumption will be discussed in greater detail below.

Electric Utility Production and Fuel Consumption

In the midprice case, nuclear and coal-fired powerplants are projected to be the most prominent sources of domestic electricity supply (see Figure 21). Nuclear plants are projected to generate 19 percent of the total electricity by 1990, compared to 13 percent in 1982.[18] Consequently, fuel inputs to nuclear plants approximately double during the forecast period. Coal-fired generation is projected to account for 51 percent of total electricity generation by 1990, compared to 53 percent in 1982.[19] Although utility coal consumption is projected to rise by about 29 percent between 1982 and 1990 as new coal plants are completed and begin operation, the slight decline in the percentage of total electricity generation occurs because the absolute growth in total generation is greater than the absolute growth in coal-fired electricity generation.

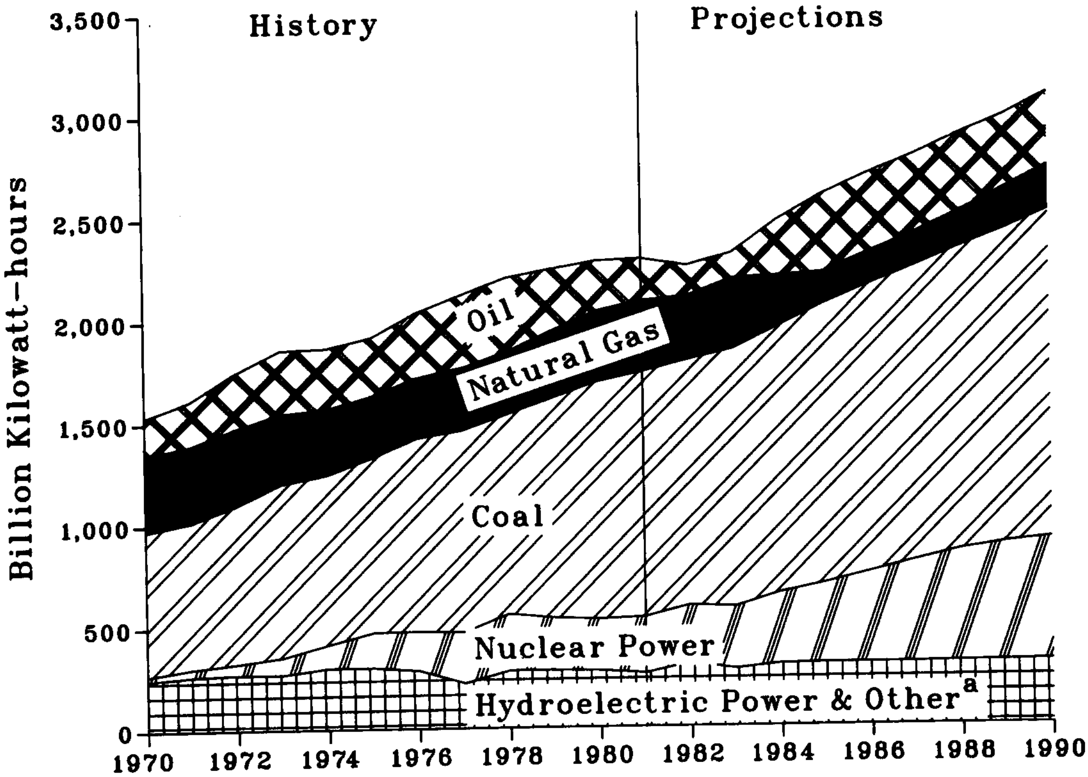
Figure 20. Electricity Consumption by End Use, Midprice Scenario, 1960 to 1990 (Billion Kilowatt-Hours per Year)



Note: Transportation use of electricity does not exceed 3 billion kilowatt-hours per year and is not shown in the figure.

Source: Historical data: Energy Information Administration, State Energy Data Report, 1960 through 1980, DOE/EIA-0214(80) (Washington, D.C., 1982), and Monthly Energy Review, DOE/EIA-0035(83/2) (Washington, D.C., 1983).

Figure 21. Sources of U.S. Electrical Supply, Midprice Scenario, 1970 to 1990 (Billion Kilowatt–Hours)



[a]Other includes geothermal, wood, waste, and net imports of electricity.

Source: Historical data: Energy Information Administration, 1981 Annual Report to Congress, Volume 2, DOE/EIA–0173(81)/2 (Washington, D.C., 1982), and Monthly Energy Review, DOE/EIA–0035(83/2) (Washington, D.C., 1983).

However, the projected reliance on coal and nuclear capacity is not as great as might be expected, given the relative fuel prices, because fuel consumption is limited by the available mix of generating capacity. Although abundant supplies of coal and uranium exist, construction and licensing periods for coal and nuclear plants are lengthy. Only coal and nuclear plants that are already under construction will be available to meet demand growth or replace existing oil and gas capacity by 1990.

Fluctuations in the relative prices of oil and gas have little impact on their combined use by electric utilities since they represent the marginal fuel choices. However, the relative prices play a significant role in the actual oil/gas split since many plants have the flexibility to burn either fuel. In the 1990 midprice forecast, utility oil and natural gas consumption is projected to total 6.4 quadrillion Btu, an increase of 31 percent from 1982. However, oil is projected to account for 63 percent of the total oil and gas demand in 1990, compared to just 32 percent in 1982. Using the 1990 midprice forecast as a reference point, total utility oil and gas demand decreases by just 3 percent in the high oil price case, but oil consumption declines by 29 percent while natural gas use rises by 41 percent. In the low oil price case, total oil and gas consumption increases by 4 percent. Oil consumption increases by 23 percent while natural gas use decreases by 27 percent. Thus, an escalation of gas prices coupled with lower oil prices would likely produce considerable switching from natural gas to oil. In the middle world oil price case this happens in 1984-1985. The switching of utilities from gas to oil in turn moderates the increase in natural gas prices.

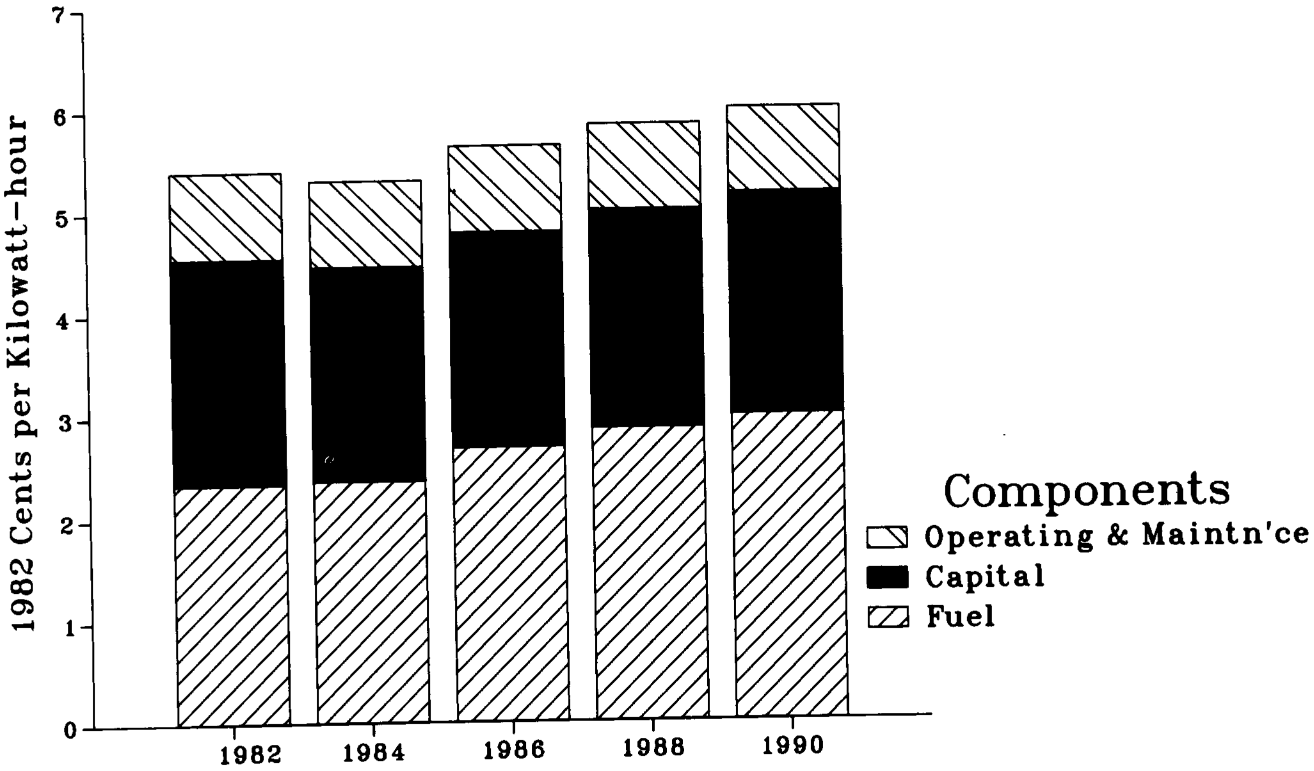
Besides the relative prices of the potential input fuels, other factors will play a significant role in the degree of fuel switching that occurs during the forecast horizon. Existing contracts could "lock" a utility into using a particular fossil fuel. Also, the difficulty and expense of switching differs from plant to plant depending on the availability and cost of the secondary fuel.

Due to the uncertainty associated with the "dual-fired" capability, an alternative case limiting fuel switches was also considered. Compared to the midprice case, this would result in a 17 percent increase in utility natural gas use and 10 percent decrease in oil consumption in 1990. This case is discussed in greater detail in the Appendix.

Financing Utility Construction

The electric utilities industry is highly capital-intensive; capital-related charges typically account for about 30 to 40 percent of the price of electricity. Throughout the forecast period, the capital cost component is projected to account for 35 to 40 percent of the electricity price (see Figure 22 and Appendix Table A.5.5). Due to long construction periods, utilities must base their construction schedules on future demand expectations. Until the early 1970's, this proved to be a relatively simple task, as output prices fell and electricity consumption grew at a fairly steady and predictable rate. However, demand forecasting became increasingly difficult as consumers began instituting conservation measures and substituting alternative energy sources in response to rapidly rising electricity prices.

Figure 22. Projected Average Electricity Prices and Cost Components, Midprice Scenario, Selected Years (1982 Cents per Kilowatt-Hour)



Note: All data are Intermediate Future Forecasting System projections, including 1982 data.

In the late 1970's, the cash flow position of many utilities began to deteriorate as generation costs rose rapidly and revenues decreased with declining electricity demand growth rates. Financial pressures were further compounded by inflation and a general weakening of the economy. As the cost of capital continued to rise, many utilities found their debt-equity ratios raised to increasingly uncomfortable levels and began to reevaluate their construction schedules.

During 1981 and 1982, the financial condition of electric utilities improved as a result of declining inflation rates, quicker responses by regulatory agencies, new Federal tax incentives, and moderated capital expenditures. In many States, the public utility commissions (PUC's) have helped to alleviate utility financial stress by allowing higher rates of return and reassessing their treatment of construction work in progress (CWIP). This has improved the immediate cash flow of many utilities and increased the funds available for internal financing. Growth in electricity demand would further strengthen the cash flow of utilities by increasing revenues. The prospect of increased cash flow has begun to lead to higher stock prices, thereby improving the capital market attractiveness of utilities.

Coal Usage and Environmental Regulations

Utility consumption of coal is projected to increase from 12.7 quadrillion Btu to 16.3 quadrillion Btu between 1981 and 1990 because projected coal prices rise relatively slowly compared to other fossil fuels burned by electric utilities.[20] Projections indicate a gradual shift from "high-" sulfur coals to "medium-" and "low-" sulfur coals over the forecast horizon. Utility consumption of high-sulfur coal, which represented about 37 percent of the utility coal demand in 1981 is projected to decline to 36 percent in 1985 and 35 percent in 1990. Consequently, utilities use more coal produced in the West, the primary source of low- and medium-sulfur subbituminous coal and lignite.

This trend toward low-sulfur coal primarily results from the New Source Performance Standards (NSPS), which place emissions restrictions on "new" coal-fired plants currently under construction which were licensed before September 1978. Utilities can generally satisfy the NSPS by burning low-sulfur coal without using sulfur emission control equipment. As more of the plants subject to the NSPS begin to operate throughout the forecast horizon, the demand for low-sulfur coal will increase.

Plants currently under construction that obtained a license after September 1978 are subject to the Revised New Source Performance Standards (RNSPS). The RNSPS tend to increase the attractiveness of high-sulfur coal since they require all coal-fired plants to build flue gas desulfurization equipment, although less scrubbing capacity is needed for low-sulfur coal. However, the standards have relatively little impact within the time frame of this forecast because many plants subject to the RNSPS do not begin operation before 1990 due to long construction lead times and delays.

Clean Air Act

The Senate Committee on Environment and Public Works proposed bill S.3041, Clean Air Act Amendment of 1982, amends Section 120 of the Act by adding a new "Part E" to address the problem of acid deposition in the eastern United States. Part E establishes an acid deposition impact region consisting of 31 States and the District of Columbia: the 26 States east of the Mississippi River and 5 States contiguous to it on the west.

This part of the Act requires by January 1, 1995, a reduction in annual emissions of sulfur dioxide of 8 million tons from the actual emissions level in 1980. The Office of Technology Assessment estimates the 1980 annual emissions level of sulfur dioxide at 16,067,700 tons.[23] Increases in sulfur dioxide emissions from major stationary sources that take place after January 1, 1981, must be offset by reductions elsewhere in the region by 1995. There are two exceptions to this requirement. These are increases up to 1.5 pounds per million Btu resulting from conversion to coal of utility boilers and increases that take place in a State that during 1980 had no utility boiler with an actual annual sulfur dioxide emission rate greater than 1.2 pounds per million Btu.

Any major stationary source of sulfur dioxide that starts operation after January 1, 1995, must provide for simultaneous reductions in emissions elsewhere in the region to offset its emissions unless it adopts best available control technology and meets the most stringent emission limitation achieved by any source of the same size, type, and class in the acid deposition region. Emissions of nitrogen oxides from existing major stationary sources, except for coal conversions, may not increase over 1980 levels or levels experienced during a 30-day period immediately prior to enactment, unless equivalent reductions are obtained in the region.

Other Sources of Uncertainty

In addition to financial and environmental questions, there are several other areas of uncertainty about the future outlook of the electric utilities industry. One important variable which could have a measurable impact on the electric utilities industry is the time patterns of demand. Since electricity cannot be stored (except for pumped storage generation) it must be produced upon demand; thus, it is the timing of the demands as well as the total volume that determines the capacity and generation requirements. Shifting some demand from peak to off-peak periods would increase the base (continuous) load and lead to improved capacity utilization. It would likely reduce fuel inputs since the boiler would operate continuously, thereby eliminating the energy loss that occurs during restarting. It could also require changes in the generating mix to include more baseload capacity, but a substantial reconfiguration of generating capacity is costly and takes time. Higher peak demand would also lead to changes in

The Nuclear Waste Policy Act

The disposal of high-level radioactive waste from nuclear powerplants has long been perceived as a vexing problem. The Nuclear Waste Policy Act of 1982 establishes the Federal programs necessary to deal with nuclear waste.

The Act requires the establishment of permanent repositories to handle high-level radioactive spent fuel by January 31, 1998, and provides for Federal interim storage of up to 1,900 metric tons of spent fuel from utilities unable to provide necessary on-site storage of spent fuel. Both of these programs are to be funded by a user fee of 1 mill per kilowatt-hour, paid by nuclear utilities.

The Act charges the Department of Energy with the establishment of test and evaluation facilities for research, development, and demonstration efforts regarding disposed spent fuel, and requires the development of a proposal for construction of one or more monitored retrievable storage facilities. Procedures for repository site selection and rights of disapproval by affected States are provided for in the Act.

the capacity mix in order to satisfy the additional power load, but the necessary additions would likely be peakload capacity types such as turbines. An increase in the peakload would also decrease capacity utilization and increase fuel consumption, particularly oil and gas, resulting in higher prices.

Another source of uncertainty is the outlook for nuclear electricity generation. The recent history of the nuclear power industry has been marked by cancellations and deferrals of scheduled plants. There have been no new domestic orders for nuclear powerplants since 1978, although some of the reasons, such as declining demand growth and financial difficulties, have involved the entire electric utilities industry. However, these problems are particularly important in the nuclear power industry because it generally involves larger units and higher capital costs.

The industry faces further uncertainty in the future as the cost and impact of current and proposed safety measures have eroded nuclear power's perceived economic advantages over other types of baseload electricity generation. Some of the safety concerns may be relieved by the recent passage of the Nuclear Waste Management Act of 1982. This Act establishes procedures and major milestone dates for the Nation's nuclear waste management programs and if implemented on schedule, it is expected to alleviate much of the uncertainty about nuclear waste policy.

U.S.-Canadian Electricity Trade

In recent years, imports of Canadian electricity have become a significant component of electricity supply in parts of the United States. It is likely that these imports will increase over the next few years. U.S. utilities purchase electricity from Canadian utilities (or from other U.S. utilities) when that electricity costs less than electricity produced by the buyer's own generating capacity. Factors that encourage purchasing power are seasonal and daily diversity of demand, reliability requirements, and the mix of different generating technologies.

Although output from Canadian thermal generation is sold to U.S. utilities, most of the imported electricity is from Canadian hydroelectric capacity. In recent years, Canadian utilities have increased their generating capacity in anticipation of increased electricity demand and to exploit their abundant hydroelectric resources. Because Canadian electricity demand growth has been less than anticipated, the Canadian electric utilities have excess generating capacity. This capacity can be used to generate electricity for sale to U.S. utilities.

The price charged by the Canadian utilities determines the extent to which this source is used. U.S. utilities will continue to buy Canadian electricity so long as that electricity is competitively priced with U.S. generation, including the cost of transmission. At present, much Canadian electricity is priced at a percentage of U.S. utilities' avoided costs. Avoided costs are the operating costs the buyer would incur if it produced the power with its own generating capacity.

There are opportunities for continued U.S.-Canadian trade based on seasonal diversity, system reliability and convenience, entitlements to shared water resources, and economy. The existing interconnections between U.S. and Canadian utilities improve the stability and reliability of the electric power systems in both countries and facilitate large, short-term transactions. These supply and demand considerations underlying existing trade between the United States and Canada are used to make assumptions for the electricity forecasts in this volume.

A recent EIA study, U.S.- Canadian Electricity Trade (DOE/EIA - 0365) examines current trading patterns and the potential for continuing electricity trade.

Nuclear generation in 1982 increased by about 4 percent over 1981,[21] at a time when overall electricity generation decreased by about 2 percent. Nuclear energy is projected to be the fastest growing source of domestic energy in the near future, as plants currently in the construction "pipeline" are completed. However, the near-term growth of nuclear power will be limited to completions of projects currently being built. Because of high reserve margins, continued low growth in electricity demand, and lengthy construction periods, the completion of any "new starts" would occur after 1990.

Another potential problem involves the average age of fossil fuel power plants in operation. Reductions in new capacity additions have placed a greater burden on existing plants. Older plants are generally less efficient and require more input fuel per unit output. This could also lead to a reduced reliability for electricity supply since older plants are liable to have higher outage rates due to more frequent breakdowns and greater preventive maintenance needs.

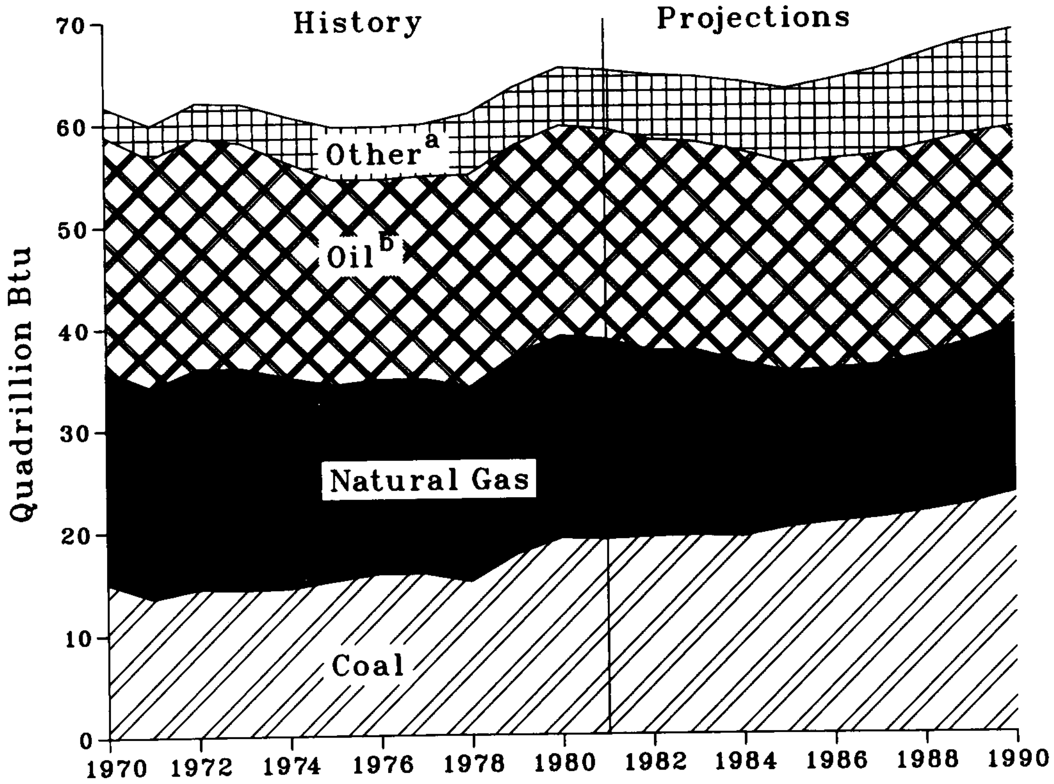
An increasingly important source of electricity has been imports from Canada. In 1981, Canadian electricity imports totalled 35.4 gigawatt-hours.[22] Although these imports were less than 2 percent of domestic sales, they were significant sources of energy in some regions, accounting for about 10 percent of electricity sales in New York and more than 5 percent in New England. Vast potential hydroelectric developments in Canada could supply parts of the United States if the economic and political climates are favorable in the future. However, these sources will take years to develop and the major impacts are beyond the time horizon of this study (see box for more details).

Supply of Energy

Except for oil imports, the United States is essentially self-sufficient in fossil fuels. A major coal exporter, the United States produced almost all of the natural gas it used in 1982, while 68 percent of U.S. oil consumption was domestically produced.

Coal production is projected to rise throughout the remainder of the 1980's, from about 19.2 quadrillion Btu in 1980 to 23.9 quadrillion Btu by 1990 (see Figure 23.) In contrast, domestic oil production is projected to remain relatively stable, rising slightly until 1984 and then decreasing slightly. Imports of oil would be expected to rise substantially from 1982 levels with economic recovery. Increased oil consumption is met by increased net imports, which rise from 4.2 million barrels a day in 1982 to 7.1 million barrels a day by 1990 in the midprice projection. Projected natural gas production declines through the middle years of the decade, rising at the end of the period.

Figure 23. Domestic Energy Production by Source, Midprice Scenario, 1970 to 1990 (Quadrillion Btu)



[a]Includes nuclear power, hydropower, geothermal energy and electric utility consumption of wood and waste.

[b]Includes natural gas plant liquids.

Source: Historical data: Energy Information Administration, 1981 Annual Report to Congress, Volume 2, DOE/EIA-0173(81)/2 (Washington, D.C., 1982), and Monthly Energy Review, DOE/EIA-0035(83/2) (Washington, D.C., 1983).

Oil Supply and Refining

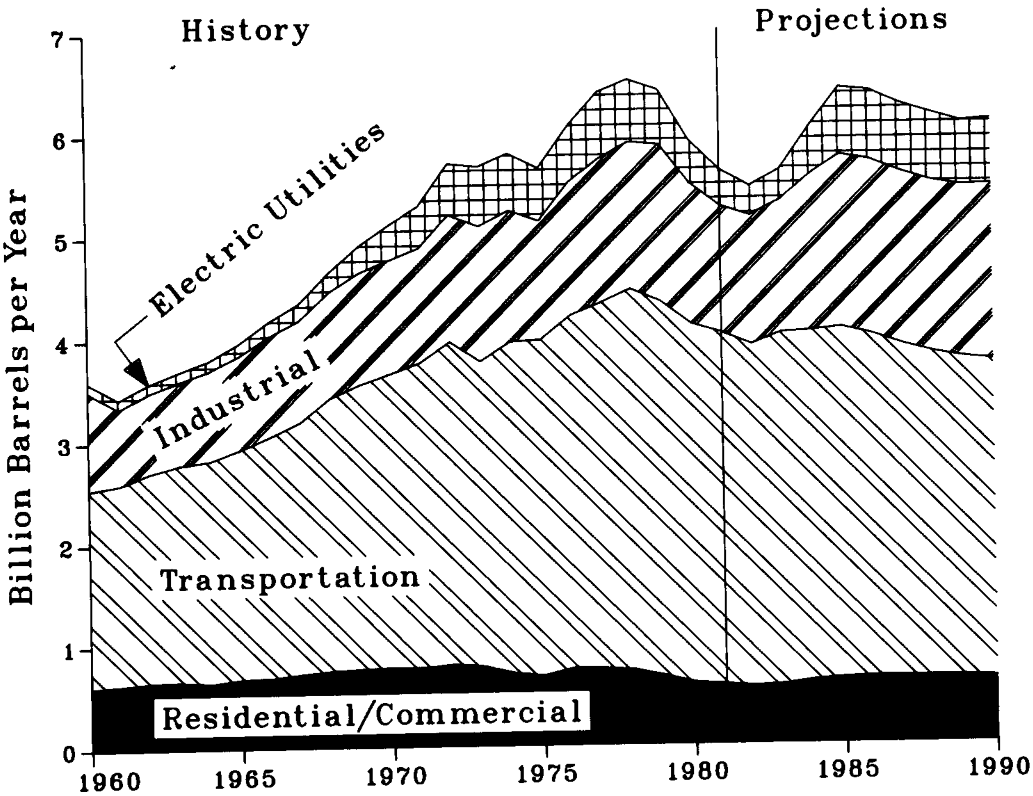
The United States has experienced several favorable trends in oil markets over the past few years, with stable domestic production and declining petroleum consumption and imports. These trends, however, are likely to change in the near future: domestic production will likely resume its long-term decline, and the declines in both consumption and imports will likely reverse. To understand these conclusions, it is useful to look at recent trends in oil markets as they reflect the influence of the determinants of oil supply and demand. Oil consumption is shown in Figure 24.

The key determinants of oil supply include the remaining resources to be discovered, the level of drilling activity, the rate at which existing reserves are produced by conventional means, and the expanded use of enhanced oil recovery techniques. In 1980, the U.S. Geological Survey estimated remaining undiscovered resources for oil to be 82.6 billion barrels.[24] To put this in perspective, proved reserves of crude oil, including lease condensate, at the end of 1981 were 29.4 billion barrels, and average production for 1982 was 8.67 million barrels per day, including lease condensate.[25]

An estimate of remaining undiscovered resources indicates the volume of oil left to be found that is also expected to be both profitable and technologically producible. The quality of what is left determines the economics of exploration and production. The amount of oil discovered (or producible reserves added per exploratory well, known as the finding rate) provides a simple measure of the efficiency of the exploratory effort and the quality of the resource base. The average for 1969 through 1972 was 179,500 barrels per well. Between 1977 and 1980 the average had fallen to 86,300 barrels per well. Part of the drop was due to higher prices that made smaller and formerly uneconomical finds profitable, lowering the average amount of oil or gas found per well. At the same time the costs (in 1972 dollars) to complete an oil well increased from a $92,400 average over the time period 1969 through 1972 to $140,800 in 1977 through 1980.[26] The rapid increases in oil prices so increased the number of available, profitable opportunities that some of the increased drilling costs, beyond the rate of inflation, are due to the rapid acceleration in drilling activity. The rest of the increased costs, however, come from drilling for deeper reserves or in areas with less favorable geological or environmental conditions.

If oil prices had remained constant over this period, oil drilling would have been substantially lower than actually occurred. The ending of domestic price controls and increasing world oil prices through 1981 spurred domestic drilling to record levels. In 1980 crude oil reserve additions matched production for the first time since 1970. When natural gas liquids are combined with crude oil, 1981 reserve additions also equaled production. The combined reserves were 36.5 billion barrels, at the end of 1981.

Figure 24. Oil Consumption by End Use, Midprice Scenario, 1960 to 1990 (Billion Barrels per Year)



Note: Industrial oil consumption excludes refinery fuel use.

Source: Historical data: Energy Information Administration, State Energy Data Report, 1960 through 1980, DOE/EIA-0214(80) (Washington, D.C., 1982), and Monthly Energy Review, DOE/EIA-0035(83/2) (Washington, D.C., 1983).

By the end of 1982, indicators of drilling activity were giving conflicting signals. Although the number of rigs in operation decreased in 1982, the number of reported well completions and total footage drilled increased. Because of the lag in the reporting well completions, the sharp decline in rig activity during the last half of 1982 is expected to be reflected in 1983 well completion and footage statistics. It is not yet known what impact this decline will have on discoveries. Nevertheless, the combination of high interest rates and recent declines in oil prices broke the speculative bubble in drilling activity.

Total domestic production rates have been much more stable than either drilling activity or reserve additions. In a sense, domestic production reflects previous years' reserve additions, since a successful well produces over many years. The rate at which a field can produce depends upon the initial volume discovered, how long the field has already produced, and on how intensively it is developed. In general, the more wells that are producing, the faster the rate of production and depletion. From the recent low of 8.1 million barrels per day in 1976, total domestic crude oil production has been on a plateau of 8.6 million barrels per day since 1979.[27]

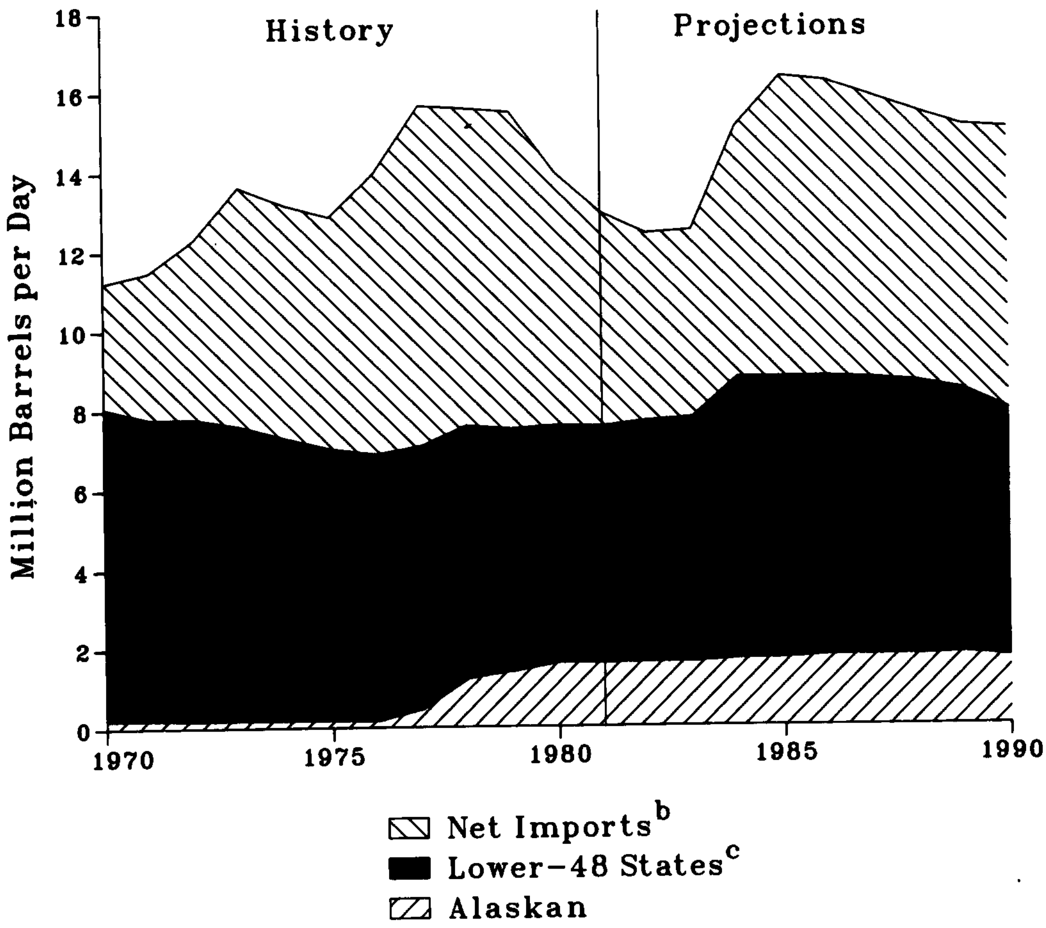
Since 1980, the major sources of crude oil supply (onshore production regions in the Lower-48 States, offshore fields and Alaska) have remained relatively constant. However, over the course of the 1970's the sources have shifted significantly. Lower-48 offshore production has declined from its peak of 1.7 million barrels per day in 1971 to 1.03 million barrels per day in 1981[28] and is expected to remain at approximately that level through this decade (see Figure 25).

Lower-48 onshore production has, however, declined from 7.8 million barrels per day in 1970 to 5.9 million barrels in 1981, a trend which is expected to continue with the exception of a slight upturn through 1983. This decline has been offset by the production of oil from Alaska. Alaskan production increased from .2 million barrels per day in 1970 to 1.6 million barrels per day in 1981,[29] and is projected to increase to a peak of 1.8 million barrels by 1989.[30]

One of the important changes in the energy picture over the recent past has been the steep decline in consumption since 1978 (see Figure 26). Between 1978 and 1981, consumption fell 15 percent. The effect on oil imports has been dramatic: gross petroleum imports, excluding crude oil imported for the Strategic Petroleum Reserve, have fallen from the 1977 peak of 8.8 million barrels per day to 5.7 million barrels per day in 1981, a 35 percent decline. If imports had remained at the same level as 1977, the 1981 expenditures on imported oil would have been 112.6 billion dollars instead of 76.2 billion.[31]

Petroleum consumption is expected to increase with economic recovery. Two other factors are likely to affect future petroleum consumption. First, with stable or declining world oil prices, the incentive for further conservation is being reduced. Second, since petroleum products and natural gas are competitive in many uses, consumption is linked. Continued gas price increases will stimulate switching to petroleum products.

Figure 25. U.S. Oil Supplies By Source,[a] Midprice Scenario, 1970 to 1990 (Million Barrels per Day)



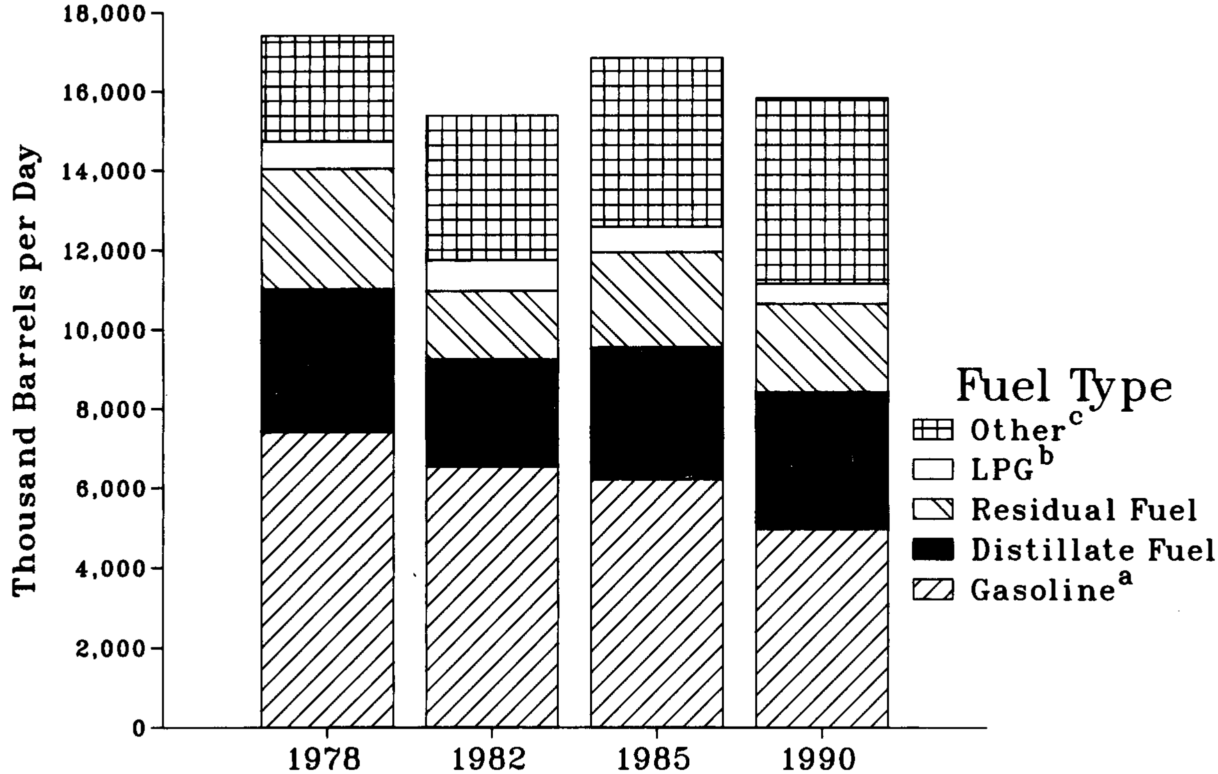
[a]Excludes domestic production of natural gas plant liquids.

[b]Includes imports for the Strategic Petroleum Reserve.

[c]Includes offshore production.

Source: Historical data: Energy Information Administration, 1981 Annual Report to Congress, Volume 2, DOE/EIA-0173(81)/2 (Washington, D.C., 1982), and Short Term Energy Outlook, Volume 1, DOE/EIA-0202(83/1Q)/1 (Washington, D.C.,1983).

Figure 26. U.S. Production of Petroleum Products, Midprice Scenario, 1978 to 1990 (Thousand Barrels per Day)



[a]Includes motor and aviation gasoline.

[b]Computed as domestic consumption of liquid petroleum gases (LPG's) used for heat and power minus net imports of LPG's. Refinery fuel use of LPG's is included, but LPG's consumed as feedstocks (and all ethane) are shown in Other products.

[c]Includes petrochemical feedstocks, ethane, natural gasoline, isopentane, unfractionated stream, plant condensate, other liquids, and all finished products not shown explicitly.

Source: Historical data: Energy Information Administration, 1981 Annual Report to Congress, Volume 2, DOE/EIA-0173(81)/2 (Washington, D.C., 1982), and Petroleum Supply Monthly, DOE/EIA-0109(83/2) (Washington, D.C., 1983).

Because of the crude oil price increases in the late 1970's, gas became the cheaper fuel almost everywhere in the Nation. With the recent gas price increases allowed under the Natural Gas Policy Act (NGPA), petroleum products have become more competitive in some areas of the country, and low-sulfur residual fuel oil may well recapture parts of the utility and industrial markets.

In 1981 and 1982 consumption requirements were met in part by drawing down petroleum inventories. This cannot continue indefinitely, and eventually increased imports are expected to fill the gap between consumption and production. In the midprice case, net petroleum imports are projected to grow to 7.1 million barrels a day in 1990 from 4.2 million barrels a day in 1982.

There are potential sources of domestic production to offset the need for increased imports. Newly explored areas in the offshore regions may contribute significant additions to reserves. There have been, for example, some important discoveries off the coast of California. New Alaskan leases may hold substantial potential, but given the climate and logistics problems, it could be many years before this potential is translated into production. However, increased reserves and production from the frontier areas will probably be offset by the continued decline in lower-48 onshore reserves and production.

The increased use of enhanced oil recovery (EOR) techniques may help slow the decline in onshore oil production. With conventional production techniques, only about 30 percent of the oil estimated to be in a field is producible. Current enhanced oil recovery techniques can increase the recovery of oil in place to as much as 40 percent. That is, existing reserves could be expanded by one-third, or 18 billion barrels, without any further exploration.[32] (Again, reserves are defined as oil that can be produced economically with current prices and current technology.)

Most EOR processes work by altering the flow characteristics of the oil. The most common technique at present heats the oil through steam injection, lowering the oil viscosity and enabling it to flow from the reservoir to the well. Many of the EOR techniques are experimental, but 4 percent of the Nation's oil was being produced by steam injection in 1982.[33]

<u>Refineries</u>. Decontrol of crude oil prices in January 1981 heralded major changes in the refinery industry. Substantial reductions in the consumption of petroleum for a variety of end uses occurred as well. At the same time, the protected status of a large percentage of small refineries under various provisions of the prior regulations effectively ended. These included not only access to crude oil but also cost advantages given small refiners. In 1981 and 1982, there has been a substantial reduction in refinery capacity as the industry realigned itself with the newer market conditions.

Refineries convert the mix of hydrocarbon compounds found in crude oil into a slate of marketable petroleum products. These products can be divided into two categories: lighter products, which include gasoline, distillate fuel, and jet fuel and heavier products, which include residual fuel oil, asphalts, lubricants, and petroleum coke. Refinery operations begin with a simple distillation process that separates the compounds found in the crude oil using differences in the boiling ranges of the compounds. Simple atmospheric distillation yields are about 10 to 20 percent gasoline and 30 to 40 percent residual fuel. End-use consumption of oil products, on the other hand, is 30 to 45 percent gasoline, and 10 to 20 percent residual fuel (see Figure 26). As a result, refineries require additional processes to transform the hydrocarbon molecules in order to change the yields coming from the distillation column into yields that are demanded by petroleum consumers.

Worldwide oil reserves contain a much higher proportion of "heavy" crudes than does the oil currently being produced and refined in the United States and overseas. Heavy oil presently sells at a discount to light oil because it cannot yield as high a percentage of the more valuable lighter products without further processing. A price differential of $8 to $12 per barrel appears to be large enough to pay the capital and operating costs necessary to "crack" heavy crudes and the residual from simple distillation into lighter products. As a result of the inevitable need to process heavier crudes and the economic advantage of upgrading heavy products into lighter products, refiners have proceeded with investments in "cracking capacity."

Cracking capacity includes thermal processes, such as cokers or new, heavy-feed catalytic cracking units and associated feed pretreatment and hydrogen manufacturing facilities, which break down the long molecules of heavy, low-quality crude oil and add hydrogen to form lighter products. There are approximately 25 such projects planned to open in the 1982 to 1984 period, representing a capital outlay over 5 billion dollars.

There are two other basic types of downstream processes that are used in refineries. These processes are "octane boosting" and desulfurization units. Octane is an indication of the antiknock quality of gasoline. As an alternative to refining higher octane gasoline refiners may add lead (tetra-ethyl) compounds to boost octane ratings of lower quality gasoline. Lead, though, is a potential source of pollution and its content in gasoline is limited by Environmental Protection Agency (EPA) regulations. Recent EPA rulings have further limited the amount of lead that refiners and blenders may use.

Another process used by refiners is desulfurization, which is a decontamination process that improves end-product quality. Sulfur dioxide is a gas that is emitted when fossil fuels containing sulfur are burned. These emissions are unhealthy, and many local governments have restricted the amount of sulfur that may be present in fuel. Desulfurization units process high-sulfur feed into low-sulfur fuel. Two factors affecting the increased need for these types of units are the increasing availability of heavier poor quality crudes relative to better quality crudes and a shift in demand to low-sulfur fuels from high-sulfur fuels. In 1981 low-sulfur residual fuel constituted 46 percent of total residual demand. This percentage is projected to rise to 52 percent by 1987.

At the same time that investment in downstream processes has occurred, smaller, simpler refineries have been closing. In 1978 total product consumption exceeded total refining distillation capacity by 2 million barrels per day. By year end 1982 operable crude distillation capacity exceeded consumption by about 1.5 million barrels per day even though some 75 refineries with a total 1.5 million barrels per day of distillation capacity had closed between 1980 and 1982.

The new equipment used to convert heavier crudes and excess residual fuel oil to lighter products is expensive and requires large amounts of capital. Between 1982 and 1990 downstream cracking capacity is projected to increase at an annual rate of about 2 percent. As this capacity comes on line, the supply of residual fuel oil will decline and its price will rise relative to crude oil and other products. Projected prices of petroleum products are shown in Figure 27.

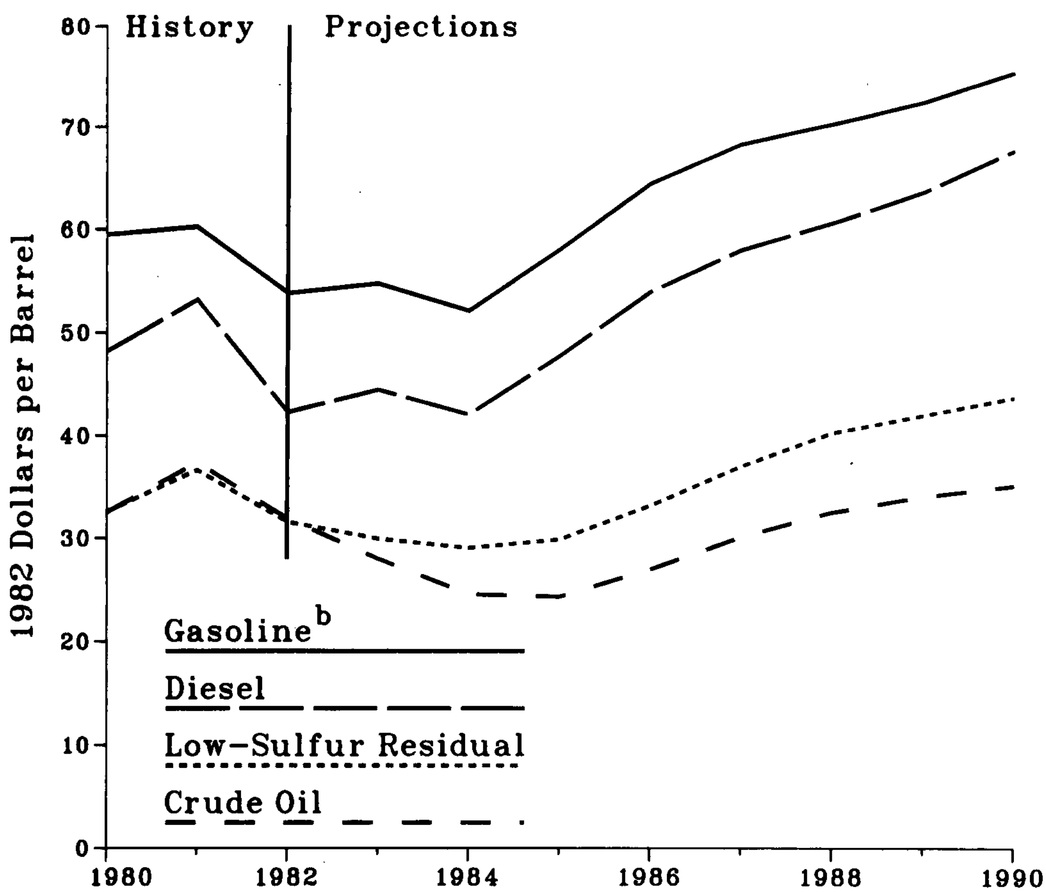
Natural Gas Markets and Supply

While oil prices have recently been stable or falling, the price of natural gas has risen rapidly. Between 1978 and 1982, the real average wellhead price of gas increased 95 percent, continuing the upward trend started in the mid 1970's (see Figure 28).[34] These increases have occurred in the face of stable or even declining consumption. The reasons for the recent price increases are related to the long history of natural gas regulations, to certain types of contractual relationships developed under those regulations and to decisions to buy long-term supplies of gas which seemed sound when they were made.

In the mid-1970's, the interstate gas market (gas bought for transportation and resale by pipeline companies that operate in more than one State) was characterized by supply shortages and resulting consumer curtailments. Interstate pipelines could not obtain the amount of gas their customers demanded at the price the Federal Power Commission permitted them to pay. The intrastate markets, unregulated at the Federal level, had plentiful gas, albeit at higher prices.

The Natural Gas Policy Act (NGPA) of 1978 (P.L. 95-621) established a new pricing structure, putting most gas under price ceilings based on the geology, distance from other wells, location, depth, and existing contractual arrangements for the gas, but creating a category of high cost gas free from price ceilings. The NGPA covered intrastate, as well as interstate, natural gas, thus eliminating a major distinction between the two markets. Price ceilings for new reservoir gas, Section 102 gas, were allowed to increase at a rate somewhat faster than inflation, but the Act limited the price of old gas to a relatively low amount. Pipeline companies, which had been unable to obtain sufficient supplies, bid readily for the uncontrolled gas and signed contracts which required most of the gas to be paid for even if not taken by the pipeline.

Figure 27. Prices of Crude Oil and Petroleum Products[a], Midprice Scenario, 1980 to 1990 (1982 Dollars Per Barrel)

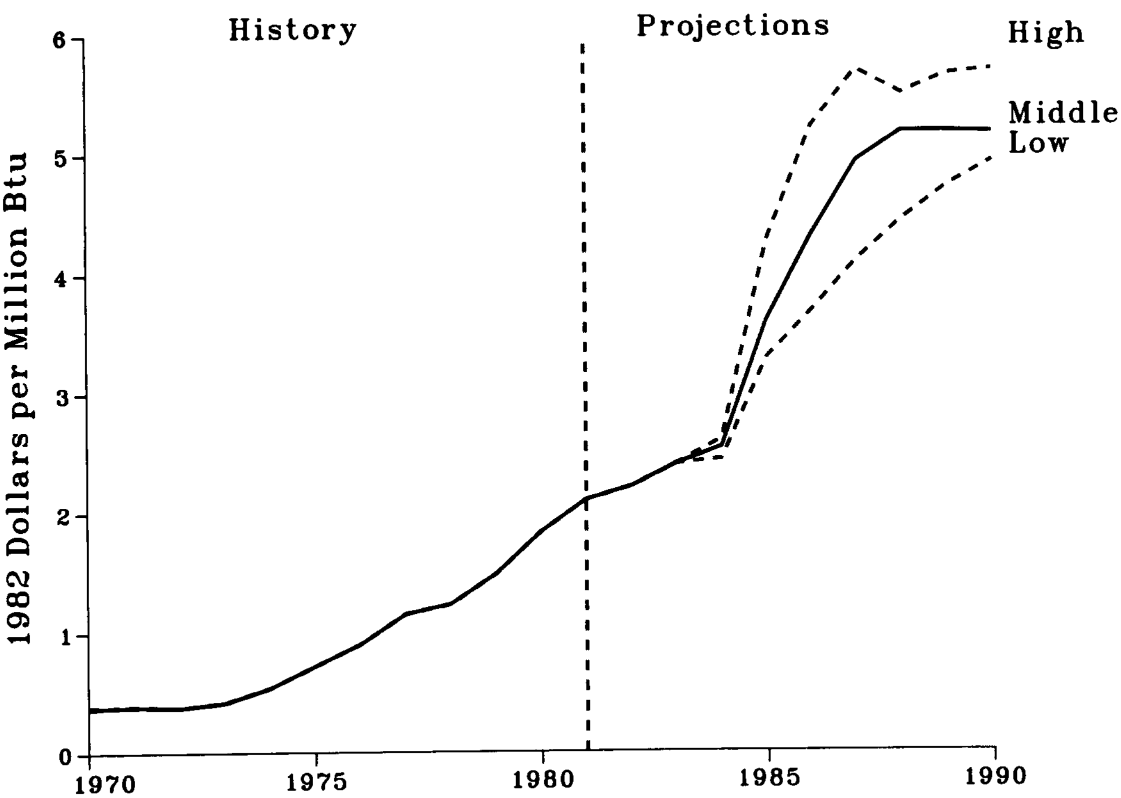


[a]Prices shown are the refiner aquisition cost of crude oil and end use product prices.

[b]Weighted average price of all types of motor gasoline.

Source: Historical data: Energy Information Administration, 1981 Annual Report to Congress, Volume 2, DOE/EIA-0173(81)/2 (Washington, D.C., 1982), and Monthly Energy Review, DOE/EIA-0035(83/2) (Washington, D.C., 1983).

Figure 28. U.S. Average Wellhead Price of Natural Gas, High, Middle and Low Price Scenarios, 1970 to 1990 (1982 Dollars per Million Btu)



Note: Prices converted from dollars per thousand cubic feet in the source to dollars per million btu using conversion factors from the Monthly Energy Review, DOE/EIA-0035(83/2) (Washington, D.C., 1983).

Source: Historical data: Energy Information Administration, 1981 Annual Report to Congress, Volume 2, DOE/EIA-0173(81)/2 (Washington, D.C., 1982).

Three factors have contributed to recent gas price increases:

1. The older, lower cost fields are slowly being depleted and, as a result, higher cost new gas is becoming a larger fraction of gas supply.
2. The prices of some new gas increase faster than the rate of inflation.
3. Contracts signed after passage of the NGPA require pipeline companies to take most of the higher cost gas covered under the contract, meaning that the pipeline buys less low cost gas when consumption falls.

In 1985, about half the natural gas production will be deregulated.[35] The effects of decontrol on prices will probably depend as much on existing contract provisions as upon underlying supply and demand conditions. Some contracts contain provisions providing that in the event of decontrol the price of gas will be established at a price equivalent to number 2 fuel oil, residual fuel oil, or some other commodity. In 1980, approximately 46 percent of the volume of gas delivered was covered by contracts containing "most-favored nation" clauses, which would come into play upon decontrol. These require that the gas covered by the contract receive a price as high as that received by other producers in the area.[36] The extent to which these contract provisions will raise gas prices to artificially high levels is very much uncertain at this point for several reasons. Two of these are the presence of "market out" clauses in some contracts, which give the purchasing pipeline relief if the gas cannot be resold, and the possibility that many contracts will be renegotiated. EIA is currently undertaking a detailed analysis of gas markets to resolve, and better represent, some of the issues presented by natural gas contracts.

During the last 2 years, there has been much public debate concerning the NGPA and its relationship to recent and continuing price increases. Many bills have been introduced in Congress to modify the Act and address perceived problems. On February 28, 1983, the Administration submitted the proposed "Natural Gas Consumer Regulatory Reform Amendments of 1983" to Congress. This proposed legislation would modify the NGPA to create a system in which prices may be more responsive to market pressures. Some provisions of the proposed bill are intended to protect consumers from sharp price increases and provide incentives to suppliers and pipelines to renegoitate contracts. The forecasts in this volume, based on legislation in place in February 1983, do not take account of the effects of the proposed Amendments.

Sources of Supply

Natural gas production is substantially similar to oil production as described in the previous section. In 1982, 21 percent of gas production was associated-dissolved gas, that is, gas found in the same deposits as crude oil and produced along with the oil. Natural gas and petroleum exploration and development projects compete for the same drilling rigs and other capital equipment. These strong links cause gas supply to be sensitive to world oil prices.

Currently, net domestic dry natural gas production is running at about 17.8 trillion cubic feet (or 18.1 quadrillion Btu) per year, about 73 percent from the onshore Lower-48 States and 26 percent from offshore. In addition, net imports provide about .9 trillion cubic feet, primarily by pipeline from Canada and Mexico. Domestic proved reserves of natural gas as of December 31, 1981, are 202 trillion cubic feet of dry natural gas, or about a 11-year supply at current levels of production.

Current production comes from proved reserves of gas. These reserves include nonassociated gas (gas from deposits that primarily produce gas) as well as associated-dissolved gas. The costs of recovering proved gas reserves vary greatly because of the location and physical characteristics of the individual reservoirs. For example, a single, large reservoir is generally less expensive to develop per unit of gas than many smaller reservoirs. In general, yearly additions to proved reserves (excluding reserves found in Alaska) have been smaller than production since 1967. In 1981 reserve additions were approximately equal to production.

Future production must come in large part from new deposits of gas, and these deposits will most likely be deeper, smaller, and more expensive to find and develop than currently producing deposits. Because it cannot be known whether gas (or oil) is present in a formation in quantities sufficient to warrant production until wells are drilled, projection of natural gas production is always subject to considerable uncertainty.

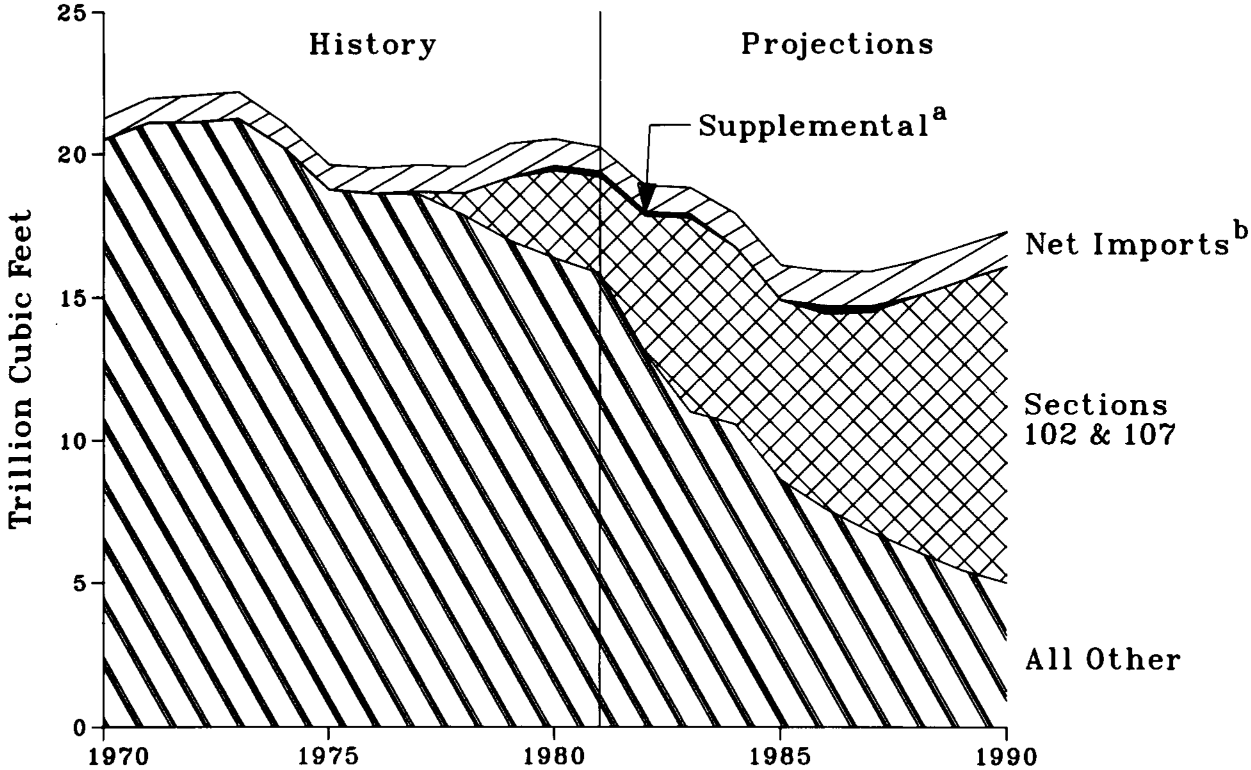
Figure 29 shows natural gas production from 1970 and projected to 1990. The area indicated as other is gas from deposits known and in production in 1977 and included in the lower-priced tiers of the NGPA pricing structure. The area marked Section 102 and 107 gas is largely gas from deposits developed since 1978.

The total production of natural gas is expected to decline from 16.7 trillion cubic feet in 1984 to 14.4 in 1986, then rise again to 16.1 in 1990. This is down approximately 3.4 trillion cubic feet from the 1980 production. What is particularly important to note is the source of the gas supply. Old reserves are being depleted and new reserves, those developed since 1978, must supply proportionately more of the gas. In 1980, this new gas constituted approximately 16 percent of domestic production. However, it increases to 42 percent of production by 1985 and 69 percent by 1990. The continuance of domestic production will rely for the most part on the exploration and development of new gas reserves.

Note that a major assumption underlying this year's forecasts is that the Alaskan pipeline will not be in service by 1990. The official start date for the Alaska natural gas transportation system project has been moved back to 1989. Given the issues yet unresolved concerning this project, it seems likely to face further delays and should not be included in the forecasts as a reliable source of supply in the current decade.

National average wellhead prices from 1970 and projected to 1990 are shown in Figure 28. Underlying these projections are the wellhead price

Figure 29. U.S. Supply of Natural Gas, Midprice Scenario, 1970 to 1990 (Trillion Cubic Feet)



[a]Delivered gas includes supplemental fuels (synthetic natural gas, etc.) that are not quantified separately from other domestic production prior to 1980. In projection years, the supply of supplemental gas is calculated as the difference between total domestic supply and the sum of new, old, and net imported gas.

[b]Includes imports of liquid natural gas.

Source: Historical data: Energy Information Administration, 1981 Annual Report to Congress, Volume 2, DOE/EIA-0173(81)/2 (Washington, D.C., 1982), and Monthly Energy Review, DOE/EIA-0035(83/2) (Washington, D.C., 1983), and The Current State of the Natural Gas Market, DOE/EIA-0313 (Washington, D.C., 1982).

controls of the NGPA. The depletion of the older, less expensive gas causes the new gas to be used in increasing amounts, accounting for the steady rise in prices.

A major price increase, or price "flyup," occurs in 1985 due to the expiration of NGPA price controls on most new gas in that year. A real increase of 42 percent in the wellhead prices in that 1 year occurs as a result of the lifting of price regulations on about half of the gas produced. Prices continue to increase the next several years as a smaller portion of lower priced gas is available and further price regulations are removed.

The production of natural gas is sensitive to the world crude oil price. Higher world oil prices stimulate the exploration and development of both oil and gas reserves and stimulate the demand for gas as a substitute for oil. In 1990, under the middle world oil price, domestic natural gas production is estimated to be 16.1 trillion cubic feet. However, this estimate declines to 15.1 trillion cubic feet under the low price oil price path but increases to 17.2 trillion cubic feet under the high price path.

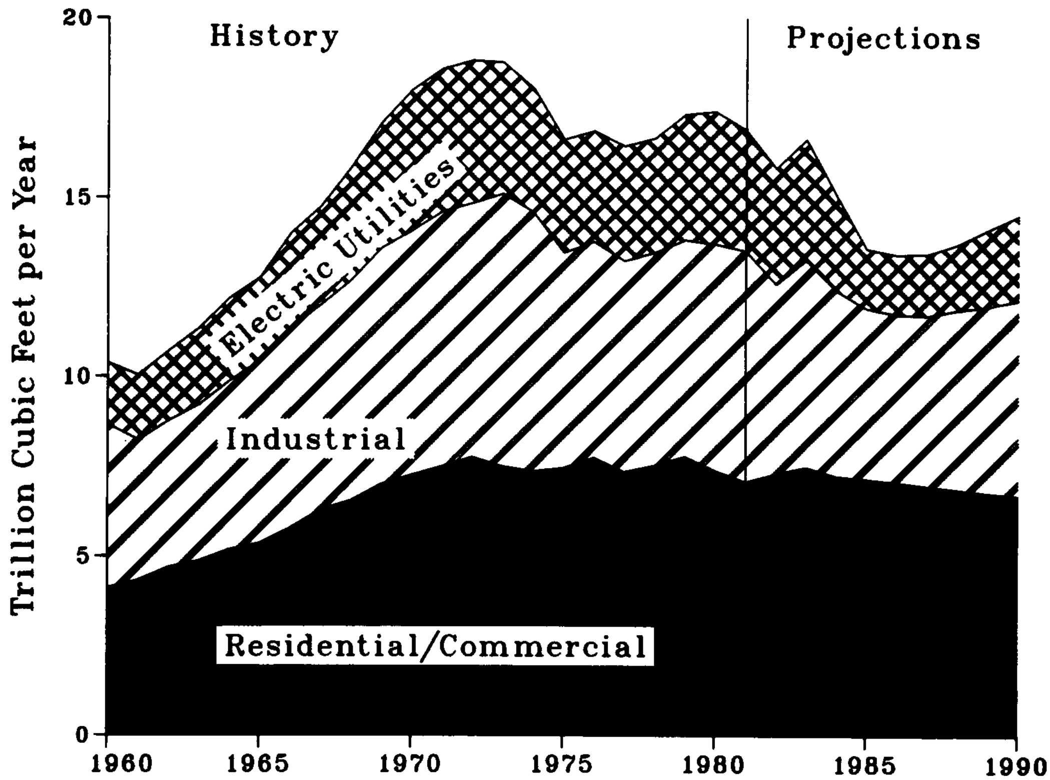
Higher production of gas is possible through higher prices, providing incentive for more costly, new gas reserves to be developed. Figure 28 depicts the wellhead prices of gas under each of the three world oil price paths. Note that the size of the flyup in 1985 increases or decreases with the world crude oil price.

The world oil price also affects the price and production of natural gas through the shifts in end-use consumption. Oil prices that are higher relative to gas prices will cause end-use consumers to shift from oil to gas, when possible, increasing both the price and production of gas. Figure 30 illustrates the historical and projected consumption of gas by end-use sector. That the electric utility sector in particular is capable of shifting between gas and oil is reflected in the drop in gas consumption in 1985. See the electric utilities section for further discussion of fuel switching in this sensitive sector.

Coal

From the end of World War II until recent years, coal gradually declined in importance as an energy source in the United States. From providing nearly 40 percent of the Nation's energy consumption in 1950, coal's share declined to 17 percent just before the 1973 oil embargo. Even when oil prices doubled following the embargo, coal's share of the U.S. energy market increased only slightly. It was not until after 1978 that coal's share of energy consumption began to increase. This movement was given additional stimulus by the second major jump in oil prices between 1979 and the end of 1980. Beginning in 1978 coal use has increased significantly (14 percent by 1982). While the recession caused a small decline in coal use in 1982, coal[37] accounted for 22 percent of gross energy consumption in that year.

Figure 30. Natural Gas Consumption by End Use, Midprice Scenario, 1960 to 1990 (Trillion Cubic Feet per Year)



Source: Historical data: Energy Information Administration, State Energy Data Report, 1960 through 1980, DOE/EIA-0214(80) (Washington, D.C., 1982), and Monthly Energy Review, DOE/EIA-0035(83/2) (Washington, D.C., 1983).

Although coal's relative share of the total domestic energy market has declined in the past 30 years, the quantity of coal consumed in the United States was 42 percent higher in 1980 than in 1950.[38] Also, dramatic changes have occurred in the markets for coal. Before and immediately after World War II, coal was burned directly to produce energy and was a major residential, industrial, and transportation fuel (see Figure 31). In 1950, for example, coal heated nearly 35 percent of the homes in the United States--more than any other single fuel. Within 20 years, however, coal's share of the residential heating market had dropped to 3 percent, and today is less than 1 percent. An even more rapid shift away from coal occurred in the transportation sector from 63 million tons in 1950 to less than .05 million tons in 1982. Coal is used primarily as a boiler fuel to generate steam which, in turn, is used most often to generate electricity. Indeed, the growth of electricity use accounts for most of the increase in coal use over the last 30 years. Industrial coal use ended its long decline in the late 1970's, and has been growing since, with the exception of mild reductions in 1980 and 1982, reflecting declines in industrial activity.

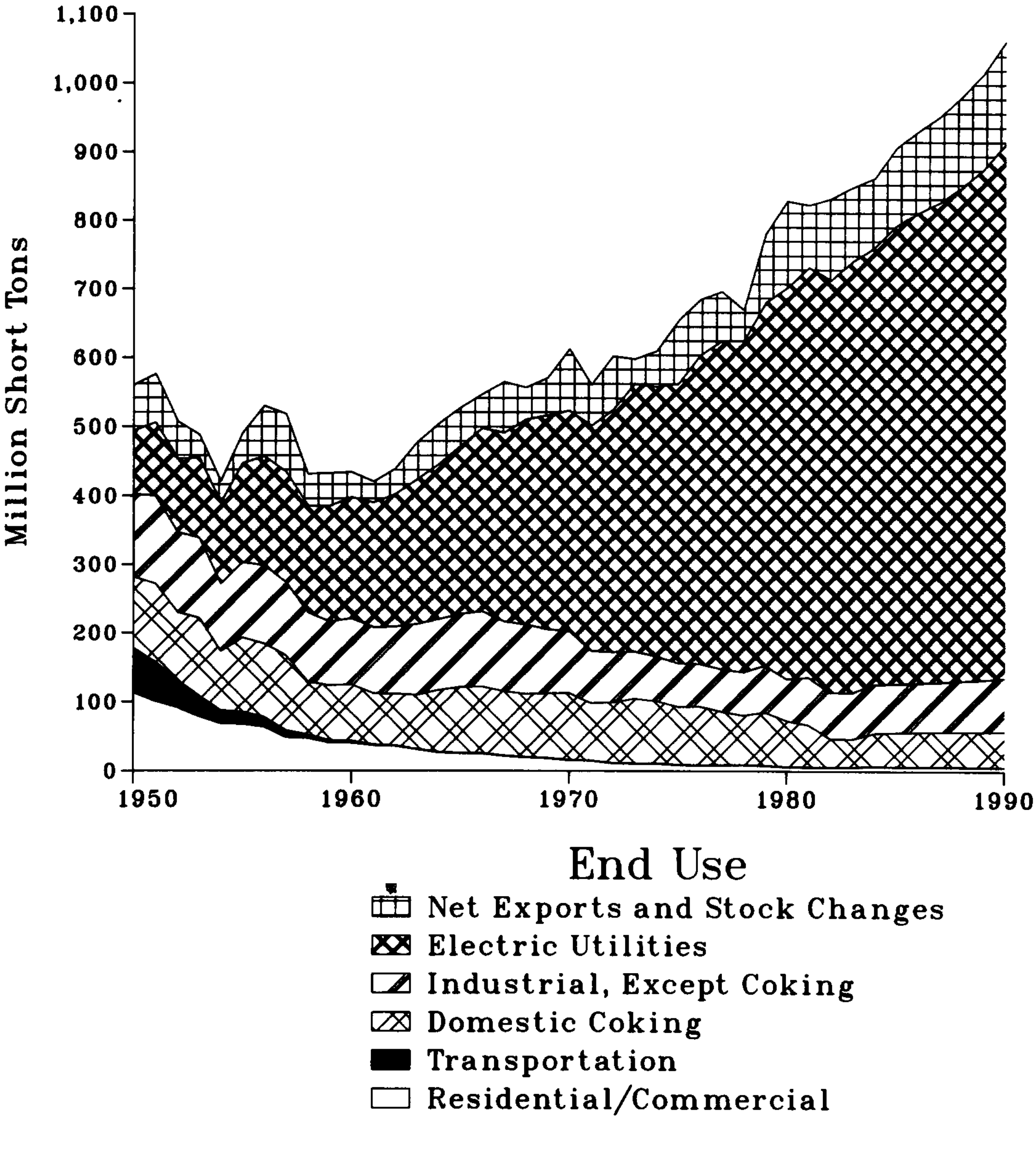
The coal industry has the capability to produce up to 100 million tons more coal per year than currently produced; coal production in the United States is limited more by demand than by supply. The coal reserve base in the United States is one of the largest in the world. The most recent estimate places it at approximately 473 billion tons, of which about 246 billion tons are considered recoverable by conventional mining techniques. This estimate represents about 25 percent of the known recoverable reserves in the world, more than the coal reserves of any other free world nation, and about 9 times the Btu equivalent of recoverable oil and gas reserves in the contiguous United States and Alaska.[39]

To meet the projected growth in both domestic and foreign demand for coal, U.S. coal production is projected to grow by 2.2 percent per year from 1980 to 1990.[40] Coal is projected to provide approximately 25 percent of the Nation's gross energy consumption in 1990 compared to about 20 percent in 1980.

The driving force behind increased coal use and production, as discussed in the utilities and industrial sections, is the relatively low price of the fuel. For example, the average price of coal to utilities in 1990 is projected to be only 1.86 (1982 dollars) per million Btu in the midprice case.

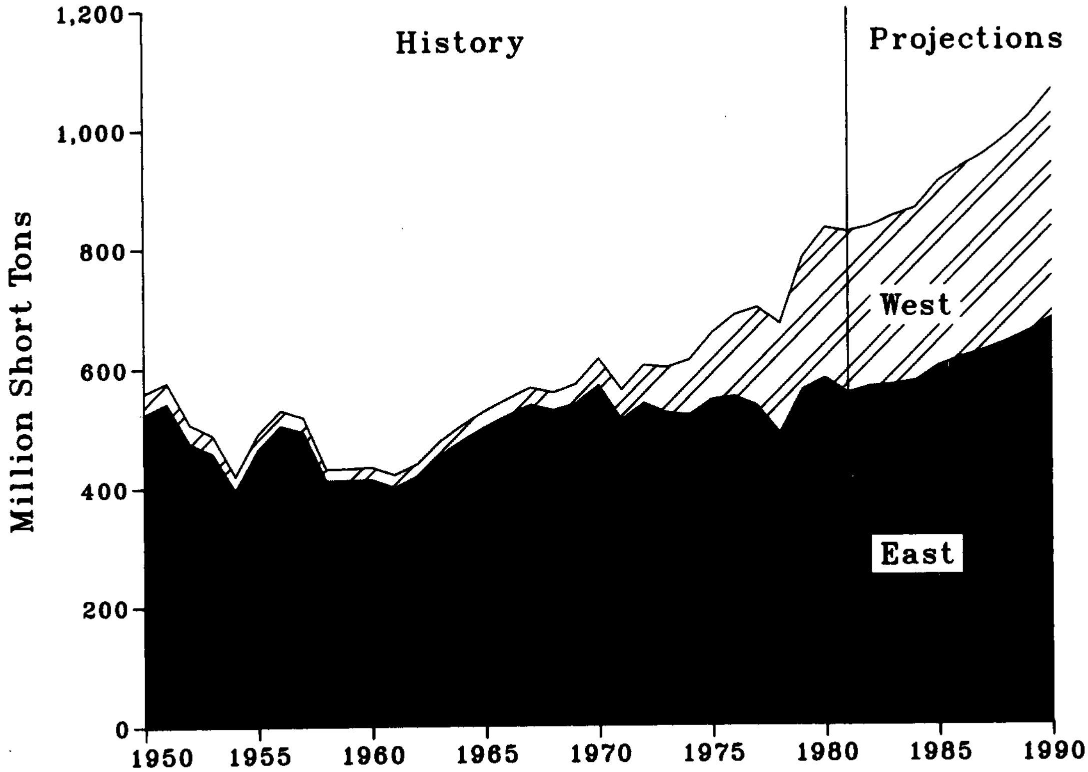
Residual fuel oil, on the other hand, is projected to cost 6.53 (1982 dollars) per million Btu. As a result, new, large fuel-burning installations operated by utilities and large industrial facilities tend to use more coal. Utility use, for example, is projected to rise by 3.0 percent per year between 1980 and 1990. The geographic location of coal mining activities is also changing. During the 1970's, the share of coal produced west of the Mississippi increased significantly, and this trend is projected to continue. In fact, the midprice projections show 36 percent of U.S. coal production coming from west of the Mississippi by 1990 (see Figure 32).

Figure 31. Coal Consumption by End Use, Midprice Scenario, 1950 to 1990 (Million Short Tons)



Source: Historical data: Energy Information Administration, 1981 Annual Report to Congress, Volume 2, DOE/EIA-0173(81)/2 (Washington, D.C., 1982), Monthly Energy Review, DOE/EIA-0035(83/2) (Washington, D.C., 1983), and Weekly Coal Production, DOE/EIA-0218, selected issues.

Figure 32. Coal Production by Major Producing Region, Midprice Scenario, 1950 to 1990 (Million Short Tons)



Source: Historical data: U.S. Department of the Interior, Bureau of Mines, Minerals Yearbooks, (Washington, D.C.) selected years; Energy Information Administration, 1981 Annual Report to Congress, Volume 2, DOE/EIA-0173/(81)/2 (Washington, D.C., 1982) and Weekly Coal Production, DOE/EIA-0218, selected issues.

Staggers Rail Act of 1980

Rail transportation that involved movements across State boundaries was totally regulated by the Interstate Commerce Commission (ICC) until the passage of the Staggers Rail Act of 1980. All rail tariffs had to be published. Generally, the ICC required that rail rates be between out-of-pocket cost and average total cost. However, the relatively large fixed cost of providing rail service and problems with allocating joint costs made it difficult to calculate these cost limits.

At the time of the enactment of the Staggers Rail Act, the Congress recognized that many of the Government regulations affecting railroads had become unnecessary and inefficient and that earnings of the railroad industry, lowest of any transportation mode, were insufficient to generate funds for future capital improvements.

The Act limits the Federal Government regulation of railroads to those situations in which the market is not an efficient allocator of transportation services. For the first time since the establishment of the ICC, the Act permits shippers and railroads to enter into bilateral contracts for rates and services outside of ICC jurisdiction. However, the regulatory umbrella of the ICC is continued for captive shippers over which railroads hold market dominance. A captive shipper is usually defined as a shipper for whom a single railroad represents the only source of transportation for the entire shipment or for a substantial share of the route.

Much coal transportation (especially to electric utilities) is provided under long-term contracts. In general, these contracts could moderate increases in coal haulage rates over the next few years.

Several factors explain this regional shift in the coal production pattern. Among the most important of these is the sulfur content of the coal. Sulfur in the coal is released into the atmosphere by combustion. The easiest way to improve air quality is to reduce sulfur dioxide emissions by burning low-sulfur coal when possible. Most of this low-sulfur coal is located in the western United States and has to be transported long distances to major coal users in the East. In addition, increasing western consumption is also satisfied by the low-sulfur western coal.

However, coal is, by its very nature, bulky and expensive to move from place to place. In 1981, 64 percent of coal movements were by railroad and 11 percent by barge with coal slurry pipelines and trucks providing the remaining haulage. Unit train rates over moderate distances run roughly 2 to 4 cents per ton-mile with shorter hauls (less than 500 miles) being in the higher range. In places far from the western coal fields, the cost of transportation greatly reduces the cost advantage that western low-sulfur coal has over eastern high-sulfur coal and other fuels. On a rail movement from Wyoming to Ohio, for example, transportation charges can amount to well over half the delivered price of the coal. Increases in rail rates, permitted by greater rate flexibility under the Staggers Rail Act of 1980, may tend to slow the production of Western coal as delivered prices rise to midwestern and southwestern markets.

Coal Exports

The use of steam coal has been expanding world wide as nations have sought to become less dependent upon oil imports from OPEC. The United States, Australia, South Africa, and Poland are currently the primary coal exporters. Each country has abundant coal reserves and is expected to continue as a major participant in the world coal market through 1990. Australia is expected to be the major competitor of the United States in the Far East, and South Africa the main competitor in the Western European coal market. The delivered cost of U.S. coal is higher than that of the other suppliers, but the United States is the only nation whose export capacity is not limited by loading, transportation, or financial constraints.

As foreign countries have shifted consumption towards coal, U.S. exports of coal have risen rapidly over the last 4 years, especially exports of steam coal from the east coast. Although exports of metallurgical coal are expected to be relatively stable during the next decade, exports of steam coal are expected to rise slightly by 1985 and then to begin increasing at a faster rate, reaching a level of 82 million short tons by 1990. Most of the exports are expected to be shipped from east coast ports.

U.S. Coal Exports, 1979-1990
(Million Short Tons)

	Actual				Projected	
Coal Type	1979	1980	1981	1982	1985	1990
Steam Coal	14	27	45	41	51	82
Metallurgical Coal .	51	63	65	65	58	61
Total Export	65	90	110	105	109	143

Note: All figures exclude exports of anthracite and lignite coal. Totals may not add due to rounding.

Source: 1979-1982 -- Energy Information Administration, Weekly Coal Production DOE/EIA-0218 (83/05), (Washington, D.C., 1983) Table 27, p. 33.

Energy Economy Interactions

An essential part of any examination of the energy sector is a review of its relationship to the rest of the economy. In nominal (current dollar) terms, the energy sector has risen from only 5.7 percent of total U.S. economic output in 1972, to approximately 11.5 percent in 1982,[41] due to the dramatic rise in energy prices over the last decade. The energy price shocks experienced in the 1970's were imposed by forces outside the United States, and yet they had an enormous effect on the daily life of every American.

If energy prices change significantly, both the inflation rate and the rate of unemployment for the whole economy can be affected. The rate of unemployment will change if the level of overall economic activity measured by such indices as the growth rate in Gross National Product (GNP) or the level of production in manufacturing is affected. Through effects on the actual or expected inflation rate, changes in energy prices may also affect the general level of interest rates, such as money market rates, mortgage rates, and the prime rate. Sudden, unanticipated jumps in the price of energy have especially important effects on all of the above variables.

During the past decade, energy prices have had a particularly significant role to play in determining the course taken by the economy. The two oil price shocks, of the 1973-1974 and 1978-1980 periods, are widely considered to be responsible for part of the increased inflation experienced during the last 10 years. During this period, the annual rate of increase in the Consumer Price Index (CPI) jumped from a relatively low level (4.6 percent at a compound annual rate from 1968 to 1972), to a rate of 13.5 percent for the year in 1980. While not all of the increased inflation can be blamed on energy prices, increased oil import prices obviously made the job of maintaining both economic activity and stable prices extremely hard. Had policies been pursued to repress all the inflationary effects of these energy price shocks, higher unemployment than was actually experienced might have been the result.

The processes by which energy price shocks are transmitted to both the general price level and the level of unemployment are complex, with some causes easier to follow than others. In the case of the link to general price inflation, it is easy to see that as the cost of energy rose, particularly imported energy, some real cost to the economy had to be reflected in changes in the general level of prices. As manufacturers in this country experienced increased energy prices at the production level, at least part of the increased energy costs would be passed on to consumers as higher prices for a great variety of goods. At the same time, increases in the actual and expected inflation rates experienced by workers led them to demand greater wage increases, thus beginning a second round in the inflationary spiral. The ultimate change in the inflation rate depends upon monetary and fiscal policy responses as well as reactions in the private sector.

The effect of energy price shocks on the unemployment rate is somewhat more complex, since there is both the general effect of energy prices on the level of economic output to consider, as well as the degree to which increases in the price of one input to production (energy) may lead to producers substituting more of another input (labor) in the production process. While the effect of energy prices on output in general may be assumed to have predominant importance in the short run, it is necessary in the long run to take account also of the specific effects of energy price increases on both the demand and supply of labor. If energy prices increase to a permanently higher level, for example, the net effect on producers may be that they demand relatively more labor per unit of output, in industries where labor can be substituted for energy.

Despite these complexities, the dominance of output in determining the overall unemployment situation argues for concentrating attention on the effects of energy prices on the level of economic activity in general, as measured by various aggregate indices. Real GNP (evaluated at constant base year prices) is adversely affected by increases in the world price of oil. The fact that a significant part of the energy supply of the United States is in the form of imported oil is an important part of any analysis; if this were not true, an increase in the world market price of oil, or any other kind of energy, would not necessarily have important adverse consequences for the level of economic activity in the United States. If the United States were not a net importer of oil, increased oil prices might simply result in a redistribution of income within the domestic economy, and regional effects would be more important than national impacts. Because the domestic economy is still dependent upon foreign oil, however, a significant increase in the price of this commodity has immediate adverse effects upon the United States merchandise trade balance, and as the net amount of dollars paid out to foreigners increases, the domestic economy is correspondingly depressed.

While eventually these U.S. dollars may return to the economy as claims on real goods and services, less of the potential aggregate supply would then be available for domestic consumption.

Of course, the United States is less vulnerable to the degree that it is less dependent than previously upon imported oil -- the level of imports has been cut considerably since its peak of 8.8 million barrels per day in 1977. Nevertheless, even at a level of imports of only 4 million barrels per day, the effect of a $5.00 per barrel shift on the trade balance is still over $7 billion per year. Because this money is spent abroad and, in the near term, only partially respent back in the U.S., the level of disposable income in the United States is reduced in the short run by energy price shocks, and households (paying more for energy) must cut back expenditures on both energy and nonenergy goods.

Due to the near term effects on incomes and economic growth, as well as more permanent effects on the relative attractiveness of energy as an input to production, important long-term effects on productivity and investment result from a sharp, and sustained, energy price increase. Higher energy prices tend to make some capital (plant and equipment) designed for a world of cheaper energy prices obsolete; as this part of the capital stock is retired more quickly, and priority is given to investment in energy-saving capital equipment, other planned investments must be postponed, and the effort to "catch up" with higher energy prices may diminish productivity growth normally associated with new investment.

In addition, the short-run reduction in economic activity accompanying an energy price shock will lead to generally lower levels of investment until the economy recovers, further slowing down the rate of productivity growth in the long run, since new capital stock is put in place more slowly. Ultimately, as the economy adjusts to higher energy prices, some of the economic growth apparently "lost" in the initial reaction to the shock may be recovered, but it is unlikely that all of it would be regained.

Similar considerations apply if energy prices move both sharply upwards and sharply downwards over time, but the effects of declining prices are more mixed. On the one hand, downward price movements will always have certain beneficial effects on the economy -- reduced inflationary pressures, stimulus to incomes and employment, improved terms of trade. On the other hand, unstable energy prices makes both financial and real investment inherently more uncertain, and thus it is possible to incur economic losses due to adjustments costs. Nevertheless, the fundamental point that generally downward movements in the oil price are good for the U.S. economy remains true.

Many efforts to quantify the economic effects of changes in the energy sector have been made in recent years. The literature on this subject is quite large, and only a few studies can be mentioned in this brief discussion.

One economist, William Nordhaus, used a small macroeconomic/energy model of the U.S. in order to measure the effects of higher oil prices in the 1973-1979 period.[42] He concluded that "inflation was almost two-thirds percentage points a year higher during the 6 years while real income per worker grew 0.5 points a year slower". Investment activity was also found to be significantly depressed by higher world oil prices.

In another study taking a retrospective look at the 1974-1975 experience, Knut Mork and Robert Hall also concluded that the impact on the economy of the OPEC price shock was substantial.[43] The energy price shock accounts for a decline in real output by 2 percent in 1974 and by 5 percent in 1975. This is roughly two-thirds of the total divergence in real output from the trend. Mork and Hall continued their work on the subject with a look at the energy price shock commencing in 1978.[44] This shock had a somewhat smaller impact than the earlier 1974-1975 shock. Real output was depressed by 1.1 percent in 1979 and 2.8 percent in 1980. As with the previous analysis, investment activity is significantly curtailed.

While the above studies have investigated the impacts of past energy shocks, a number of studies have analyzed the potential impacts of future price shocks. A recent study prepared by the Congressional Budget Office uses the DRI Quarterly model to assess two disruption scenarios, each of 1 year duration and occurring in 1982.[45] When faced with a world shortfall of 3.0 million barrels per day real GNP declines by an average of 1.6 percent for the five quarters after the disruption. In an even larger disruption case the world shortfall is 7.5 million barrels per day, the negative impacts on the economy averages 4.3 percent for the five quarters after the disruption.

Edward Novicky presents a similar analysis of alternative sized disruptions. He postulates four disruptions of worldwide supply between 7 and 14 million barrels per day.[46] He finds that GNP losses rise much more than proportionately to the size of the disruption. Doubling the size of a U.S. shortfall would cause the decline in GNP to more than double. This result is typical of much work, and results from the increasing marginal value of oil as curtailment of supply increases in severity.

A forthcoming EIA survey of research on oil price effects on the economy[47] draws from some of the studies mentioned above and others to bring into focus current thought on the issue. The paper compares EIA simulation results to simulation results extracted from a review of the literature and also to recently released results from the Energy Modeling Forum[48] at Stanford University.

On average, the studies surveyed indicate that a 25 percent increase in world oil prices would tend to reduce GNP by 1 percent. Oil prices rise very rapidly as the severity of a disruption increases. As a result, a 250 percent increase in price gives rise to a 5 percent first-year loss in real GNP.

Comparison With Other Forecasts

A number of factors have caused the projections presented in this volume to differ from those contained in the 1981 Annual Report. Among these are recent events in world oil markets, (leading to lower world oil price projections) somewhat less optimistic macroeconomic assumptions, uncertainty about projected natural gas and coal prices, updates and revisions in data, and the reestimation of demand relationships based on new information. This year annual projections are presented rather than values for 1985 and 1990 alone. Table 9 presents a summary of recent forecasts. In 1990, total projected energy supply is about 4 quadrillion Btu less than in the 1981 Annual Report. This is a net change reflecting an increase of 3.0 quadrillion Btu in net energy imports and a decline of 7.3 quadrillion Btu in domestic energy production. The decline in projected domestic coal production, nuclear power and hydroelectric power accounts for approximately 65 percent of this decrease in domestic energy production, while oil and gas account for the remainder. The projected decline in domestic coal production results from reduced electrical utility and industrial demand for coal. Projected lower levels of nuclear plant utilization, cancellations, and postponement of plant startups explain the 1.3 quadrillion Btu decline in nuclear power supply. Data revisions are the primary reasons for the decline in hydroelectric power supply.

Combined net oil and gas imports increase by approximately 3.6 quadrillion Btu between the 1981 and the 1982 midprice projections. Offsetting increased energy imports is an increase of approximately 0.3 quadrillion Btu in projected coal exports.

Table 9. Comparison of U.S. Energy Supply/Demand Detail for 1990
(Quadrillion Btu per year)
(Real 1982 Dollars)

	1982 AEO	1981 ARC[a]	DRI[b]	CHASE[c]	7/82 PPAE[d]
Domestic Energy Supply					
Oil......................	19.3	20.0	19.9	19.4	18.0
Natural Gas..............	16.4	18.1	15.9	17.8	18.4
Coal.....................	23.9	27.1	23.6	27.1	25.8
Hydroelectric power......	3.2	3.5	3.5	3.9	3.4
Nuclear Power............	6.3	7.6	6.8	4.3	7.3
Total Domestic Production..	69.1	76.4	69.7	72.5	72.9
Net Imports					
Oil......................	15.1	12.0	13.1	13.2	12.7
Natural Gas..............	1.2	.7	2.4	1.1	1.8
Coal.....................	-3.8	-3.5	-3.4	-3.8	-3.2
Total Supply	81.6	85.6	81.8	83.0	84.2
Consumption					
Residential..............	9.3	8.9	9.3	9.5	9.1
Commercial...............	6.9	5.9	6.5	6.8	6.4
Industrial...............	24.1	26.9	22.9	22.4	27.7
Transportation...........	16.9	17.7	19.1	17.8	16.7
Total End-Use Consumption..	57.2	59.4	57.3	56.5	59.9
Gross National Product (billions).................	3,920.4	4,062.1	4,021.7	4,047.1	--
Disposable Income (billions).................	2,719.2	2,844.5	2,824.2	2,874.5	--
World Oil Price (per barrel)...............	36.71	57.48	36.89	38.07	45.55

-- = Not applicable.

Table 9 (continued)

[a]For comparison, natural gas use in the transportation sector and lease and plant fuel natural gas in the industrial sector have been deleted.

[b]Industrial total excludes natural gas used a lease and plant fuel, hydroelectric power, solar, and exotic energy forms but includes natural gas used as a raw material. Transportation total excludes natural gas used as a transportation fuel.

[c]Sectoral consumption totals exclude electricity conversion losses and natural gas used as a lease and plant fuel and pipeline fuel have been excluded from the industrial and transportation sectors totals respectively.

[d]Renewable energy consumption has been excluded from residential, commercial, and industrial totals. Natural gas used by the transportation sector has been excluded from that sector's total consumption. Industrial sector total includes natural gas lease and plant fuel consumption, and asphalt which has been transferred from the commercial sector.

Sources:

Data Resources Incorporated, Data Resources Energy Review, Spring 1983. Volume 7 Number 1, (Lexington, Massachusetts, 1982).

Chase Econometrics, Energy Analysis Quarterly Third Quarter 1982, (Bala Cynwyd, Pennsylvania, 1982).

Energy Information Administration, 1981 Annual Report to Congress, Volume 3 DOE/EIA-0173(81) (Washington, D.C., 1982).

U.S. Department of Energy, Division of Analytical Services, Office of Policy, Planning and Analysis, July 1982 Energy Projections, (Washington, D.C., 1982).

Total projected end-use consumption declined by approximately 2.2 quadrillion Btu between forecasts, with a 1.4 quadrillion Btu increase in combined residential and commercial consumption being offset by a 3.0 quadrillion Btu decrease in transportation and industrial consumption. The increase in projected residential and commercial consumption reflects the impact of lower assumed oil prices. Projected industrial sector energy consumption decreases by approximately 2.8 quadrillion Btu; data revisions and reestimation of the projection system offset the effect of lower oil prices. Feedstock use declines by 2.2 quadrillion Btu, while heat and power uses account for the remainder of the decline. Transportation consumption declines by approximately .8 quadrillion Btu due to the projected increased efficiency of the vehicle stock and a lower projection of disposable income.

Footnotes to Chapter 3

[1]Fechtel, Brian R., Edward R. Novicky, and Arlene Ryan Wusterbarth, Energy Capital in the U.S. Economy (Bethesda, Maryland: MTSC, Inc., 1980), pp. 2.13.2, 2.12.3, 2.14.1.

[2]Various household populations in this paragraph from: U.S. Department of Commerce/Bureau of the Census, Housing Survey: 1980 General Housing Characteristics, (Washington, D.C., 1982).

[3]Estimates of end-use energy consumption were made in the Office of Energy Markets and End Use using the Residential Energy Consumption Survey data base covering the period April 1980 through March 1981.

[4]Historical values for energy consumption from: Energy Information Administration, State Energy Data Report 1960-1980, DOE/EIA-0214(80) (Washington, D.C., 1982); Historical values for households from: U.S. Department of Commerce, Bureau of the Census Annual Housing Survey: 1980 General Housing Characteristics, (Washington, D.C., 1980).

[5]Historical values for wood consumption are from: Energy Information Administration, Estimates of U.S. Wood Energy Consumption from 1949 to 1981, DOE/EIA-0341 (Washington, D.C., 1982).

[6]Historical data in the commercial sector discussion are from Energy Information Administration, State Energy Data Report 1960-1980, DOE/EIA-0214(80) (Washington, D.C., 1982), p. 16.

[7]The industrial sector includes manufacturing, mining, construction, and agriculture. However, lease and plant fuel, refinery fuel use, and fuel for transportation in agriculture and construction are excluded.

[8]U.S. Department of Energy, Office of Conservation and Renewable Energy, The Annual Report: Industrial Energy Efficiency Program (DOE/CS/0111) various dates.

[9]U.S. Department of Commerce, Bureau of Census. Hydrocarbon, coal, and coke materials consumed M80C(AS)-4.3 and 1980 Annual Survey of Manufactures Fuel and Electricity Consumed, Industry Groups and Industries M80(AS)-4.1 9 (Washington, D.C., 1982).

[10]International Energy Journal, July 1982, Volume XLIX, #7, pp. 286-290.

[11]R. Ball, "New Process A German Maverick Pioneer in Steel" Fortune, October 4, 1982, pp. 131-134.

[12]U.S. Department of Energy, Office of Conservation and Renewable Energy, Trends on Energy Use and Fuel Efficiency in the U.S. Commercial Airline Industry, (Washington, D.C., 1982), p. 6.

[13]Computed from information contained in Office of Conservation and Renewable Energy, Trends in Energy Use and Fuel Efficiency in the U.S. Commercial Airline Industry, (Washington, D.C., 1982), p. 14, Table 4.

[14]Computed from data in Energy Information Administration, Monthly Energy Review, DOE/EIA-0035(83/3) (Washington, D.C., 1983), p. 24-27.

[15]Computed from data in Energy Information Administration, 1980 Annual Report to Congress, Volume 2, DOE/EIA-0173(79)/2 (Washington, D.C., 1980).

[16]Computed from data in Energy Information Administration, Monthly Energy Review, DOE/EIA-0035(83/2) (Washington, D.C., 1983), p. 92.

[17]Computed from data in Energy Information Administration, Inventory of Power Plants in the United States 1981 Annual, DOE/EIA-0095(81) (Washington, D.C., 1983).

[18]Computed from data in Energy Information Administration, Monthly Energy Review, DOE/EIA-0035(83)/2 (Washington, D.C., 1983), p. 68.

[19]Ibid.

[20]Computed from data in Energy Information Administration, Monthly Energy Review, DOE/EIA-0035(83/2) (Washington, D.C., 1983).

[21]Ibid.

[22]Energy Information Administration, U.S.-Canadian Electricity Trade, DOE/EIA-0365 (Washington, D.C., 1982).

[23]Committee on Environment and Public Works, United States Senate, Report together with Additional, Supplemental, and Minority Views to Accompany S.3041 (Clean Air Act Amendment of 1982), p. 66-67.

[24]Energy Information Administration, Petroleum Supply Annual 1981, Volume 1, DOE/EIA-0340(81)/1, (Washington, D.C., 1982).

[25]Alaska Department of Revenue, Petroleum Production Revenue Forecast: Quarterly Report, (Juneau, Alaska, 1982).

[26]Energy Information Administration, Petroleum Supply Monthly, DOE/EIA-0109(82)/11 (Washington, D.C., 1982).

[27]Energy Information Administration, 1981 Annual Report to Congress, Volume 2 DOE/EIA-0173(81)/2 (Washington, D.C., 1982).

[28]Ibid.

[29]Ibid.

[30]Ibid.

[31]Energy Information Administration, 1981 Annual Report to Congress, Volume 2, DOE/EIA-0173(81)/2 (Washington, D.C., 1982).

[32]Energy Information Administration, Petroleum Supply Monthly, DOE/EIA-0109(82)/11 (Washington, D.C., 1982).

[33]Ibid.

[34]Energy Information Administration, 1981 Annual Report to Congress, Volume 2, DOE/EIA-0173(81)/2 (Washington, D.C., 1982).

[35]Energy Information Administration, The Current State of the Natural Gas Market, DOE/EIA-0313, (Washington, D.C., 1982).

[36]Energy Information Administration, Natural Gas Producer/Purchaser Contracts and their Potential Impacts on the Natural Gas Market, DOE/EIA-0330 (Washington, D.C., 1982).

[37]Energy Information Administration, Short-Term Energy Outlook, DOE/EIA-0202(82/4Q)1 (Washington, D.C., 1982).

[38]Computed from Energy Information Administration, Short-Term Energy Outlook, DOE/EIA-0202(82/4Q)1 (Washington, D.C., 1982); U.S. Department of Energy, Energy Information Administration, 1980 Annual Report to Congress, Volume 2, DOE/EIA-0173(80)/2 (Washington, D.C., 1981).

[39]Energy Information Administration, 1981 Annual Report to Congress, Volume 2, DOE/EIA-0173(81)/2 (Washington, D.C., 1982).

[40]Energy Information Administration, Short-Term Energy Outlook, DOE/EIA-0202(82/4Q)1 (Washington, D.C., 1982).

[41]Based on the Data Resources, Inc., Interindustry Model forecast of October 1982.

[42]Nordhaus, W.D. "Oil and Economic Performance in Industrial Countries," Brookings Papers on Economic Activity 2 (1980, Washington, D.C.) pp.341-88

[43]Mork, K.A., and Hall, R.E. "Energy Prices and the U.S. Economy in 1979-1981." MIT Energy Laboratory Working Paper No. MIT-EL 79-04WP, (Cambridge, Mass., August 1979).

[44]Mork, K.A., and Hall, R.E. "Energy Prices, Inflation, and Recession, 1974-75." MIT Energy Laboratory Working Paper No. MIT-EL 79-028WP, (Cambridge, Mass., May 1979).

[45]Webre, P. "Managing Oil Disruptions: Issues and Policy Options." Congressional Budget Office Study, (Washington, D.C., September 1981).

[46]Novicky, E. "DRI Macroeconomic Simulations for the SPR Sizing Study - 1980." Memorandum from Ed Novicky to Roger Naill, Jick Myers, and Glen Sweetnam, (October 30, 1980).

[47]Earley, Ronald F. and Curtis, William P. "Impacts of World Oil Market Shocks on the U.S. Economy: Literature Review," (Washington, D.C. to be published).

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4. Energy Markets in the Longer Term

Since the oil crisis of 1973 to 1974, the United States has witnessed a set of events that, taken together, seem to indicate that the "energy crisis" is over. Some of the events indicate underlying changes to the economy, while others are shorter term events that cloud the analysis. For example, in the United States, new nuclear powerplant orders were virtually eliminated, while private and Government sponsorship of a synthetic fuels industry was initiated and largely withdrawn. Recently, domestic oil and gas drilling activity has declined.

These changes have been accompanied by significant declines in the per capita demand for energy. At least half of the homeowners have added insulation and/or taken other energy conservation measures in their homes. Industry has reduced its energy intensity (energy input per unit output), and automobiles have been made more energy efficient. Over the past few years, the international demand for oil has dramatically declined, contributing to the fall in the world oil price in real terms.

These recent events have shaped energy price perceptions and, hence, affected both energy supply and demand. Although price perceptions are formed in the short run, they affect the level and type of investment in new capital equipment that will operate in the long run. One effect of the perception that oil prices will not increase sharply and quantities will be readily available is that research and investment in synthetic fuels have nearly come to a halt. Only three synthetic fuel programs are still active, while scores were either in progress or planned only 2 years ago. Perceptions also influence long-run energy demand and affect the introduction of new energy technologies. If future oil prices are higher than expected and low-cost supplies smaller than currently perceived, the impact of the less energy-efficient equipment will be to advance the time when high energy prices pose a problem. The effect on the supply side will be to reduce the available options and the rate at which they can be brought on-line once prices rise.

Role of Energy in the Economy: Long-Range Perspective

Advanced industrial societies annually use energy at a rate of about 350 million Btu per capita, most of it derived from nonrenewable sources. Continuation of the historic trend would result in a tripling of per capita energy use within the next quarter to half a century. It seems unlikely that this will come to pass. Today's technological outlook, the lead time needed to introduce new technologies, and even the most optimistic assumptions about the discovery of new fossil fuel reserves cannot support such enormous consumption. However, such a future cannot be wholly ruled out, particularly should some stunning technological advances permit humankind to harness thermonuclear energy directly or via the sun. If the world's 4 billion people all consumed energy at the U.S. per capita rate, annual world consumption would be about six times the current amount.

The projections analyzed here are characterized as an extension of the trends of the recent past with the consumption and production decisions affected by relative prices and viable new technologies. Structural changes in the economy are indicated only to the extent that such changes are extensions of the recent past.

Forecast Comparisons

This review is limited to forecasts of energy supply and demand for the year 2000 that are widely circulated, sufficiently documented, and sufficiently detailed in energy and economic areas to permit comparison and assessment. A comparison of the forecast results for the year 2000 indicates basic agreement that the core sources of energy supply will be oil, natural gas and coal. There is far less agreement about the role of synthetic fuels, renewable sources, and nuclear power.

Four forecasts were selected for this review:

1. 1981 Annual Report to Congress, Volume 3,[1] Energy Information Administration, February 1982.

2. Energy Projections in the Year 2000[2] (a supplement to the National Energy Policy Plan, U.S. Department of Energy, Office of Policy, Planning, and Analysis), July 1981.

3. Data Resources Energy Review, Autumn 1982.[3]

4. Integrated Forecasting Model Synthetic Fuels Study.[4] Prepared for the Electric Power Research Institute by Decision Focus Incorporated, April 1982.

These forecasts were prepared up to a year before the publication date. Forecasts made in 1983 would be based on different assumptions, particularly with respect to the world price of oil, affecting forecasts of energy production, consumption, and the use of synthetics.

Forecast Analyses

Driving Assumptions. Input assumptions are often more important determinants of conclusions derived from forecasts than the methodologies used to produce the forecasts. In general, the most important input assumptions used in energy forecasting are economic activity (GNP), population (demographics), and future world oil prices. Assumptions for GNP and world oil prices for the studies reviewed here are presented in Table 10 below. It should be noted that the current EIA view of the future world oil price is substantially lower than those used in the above forecasts. The current Annual Energy Outlook projects the world oil price, in 1980 dollars, to be \$31.63 per barrel in 1990. The world oil price in 2000 would be correspondingly lower (\$50.41). The potential implications of such a revised view are discussed in the conclusions.

Assumptions regarding economic growth (Table 10) vary only slightly across the forecasts: the National Energy Policy Plan (NEPP), the 1981 Annual Report to Congress, and the Data Resource Energy Review (DRI) forecasts use a 2.5-percent per year average GNP growth rate through year 2000 as their

Table 10. Macroeconomic and World Oil Price Assumptions

Forecast	U.S. GNP Growth (percent per year from 1980) 2000 Midrange	2000 Range	World Oil Price (1980 dollars/barrels) 2000 Midrange	2000 Range
NEPP[a]	2.5	2.0 - 3.0	64	46 - 87
ARC[b]	2.5	--	75	50 - 100
DRI[c]	2.5	--	46	--
EPRI[d]	2.8	--	--	32 - 48
EIA	--	--	50	--

[a]U.S. Department of Energy, Office of Policy, Planning, and Analysis, Energy Projections in the Year 2000, DOE/PE-0029 (Washington, D.C., 1981).

[b]Energy Information Administration, 1981 Annual Report to Congress, Volume 3, DOE/EIA-0173(81)3 (Washington, D.C., 1982).

[c]Data Resources Incorporated, Data Resources Energy Review, Autumn (Cambridge, Massachusetts, 1982).

[d]Decision Focus Incorporated, Integrated Forecasting Model Synthetic Fuels Study (Palo Alto, California: Electric Power Research Institute, 1982).

-- = Not applicable.

Table 11. Projections of U.S. Energy Consumption for the Year 2000
(Quadrillion Btu)

Sector	1980[a]	NEPP[b]		1981 Annual Report to Congress[c]			DRI[d]
		Midrange	Range	Low	Mid	High	
Residential/Commercial							
Oil and LPG	3.3	2.2	--	1.9	1.9	2.0	1.6
Gas	7.5	7.8	--	7.2	7.0	7.4	7.2
Electricity	4.1	6.3	--	6.4	6.8	7.3	7.2
Coal	0.2	0.3	--	0.2	0.2	0.2	0.3
Other	[f]0.8	1.2	0.8 - 1.6	1.8	1.8	1.9	0.7
Total	15.9	17.8	--	17.4	17.7	18.9	17.0
Industrial							
Oil and LPG[e]	9.3	4.8	--	11.1	11.8	12.4	10.1
Gas	8.4	10.9	--	9.0	9.3	9.3	8.3
Coal	3.2	7.2	--	8.0	8.6	8.9	5.6
Electricity	3.0	6.0	--	4.7	5.2	5.6	4.3
Other	[f]1.4	2.6	2.2 - 3.1	2.4	2.5	2.4	0.1
Total	25.3	31.5	--	35.0	37.3	38.8	28.5
Transportation							
Oil	19.0	17.2	--	17.1	17.8	19.5	19.2
Gas (pipeline)	0.6	0.8	--	0.6	0.6	0.6	0.4
Electricity	--	--	--	0.1	0.2	0.1	--[f]
Alcohol	--	0.4	0.2 - 0.6	--	--	--	--
Total	19.6	18.4	17.0 - 20.0	17.8	18.6	20.3	19.6
Total End-Use Consumption ..	60.8	67.7	62.0 - 74.0	70.2	73.6	78.0	65.2

Table 11. Projections of U.S. Energy Consumption for the Year 2000 (continued)
(Quadrillion Btu)

Sector	1980[a]	NEPP[b] Midrange	NEPP[b] Range	1981 Annual Report to Congress[c] Low	Mid	High	DRI[d]
Conversion Losses							
Synthetic	--	2.7	1.2 - 3.8	2.3	2.2	2.4	0.1
Power Generation	17.3	29.1	24.7 - 32.8	25.9	27.9	30.2	27.7
Total Losses[h]	17.3	31.8	28.0 - 36.0	28.4	30.3	32.8	27.8
Total Disposition	78.1	99.9	99.0 - 110.0	98.6	103.9	110.8	92.9
Fuels for Power Generation							
Coal	12.1	22.0	17.9 - 24.8	21.6	22.9	25.0	24.2
Oil	2.7	1.1	0.6 - 2.8	0.5	0.5	0.6	1.3
Gas	3.8	2.2	1.1 - 3.3	1.2	1.2	1.3	2.2
Nuclear	2.7	10.6	9.2 - 11.9	9.1	10.5	11.6	7.4
Other	3.2	5.5	4.7 - 6.5	4.7	4.7	4.7	4.1
Total	24.4	41.3	35.1 - 46.7	37.1	39.9	43.2	39.2
Electricity Generated	7.2	12.3	10.4 - 13.9	11.2	12.0	13.0	11.5

[a] Energy Information Administration, 1981 Annual Report to Congress, Volume 2, DOE/EIA-0173(81)/3 (Washington, D.C., 1981).

[b] U.S. Department of Energy, Office of Policy, Planning, and Analysis, Energy Projections to the Year 2000, DOE/PE-0029 (Washington, D.C., 1981).

[c] Energy Information Administration, 1981 Annual Report to Congress, Volume 3, DOE/EIA-0173(81)/3 (Washington, D.C., 1981). Low = Low GNP, Low Nuclear, Middle World Oil Price; Middle = Middle GNP, Middle Nuclear, Middle World Oil Price; High = High GNP, High Nuclear, Middle World Oil Price.

[d] Data Resource, Inc., Energy Review, Autumn (Cambridge, Massachusetts, 1982).

[e] Includes asphalt.

[f] Energy Information Administration, Estimates of Wood Energy Consumption from 1949 to 1981, DOE/EIA-0341 (Washington, D.C., 1982).

[g] Less than 0.05 quadrillion Btu.

[h] Includes unaccounted gas losses.

-- = Not applicable.

base values and the Electric Power Research Institute (EPRI) uses 2.8 percent per year.

Energy Demand. The NEPP, Annual Report, and DRI forecasts, shown in Table 11, envision a similar future for residential/commercial energy as well as a shift away from oil and toward electricity. The EPRI forecast is excluded from this table because demand detail is lacking in the documentation. In the aggregate, the forecasts differ by less than 2 quadrillion Btu; the DRI forecast is at the low end, but DRI's low value is likely due to the exclusion of items included in the "other" category in the Annual Report and NEPP forecasts.

The forecasts are also consistent regarding transportation demand; all show stability or a slight decline in energy use for this sector. As with the residential/commercial sector, differences among the forecasts are limited to about 2 quadrillion Btu.

The industrial sector forecasts show the greatest diversity. The Annual Report shows a range of 35 to 38.8 quadrillion Btu, the NEPP is somewhat lower, and DRI shows only 28.5 quadrillion Btu by year 2000. Both the NEPP and Annual Report show higher growth of electricity and the direct use of coal in the industrial sector than does DRI. The Annual Report shows a slight growth from 1980 in the use of oil and LPG, while the NEPP envisions a reduction by 2000 to less than 50 percent of the 1980 level. It should be noted that this figure is lower than feedstock use for the chemicals and allied products industries in 1979. All the forecasts considered here show slight increases by the year 2000 from 1980 levels for natural gas use; forecasts for "other" fuels are consistent except DRI.

Energy Supply

Differences in the projected mix of energy supply are more pronounced than differences in demand. Although there is broad agreement on the continued role of domestic oil, natural gas, and coal, there are major differences on the future roles of synthetics, nuclear power, renewables, and oil imports (see Table 12). Renewables are those energy resources that either replenish themselves naturally, such as wood, wind, hydroelectric power, and biomass, or that have a long geologic time horizon such as geothermal and solar energy.

Conventional Fuel Supply. All forecasts except NEPP show moderate declines in domestic oil, natural gas liquids, and natural gas production. All forecasts show coal production approximately doubling from 1980 to 2000.

All forecasts show a decline in conventional oil production from the Lower-48 States, and stability or slight increases in supply from enhanced oil recovery and Alaska. The major differences are in synthetics and total liquid fuel supply; forecasts with lower synthetics projections and/or higher requirements for liquid fuel supply have higher oil imports.

Table 12. U.S. Energy Production and Net Imports for the Year 2000
(Quadrillion Btu)

Sector	1980[d]	NEPP[a]		ARC[b]			DRI[e]	EPRI[c]	
		Midrange	Range	Low	Mid	High		YYY	NNN
Oil and NGL	20.5	17.5	14.0 - 23.2	19.8	19.8	19.8	17.4	15.9	17.1
Synthetic Liquids									
Shale	--	2.3	1.3 - 3.4	1.7	1.7	1.7	0.	1.6	0.1
Coal-derived[f]	--	2.3	1.3 - 3.6	1.5	1.5	1.5	0.3	8.1	2.0
Biomass[f]	--	--	--	0.8	0.8	0.8	--	--	--
Synthetic Gas[f]	--	1.4	1.0 - 2.0	0.1	0.1	0.2	0.4	3.9	0.5
Natural Gas	20.1	18.0	14.7 - 21.4	17.3	17.6	17.6	15.5	18.3	17.7
Coal	19.2	41.7	37.1 - 45.9	38.5	40.5	43.0	35.9	51.4	38.5
Nuclear	2.7	10.6	7.4 - 14.0	9.1	10.5	11.6	7.4	3.9	3.9
Renewables	[g]5.2	9.7	7.6 - 11.9	10.5	10.6	10.8	4.2	--	--
Total Domestic Production .	67.7	99.8	83.0 -116.0	96.9	100.7	104.5	80.9	--	--
Net Imports									
Oil	13.5	2.5	0.0 - 11.0	6.8	8.3	10.8	14.1	7.4	13.9
Gas	1.0	2.0	1.0 - 3.1	0.5	0.6	1.1	2.8	1.5	1.1
Coal and Hydro	-2.2	-5.9	-3.4 - -8.4	-5.6	-5.6	-5.6	-4.8	--	--
Total Net Imports	12.3	0.0	NA	1.7	3.3	6.3	12.1	--	--
Adjustments	-1.9	--	--	NA	NA	NA	--	--	--
Total Domestic Supply	78.1	100.0	90.0 -110.0	98.6	104.0	110.8	92.9	--	--

Table 12. U.S. Energy Production and Net Imports for the Year 2000 (continued)
(Quadrillion Btu)

Sector	1980[1]	NEPP Midrange	NEPP Range	ARC Low	ARC Mid	ARC High	DRI	EPRI YYY	EPRI NNN
Conventional Oil									
Lower-48 States	14.8	8.9	7.2 - 12.7	11.7*	11.7*	11.7*	9.5	15.9	17.1
Alaska	3.4	3.8	3.0 - 4.2	4.5*	4.5*	4.5*	3.1		
Natural Gas Liquids	2.2	1.0	1.3 - 1.7	*	*	*	1.2		
Enhanced Oil Recovery	**	3.8	3.0 - 5.1	3.6	3.6	3.6	3.6		
Shale Oil	-	2.3	1.3 - 3.4	1.7	1.7	1.7	0.5	1.6	0.1
Synthetics									
Coal Liquids	-	2.3	1.3 - 3.6	1.5	1.5	1.5	0.3	8.1	2.0
Liquids from Biomass	-	-	-	0.8	0.8	0.8	-	-	-
Total Domestic Production	20.5	22.2	19.5 - 26.6	23.8	23.8	23.8	18.2	25.7	19.2
Net Oil Imports	13.5	2.5	0.0 - 11.0	6.8	8.3	10.8	14.1	7.4	13.9
Total Liquid Supplies	34.0	24.7	24.0 - 28.0	30.6	32.0	34.5	32.4	33.1	33.1

*Conventional oil and natural gas liquids are combined.
**Included in conventional oil.
Note: Totals may not add due to rounding and/or fuel conversion factors us

[a]U.S. Department of Energy, Office of Policy, Planning, and Analysis, Energy Projections to the Year 2000, DOE/PE-0029 (Washington, D.C., 1982).

[b]Energy Information Administration, 1981 Annual Report to Congress, Volume 3, DOE/EIA-0173/81)3 (Washington, D.C., 1982).

[c]Decision Focus Incorporated, Integrated Forecasting Model Synthetic Fuels Study, Volume I, Overview and Findings, (Palo Alto, California: Electric Power Research Institute, 1982).

[d]Energy Information Administration, 1981 Annual Report to Congress, Volume 2, DOE/EIA-0173(81)2 Washington, D.C., 1982).

[e]Data Resource Incorporated, Data Resources Energy Review, Autumn (Cambridge, Massachusetts, 1982).

[f]These categories are shown for informational purposes, but are not included in the total. Fuels used by these processes are already included in the other fuel categories. Low and medium Btu coal gas is not included in this category for the Annual Report forecast but is for the other forecasts.

[g]Adjusted to include biomass.

-- = Not applicable.

NA = Not available.

Note: Totals may not sum because of rounding and/or fuel conversion factors used.

Synthetic Fuels. All forecasts project some role for synthetic fuels by the year 2000. However, the size of the role seems conditioned by recent events; the more recent the forecasts, the less optimistic the future role of the Synthetic Fuels Corporation and the less optimistic the outlook for synthetics. The NEPP (July 1981) midrange case projects 6 quadrillion Btu by 2000, the Annual Report (February 1982) projects approximately 4 quadrillion Btu, and DRI (Autumn 1982) only 1.2 quadrillion Btu. The EPRI forecast (April 1982), which focused on synthetics, shows 2.7 quadrillion Btu for its least favorable synfuels scenario and 13.6 quadrillion Btu for its most optimistic projection. All forecasts show synthetic liquids playing a far larger role than synthetic gas. Liquids from coal and shale are roughly equal in all forecasts but EPRI's; EPRI projects that coal liquids will be significantly more important than liquids from shale.

Lower projections of synfuels production across the NEPP, Annual Report, and DRI forecasts are consistent with the perceptions of lower future world oil prices associated with each forecast. The more bullish EPRI forecasts must be attributed to assumptions regarding future coal prices and differences in forecast methodology. Resource supply curves for coal in the Integrated Forecasting Model (IFM) used in producing the EPRI forecasts show extensive additions to reserves available at $1 per million Btu or less, implying no real increases in the cost of coal over a long-term horizon.

Nuclear Power. NEPP and Annual Report project about 10 quadrillion Btu of nuclear power by 2000 versus 2.7 in 1980. DRI projects 7.4 quadrillion Btu, and EPRI only 3.9 quadrillion Btu. Given that existing plants and those currently under construction can provide about 7.3 quadrillion Btu, and that no new plants have been ordered since 1978, the higher forecasts imply that a strong resurgence of the industry may occur in the longer term.

Renewables. As with nuclear, NEPP and Annual Report are more optimistic about the contribution of renewables than DRI (although DRI does show a substantial increase for year 2000 above 1980 levels). Renewables are more competitive in the DOE scenarios with higher oil price paths.

All forecasts show a modest increase in the contribution from hydroelectric power by the year 2000, and a substantial increase in the contribution from other renewable sources. The Annual Report is more optimistic about the future of geothermal and biomass than the other forecasts, while NEPP is more bullish on the future of wind and wave power. The two DOE forecasts are not in broad agreement regarding the future of renewables, while DRI appears considerably more conservative. The DRI forecast does not differentiate among renewable energy sources and does not seem to include biomass. In view of the lower expected future world oil price path and the relatively high capital cost of many renewable technologies, future use of renewable energy resources would probably now be forecast to be lower than either the 1981 Annual Report or NEPP.

Table 13. Energy and Economic Growth

History and Forecast	Primary Energy Quadrillion Btu)[a]	Real GNP (Billions of 1972$)[b]	Energy/GNP Ratio (1,000 Btu/1972$)[c]
1960	44	737	59.7
1965	53	929	57.1
1970	67	1,086	61.7
1975	71	1,232	59.5
1980	76	1,474	51.5
1981	74	1,503	49.3
AEO82[d]			
1990	88	1,826	48.2
NEPP[d]			
1990	88	1,950	44.6
2000	100	2,420	41.3
ARC[d]			
1990	89	1,953	45.6
2000	104	2,433	42.7
DRI[d]			
1990	82	1,919	42.7
2000	93	2,445	38.0

[a]The figures do not include wood usage in the nonutility applications (about 2.2 quadrillion Btu, 1980). Wood usage is included for all forecast years with about 3 quadrillion Btu in the Annual Energy Outlook forecasts for 1990. Also, see the Energy Information Administration Annual Report to Congress, 1982, p. 7.

[b]Economic Report of the President, Council of Economic Advisors, (Washington, D.C., 1983) p. 234.

[c]Computed from previous two columns.

[d]These represent the "base" or "midprice" cases.

Table 14. Reductions in the Energy/GNP Ratios
(Percent Reduction)

Forecast	1970-1990	1980-2000
ARC81	26.1	16.4
AEO82	21.9	--
NEPP	27.7	19.2
DRI	30.1	25.6

Note: For historical data, 1960-1980, the energy/GNP ratio declined 14.4 percent of total.

-- = Not applicable.

Imports and Exports. All forecasts show a substantial increase in coal exports by the year 2000, and from 1 to 3 quadrillion Btu of natural gas imports. Although projecting the lowest overall energy demand, DRI projects the highest oil imports (14.1 quadrillion Btu, approximately 7 million barrels per day) for the year 2000. This is due to lower projections of supply from domestic sources in all areas, but especially nuclear and synthetic fuels. Both the Annual Report and NEPP show a broad range of imports for various scenarios, but none as high as DRI. The midrange case for NEPP has only 2.5 quadrillion Btu of oil imports, and the Annual Report has 8.3 quadrillion Btu.

Energy-GNP Ratios

A common measure of the aggregate efficiency of energy use in the economy is provided by the ratio of primary energy consumption to the constant dollar value of total final output (i.e., the GNP). While fluctuating in the short run, there has been a general downward trend in this measure over the last 20 years (see Table 13). This has occurred even though delivered energy prices were declining for much of this period in real terms. With rising real energy prices, the energy intensity of the economy should continue to decline.

The ratio has declined 14.4 percent in the 21-year period from 1960 to 1980. Most of this change occurred in the second half of the 1970's, at least as a partial response to the rapid price escalation of the 1970's. Since NEPP, 1981 Annual Report, and the DRI forecasts all assume a real 2.5 percent/year growth, differences in energy use for the 1980 to 2000 period must be attributed to differences in the economic and technological structure of the economy.

All of the forecasts indicate an acceleration in the decline of the ratio for the period 1970 to 1990, with DRI showing a 30.1 percent decline from 1970 and this year's Annual Energy Outlook showing the smallest decline, 21.9 percent (see Table 14). The reductions for the 1980 to 2000 forecast period range from 16.4 percent in the 1981 Annual Report to 25.6 percent (DRI). The 1981 Annual Report forecast clearly assumes a continuation of recent historical declines of the energy GNP ratio and a continuation of the economic trends of the past 20 years. DRI, however, seems to be implying accelerated structural changes in the economy, away from energy-intensive industries and towards communications and services.[5]

Synthetic Fuels

History

Synthetic fuels (liquids or gas produced from coal, oil shale, or tar sands) have been produced in commercial quantities sporadically since the mid-1800's. Kerosene for illumination was produced from shale oil in the American West until driven out by inexpensive petroleum. The gas street lights still in use in some eastern cities are reminders that before the coming of the electric light, gas from coal-brightened streets (each municipality had its own "gasworks").

The deposits of solid fossil energy sources are enormous--shale alone in the western United States is estimated to hold the equivalent of 1,800 billion barrels of proven reserves. Periodically, interest in establishing a synthetic fuel industry has been aroused when it seemed that demand for liquid fuels would outstrip supplies. In each instance, abundant petroleum became available at prices below those required for economic viability of synthetic fuels production. Outside the United States, liquid fuels from coal have been produced only when economics have been secondary to the security of the supply (in Germany before and during World War II, and in South Africa since the 1950's). Production of liquids from the rich Athabasca tar sands of Canada and from oil shale in Brazil have proceeded only with significant government encouragement.

The German war effort produced 100,000 barrels per day at its peak in 1944; South Africa's program will reach this level in the mid-1980's. The new South African facilities (Sasol II and III), with capacities of 50,000 barrels per day, are the largest yet constructed. Costs of liquid fuels from these plants are estimated at $50 to $80 per barrel; costs in the United States would be higher due to stricter environmental control requirements and higher labor costs.

When the United States Government announced its intention to stimulate development of a synthetic fuels industry following the OPEC embargo in 1973, there was a surge of interest by private industry. This interest has all but disappeared as former perceptions of continually increasing oil prices have been reversed by lower prices associated with the current "oil glut." The original goals of the Synthetic Fuels Production Act of 1980 (500,000 barrels per day of oil equivalent by 1987, 2 million barrels per day by 1992) have become unrealistic in a very short time.

Uncertainty Regarding Technological Viability

Cost. Although no one knows what the actual cost of production for synthetic fuels in the United States will be until a commercial-scale facility is constructed and operated, recent experience with development and demonstration has reduced the technical uncertainties, increased the confidence, and reduced the range of engineering cost estimates.[6] In spite of improvements in the quality of cost estimates, enough uncertainty remains to affect the course of major projects; the stated reason for Exxon's withdrawal from the Colony oil shale project was cost escalation during detailed design.[7]

One uncertainty that could increase costs, as with nuclear power plants, is an increase in the time required to bring a plant into production from the start of construction. With the high interest rates prevailing in the late 1970's, interest during construction can account for a third of a plant's capital cost. The possibility of legal intervention during plant construction carries with it the prospect of increased costs associated with delays.

Environment. The environmental effects of a synthetic fuels industry range from the disturbance of land through mining to the poisoning of water tables through potentially carcinogenic compounds in the fuel byproducts. However, environmental problems are not expected to be a limiting factor, at least during the early stages of industry development. Synthetic fuels production may be compared to petroleum refining or electric power generation; while not totally environmentally benign, effects of these industries appear manageable at reasonable cost with existing technology.

Water Availability. Water availability is an issue in arid sections of the West if the vast oil shale and low-cost coal resources of the West are developed. Synthetic fuels production required 2 to 4 barrels of water per barrel of oil, but a well financed synthetic fuels industry could likely bid water away from agricultural interests. Several studies[8] indicate that sufficient water could be made available to support substantial synthetic fuels production in the West without displacement of agriculture. Water availability is not in general a problem for facilities in the East.

Government Involvement. The first United States Government involvement in synthetic fuels development came with the Synthetic Liquid Fuels Act of 1944 and supported development of methods for large-scale shale oil production by the U.S. Bureau of Mines at Anvil Points, Colorado. The Energy Research and Development Administration, and later the Department of Energy, supported research, development, and demonstration of synthetic fuels technology throughout the 1970's. The Energy Security Act of 1980 established the U.S. Synthetic Fuels Corporation (SFC). The goal of the SFC was to establish the industry by working as an investment bank, offering loan guarantees, price guarantees, purchase agreements, loans, and joint ventures to private industry; Congress appropriated approximately $20 billion for this purpose. Only two of the 61 projects entered in the first phase of the SFC's solicitations were advanced into negotiations for possible financial assistance by June of 1982: the Hampshire and Breckenridge coal liquids projects. By the end of November 1982, the major sponsors of both projects (Standard Oil of Ohio and Ashland Oil, respectively) had withdrawn from participation.

Prior to the activation of the SFC, The American Natural Resources' Coal Gasification Project (North Dakota) received $2 billion in loan guarantees from the Department of Energy, and Union Oil was awarded $400 million in price guarantees for its oil shale project (Colorado). Tosco, with a 40 percent interest in the Colony oil shale project, had also received aid (which will be refunded to the Government now that the project has been cancelled).

National Security. The current view of the majority of energy analysts is that one of the objectives of a synfuels industry--reduced threat of economic disruption from oil supply interruptions--can be more effectively addressed via other options (particularly stockpiling). Two other goals--improving the balance of payments and increasing national security by reducing dependence upon imported oil--may be achieved more economically through demand reductions and stimulation of alternative domestic supplies. Nevertheless, the goal of national security may be furthered by the existence of a synfuels industry that would provide additional liquid fuels.

Outlook

The optimism that surrounded the creation of the SFC in 1980 has rapidly given way to disenchantment in the face of rising project costs and falling oil prices. In the current environment, even with Government assistance, the private sector cannot justify major investments in synthetic fuels facilities.

Yet, several U.S. projects are moving ahead--most notably the American Natural Resources coal gasification and Union Oil shale oil projects--and these will add to the technology information base required for the ultimate development of a mature industry. Active projects in other countries, including Germany, New Zealand, and South Africa, will also contribute to the state of knowledge. Although at the present pace of development, synfuels will contribute little in the short run to the goals of the Energy Security Act--to "improve the nation's balance of payments, reduce the threat of economic disruption from oil supply interruptions, and increase the nation's security by reducing dependence upon imported oil." The long-term potential contribution of synfuels from oil shale, coal, and tar sands remains enormous.

Electric Utility Energy Outlook

Long-Term Electric Utility Outlook

The price of world oil has only an indirect effect on the end-use demand for electricity. Accordingly, prospects for electric power generation in the long term depend on broad economic, social, and environmental factors and on the continued availability of conventional energy resources used in generation. These include, coal, oil, natural gas, and uranium supplies besides hydroelectric power and wind generation. In addition, alternative technological approaches designed to reduce the consumption of oil and natural gas will probably utilize a combination of previously unused but existing technologies or use other resources like the sun, the wind, geothermal, and biomass that are characterized by unrestricted availability or by natural renewability.

Notwithstanding the potential for new developments in the future, electric power generation in 2000 will probably be dominated by prevailing conventional production methods. Accordingly, coal-, oil-, gas- and nuclear-powered generating plants, with significant contributions from hydroelectricity, will continue to provide the major share of needed capacity. Among the potential technologies that currently hold the promise of being adopted by the year 2000 are: atmospheric fluidized bed boilers fired by coal, low-Btu gas combined cycle, fuel cell supplied either by coal gasifier or by oil, fast breeder reactors, and some renewable technologies. The latter category includes biomass and wind. Other, somewhat less mature technologies like magnetohydrodynamics and ocean thermal electricity, though not likely to contribute significantly by year 2000, may make substantial energy contributions at approximately the same time as magnetic fusion. The extent of penetration of these new technologies would, however, hinge on the interaction of market forces to determine their economic feasibility for commercialization and their functional role in providing either baseload or peaking power on a cost-effective basis. Given the various uncertainties that inevitably govern the implementation of any new technology or resource, the electric utility industry will probably continue to rely on coal and nuclear fuels and attempt to minimize, to the extent possible, the use of oil and natural gas in the future. Even here, interfuel generation choices will be conditioned by the usual cost benefit considerations, adaptability to siting restrictions, and compliance with prevailing environmental requirements.

Regional limitations on the mining and transportation of large quantities of coal and air quality standards might result in higher coal costs and lower growth rates of coal use than currently envisaged. Fuel-specific aspects of the outlook for nuclear power involve questions of the extent of the domestic uranium resource base and the efficiency of current and potential nuclear technologies. In addition, the safety, environmental, and nonproliferation issues associated with nuclear technologies are of increasing domestic and international concern. Finally, the social acceptability of nuclear power in the light of the Three Mile Island accident remains difficult to assess and quantify objectively. In view of these uncertainties, renewable and/or other resources like the sun and the wind might possibly play a greater than anticipated role. These developments will come only gradually and over an extended time horizon well into the next century.

Factors in the Long-Term Development of Electric Power

The various projections used in this chapter show an increasing demand for electricity, but at rates significantly lower than those of the earlier projections. As a result, only gradual changes in the overall composition of the national generating system are likely to occur by the year 2000. However, the potential for rather radical (although less likely) changes during the long term also exists. For example, there could be a significant lifestyle change which leads to an increase in the use of small, dispersed cogenerating systems that might provide both heat and electricity to local areas more efficiently.

Such an increase may stimulate additional requirements for coal systems, such as fluidized-bed combustion boilers and coal gasifier-combined cycle systems. These technologies are expected to be suited to small scale operations (50 to 300 megawatt), and might be used locally, satisfying the environmental need to control noxious emissions. Nuclear power systems, however, may be noncompetitive in the local settings, owing to the very high cost of constructing small reactor plants (less than 600 megawatt) reactor plants and the severe criteria for reactor siting.

It is also possible that factors of water competition, site geology, and population density may reduce the number of nuclear sites likely to be available in the future. This situation has been intensified by the Three Mile Island accident, which revealed the need for improved civil preparedness and evacuation procedures during a nuclear emergency. These added uncertainties and stringent siting restrictions may imply that future reactors may be located primarily on existing nuclear sites. These considerations would, however, apply to new construction projects rather than those already in the pipeline.

Capacity expansion forecasts for the electric utility sector for the long-term project continued dependence on coal-fired and nuclear units. Over 80 percent of total domestic electric supply will probably come from coal and uranium in the year 2000 with oil and natural gas used mainly to provide peak demand. Coal and nuclear power generation provided 66.5 percent of the total power generated in the United States in 1982. The contribution of oil, natural gas, hydroelectric power, geothermal heat, biomass, wind, solar energy, and other new technologies are expected to provide the remainder. Of this, solar and other production possibilities may provide up to 2 percent of the total in the year 2000.

Nuclear Energy in the Longer Term

A long-term resurgence in new nuclear power orders is possible under the following conditions:

- The need for new electric generating capacity clearly increases.
- Nuclear power remains competitive with alternative generation sources, such as coal.
- Utility financial practices and utility rate structures are modified to reduce debt equity and cash-flow burdens of new nuclear construction.
- Uncertainties surrounding nuclear generating plants are resolved, including the predictability of the nuclear licensing process, nuclear safety regulations, reactor siting, and long-term uranium availability.
- The nuclear waste disposal problem is resolved, particularly the construction of a Federal repository for the long-term disposition of highly radioactive wastes.

Table 15. Nuclear Power Capacity Projections Through 2000 (Gigawatts of Net Electrical Capacity)[a]

Year	Low Nuclear Case[b]	Middle Nuclear Case	High Nuclear Case
1982	60	60	60
1985	72	80	90
1990	112	114	121
1995	113	122	127
2000	110	130	140

[a]Capacity estimates are rounded at yearend. Middle and high nuclear cases beyond the year 2000 are based on the respective year--2000 capacities adjusted by the long-term growth rates for nuclear capacity from Table 28 of the EIA 1981 Annual Report to Congress, Volume 3, DOE/EIA-0173(81)/3 (Washington, D.C., February 1982), p. 110.

[b]The low nuclear sensitivity assumes a lower GNP and electricity demand growth than the middle case and a reactor addition rate sufficient to replace retirements only.

A major concern among various industry segments is that a long delay in attaining these conditions would result in the dissolution of the industry infrastructure and the dispersal of the highly skilled technical staff to other areas of the economy. All but one domestic vendor have turned their corporate resources to nuclear fuel services and plant maintenance rather than outright promotion of new nuclear reactor sales.

In view of the continued attrition in demand growth, utility financial constraints and the 18 nuclear power plant cancellations experienced in 1982, the longer term nuclear power projections of EIA's 1981 Annual Report to Congress have been reassessed and are presented in Table 15. Nuclear capacity could reach 130 gigawatts (GWs) by the year 2000.

Although there is no specific accounting in this reassessment for advanced nuclear technologies, two such technologies are potential new sources of power in the longer term. The first, the liquid metal fast breeder reactor is currently in the development stage in the United States and is designed to extract more energy from uranium than current reactors. The breeder reactor is not generally projected to become economically competitive with conventional nuclear technology until well into the 21st century because the cost of uranium is projected to remain relatively low.

A potential alternative, magnetic fusion energy, is technically less-developed than the fast-breeder reactor, but it could offer a potentially safer, more abundant resource for future electricity generation. The process requires the fusion of heavy hydrogen nuclei, under great temperatures, to form helium. The central problem is the maintenance of a large-scale, sustained, and controlled fusion reaction. Fusion technology is not likely to contribute significantly to electricity generation until well into the next century. These results are highly conditioned on the timing of necessary technological innovations and other economic and institutional factors, all of which are highly uncertain.

The long-term projections reviewed earlier in this chapter imply that electricity demand will continue to increase, albeit at lower levels, corresponding to lower expectations for growth relative to growth in the general economy. Coal-fired and nuclear powered technologies could serve the major portion of future demand for electricity barring unforeseen constraints. A total phase-out of fission, over the long term, however, if replaced by coal-fired generation, may lead to untenable levels of coal utilization. On the other hand, if new coal generation technologies are more expensive than currently estimated, nuclear power could contribute even more significantly if a plentiful and reasonably priced supply of uranium continues to be available and if the nuclear power infrastructure still exists in the late 1980's to meet the anticipated increase in demand for reactor systems.

Financial Constraints

Projected developments for the electric utility industry in the long term depend on the availability of financial capital to undertake new investment activity in plant, equipment, and related infrastructure. Since the early 1970's, investor-owned utilities have encountered difficulty in financing new investments. A decline in demand growth to lower-than-historical averages compounded the problem by causing a decline in total utility revenues. In consequence, the residual profits of the utilities were significantly squeezed. Accordingly, many utilities have postponed or canceled construction of planned capacity additions.

Although the financial results of the utilities have improved dramatically during the last 2 years, 1981 and 1982, there is still cause for continuing concern. If the utilities face no financial constraints, they could be expected to build capacity additions commensurate with economic growth and the resulting growth of demand for power. It would also be reasonable to assume that uneconomic generating capacity would also be retired and fuel conversions would proceed as planned. If, on the other hand, utilities cannot obtain financing readily (due to inadequate earnings), they will not be able to replace uneconomic existing generating capacity to nearly the same degree and may be forced to keep the older plants in service longer. Some cutback in new construction activity would also be inevitable. Both these developments, while undesirable from the viewpoint of its impact on the economy, will also result in raising the long-term price of delivered power.

System reliability may be ensured by building additional combustion turbines that are also more expensive to operate than coal or nuclear. Given the long lead times necessary for new coal-fired plants (7 to 9 years) and nuclear plants (11 to 13 years), potential delays and/or cancellations might well imply that the most economically efficient capacity may not be available to meet demand.[9]

Footnotes to Chapter 4

1. Energy Information Adminstration, Annual Report to Congress, 17. Vol. 3, DOE/EIA-0173(81)/3 (Washington, D.C. 1981).

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Appendix A
Base Case and Sensitivity Case Reports

This appendix presents a guide to the key tables which briefly summarize the contents of each table. A location guide to the specific data in each table is then given. The specific data include: historical and projected values for energy prices, quantities, macroeconomic information, and measures of energy efficiency. Then the selected output reports for the three world oil price cases and the five sensitivity cases are provided. The same set of tables has been included for the base case and the world oil price sensitivity cases but the five other sensitivity cases contain the executive summary tables, Table 1.1 thru 1.4, and the appropriate tables to illustrate the impact of the sensitivity assumptions.

A complete listing of the output reports for each case can be found in the supplement to the Annual Energy Outlook.

Guide to Key Tables

In each section of scenario tables, the same numbering sequence has been adopted. In most cases, to minimize the size of this volume, not all of the tables have been provided. Although the tables are numbered A.1.1 to H.8.1, they are described generically below as 1.1 to 8.1.

This appendix contains the tables that form the basis for the projections for the midprice case. The tables are preceded by a short description of the key entries in each table and a guide that indicates where specific pieces of information can be found. Finally, there is a summary of the key changes for several sensitivity analyses.

Tables 1.1 to 1.4 provide national summaries of energy supply, demand, and prices. Quantities are in quadrillion Btu per year and prices are in 1982 dollars per million Btu. In general, these tables present the basic energy balance but only summarize the detail found in the subsequent fuel or sector specific tables. Table 1.1 and Table 1.2 aggregate the results described at the sector/fuel level in Table 1.3. Table 1.4 provides the corresponding sector/fuel prices. Basic consumption forecasts by sector are provided in Table 4, and the electric utilities summaries can be found in Table 5. Fuel specific balances for oil, gas, and coal can be found in Tables 6.1, 7.1, and 8.1, respectively.

Table 1.1 - Supply/Disposition of Total Energy

This is the key balance table designed to be consistent with Table 2 of the Short-term Energy Outlook, February 1983. It provides:

- Domestic production by fuel type
- Imports (exports) by fuel type
- Nonutility consumption by fuel type (expanded in Table 1.3)
- Utility fuel inputs by fuel type (expanded in Table 1.3)
- Total energy supply and disposition.

Table 1.2 - Supply/Demand Balance

This table emphasizes sectoral contributions but is otherwise identical to Table 1.1. It provides:

- Domestic supply by fuel type
- Imports by fuel type
- Consumption by end-use sector
- Adjustments such as losses, exports, or stock changes
- Electric utility fuel consumption by fuel type
- Electricity generation
- Total supply, end-use consumption, and disposition.

Table 1.3 - Consumption Summary

This table provides a detailed backup to Tables 1.1 and 1.2. It describes fuel consumption by sector, but does not include losses, such as those which occur in refineries, or electricity generation and transmission. These losses are shown in Table 1.1 and 1.2.

Table 1.4 - Price Summary

This table provides the sectoral composition of prices associated with Table 1.3. It includes:

- World oil price
- Prices by end-use sector and fuel.

Supply prices are found in sections 6, 7, and 8.

Tables 2.1 to 2.4 provide summaries of various international economic and energy indicators.

Table 2.1 - Real Gross Domestic Product Annual Average Compound Growth Rates

This table provides annual average compound percentage growth rates of real gross domestic product for groups of countries in the Organization for Economic Cooperation and Development (OECD), for non-OECD countries, and for free world countries for the periods 1960 to 1973, 1973 to 1980, and projections for 1980 to 1990.

Table 2.2 - Alternate OPEC Production Capacities, 1981-1990

This table provides the production for each Organization of Petroleum Exporting Country (OPEC) for 1981 and projections of low and high production capacities for each OPEC country for 1985 and 1990.

Table 2.3 - Free World Oil Consumption and Production

This table provides world petroleum prices, consumption, and production for historical years 1960, 1973, and 1981 and high, medium, and low price projections for 1985 and 1990. It includes:

- World oil price in 1982 dollars
- Consumption for several countries or groups of countries
- Production for several countries or groups of countries.

Table 2.4 - World Oil Prices Sensitivity Analysis

This table provides sensitivity ranges for world oil price projections under a variety of scenarios for 1985, 1990, and 2000.

Table 3.1 - National Macroeconomic Indicators

Table 3.1 provides key macroeconomic variables. These include:

- Real growth rate
- Inflation rate
- Unemployment rate
- Population (in millions)
- Per capital real disposable income (1979 dollars)
- Federal Reserve Production Index (1976 base).

The projections in the table represent outputs of the macroeconomic model in the Integrated Future Forecasting System. They are not the input macroeconomic assumptions, but differ slightly from these due principally to calibration errors between the model and the Data Resources Incorporated quarterly projection, TRENDLONG 0283. Changes in the table between different scenarios represent an assessment of the economic impacts of the energy changes. However, differences between this and the input assumptions mainly reflect calibration errors.

Tables 4.1 to 4.4 provide detailed consumption summaries for the residential, commercial, industrial, and transportation sectors, respectively. Note that the residential and industrial tables describe fuel use in trillions of Btu per year, whereas the commercial and transportation tables give fuel consumption in quadrillion Btu per year. The results of these tables are summarized in Table 1.3 and 1.4.

Table 4.1 - Residential Consumption by End-Use Service

- Space heating
- Water heating
- Air conditioning
- Other end uses: includes lighting, cooking, refrigeration, washing, drying.

Table 4.2 - Commercial Consumption and Floorspace by Building Category

- Warehouses: agricultural, refrigeration, nonrefrigeration, storage
- Institutions: jails, hospitals
- Offices: laboratories, outpatient clinics, educational buildings
- Hotel/motel
- Retail/wholesale
- Miscellaneous: religious facilities, assembly halls, parking garages, recreational facilities.

Table 4.3 - Industrial Energy Consumption

- Coal: steam and metallurgical
- Oil products: distillate, residual fuel, liquid petroleum gas, petrochemical feedstocks, other
- Natural gas: includes feedstocks
- Other: includes asphalt, petroleum coke, lubricants, industrial kerosene, waxes, miscellaneous petroleum products.

Table 4.4 - Transportation Sector Energy Consumption

- Fuel use: gasoline, distillate, jet fuel, residual fuel, liquid gas
- Light duty vehicles: sales, vehicle miles, fuel efficiency, fuel use
- Heavy trucks: sales, vehicles miles, fleet efficiency, fuel use
- Air travel: revenue passenger miles, load factor, fuel use.

Tables 5.1 to 5.5 are the electric utilities summaries. Projections include fuel prices, fuel consumption, sectoral and U.S. electricity prices and demands, available capacity, generation provided by capacity type, and components of electricity price. Fuel prices are 1982 dollars per million Btu, while electricity components of price are in 1982 dollars per thousand kilowatt-hours per year. Capacity projections are in gigawatts. In addition, Table 5.4 contains a list of scheduled capacity additions for each year, in megawatts.

Table 5.1 - Electric utility fuel prices and consumption

- Fuel prices: coal, natural gas, distillate, high and low sulfur residual fuel, uranium
- Fuel inputs by plant type: coal, natural gas, distillate, high and low sulfur residual fuel, nuclear power, hydroelectric power.

Table 5.2 - Electricity Prices and Demands

- Sectoral prices: residential, commercial, industrial, transportation
- Average U.S. price
- Sectoral electricity demands
- Total U.S. demand.

Table 5.3 - Capacity

- Available capacity by plant type (gigawatts)
- Generation produced by plant type (billion kilowatt-hours per year)
- Canadian imports (billion kilowatt-hours per year).

Table 5.4 - Scheduled Capacity Additions

- Utility plants presently under construction or possessing a construction permit (megawatts)
- Represents input data not projections.

Table 5.5 - Summary of Components of Electricity Price

- Components include capital, fuel, operating and maintenance (O&M), and other (depreciation and taxes)
- Price components for private utilities and all utilities.

Table 6.1 - Annual Supply and Disposition of Petroleum

Table 6.1 is the petroleum supply and demand summary equivalent to Table 5 in the Short-term Energy Outlook February 1983. It provides:

- Production: crude oil, natural gas liquids, other
- Imports: crude oil, refined products
- Imports include acquisitions for Strategic Petroleum Reserve (SPR)
- Exports: crude oil, refined products
- Stock changes (exclude SPR stock changes)
- Products supplied: motor gasoline, distillate, residual, fuel oil, other.

Table 7.1 - Natural Gas Supply/Demand Balance

Table 7.1 is the natural gas supply and demand summary. It includes:

- Domestic supply: lower-48 onshore and offshore
- Imports (dry gas plus liquified natural gas)
- Supplemental gas: synthetic gas or increased gas imports
- Supply and prices by category: new, old interstate, old intra-state, and deep gas
- Consumption and delivered prices by sector: residential, commercial, refinery, utilities, industrial
- Losses: lease and plant fuel, gas used in pipelines.

Table 8.1 - Coal Production by Type

Table 8.1 presents the coal production projections in million of short tons year.

- Domestic supply by region: Eastern, Western
- Other supply sources: Net Imports and Stock Withdrawals (for 1980 only)
- Consumption by end-use sectors including synthetic use.

Location of Key Solution Values

Outlined below is a topical reference guide for the tables contained in this appendix. It indicates where to find specific topics including supply, demand, and prices of primary fuels and products. A "P" in parentheses indicates projections are in physical units, while a "S" denotes standard units (Btu). Note that the actual tables are numbered A.1.1 etc., for case A, B.1.1-etc., for case B.

Domestic supply

- Coal
  - (1) Total U.S.: Tables 1.1(S), 1.2(S), 8.1(P)
  - (2) By region: Tables 8.1(P)
- Petroleum
  - (1) Total U.S.: Tables 1.1(S), 1.2(S), 6.1(P)
  - (2) Crude oil: Tables 1.1(S), 1.2(S)
  - (3) Products: Table 6.1(P)
- Natural Gas
  - (1) Total U.S.: Tables 1.1(S), 1.2(S), 7.1(S)
  - (2) Offshore or onshore: Table 7.1(S)
  - (3) Category: Table 7.1(S)
- Electricity
  - (1) Total U.S.: Table 1.2(S), Table 5.3(P)
  - (2) Nuclear: Table 1.1(S), Table 1.2(S), Table 5.3(P)
  - (3) Hydroelectric/other: Table 1.1(S), Table 1.2(S), Table 5.3(P).

Imports (Exports)

- Coal: Tables 1.1(S), 1.2(S), 8.1(P)
- Total oil: Tables 1.2(S), 6.1(P)
- Crude oil: Tables 1.1(S), 6.1(P)
- Petroleum products: Tables 1.1(S), 6.1(P)
- Natural gas: Tables 1.1(S), 1.2(S), 7.1(S)
- Supplemental gas: Tables 1.1(S), 1.2(S), 7.1(S)
- Electricity: Table 1.1(S).

Consumption

- End-use sector: Tables 1.2(S), 1.3(S), 4.1(S), 4.2(S), 4.3(S), 4.4(S)
- Electric utilities Tables 1.1(S), 1.2(S), 1.3(S), 5.1(S)
- Coal: Tables 1.1(S), 1.2(S), 1.3(S), 5.1(S), 8.1(P)
- Petroleum: Tables 1.1(S), 1.2(S), 1.3(S), 5.1(S), 6.1(P)
- Natural gas: Tables 1.1(S), 1.2(S), 1.3(S), 5.1(S), 7.1(S)
- Electricity: Tables 1.3(S), 5.2(S)
- Refineries Table 1.2(S), 1.3(S).

Prices

- World oil price: Table 1.4(P)
- Sectoral: Table 1.4(S)
- Coal: Table 1.4(S)
- Oil: Table 1.4(S)
- Natural gas: Table 1.4(S), 6.1(S)
- Electricity: Table 1.4(S), 5.2(P), 5.5(P).

Electric Utilities

- Generation: Tables 1.2(S), 5.3(P)
- Fuel consumption: 1.1(S), 1.2(S), 1.3(S), 5.1(S)
- Electricity consumption: Tables 1.3(S), 5.2(P)
- Prices: Tables 1.4(S), 5.1(S), 5.2(P), 5.5(P)
- Capacity: Tables 5.3(P), 5.4(P).

Case A
Middle World Oil Price Forecast

The following is the established base case forecast. It employs the middle world oil price path assumptions and an additional assumption that there is no change in Federal regulations. The key Federal regulation that, given declining oil prices, appears to have a dominant effect on the supply mix in the energy balance is the Natural Gas Policy Act and the assumption that natural gas contracts negotiated under its environment will continue as negotiated. A detailed discussion is given in the Executive Summary.

THE FOLLOWING SECTION OF TABLES ARE FOR THE:

CASE A: MIDDLE WORLD OIL PRICE

THIS SECTION CONTAINS THE FOLLOWING TABLES:

TABLE A.1.1. YEARLY SUPPLY AND DISPOSITION OF TOTAL ENERGY
CASE A: MIDDLE WORLD OIL PRICE
(QUADRILLION BTU PER YEAR)

	1975	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990
SUPPLY												
PRODUCTION												
PETROLEUM..........	20.1	20.5	20.4	20.6	20.5	20.6	20.4	20.5	20.5	20.5	20.3	19.3
NATURAL GAS........	19.6	20.1	19.9	18.2	17.5	17.0	15.2	14.7	14.8	15.3	15.9	16.4
COAL...............	15.2	19.2	19.1	19.1	19.4	19.4	20.3	20.8	21.4	22.0	22.8	23.9
NUCLEAR............	1.9	2.7	2.9	3.0	3.2	3.7	4.1	4.7	5.3	5.8	6.1	6.3
HYDRO/GEO/OTHER....	3.2	3.0	2.9	3.3	3.2	3.1	3.1	3.1	3.2	3.2	3.2	3.2
SUBTOTAL.........	60.1	65.5	65.2	64.2	63.7	63.9	63.2	63.9	65.0	66.8	68.2	69.1
NET IMPORTS												
CRUDE OIL..........	8.7	10.6	8.8	6.8	7.5	10.4	13.0	12.7	12.0	11.4	11.0	11.9
OTHER PETROLEUM....	3.8	2.9	2.6	2.1	2.5	3.0	3.1	3.1	3.1	3.1	3.1	3.2
NG (CONTRACTED)(1).	0.9	1.0	.9	.9	1.1	1.2	1.2	1.2	1.2	1.2	1.2	1.2
OTHER GAS(2).......	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.2	0.0	0.0	0.0
COAL AND COKE......	-1.7	-2.4	-2.9	-2.8	-2.6	-2.7	-2.9	-3.0	-3.2	-3.4	-3.6	-3.8
ELECTRICITY........	0.1	.2	.2	.2	.2	0.3	0.3	0.3	0.3	0.3	0.4	0.4
SUBTOTAL.........	11.7	12.3	9.6	7.3	8.6	12.3	14.8	14.6	13.7	12.7	12.2	12.9
SPR ADDITIONS(3)....	0.0	-.1	-.7	-.4	-.4	-0.3	-0.3	-0.3	-0.3	-0.3	-0.3	-0.3
STOCK WITHDRAWALS...	-1.1	-1.8	0.0	-.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL SUPPLY.........	70.7	75.9	74.1	70.9	71.9	75.8	77.6	78.2	78.4	79.2	80.1	81.7
CONSUMPTION												
NON-ELEC UTILITY FUEL												
PETROLEUM..........	29.5	31.5	29.9	28.6	29.2	30.7	32.1	31.8	31.2	30.6	30.3	30.3
NATURAL GAS(4).....	16.7	16.6	16.1	15.0	14.9	14.5	13.7	13.5	13.5	13.7	13.9	14.1
COAL...............	4.0	3.4	3.4	3.0	2.9	3.2	3.3	3.3	3.4	3.5	3.7	3.8
SUBTOTAL.........	50.2	51.4	49.4	46.4	47.0	48.4	49.0	48.6	48.1	47.8	47.8	48.2
ELECTRIC UTILITY FUEL												
PETROLEUM..........	3.2	2.7	2.2	1.8	1.5	2.9	4.1	4.2	4.2	4.2	4.0	4.0
NATURAL GAS........	3.2	3.8	3.8	3.3	3.4	2.7	1.7	1.7	1.7	1.9	2.2	2.4
COAL...............	8.8	12.1	12.7	12.7	13.2	13.5	14.2	14.5	14.8	15.1	15.6	16.3
NUCLEAR............	1.9	2.7	2.9	3.0	3.2	3.7	4.1	4.7	5.3	5.8	6.1	6.3
HYDRO/GEO/OTHER(5).	3.4	3.2	3.1	3.5	3.4	3.4	3.5	3.5	3.5	3.5	3.5	3.6
SUBTOTAL.........	20.5	24.5	24.7	24.3	24.7	26.0	27.2	28.3	29.1	30.1	31.0	32.2
TOTAL CONSUMPTION....	70.7	75.9	74.1	70.7	71.7	74.4	76.3	76.9	77.2	78.0	78.9	80.4
ADJUSTMENTS												
REFINERY LOSSES(6).	0.0	0.0	0.0	0.0	-0.1	0.0	0.2	0.2	0.2	0.2	0.2	0.2
DISCREPANCY(7).....	0.0	0.0	0.0	0.2	0.3	1.4	1.1	1.1	1.0	1.0	1.0	1.1
TOTAL DISPOSITION....	70.7	75.9	74.1	70.9	71.9	75.8	77.6	78.2	78.4	79.2	80.1	81.7

NOTE: THE "ANNUAL ENERGY REVIEW" FOR 1982 WILL CONTAIN LATER REVISIONS TO HISTORICAL DATA FOR 1975, 1980 AND 1982.
NOTE: TOTALS MAY NOT EQUAL SUM OF COMPONENTS DUE TO INDEPENDENT ROUNDING. FOR TABLE FOOTNOTES AND SOURCES SEE PAGE 219.

TABLE A.1.2. SUPPLY/DEMAND BALANCE
CASE A: MIDDLE WORLD OIL PRICE
(QUADRILLION BTU PER YEAR)

	1975	1980	1985	1986	1987	1988	1989	1990
DOMESTIC SUPPLY								
COAL..................	15.2	19.2	20.3	20.8	21.4	22.0	22.8	23.9
NATURAL GAS...........	19.6	19.9	15.2	14.7	14.8	15.3	15.9	16.4
PETROLEUM.............	20.1	20.5	20.4	20.5	20.5	20.5	20.3	19.3
NUCLEAR...............	1.9	2.7	4.1	4.7	5.3	5.8	6.1	6.3
OTHER(1)..............	3.2	3.0	3.1	3.1	3.2	3.2	3.2	3.2
TOTAL DOMESTIC SUPPLY..................	60.0	65.3	63.2	63.9	65.0	66.8	68.2	69.1
NATURAL GAS IMPORTS...	0.9	1.0	1.2	1.2	1.2	1.2	1.2	1.2
SUPPLEMENTAL GAS(2)...	0.0	0.2	0.0	0.3	0.2	0.0	0.0	0.0
PETROLEUM IMPORTS.....	12.5	13.5	16.1	15.8	15.1	14.5	14.1	15.1
TOTAL SUPPLY(3).........	73.4	80.0	80.4	81.2	81.6	82.5	83.6	85.4
DISPOSITION								
RESIDENTIAL...........	9.6	9.3	9.2	9.2	9.2	9.2	9.2	9.3
COMMERCIAL............	5.5	5.9	6.6	6.7	6.8	6.8	6.8	6.9
INDUSTRIAL(4).........	21.3	23.0	22.2	22.4	22.5	22.9	23.3	24.1
TRANSPORTATION........	17.7	19.7	18.6	18.2	17.7	17.3	17.0	16.9
TOTAL END-USE CONSUMPTION.............	54.1	57.9	56.6	56.5	56.2	56.2	56.4	57.2
DISCREPANCY.............	0.2	-0.1	-0.2	-0.1	-0.2	-0.3	-0.4	-0.5
ADJUSTMENTS.............	19.1	22.2	24.0	24.8	25.6	26.6	27.6	28.7
UTILITY GENERATION....	13.7	16.5	18.3	19.0	19.5	20.2	20.8	21.6
UTILITY TRANSMISSION..	0.6	0.7	0.9	0.9	0.9	1.0	1.0	1.0
REFINERY(5)...........	0.0	0.0	0.2	0.2	0.2	0.2	0.2	0.2
GAS PIPELINE(6).......	0.6	0.6	1.1	1.0	1.0	1.1	1.1	1.1
LEASE/PLANT FUEL(7)...	1.4	1.0	1.1	1.1	1.1	1.1	1.2	1.2
COAL EXPORTS..........	1.7	2.4	2.9	3.0	3.2	3.4	3.6	3.8
SPR ADDITIONS.........	0.0	0.1	0.3	0.3	0.3	0.3	0.3	0.3
STOCK WITHDRAWALS.....	1.1	1.8	0.0	0.0	0.0	0.0	0.0	0.0
RECLASSIFIED..........	0.0	-0.9	-0.7	-0.7	-0.7	-0.6	-0.6	-0.6
ADJUSTED CONSUMPTION....	73.4	80.0	80.4	81.2	81.6	82.5	83.6	85.4
ELECTRIC UTILITY FUEL								
COAL..................	8.8	12.1	14.2	14.5	14.8	15.1	15.6	16.3
PETROLEUM.............	3.2	2.7	4.1	4.2	4.2	4.2	4.0	4.0
NATURAL GAS...........	3.2	3.8	1.7	1.7	1.7	1.9	2.2	2.4
TOTAL FOSSIL............	15.2	18.6	20.0	20.4	20.7	21.2	21.7	22.6
NUCLEAR...............	1.9	2.7	4.1	4.7	5.3	5.8	6.1	6.3
OTHER.................	3.2	3.0	3.1	3.1	3.2	3.2	3.2	3.2
TOTAL...................	20.3	24.3	27.2	28.3	29.1	30.1	31.0	32.2
GENERATION..............	6.6	7.8	8.9	9.3	9.6	9.9	10.2	10.6

NOTE: TOTALS MAY NOT EQUAL SUM OF COMPONENTS DUE TO INDEPENDENT ROUNDING. FOR TABLE FOOTNOTES AND SOURCES SEE PAGE 219.

TABLE A.1.3. CONSUMPTION SUMMARY
CASE A: MIDDLE WORLD OIL PRICE
(QUADRILLION BTU PER YEAR)

	1975	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990
RESIDENTIAL	9.571	9.335	9.104	9.236	9.143	9.174	9.207	9.230	9.236	9.238	9.250	9.269
STEAM COAL.............	0.091	0.065	0.080	0.082	0.071	0.078	0.076	0.074	0.073	0.071	0.069	0.068
NATURAL GAS............	5.022	4.866	4.654	4.793	4.710	4.649	4.585	4.521	4.463	4.413	4.375	4.345
DISTILLATE(1)..........	1.923	1.417	1.375	1.303	1.230	1.308	1.328	1.336	1.331	1.318	1.302	1.286
LIQUID PETROLEUM GAS...	0.528	0.539	0.536	0.570	0.590	0.565	0.576	0.582	0.582	0.578	0.574	0.570
ELECTRICITY	2.007	2.448	2.459	2.488	2.530	2.574	2.642	2.717	2.787	2.857	2.929	3.001
COMMERCIAL	5.513	5.892	5.818	5.866	6.182	6.438	6.601	6.708	6.759	6.776	6.816	6.865
STEAM COAL.............	0.135	0.095	0.107	0.122	0.086	0.097	0.095	0.092	0.090	0.087	0.085	0.082
NATURAL GAS............	2.559	2.674	2.580	2.683	2.720	2.731	2.723	2.692	2.644	2.587	2.542	2.500
DISTILLATE(1)..........	0.622	0.556	0.540	0.511	0.670	0.738	0.775	0.801	0.815	0.820	0.824	0.827
LO-SULFUR RESIDUAL.....	0.506	0.566	0.470	0.376	0.490	0.542	0.569	0.588	0.598	0.602	0.605	0.608
LIQUID PETROLEUM GAS...	0.093	0.095	0.095	0.101	0.090	0.080	0.078	0.076	0.074	0.072	0.070	0.068
ELECTRICITY	1.598	1.906	2.026	2.074	2.150	2.251	2.361	2.459	2.538	2.607	2.690	2.779
INDUSTRIAL(2)	18.503	20.185	19.513	16.876	17.365	18.908	19.614	19.848	20.023	20.513	20.950	21.707
STEAM COAL.............	1.619	1.388	1.570	1.626	1.501	1.771	1.800	1.853	1.933	2.038	2.148	2.257
METALLURGICAL COAL.....	2.178	1.793	1.647	1.057	1.132	1.262	1.302	1.325	1.337	1.353	1.359	1.375
NATURAL GAS............	6.133	6.497	6.639	5.414	5.340	5.339	4.907	4.831	4.896	5.158	5.352	5.619
DISTILLATE.............	1.272	1.569	1.285	1.212	1.340	1.752	2.230	2.252	2.146	2.038	1.962	1.946
LO-SULFUR RESIDUAL.....	0.428	0.554	0.423	0.367	0.390	0.485	0.551	0.559	0.552	0.548	0.544	0.560
HI-SULFUR RESIDUAL.....	0.856	0.713	0.531	0.484	0.530	0.704	0.838	0.854	0.843	0.830	0.822	0.841
LIQUID PETROLEUM GAS...	0.252	0.308	0.323	0.332	0.370	0.366	0.384	0.359	0.313	0.266	0.220	0.183
PET-CHEM FEEDSTOCK(3)..	1.519	2.401	2.111	1.862	1.980	2.176	2.292	2.373	2.453	2.559	2.674	2.838
OTHER(4)...............	1.900	2.180	2.166	1.977	2.240	2.207	2.259	2.253	2.241	2.239	2.257	2.288
ELECTRICITY	2.346	2.781	2.817	2.545	2.620	2.846	3.051	3.189	3.310	3.484	3.611	3.801
TRANSPORTATION(5)	17.725	19.655	18.715	18.129	17.910	18.538	18.608	18.187	17.698	17.265	17.035	16.939
DISTILLATE.............	2.069	2.782	2.738	2.582	2.510	2.781	2.892	2.964	3.038	3.111	3.201	3.312
HI-SULFUR RESIDUAL.....	0.731	1.401	1.163	0.930	0.900	1.012	1.054	1.079	1.102	1.122	1.148	1.181
GASOLINE(6)............	12.868	13.253	12.688	12.528	12.180	12.471	12.290	11.713	11.082	10.523	10.128	9.831
JET FUEL(7)............	2.029	2.179	2.087	2.049	2.280	2.234	2.331	2.391	2.435	2.470	2.518	2.574
LIQUID PETROLEUM GAS...	0.016	0.014	0.014	0.015	0.020	0.015	0.015	0.015	0.015	0.015	0.015	0.015
OTHER..................	0.000	0.014	0.014	0.014	0.010	0.014	0.014	0.014	0.014	0.014	0.014	0.014
ELECTRICITY	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010
ELECTRIC UTILITY FUEL	20.360	24.243	24.462	24.203	24.480	25.951	27.238	28.260	29.106	30.136	31.044	32.190
STEAM COAL.............	8.790	12.122	12.707	12.697	13.190	13.542	14.153	14.489	14.757	15.135	15.610	16.290
NATURAL GAS............	3.240	3.807	3.764	3.336	3.440	2.707	1.701	1.719	1.748	1.868	2.180	2.394
DISTILLATE(8)..........	0.350	0.121	0.077	0.048	0.090	0.182	0.347	0.376	0.328	0.348	0.379	0.465
LO-SULFUR RESIDUAL(9)..	2.860	1.611	1.251	0.980	0.780	1.787	2.600	2.649	2.661	2.627	2.379	2.290
HI-SULFUR RESIDUAL.....	NA	0.922	0.898	0.789	0.600	0.947	1.185	1.199	1.206	1.207	1.196	1.209
HYDRO/GEO/OTHER(10)....	3.220	2.988	2.864	3.340	3.190	3.115	3.133	3.149	3.153	3.168	3.186	3.212
NUCLEAR................	1.900	2.672	2.901	3.013	3.190	3.671	4.118	4.678	5.253	5.782	6.114	6.331
REFINERY FUEL(11)	2.769	2.787	2.304	2.190	2.480	2.357	2.563	2.550	2.493	2.437	2.387	2.379
NATURAL GAS............	0.975	0.846	0.668	0.574	0.720	0.437	0.298	0.280	0.289	0.325	0.350	0.380
DISTILLATE.............	0.035	0.018	0.011	0.011	0.010	0.012	0.013	0.013	0.012	0.012	0.012	0.012
LO-SULFUR RESIDUAL.....	NA	NA	NA	NA	0.090	0.118	0.151	0.151	0.143	0.131	0.123	0.119
HI-SULFUR RESIDUAL.....	0.269	0.213	0.167	0.137	0.200	0.295	0.476	0.489	0.468	0.424	0.389	0.360
LIQUID PETROLEUM GAS...	0.050	0.043	0.024	0.038	0.030	0.026	0.028	0.028	0.027	0.026	0.026	0.026
OTHER(12)..............	0.390	0.436	0.359	0.348	0.360	0.366	0.398	0.396	0.387	0.378	0.370	0.369
STILL GAS..............	1.050	1.231	1.073	1.085	1.080	1.103	1.200	1.194	1.167	1.141	1.117	1.114

NOTE: TOTALS MAY NOT EQUAL SUM OF COMPONENTS DUE TO INDEPENDENT ROUNDING. FOR TABLE FOOTNOTES AND SOURCES SEE PAGE 219.

TABLE A.1.4. PRICE SUMMARY
CASE A: MIDDLE WORLD OIL PRICE
(1982 DOLLARS PER MILLION BTU)

	1975	1980	1985	1986	1987	1988	1989	1990
WORLD OIL PRICE.........	20.70	39.32	25.47	28.24	31.53	34.11	35.68	36.71
RESIDENTIAL	5.95	8.33	9.52	10.27	10.93	11.29	11.49	11.74
NATURAL GAS...........	2.75	4.16	6.65	7.43	8.01	8.28	8.35	8.53
DISTILLATE(1).........	4.75	8.59	6.27	6.93	7.72	8.35	8.75	9.02
LIQUID PETROLEUM GAS..	4.11	6.67	6.04	6.67	7.36	7.89	8.21	8.49
ELECTRICITY	15.61	16.78	17.11	17.61	18.08	18.21	18.26	18.36
COMMERCIAL	6.27	8.38	10.07	10.82	11.50	11.90	12.16	12.44
NATURAL GAS...........	2.17	3.84	6.42	7.24	7.85	8.14	8.27	8.48
DISTILLATE(1).........	4.30	8.06	5.94	6.56	7.31	7.91	8.29	8.54
LO-SULFUR RESIDUAL....	4.13	5.32	4.78	5.31	5.92	6.43	6.76	7.06
LIQUID PETROLEUM GAS..	NA	6.67	6.05	6.68	7.38	7.91	8.23	8.51
ELECTRICITY	15.55	17.21	17.35	17.88	18.40	18.58	18.64	18.74
INDUSTRIAL(2)	3.37	5.44	6.44	7.02	7.57	7.90	8.09	8.27
STEAM COAL............	1.81	1.55	2.10	2.13	2.16	2.20	2.25	2.33
METALLURGICAL COAL....	2.80	2.51	2.56	2.59	2.61	2.63	2.66	2.72
NATURAL GAS...........	1.49	2.90	5.62	6.45	7.00	7.13	7.17	7.23
DISTILLATE............	4.24	7.99	5.84	6.47	7.21	7.81	8.18	8.43
LO-SULFUR RESIDUAL....	4.11	5.14	4.70	5.22	5.82	6.32	6.64	6.95
HI-SULFUR RESIDUAL....	2.93	NA	4.19	4.72	5.34	5.86	6.19	6.49
LIQUID PETROLEUM GAS..	3.83	6.34	5.83	6.44	7.11	7.62	7.91	8.18
PET-CHEM FEEDSTOCK(3).	NA	7.88	6.72	7.41	8.25	8.92	9.34	9.63
OTHER(4)..............	NA	NA	5.18	5.71	6.35	6.88	7.21	7.45
ELECTRICITY	9.42	11.67	14.15	14.59	15.03	15.16	15.23	15.35
TRANSPORTATION(5)	6.72	9.91	7.75	8.43	9.21	9.78	10.07	10.21
DISTILLATE............	5.85	8.39	6.21	6.87	7.66	8.29	8.69	8.95
HI-SULFUR RESIDUAL....	2.93	3.97	3.65	4.13	4.68	5.16	5.45	5.74
GASOLINE(6)...........	7.57	11.32	8.69	9.47	10.35	10.97	11.29	11.41
JET FUEL(7)...........	3.69	7.51	6.59	7.23	8.04	8.68	9.08	9.34
LIQUID PETROLEUM GAS..	NA	NA	5.78	6.39	7.07	7.58	7.88	8.16
ELECTRICITY	NA	NA	16.71	17.26	17.79	17.99	18.08	18.16
ELECTRIC UTILITY FUEL	2.04	1.84	2.07	2.19	2.29	2.36	2.40	2.47
STEAM COAL............	1.58	1.71	1.74	1.76	1.77	1.79	1.81	1.86
NATURAL GAS...........	1.14	2.80	5.54	6.43	7.00	7.02	7.13	7.19
DISTILLATE(8).........	3.28	7.22	5.87	6.50	7.24	7.84	8.21	8.47
LO-SULFUR RESIDUAL(9).	3.27	5.90	4.78	5.31	5.92	6.44	6.68	6.94
HI-SULFUR RESIDUAL....	NA	4.55	3.67	4.14	4.70	5.16	5.46	5.74
NUCLEAR...............	NA	.85	0.85	0.85	0.85	0.85	0.85	0.85
REFINERY FUEL	NA	NA	2.31	2.59	2.90	3.14	3.28	3.39
NATURAL GAS...........	NA	3.08	4.75	5.50	6.06	6.21	6.24	6.25
DISTILLATE............	NA	6.09	5.14	5.70	6.36	6.90	7.23	7.46
LO-SULFUR RESIDUAL....	NA	NA	4.12	4.59	5.13	5.59	5.88	6.17
HI-SULFUR RESIDUAL....	NA	4.89	3.47	3.93	4.47	4.94	5.23	5.51
LIQUID PETROLEUM GAS..	NA	NA	5.13	5.69	6.30	6.76	7.03	7.28
OTHER(10).............	NA	NA	5.07	5.60	6.24	6.77	7.10	7.34

NOTE: TOTALS MAY NOT EQUAL SUM OF COMPONENTS DUE TO INDEPENDENT ROUNDING. FOR TABLE FOOTNOTES AND SOURCES SEE PAGE 219.

Appendix Table 2.1: Real Gross Domestic Product Annual Average Compound Growth Rates[a] (Percent)

	1960-1973	1973-1980	1980-1990
United States	4.1	2.2	2.5
Canada	5.5	2.9	2.2
Japan	9.9	3.7	3.1
Western Europe	4.8	2.3	2.2
Finland/Norway/Sweden	4.3	2.7	2.4
United Kingdom/Ireland	3.2	1.0	0.9
Benelux/Denmark	4.8	2.2	1.9
West Germany	4.5	2.3	1.7
France	5.5	2.9	2.5
Austria/Switzerland	3.8	1.4	1.8
Spain/Portugal	7.2	2.5	3.2
Italy	5.3	2.8	3.0
Greece/Turkey	6.6	4.0	4.4
Australia/New Zealand	5.1	2.3	2.7
Total OECD	5.0	2.5	2.4
Total Non-OECD	6.3	4.5	3.3
Total Free World	5.2	2.9	2.6

[a]Aggregates at 1975 United States dollars and 1975 exchange rates.

Source: Calculated using data from: Wharton Econometric Forecasting Associates, World Historical Data (Philadelphia, Pennsylvania, 1982); and International Bank of Reconstruction and Development, World Tables, Second Edition (Baltimore, Maryland, 1980).

Appendix Table 2.3 — Free World Oil Consumption and Production;[a] History and High, Middle, and Low Price Case Projections[b]
(Million Barrels per day)

Country or Region	1960	1973	1981	1985 High Prices	1985 Mid Prices	1985 Low Prices	1990 High Prices	1990 Mid Prices	1990 Low Prices
World Oil Price									
(1982 dollars per barrel)	8.69	8.00	39.27	34.00	25.00	21.00	48.00	37.00	28.00
Consumption									
United States[c]	9.8	17.6	16.5	17.0	18.4	19.4	15.7	17.4	19.3
Canada	0.8	1.7	1.8	1.8	1.9	1.9	1.7	2.0	2.3
Japan	0.7	5.1	4.8	4.6	4.9	5.0	4.7	5.3	6.1
OECD Europe	4.5	15.2	12.6	12.0	12.8	13.4	11.6	13.5	16.0
OPEC	0.7	1.9	2.8	3.2	3.2	3.2	3.9	3.9	3.9
Other Countries[d]	2.4	7.0	8.9	9.1	9.7	10.1	10.2	10.7	11.3
Total Consumption[e]	19.2	49.2	47.4	47.6	50.8	53.1	47.9	52.8	58.9
Production									
United States	8.1	11.4	10.7	10.8	10.6	10.4	10.6	10.0	9.5
Canada	0.5	2.1	1.6	1.5	1.5	1.5	1.7	1.7	1.6
OECD Europe	0.3	0.5	2.8	3.4	3.4	3.4	3.1	3.0	2.8
OPEC	8.7	31.3	23.7	23.2	25.8	27.6	22.5	27.7	33.7
Other Countries[d]	1.1	2.6	6.7	8.8	8.8	8.8	10.5	10.2	9.9
Total Production[e]	19.0	48.9	45.5	47.7	50.1	51.7	48.5	52.6	57.5
Net Exports from Centrally Planned Economies (imports)	0.5	0.8	1.2	0.5	1.0	1.5	0.0	0.5	1.5
Stock Change	-0.3	-0.5	-0.7	0.6	0.3	0.1	0.6	0.3	0.1

[a]Includes crude oil and natrual gas liquids. United States includes other hydrocarbons, hydrogen, and refinery gains.
[b]Projections derived using assumptions under the midprice case, except for world oil prices.
[c]Includes Puerto Rico, Virgin Islands, and purchases for the Strategic Petroleum Reserve.
[d]Excludes Centrally Planned Economies (CPE).
[e]Numbers may not add to totals because of rounding.

Source: Historical Data: U.S. Department of Energy, Energy Information Administration, 1981 Annual Report to Congress, DOE/EIA-173(81)/3 (Washington, D.C., 1982); Monthly Energy Review DOE/EIA-0035 (82/11), and 1981 International Energy Annual DOE/EIA-01219(81); Organization for Economic Cooperation and Development/International Energy Agency, Quarterly Oil Statistics, Second Quarter 1982 (Paris, France, 1982); and Petroleum Economics Limited Quarterly Supply/Demand Outlook, (London, England, 1982).

Appendix Table 2.2 Alternate OPEC Oil Production Capacities, 1981 to 1990
(Million Barrels per Day)

Country	1981	Projections 1985 Low	Projections 1985 High	Projections 1990 Low	Projections 1990 High
Crude Oil and Natural Gas Liquids					
Algeria	1.4	1.0	1.1	0.7	1.0
Ecuador	0.2	0.1	0.2	0.2	0.2
Gabon	0.2	0.1	0.2	0.1	0.2
Indonesia	3.0	2.5	3.5	2.5	3.5
Iran	3.5	0.8	4.0	4.0	5.0
Iraq	3.5	0.8	4.0	4.0	5.0
Kuwait	2.1	1.6	1.6	1.5	1.5
Libya	2.1	1.8	2.2	1.8	2.2
Neutral Zone	0.6	0.5	0.6	0.4	0.5
Nigeria	2.2	1.9	2.2	1.7	1.9
Qatar	0.6	0.6	0.7	0.5	0.7
Saudi Arabia	10.4	10.0	10.7	10.0	11.0
United Arab Emirates	2.4	2.2	2.4	2.0	2.2
Venezuela	2.4	2.4	2.4	2.0	2.2
Total	32.8	27.1	33.5	28.6	33.6

Source: U.S. Department of Energy, Office of International Affairs.

TABLE A.3.1. NATIONAL MACROECONOMIC INDICATORS
CASE A: MIDDLE WORLD OIL PRICE

	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990
REAL GROSS NATIONAL PRODUCT(1).....	2408.8	2455.6	2411.2	2444.0	2556.2	2667.1	2754.1	2840.2	2912.5	2990.0	3082.0
GROSS NATIONAL PRODUCT DEFLATOR(2).	1.0931	1.1964	1.2681	1.3314	1.3997	1.4767	1.5635	1.6664	1.7859	1.9105	2.0402
REAL GROWTH(3)....................	-0.41	1.98	-1.81	1.16	4.59	4.34	3.26	3.13	2.54	2.66	3.08
INFLATION(3)......................	9.31	9.45	5.99	7.17	5.13	5.50	5.88	6.58	7.18	6.97	6.79
REAL PERSONAL DISPOSABLE INCOME(1).	1663.6	1704.6	1723.3	1745.1	1827.2	1895.8	1954.5	1998.5	2030.8	2078.2	2129.7
UNEMPLOYMENT RATE(3)..............	7.1	7.6	9.7	10.65	9.57	8.42	7.97	7.71	7.64	7.66	7.49
POPULATION(5).....................	222.138	224.175	226.219	228.160	230.305	232.344	234.480	236.597	238.760	240.846	242.977
REAL PERS DISP INCOME PER CAPITA(6)	7487.0	7603.9	7617.8	7648.5	7933.8	8159.6	8335.6	8446.7	8505.5	8628.9	8765.2
RESIDENTIAL HOUSING STARTS(5)......	1.292	1.084	1.060	1.456	1.666	1.866	1.872	1.885	1.864	1.806	1.754
AAA BOND RATE(3)..................	11.94	14.17	13.79	11.13	10.36	10.28	10.38	10.41	10.36	10.13	9.84
MORTGAGE RATE(3)..................	12.66	14.70	15.14	8.35	8.86	9.26	9.68	9.07	9.04	9.18	8.92
FEDERAL RESERVE PRODUCTION INDEX(4)	147.0	151.0	138.6	139.95	152.80	163.22	169.38	175.37	180.84	187.53	196.07

(1) BILLIONS OF 1979 DOLLARS.
(2) INDEX EQUAL TO 1.0 IN 1979.
(3) PERCENTAGE.
(4) INDEX EQUAL TO 100 IN 1967.
(5) MILLIONS OF UNITS.
(6) 1979 DOLLARS.
NOTE: ENTRIES FOR 1980, 1981 AND 1982 ARE HISTORICAL DATA.
SOURCES: ON PAGE 222, SEE 9, PAGE 164, TABLE B-2; 9, PAGE 166, TABLE B-3; 9, PAGE 191, TABLE B-24; 9, PAGE 201, TABLE B-33; 9, PAGE 216, TABLE B-47; 9, PAGE 240, TABLE B-67; AND 9, PAGE 210, TABLE B-42.

Appendix Table 2.4 World Oil Prices Sensitivity Anaysis (1982 Dollars per Barrel)

Scenario	1985	1990	2000
	World Oil Prices		
Midprice Case	25.00	37.00	59.00
	Differences from Midprice Case Prices		
Sensitivity Scenario[a]			
High Economic Growth	0.46	1.80	9.00
Low Economic Growth	-0.42	-0.93	-6.83
Low Price Elasticity	-0.30	1.91	14.19
High Price Elasticity	0.33	-1.80	-7.16
Low Income Feedback Elasticity	-0.06	0.33	0.60
High Income Feedback Elasticity	-0.06	-0.32	-0.58
Low OPEC Oil Production Capacity	7.99	2.11	3.12
High OPEC Oil Production Capacity	-3.79	-2.54	-5.72
Low Non-OPEC Oil Supply	4.19	10.43	20.57
High Non-OPEC Oil Supply	-2.29	-7.90	-11.55
	World Oil Price Range		
Combined Uncertainty[b]			
Low Price Scenario	21.00	28.00	42.00
High Price Scenario	34.00	48.00	85.00

[a]Scenario prices are derived by varying each sensitivity factor separately while holding all other factors at midprice case levels. High and low ranges for the sensitivity factors are -0.4 and +0.4 percent per year for economic growth rates; -25 and +25 percent of estimated price and income-feedback elasticities; -9 to +14 percent of midprice case OPEC production capacity values by 2000; and -26 to +26 percent of midprice case non-OPEC oil supply values by 2000.

[b]The square root of the sum of the squares of the individual high, or low, differentials added to, or subtracted from, the midprice.

TABLE A.4.1. RESIDENTIAL SECTOR FUEL CONSUMPTION BY END-USE SERVICE
CASE A: MIDDLE WORLD OIL PRICE
(TRILLIONS OF BTU PER YEAR)

	1980	1985	1986	1987	1988	1989	1990
SPACE HEATING							
ELECTRICITY(1).....	201.	244.	260.	274.	288.	302.	316.
NATURAL GAS........	3225.	2995.	2930.	2868.	2813.	2769.	2731.
FUEL OIL...........	1172.	1091.	1099.	1095.	1083.	1068.	1052.
LIQUID GAS.........	390.	414.	418.	418.	416.	413.	410.
COAL...............	65.	76.	74.	73.	71.	69.	68.
MARKET TOTAL.......	5054.	4820.	4781.	4729.	4671.	4621.	4577.
WOOD...............	818.	1127.	1151.	1172.	1187.	1197.	1203.
WATER HEATING							
ELECTRICITY........	286.	317.	328.	338.	348.	358.	368.
NATURAL GAS........	1055.	1030.	1032.	1035.	1040.	1046.	1052.
FUEL OIL...........	244.	237.	237.	236.	235.	234.	234.
LIQUID GAS.........	149.	162.	164.	163.	162.	161.	160.
MARKET TOTAL.......	1734.	1746.	1760.	1773.	1785.	1799.	1814.
AIR CONDITIONING							
ELECTRICITY........	351.	380.	389.	398.	407.	416.	426.
NATURAL GAS........	12.	13.	13.	13.	13.	13.	13.
MARKET TOTAL.......	363.	393.	402.	410.	420.	429.	439.
OTHER END-USES(2)							
ELECTRICITY........	1610.	1700.	1740.	1777.	1814.	1853.	1891.
NATURAL GAS........	574.	548.	547.	547.	547.	547.	548.
MARKET TOTAL.......	2185.	2248.	2287.	2324.	2361.	2400.	2439.
FOR ALL END USES							
ELECTRICITY........	2448.	2642.	2717.	2787.	2857.	2929.	3001.
NATURAL GAS........	4866.	4585.	4521.	4463.	4413.	4375.	4345.
FUEL OIL...........	1417.	1328.	1336.	1331.	1318.	1302.	1286.
LIQUID GAS.........	539.	576.	582.	582.	578.	574.	570.
COAL...............	65.	76.	74.	73.	71.	69.	68.
MARKET TOTAL.......	9335.	9207.	9230.	9236.	9238.	9250.	9269.
WOOD...............	818.	1127.	1151.	1172.	1187.	1197.	1203.

(1) ELECTRIC SPACE HEATING INCLUDES BOTH ELECTRIC RESISTANCE AND HEAT PUMPS.
(2) SOME OF THE MAJOR USES ARE LIGHTING, COOKING, REFRIGERATION, WASHING, AND DRYING.
NOTE: ENTRIES FOR 1980 ARE A COMBINATION OF HISTORICAL AND ESTIMATED VALUES.
SOURCES: ON PAGE 222, SEE 1, PAGE 15; AND 19, PAGE 101, TABLE A4.

TABLE A.4.2. COMMERCIAL SECTOR ENERGY CONSUMPTION AND FLOORSPACE BY BUILDING CATEGORY
CASE A: MIDDLE WORLD OIL PRICE
(CONSUMPTION IN QUADRILLION BTU PER YEAR, FLOORSPACE IN BILLIONS OF SQUARE FEET)

		1980	1985	1986	1987	1988	1989	1990
ALL CATEGORIES...	ALL FUELS.......	5.892	6.601	6.708	6.759	6.776	6.816	6.865
	NATURAL GAS.....	2.674	2.723	2.692	2.644	2.587	2.542	2.500
	ELECTRICITY.....	1.907	2.362	2.459	2.538	2.607	2.690	2.779
	FUEL OIL(1).....	1.122	1.344	1.389	1.413	1.422	1.430	1.435
	OTHER FUELS(2)..	0.190	0.173	0.169	0.164	0.159	0.155	0.151
	FLOORSPACE......	44.75	51.29	52.78	54.04	55.15	56.48	57.93
WAREHOUSE........	ALL FUELS.......	0.826	0.936	0.956	0.968	0.976	0.988	1.000
	NATURAL GAS.....	0.376	0.377	0.372	0.365	0.357	0.349	0.343
	ELECTRICITY.....	0.254	0.322	0.334	0.345	0.356	0.368	0.380
	FUEL OIL(1).....	0.167	0.211	0.224	0.233	0.239	0.247	0.254
	OTHER FUELS(2)..	0.028	0.026	0.026	0.025	0.024	0.024	0.023
	FLOORSPACE......	6.29	7.29	7.50	7.70	7.89	8.10	8.31
INSTITUTION(3)...	ALL FUELS.......	0.675	0.717	0.723	0.720	0.710	0.704	0.699
	NATURAL GAS.....	0.392	0.360	0.351	0.338	0.324	0.313	0.302
	ELECTRICITY.....	0.108	0.135	0.140	0.144	0.148	0.154	0.159
	FUEL OIL(1).....	0.155	0.205	0.216	0.221	0.223	0.224	0.224
	OTHER FUELS(2)..	0.019	0.017	0.016	0.016	0.015	0.014	0.014
	FLOORSPACE......	1.65	1.89	1.95	1.99	2.03	2.08	2.13
OFFICE...........	ALL FUELS.......	1.935	2.189	2.232	2.257	2.269	2.290	2.315
	NATURAL GAS.....	0.755	0.767	0.758	0.744	0.729	0.716	0.703
	ELECTRICITY.....	0.726	0.899	0.939	0.970	0.996	1.028	1.063
	FUEL OIL(1).....	0.393	0.466	0.481	0.489	0.493	0.496	0.499
	OTHER FUELS(2)..	0.062	0.056	0.055	0.054	0.052	0.051	0.050
	FLOORSPACE......	15.74	18.11	18.67	19.12	19.50	19.98	20.51
HOTEL AND MOTEL..	ALL FUELS.......	0.299	0.342	0.346	0.348	0.347	0.348	0.350
	NATURAL GAS.....	0.142	0.149	0.147	0.144	0.141	0.138	0.135
	ELECTRICITY.....	0.114	0.146	0.152	0.157	0.160	0.165	0.171
	FUEL OIL(1).....	0.033	0.037	0.038	0.038	0.038	0.037	0.036
	OTHER FUELS(2)..	0.010	0.009	0.009	0.009	0.008	0.008	0.008
	FLOORSPACE......	2.12	2.42	2.50	2.56	2.60	2.67	2.74
RETAIL/WHOLESALE.	ALL FUELS.......	1.552	1.806	1.841	1.861	1.872	1.888	1.906
	NATURAL GAS.....	0.733	0.793	0.792	0.786	0.777	0.771	0.766
	ELECTRICITY.....	0.545	0.682	0.713	0.738	0.761	0.788	0.816
	FUEL OIL(1).....	0.223	0.283	0.289	0.290	0.289	0.285	0.281
	OTHER FUELS(2)..	0.051	0.048	0.047	0.046	0.045	0.044	0.043
	FLOORSPACE......	13.18	15.37	15.87	16.30	16.68	17.13	17.63
MISCELLANEOUS(4).	ALL FUELS.......	0.606	0.612	0.610	0.606	0.602	0.598	0.595
	NATURAL GAS.....	0.276	0.276	0.272	0.267	0.261	0.256	0.251
	ELECTRICITY.....	0.160	0.178	0.181	0.183	0.186	0.188	0.190
	FUEL OIL(1).....	0.151	0.142	0.142	0.142	0.141	0.141	0.141
	OTHER FUELS(2)..	0.019	0.016	0.016	0.015	0.014	0.014	0.013
	FLOORSPACE......	5.76	6.20	6.29	6.37	6.44	6.52	6.60

(1) FUEL OIL CONSISTS OF LOW SULFUR RESIDUAL OIL AND DISTILLATE OIL.
(2) OTHER FUELS CONSIST OF LIQUID PETROLEUM GASES AND COAL.
(3) INCLUDES MAINLY HEALTH FACILITIES AND PENAL INSTITUTIONS.
(4) INCLUDES MAINLY RELIGIOUS FACILITIES, ASSEMBLEY HALLS, PARKING GARAGES, AND RECREATIONAL FACILITIES.
NOTE: ENTRIES FOR 1980 ARE A COMBINATION OF HISTORICAL AND ESTIMATED VALUES.
SOURCES: ON PAGE 222, SEE 1, PAGE 16.

TABLE A.4.3. INDUSTRIAL SECTOR ENERGY CONSUMPTION
CASE A: MIDDLE WORLD OIL PRICE
(TRILLIONS OF BTU PER YEAR)

	1980	1985	1986	1987	1988	1989	1990
COAL....................	1387.88	1800.39	1852.90	1932.94	2038.12	2148.25	2256.76
NATURAL GAS.............	6497.36	4906.59	4830.55	4895.95	5157.55	5352.27	5614.24
(RAW MATERIALS(1).....	650.77	489.58	476.12	471.78	478.23	488.28	494.85)
DISTILLATE..............	1568.69	2230.28	2252.37	2145.84	2038.19	1961.65	1945.71
HI-SULFUR RESIDUAL......	713.20	837.91	854.27	843.16	830.30	822.17	840.63
LO-SULFUR RESIDUAL......	553.58	551.23	558.83	551.52	547.54	543.68	559.93
ELECTRICITY.............	2780.85	3051.37	3188.60	3309.77	3484.43	3611.45	3801.18
LIQUID PETROLEUM GAS....	307.88	383.78	358.73	313.10	266.06	219.94	182.99
PET-CHEM FEEDSTOCKS(2)..	2401.48	2291.92	2373.35	2452.92	2559.23	2674.48	2836.00
METALLURGICAL COAL......	1793.34	1302.24	1324.68	1336.65	1352.73	1358.75	1374.51
OTHER(3)................	2180.32	2258.64	2253.37	2240.71	2239.25	2257.45	2288.56
TOTAL ENERGY............	20184.58	19614.33	19847.61	20022.55	20513.38	20950.08	21700.50

(1) NATURAL GAS CONSUMED AS A FEEDSTOCK BY THE CHEMICAL INDUSTRY (ALREADY INCLUDED IN THE NATURAL GAS TOTAL).
(2) CONSISTS OF STILL GAS USED FOR FEEDSTOCK PUROPSES, NAPTHAS LESS THAN 400 DEGREES, OTHER FUELS GREATER THAN 400 DEGREES, AND LIQUID PETROLEUM GASES USED FOR GAS UTILITY FUEL AND FOR CHEMICAL FEEDSTOCKS.
(3) ASPHALT, PETROLEUM COKE, LUBRICANTS, INDUSTRIAL KEROSENE, WAXES AND MISCELLANEOUS PETROLEUM PRODUCTS.
NOTE: INDUSTRIAL SECTOR TOTAL DIFFER FROM THOSE SHOWN IN THE "MONTHLY ENERGY REVIEW" BY EXCLUDING ELECTRICITY LOSSES, GASOLINE, NATURAL GAS USED AS A LEASE AND PLANT FUEL, AND ALL REFINERY FUELS EXCEPT COAL AND ELECTRICITY, AND BY INCLUDING LUBRICANTS CONSUMED BY THE TRANSPORTATION SECTOR. IN 1980 ONLY, THE RESIDUAL AND DISTILLATE DETAIL HAS BEEN CONVERTED TO THE NEW BASIS FOR CONSISTENCY WITH THE PETROLEUM BALANCE TABLE AND WITH 1980 FUEL DETAIL USED IN THE "SHORT-TERM ENERGY OUTLOOK."
NOTE: ENTRIES FOR 1980 ARE HISTORICAL DATA.
SOURCES: ON PAGE 222, SEE 1, PAGE 17; 15, PAGE 11, TABLE 5; AND 15, PAGE 127, TABLE 55.

TABLE A.4.4. TRANSPORTATION SECTOR ENERGY CONSUMPTION BY MODE
CASE A: MIDDLE WORLD OIL PRICE

	1980	1985	1986	1987	1988	1989	1990
FUEL CONSUMPTION, ALL MODES							
GASOLINE(1)	13.253	12.290	11.713	11.082	10.523	10.128	9.831
DISTILLATE(1)	2.782	2.892	2.964	3.038	3.111	3.201	3.312
JET FUEL(1)	2.179	2.331	2.391	2.435	2.470	2.518	2.574
RESIDUAL(1)	1.401	1.054	1.079	1.102	1.122	1.148	1.181
LIQUID GAS(1)	0.014	0.015	0.015	0.015	0.015	0.015	0.015
FUEL USE IN LIGHT DUTY VEHICLES							
SALES:LIGHT DUTY VEHICLES(3)	10.750	13.254	13.644	14.123	14.702	15.081	15.004
VEHICLE-MILES:TOTAL(2)	1383.	1607.	1634.	1651.	1668.	1697.	1731.
FLEET-MILES PER GALLON:TOTAL	14.17	16.68	17.74	18.89	20.01	21.04	21.98
PERCENT FLEET VMT DIESEL	0.010	0.021	0.025	0.032	0.039	0.046	0.055
VEHICLE-MILES:GAS(2)	1368.	1574.	1592.	1599.	1603.	1618.	1636.
FLEET-MILES PER GALLON:GAS	13.95	16.46	17.47	18.55	19.58	20.51	21.36
FUEL USE:GAS(4)	98.080	95.610	91.133	86.225	81.909	78.902	76.606
VEHICLE-MILES:DIESEL(2)	14.	33.	42.	52.	64.	79.	95.
FLEET-MILES PER GALLON:DIESEL	25.34	27.30	28.43	29.63	30.73	31.69	32.54
FUEL USE:DIESEL(4)	0.564	1.214	1.465	1.761	2.097	2.481	2.907
FUEL USE IN HEAVY TRUCKS							
SALES:HEAVY TRUCKS(3)	0.487	0.644	0.675	0.706	0.736	0.756	0.734
VEHICLE-MILES:TOTAL(2)	105.	125.	128.	131.	134.	137.	142.
FLEET-MILES PER GALLON:TOTAL	5.82	6.85	7.07	7.29	7.52	7.75	7.94
PERCENT FLEET VMT DIESEL	0.591	0.656	0.669	0.683	0.697	0.710	0.722
VEHICLE-MILES:GAS(2)	43.	43.	42.	42.	41.	40.	39.
FLEET-MILES PER GALLON:GAS	6.84	8.29	8.60	8.92	9.25	9.56	9.78
FUEL USE:GAS(4)	6.266	5.173	4.918	4.656	4.386	4.156	4.018
VEHICLE-MILES:DIESEL(2)	62.	82.	86.	89.	93.	97.	102.
FLEET-MILES PER GALLON:DIESEL	5.09	6.09	6.31	6.54	6.77	7.01	7.23
FUEL USE:DIESEL(4)	12.168	13.405	13.554	13.674	13.756	13.903	14.138
FUEL USE IN AIR							
REVENUE PASSENGER-MILES(3)	265.	344.	361.	374.	385.	398.	414.
AVERAGE FLIGHT SIZE	158.	167.	170.	172.	174.	176.	178.
LOAD FACTOR	0.62	0.64	0.64	0.65	0.65	0.66	0.66
FUEL BURNED PER SEAT-MILE(5)	0.023	0.022	0.021	0.021	0.021	0.020	0.020
TOTAL JET FUEL(4)	16.543	19.029	19.518	19.874	20.156	20.549	21.009
FUEL USE IN OTHER							
NON-HWY DSL(1)	4.438	4.697	4.779	4.859	4.925	4.995	5.077
RESIDUAL(1)	1.550	1.795	1.837	1.876	1.910	1.955	2.011

(1) QUADRILLION BTU PER YEAR.
(2) BILLIONS PER YEAR.
(3) MILLIONS PER YEAR.
(4) BILLIONS OF GALLONS PER YEAR.
(5) GALLONS PER YEAR.
NOTE: ENTRIES FOR 1980 ARE A COMBINATION OF HISTORICAL AND ESTIMATED VALUES.

TABLE A.5.1. ELECTRIC UTILITY FUEL PRICES AND CONSUMPTION
CASE A: MIDDLE WORLD OIL PRICE
(1982 DOLLARS PER MILLION BTU; TRILLIONS OF BTU PER YEAR)

YEARS	COAL	NATURAL GAS	DISTILLATE	LO-S RESID	HI-S RESID	FOSSIL FUEL	NUCLEAR	HYDRO	ALL FUELS
FUEL PRICES									
1980	1.71	2.80	7.22	5.90	4.55	NA	NA	--	NA
1985	1.74	5.54	5.84	4.78	3.67	2.64	0.85	--	2.07
1986	1.76	6.43	6.50	5.31	4.14	2.83	0.85	--	2.19
1987	1.77	7.00	7.23	5.92	4.69	3.00	0.85	--	2.29
1988	1.79	7.02	7.81	6.44	5.16	3.12	0.85	--	2.36
1989	1.81	7.13	8.18	6.68	5.46	3.19	0.85	--	2.40
1990	1.86	7.19	8.43	6.94	5.74	3.28	0.85	--	2.47
FUEL CONSUMPTION									
1980	12122.	3807.	121.	1611.	922.	18583.	2672.	2988.	24243.
1985	14153.	1701.	347.	2600.	1185.	19987.	4118.	3133.	27238.
1986	14489.	1693.	376.	2649.	1199.	20407.	4678.	3149.	28234.
1987	14757.	1748.	328.	2661.	1206.	20700.	5253.	3153.	29106.
1988	15135.	1868.	348.	2627.	1207.	21185.	5782.	3168.	30136.
1989	15610.	2180.	379.	2379.	1196.	21744.	6114.	3186.	31044.
1990	16290.	2394.	465.	2290.	1209.	22647.	6331.	3212.	32190.

NA=NOT AVAILABLE.
--=NOT APPLICABLE.
NOTE: ENTRIES FOR 1980 ARE HISTORICAL DATA.
SOURCES: ON PAGE 222, SEE 1; 2, PP 160-170, TABLES B1, B2, B3, AND B4; 2, PP 253-255, TABLE C9; 2, PP 262-263, TABLE C13; 2, PP 270-271, TABLE C17; AND 2, PP 290-291, TABLE C27.

TABLE A.5.2. END-USE ELECTRICITY PRICES AND CONSUMPTION
CASE A: MIDDLE WORLD OIL PRICE
(1982 MILLS PER KWH; BILLION KWH PER YEAR)

YEARS	RESIDENTIAL	COMMERCIAL	TRANSPORTATION	INDUSTRIAL	AVG./TOTAL
END-USE PRICES					
1980	57.25	58.72	NA	39.82	50.82
1985	58.37	59.19	57.03	48.28	54.79
1986	60.07	61.02	58.90	49.77	56.43
1987	61.70	62.79	60.72	51.27	58.03
1988	62.15	63.38	61.40	51.72	58.45
1989	62.32	63.61	61.68	51.96	58.64
1990	62.65	63.95	61.95	52.39	58.96
END-USE CONSUMPTION					
1980	717.50	558.91	0.00	815.06	2091.47
1985	774.37	692.15	3.05	894.36	2363.92
1986	796.22	720.59	3.05	934.58	2454.43
1987	816.88	743.97	3.05	970.09	2533.98
1988	837.41	764.10	3.05	1021.29	2625.84
1989	858.41	788.41	3.05	1058.52	2708.38
1990	879.48	814.63	3.05	1114.11	2811.27

NA=NOT AVAILABLE.
NOTE: ENTRIES FOR 1980 ARE HISTORICAL DATA.
SOURCES: ON PAGE 222, SEE 1, PP 15-18; AND 2, PP 229-40, TABLES C1, C2, C3, AND C4.

TABLE A.5.3. ELECTRIC UTILITY CAPACITY AND GENERATION
CASE A: MIDDLE WORLD OIL PRICE
(CAPACITY IN GIGAWATTS; GENERATION IN BILLION KWH)

CAPACITY TYPE		1980	1985	1986	1987	1988	1989	1990
COAL STEAM	CAPACITY...	176.58	224.96	233.92	238.89	246.92	255.00	265.72
	GENERATION.	943.4	1148.1	1185.7	1213.7	1249.7	1291.9	1350.5
NATURAL GAS STEAM	CAPACITY...	40.99	40.99	40.99	40.99	40.99	40.99	40.99
	GENERATION.	158.2	71.3	70.1	70.7	71.1	67.3	66.6
OIL STEAM	CAPACITY...	32.27	35.07	35.07	35.07	35.12	35.12	35.12
	GENERATION.	113.0	126.2	127.1	126.5	126.1	121.8	123.9
NG/COAL STEAM	CAPACITY...	32.31	32.46	32.46	32.46	32.46	32.46	32.46
	GENERATION.	123.5	104.3	101.9	100.9	102.5	104.5	108.8
OIL/COAL STEAM	CAPACITY...	40.18	40.18	40.18	40.18	40.18	40.18	40.18
	GENERATION.	149.5	151.4	151.2	151.5	152.3	155.6	160.5
NG/OIL STEAM	CAPACITY...	69.81	69.81	69.81	69.81	69.81	69.81	69.81
	GENERATION.	233.0	240.8	243.6	246.1	247.9	251.3	252.4
NG COMBINED CYCLE	CAPACITY...	4.45	4.45	4.45	4.45	4.45	4.45	4.45
	GENERATION.	12.7	16.7	19.0	18.5	19.5	24.5	27.6
OIL COMBINED CYCLE	CAPACITY...	3.34	3.49	3.49	3.49	3.49	3.49	3.49
	GENERATION.	2.3	8.6	8.8	9.0	10.4	9.9	10.9
NATURAL GAS TURBINE	CAPACITY...	4.64	5.06	5.06	5.06	5.06	5.06	5.06
	GENERATION.	5.3	1.7	2.2	3.6	4.4	5.8	7.8
OIL TURBINE	CAPACITY...	46.51	48.09	48.20	48.28	48.34	48.51	48.58
	GENERATION.	5.6	13.8	14.9	12.9	14.9	16.8	21.5
NG/OIL TURBINE	CAPACITY...	52.62	52.68	52.68	52.68	52.68	52.68	52.68
	GENERATION.	8.1	7.4	7.7	7.8	9.5	11.5	14.4
NUCLEAR	CAPACITY...	50.18	77.94	88.30	99.06	106.37	112.76	113.93
	GENERATION.	251.0	387.1	439.7	493.8	543.5	574.8	595.1
PUMP STORAGE HYDRO(1)	CAPACITY...	88.20	14.25	15.82	18.66	19.50	20.28	20.54
	GENERATION.	282.0	12.8	16.2	20.1	23.2	27.7	33.0
PONDAGE HYDRO(1)	CAPACITY...	--	72.05	72.44	72.52	72.65	72.85	72.92
	GENERATION.	--	302.7	304.2	304.6	306.1	307.8	310.3
DOMESTIC TOTAL	CAPACITY...	642.08	721.48	742.87	761.60	778.02	793.64	805.93
	GENERATION.	2287.6	2592.9	2692.3	2779.7	2881.1	2971.2	3083.3
CANADIAN IMPORTS	GENERATION.	26.72	94.29	96.73	98.90	101.32	104.01	107.10

(1) IN 1980, PONDAGE HYDROPOWER IS INCLUDED IN PUMP STORAGE HYDROPOWER.
--=NOT APPLICABLE.
NOTE: "CAPACITY" INDICATES THE POTENTIAL AMOUNT OF ELECTRICAL POWER THAT COULD BE GENERATED IF POWERPLANTS OPERATED NONSTOP.
NOTE: "GENERATION" INDICATES THE AMOUNT OF ELECTRICITY PRODUCED FROM EACH CAPACITY TYPE.
NOTE: ENTRIES FOR 1980 ARE A COMBINATION OF HISTORICAL AND ESTIMATED VALUES.
SOURCES: ON PAGE 222, SEE 10, PP 273-287, TABLE 9; AND 11, PAGE 1, TABLE 1.

TABLE A.5.4. SCHEDULED ELECTRIC UTILITY CAPACITY ADDITIONS
CASE A: MIDDLE WORLD OIL PRICE
(CAPACITY IN MEGAWATTS)

NEW CAPACITY TYPE	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	TOTAL
COAL STEAM........	13633.	9499.	9821.	7023.	8088.	10524.	4918.	6198.	7753.	9537.	9269.	96261.
OIL STEAM.........	987.	1895.	0.	0.	0.	10.	0.	0.	50.	0.	0.	2942.
NG/COAL STEAM.....	570.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	570.
OIL CC............	0.	0.	90.	60.	0.	0.	0.	0.	0.	0.	0.	150.
NG TURBINE........	76.	375.	8.	0.	0.	0.	0.	0.	0.	0.	0.	459.
OIL TURBINE.......	978.	238.	230.	320.	82.	154.	73.	97.	54.	140.	94.	2460.
NG/OIL TURBINE....	0.	60.	0.	0.	0.	0.	0.	0.	0.	0.	0.	60.
NUCLEAR...........	1819.	3912.	3296.	5250.	9269.	9183.	14455.	4910.	10063.	2355.	0.	64512.
PUMP STORAGE......	256.	0.	997.	531.	0.	1050.	2050.	2325.	0.	955.	150.	8314.
PONDAGE HYDRO.....	1373.	259.	772.	923.	679.	482.	187.	103.	232.	74.	0.	5083.
TOTAL NEW CAPACITY	19692.	16237.	15214.	14107.	18118.	21403.	21683.	13633.	18152.	13061.	9513.	180806.

SOURCES: ON PAGE 222, SEE 10, PP 27-259, TABLE 7; AND 10, PP 273-287, TABLE 9.

TABLE A.5.5. SUMMARY OF COMPONENTS OF ELECTRICITY PRICE
CASE A: MIDDLE WORLD OIL PRICE
(1982 MILLS PER KWH)

	1980	1985	1986	1987	1988	1989	1990
PRIVATE UTILITIES							
CAPITAL COMPONENT...	10.21	10.16	10.45	10.30	10.47	10.19	9.83
FUEL COMPONENT......	26.14	26.67	27.98	29.10	29.71	30.08	30.77
O&M COMPONENT(1)....	8.33	8.70	8.72	8.73	8.70	8.67	8.57
OTHERS(2)...........	12.22	11.49	11.65	12.38	12.05	12.19	12.15
TOTAL PRICE.........	56.90	57.02	58.81	60.51	60.93	61.13	61.33
PUBLIC & PRIVATE UTILITIES							
CAPITAL COMPONENT...	10.51	10.64	10.79	10.61	10.63	10.30	10.01
FUEL COMPONENT......	25.32	25.64	26.93	28.01	28.71	29.15	29.92
O&M COMPONENT(1)....	8.06	8.44	8.45	8.47	8.43	8.41	8.31
OTHERS(2)...........	10.67	10.07	10.25	10.94	10.68	10.79	10.72
TOTAL PRICE.........	54.56	54.79	56.43	58.03	58.45	58.64	58.96

(1) OPERATION AND MAINTENANCE.
(2) INCLUDES DEPRECIATION AND TAXES.
NOTE: ENTRIES FOR 1980 ARE A COMBINATION OF HISTORICAL AND ESTIMATED VALUES.

TABLE A.6.1. ANNUAL SUPPLY AND DISPOSITION OF PETROLEUM
CASE A: MIDDLE WORLD OIL PRICE
(MILLIONS OF BARRELS PER DAY)

	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990
SUPPLY											
PRODUCTION											
CRUDE OIL....................	8.60	8.57	8.67	8.64	8.77	8.79	8.85	8.84	8.80	8.66	8.21
NORTH SLOPE.............	1.52	1.53	1.61	1.63	1.70	1.71	1.78	1.78	1.78	1.82	1.73
SUBARCTIC(1).............	7.08	7.05	7.06	7.00	7.05	7.04	6.98	6.93	6.84	6.60	6.19
NATURAL GAS LIQUIDS........	1.57	1.61	1.55	1.54	1.36	1.21	1.17	1.17	1.22	1.26	1.30
OTHER DOMESTIC(2)...........	0.04	0.05	0.05	0.05	0.02	0.04	0.09	0.14	0.19	0.24	0.29
PROCESSING GAIN............	0.60	0.51	0.53	0.49	0.53	0.57	0.57	0.55	0.54	0.54	0.54
TOTAL PRODUCTION.........	10.81	10.74	10.81	10.72	10.66	10.57	10.59	10.57	10.57	10.46	10.04
IMPORTS(3)											
CRUDE OIL....................	5.26	4.40	3.46	3.75	5.17	6.35	6.21	5.89	5.60	5.45	5.86
REFINED PRODUCTS(4)........	1.65	1.60	1.58	1.76	2.03	2.10	2.11	2.10	2.09	2.08	2.10
TOTAL IMPORTS............	6.91	6.00	5.04	5.51	7.20	8.45	8.32	7.99	7.69	7.53	7.96
EXPORTS											
CRUDE OIL....................	0.29	0.23	0.24	0.23	0.25	0.25	0.25	0.25	0.25	0.25	0.25
REFINED PRODUCTS(4)........	0.26	0.37	0.58	0.55	0.62	0.62	0.62	0.62	0.62	0.62	0.62
TOTAL EXPORTS............	0.54	0.59	0.82	0.78	0.87	0.87	0.87	0.87	0.87	0.87	0.87
NET IMPORTS...........	6.37	5.40	4.23	4.72	6.33	7.58	7.45	7.12	6.82	6.66	7.09
PRIMARY STOCK CHANGES(5)											
NET WITHDRAWALS............	-0.09	0.18	0.32	0.14	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SPR FILL RATE ADDITIONS(6).	-0.05	-0.34	-0.17	-0.21	-0.15	-0.15	-0.15	-0.15	-0.15	-0.15	-0.15
TOTAL PRIMARY SUPPLY......	17.04	15.98	15.18	15.37	16.84	18.00	17.89	17.54	17.24	16.97	16.98
PRODUCT SUPPLIED											
MOTOR GASOLINE............	6.86	6.59	6.54	6.36	6.54	6.42	6.11	5.79	5.49	5.29	5.13
DISTILLATE FUEL OIL........	2.97	2.83	2.67	2.75	3.19	3.57	3.64	3.61	3.60	3.61	3.69
RESIDUAL FUEL OIL..........	2.56	2.09	1.69	1.73	2.57	3.23	3.30	3.30	3.26	3.14	3.12
OTHER PRODUCTS(7)...........	5.11	4.83	4.66	4.83	4.88	5.10	5.15	5.17	5.19	5.24	5.34
TOTAL RECLASSIFIED(8)......	-0.44	-0.27	-0.31	-0.30	-0.30	-0.32	-0.32	-0.31	-0.31	-0.30	-0.30
TOTAL PRODUCT SUPPLIED...	17.06	16.06	15.25	15.37	16.84	18.00	17.89	17.55	17.24	16.98	16.99
DISCREPANCY..............	-0.02	-0.08	-0.07	0.00	-0.00	-0.00	-0.00	-0.01	-0.00	-0.01	-0.01
NET DISPOSITION..........	17.04	15.98	15.18	15.37	16.84	18.00	17.89	17.54	17.24	16.97	16.98

(1) INCLUDES LOWER-48 STATES AND SOUTHERN ALASKA.
(2) OTHER DOMESTIC REPRESENTS OTHER HYDROCARBON INPUT.
(3) INCLUDES IMPORTS FOR THE STRATEGIC PETROLEUM RESERVE.
(4) CONSISTS OF NATURAL GAS PLANT LIQUIDS, UNFINISHED OILS, AND REFINED PRODUCT IMPORTS.
(5) EXCLUDES CRUDE OIL FOR THE STRATEGIC PETROLEUM RESERVE.
(6) ADDITIONS TO THE STRATEGIC PETROLEUM RESERVE (SHOWN AS NEGATIVE ENTRIES).
(7) COMPOSED OF JET FUEL, LIQUEFIED GASES, AND OTHER PRODUCTS.
(8) PETROLEUM PRODUCTS REPROCESSED INTO OTHER PRODUCT CATEGORIES.
NOTE: IN 1980, GASOLINE SUPPLIED HAS BEEN ADJUSTED TO CORRECT UNDERESTIMATION OF PRODUCT SUPPLIED. DISTILLATE AND RESIDUAL FUEL OIL HAVE BEEN RESTATED INTO THE NEW BASIS FOR COMPARABILITY PURPOSES.
NOTE: ENTRIES FOR 1980 ARE A COMBINATION OF HISTORICAL AND ESTIMATED VALUES.
SOURCES: ON PAGE 222, SEE 4, PAGE 6, TABLE 1; AND 20, PAGE 18, TABLE 7.

TABLE A.7.1. NATURAL GAS SUPPLY/DEMAND BALANCE
CASE A: MIDDLE WORLD OIL PRICE
(TRILLION BTU PER YEAR; 1982 DOLLARS PER MILLION BTU)

	1980	1985	1986	1987	1988	1989	1990
LOWER-48 ONSHORE SUPPLY	14435.	11270.	10674.	10566.	11159.	11839.	12679.
LOWER-48 OFFSHORE SUPPLY	5477.	3911.	4016.	4189.	4173.	4015.	3680.
TOTAL DOMESTIC SUPPLY	19912.	15181.	14690.	14755.	15332.	15854.	16359.
CATEGORY 102 (NEW GAS)	3439.	6187.	6619.	7342.	8267.	9307.	10009.
CATEGORY 104 (OLD INTERSTATE GAS)	8910.	5730.	4980.	4360.	3850.	3440.	3090.
CATEGORY 105 (OLD INTRASTATE GAS)	6899.	3050.	2750.	2550.	2370.	2110.	2000.
CATEGORY 107 (DEEP GAS)	664.	214.	341.	503.	845.	997.	1259.
SUPPLEMENTAL GAS(1)	159.	0.	272.	208.	0.	0.	0.
IMPORTS	957.	1230.	1230.	1230.	1230.	1230.	1230.
TOTAL SUPPLY	21028.	16411.	16192.	16193.	16562.	17084.	17589.
LEASE AND PLANT FUEL(2)	1045.	1139.	1102.	1107.	1150.	1189.	1227.
TRANSPORTATION LOSS(3)	647.	1054.	1047.	1045.	1062.	1097.	1124.
CONSUMPTION BY SECTOR							
RESIDENTIAL	4866.	4585.	4521.	4463.	4413.	4375.	4344.
COMMERCIAL(4)	2674.	2723.	2692.	2644.	2587.	2542.	2500.
REFINERY	846.	298.	280.	289.	325.	350.	380.
ELECTRIC UTILITY	3807.	1701.	1719.	1748.	1868.	2180.	2394.
INDUSTRIAL(5)	6497.	4907.	4831.	4896.	5158.	5352.	5620.
TOTAL END-USE CONSUMPTION	18690.	14213.	14044.	14040.	14350.	14799.	15238.
DISCREPANCY(6)	-646.	0.	0.	0.	0.	0.	0.
WELLHEAD PRICES							
AVERAGE PRICE	1.79	3.60	4.31	4.93	5.18	5.18	5.17
CATEGORY 102 (NEW GAS)	2.69	4.55	5.39	5.95	6.05	5.91	5.79
CATEGORY 104 (OLD INTERSTATE GAS)	1.32	2.12	2.33	2.59	2.64	2.63	2.60
CATEGORY 105 (OLD INTRASTATE GAS)	1.67	4.35	5.13	5.83	5.94	5.81	5.70
CATEGORY 107 (DEEP GAS)	4.78	4.55	5.39	5.95	6.05	5.91	5.79
DELIVERED PRICE BY SECTOR							
RESIDENTIAL	4.16	6.65	7.43	8.01	8.28	8.35	8.53
COMMERCIAL(4)	3.84	6.42	7.24	7.85	8.14	8.27	8.48
REFINERY	3.08	4.75	5.50	6.06	6.21	6.24	6.25
ELECTRIC UTILITY	2.80	5.54	6.43	7.00	7.02	7.13	7.19
INDUSTRIAL(5)	2.90	5.62	6.45	7.00	7.13	7.17	7.23

(1) INCLUDES INCREASED GAS OR OIL IMPORTS.
(2) REPRESENTS GAS USED AS A FUEL IN FIELD GATHERING AND PLANT PROCESSING MACHINERY.
(3) INDICATES GAS USED TO FUEL COMPRESSORS IN THE PIPELINE MACHINERY.
(4) COMMERCIAL IS AN AGGREGATE OF COMMERCIAL AND OTHER CATEGORIES.
(5) EXCLUDES LEASE AND PLANT FUEL CONSUMPTION.
(6) REPRESENTS IMBALANCES RESULTING FROM THE MERGER OF DATA REPORTING SYSTEMS WHICH VARY IN SCOPE, FORMAT, DEFINITIONS AND TYPE OF RESPONDANTS.
NOTE: ENTRIES FOR 1980 ARE A COMBINATION OF HISTORICAL AND ESTIMATED VALUES.
SOURCES: ON PAGE 222, SEE 1, PP 15-19; 12, PAGE 7, TABLE 1; 13, PAGE 133, TABLE A7.

TABLE A.8.1. COAL SUPPLY AND DISPOSITION
CASE A: MEDIUM WORLD OIL PRICE
(MILLIONS OF SHORT TONS PER YEAR)

	1980	1985	1986	1987	1988	1989	1990
DOMESTIC SUPPLY							
EASTERN.............	579.	604.	619.	631.	648.	667.	692.
WESTERN.............	251.	310.	320.	332.	347.	364.	388.
NET IMPORTS(1)......	-91.	-109.	-114.	-120.	-127.	-135.	-144.
STOCK WITHDRAWALS...	-36.	0.	0.	0.	0.	0.	0.
TOTAL SUPPLY..........	703.	805.	825.	843.	868.	896.	936.
CONSUMPTION							
RESIDENTIAL/COMM....	7.	7.	7.	7.	7.	6.	6.
INDUSTRIAL..........	60.	76.	78.	81.	85.	89.	93.
METALLURGICAL.......	67.	49.	50.	50.	51.	51.	52.
ELECTRIC UTILITY....	569.	667.	685.	700.	720.	744.	780.
SYNTHETIC USE.......	0.	5.	5.	5.	5.	5.	5.
TOTAL CONSUMPTION.....	703.	805.	825.	843.	868.	896.	936.
TOTAL DISPOSITION.....	703.	805.	825.	843.	868.	896.	936.

(1) EXPORTS TO EUROPE AND JAPAN.
NOTE: EASTERN INCLUDES PENSYLVANIA, OHIO, MARYLAND, WEST VIRGINIA, VIRGINIA, KENTUCKY, TENNESSEE, ALABAMA, ILLINOIS, AND INDIANA. WESTERN INCLUDES IOWA, MISSOURI, KANSAS, ARKANSAS, OKLAHOMA, TEXAS, NORTH DAKOTA, SOUTH DAKOTA, MONTANA, WYOMING, COLORADO, UTAH, ARIZONA, NEW MEXICO, WASHINGTON, AND ALASKA.
NOTE: ENTRIES FOR 1980 ARE HISTORICAL DATA, AND STOCK WITHDRAWALS INCLUDES DISCREPANCY.

Case B
Low World Oil Price Forecast

Of all the underlying assumptions, perhaps the greatest amount of uncertainty surrounds the world oil price. Since 1973, the petroleum market has experienced two major price shocks--the first resulting from the OPEC oil embargo in 1973-1974 and the second following the Iranian revolution in 1979. Because the energy projections are highly dependent on the assumed path of future oil prices, two additional price paths were examined.

The middle world oil forecast (Case A) assumed that the real price of oil (in 1982 dollars) delivered to the United States will decrease from $34 per barrel in 1982 to $25 per barrel in 1985, and then increase to $37 per barrel by 1990 (see Table 1.4). In the low world oil price case B, the cost of imported oil is assumed to decline to $21 per barrel in 1985 (see Table B.1.4). It does not begin to rise again until 1987, and it subsequently increases to $28 per barrel by 1990. In the high price case C, the oil price decreases until 1984, then increases to $34 per barrel in 1985 and rises rapidly thereafter. By 1990, the "high" world oil price is $48 per barrel.

Lower world oil price (Case B scenario) would increase total energy consumption. In 1985, total consumption is projected to be about 2 percent higher than in the midprice case (see Table A.1.1). The incremental energy demand would be met by oil imports (crude plus products), which would increase by about 14 percent. The additional oil imports would also replace domestic supplies of oil and natural gas, both of which would decline slightly.

The substitution of imported oil for domestic oil and natural gas would intensify through 1990. Oil imports in the low case are projected to be about 33 percent higher than in the midprice case, while domestic oil production would decrease by 1.1 quadrillion Btu, and domestic natural gas supply would decline by approximately 7 percent.

THE FOLLOWING SECTION OF TABLES ARE FOR THE:

CASE B: LOW WORLD OIL PRICE

THIS SECTION CONTAINS THE FOLLOWING TABLES:

TABLE B.1.1. YEARLY SUPPLY AND DISPOSITION OF TOTAL ENERGY
CASE B: LOW WORLD OIL PRICE
(QUADRILLION BTU PER YEAR)

	1975	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990
SUPPLY												
PRODUCTION												
PETROLEUM..........	20.1	20.5	20.4	20.6	20.5	20.4	20.1	19.9	19.6	19.4	19.1	18.2
NATURAL GAS........	19.6	20.1	19.9	18.2	17.5	16.9	14.9	14.2	14.0	14.3	14.8	15.3
COAL...............	15.2	19.2	19.1	19.1	19.4	19.4	20.3	20.8	21.3	21.9	22.7	23.7
NUCLEAR............	1.9	2.7	2.9	3.0	3.2	3.7	4.1	4.7	5.3	5.8	6.1	6.3
HYDRO/GEO/OTHER....	3.2	3.0	2.9	3.3	3.2	3.1	3.1	3.1	3.2	3.2	3.2	3.2
SUBTOTAL.........	60.1	65.5	65.2	64.2	63.7	63.5	62.5	62.7	63.2	64.5	65.8	66.8
NET IMPORTS												
CRUDE OIL..........	8.7	10.6	8.8	6.8	7.5	11.6	15.2	16.1	16.3	16.1	15.9	16.7
OTHER PETROLEUM....	3.8	2.9	2.6	2.1	2.5	3.0	3.2	3.3	3.4	3.4	3.3	3.4
NG (CONTRACTED)(1).	0.9	1.0	.9	.9	1.1	1.2	1.2	1.2	1.2	1.2	1.2	1.2
OTHER GAS(2).......	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.6	0.8	0.7	0.4	0.0
COAL AND COKE......	-1.7	-2.4	-2.9	-2.8	-2.6	-2.7	-2.9	-3.0	-3.2	-3.4	-3.6	-3.8
ELECTRICITY........	0.1	.2	.2	.2	.2	0.3	0.3	0.3	0.3	0.3	0.4	0.4
SUBTOTAL.........	11.7	12.3	9.6	7.3	8.6	13.4	17.2	18.6	18.9	18.4	17.6	18.0
SPR ADDITIONS(3)....	0.0	-.1	-.7	-.4	-.4	-0.3	-0.3	-0.3	-0.3	-0.3	-0.3	-0.3
STOCK WITHDRAWALS...	-1.1	-1.8	0.0	-.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL SUPPLY.........	70.7	75.9	74.1	70.9	71.9	76.6	79.4	81.0	81.8	82.6	83.1	84.4
CONSUMPTION												
NON-ELEC UTILITY FUEL												
PETROLEUM..........	29.5	31.5	29.9	28.6	29.2	31.6	33.8	34.5	34.4	34.0	33.4	33.3
NATURAL GAS(4).....	16.7	16.6	16.1	15.0	14.9	14.4	13.6	13.4	13.4	13.6	13.7	13.9
COAL...............	4.0	3.4	3.4	3.0	2.9	3.2	3.3	3.3	3.4	3.4	3.5	3.6
SUBTOTAL.........	50.2	51.4	49.4	46.4	47.0	49.2	50.7	51.3	51.2	51.0	50.6	50.8
ELECTRIC UTILITY FUEL												
PETROLEUM..........	3.2	2.7	2.2	1.8	1.5	3.0	4.3	4.5	4.5	4.6	4.7	4.9
NATURAL GAS........	3.2	3.8	3.8	3.3	3.4	2.6	1.6	1.6	1.6	1.7	1.7	1.7
COAL...............	8.8	12.1	12.7	12.7	13.2	13.5	14.1	14.5	14.7	15.1	15.6	16.3
NUCLEAR............	1.9	2.7	2.9	3.0	3.2	3.7	4.1	4.7	5.3	5.8	6.1	6.3
HYDRO/GEO/OTHER(5).	3.4	3.2	3.1	3.5	3.4	3.4	3.5	3.5	3.5	3.5	3.5	3.6
SUBTOTAL.........	20.5	24.5	24.7	24.3	24.7	26.0	27.3	28.4	29.3	30.4	31.3	32.4
TOTAL CONSUMPTION....	70.7	75.9	74.1	70.7	71.7	75.2	78.0	79.7	80.5	81.3	81.9	83.2
ADJUSTMENTS												
REFINERY LOSSES(6).	0.0	0.0	0.0	0.0	-0.1	0.0	0.2	0.2	0.2	0.3	0.3	0.3
DISCREPANCY(7).....	0.0	0.0	0.0	0.2	0.3	1.4	1.2	1.1	1.1	1.0	0.9	0.9
TOTAL DISPOSITION....	70.7	75.9	74.1	70.9	71.9	76.6	79.4	81.0	81.8	82.6	83.1	84.4

NOTE: THE "ANNUAL ENERGY REVIEW" FOR 1982 WILL CONTAIN LATER REVISIONS TO HISTORICAL DATA FOR 1975, 1980 AND 1982.
NOTE: TOTALS MAY NOT EQUAL SUM OF COMPONENTS DUE TO INDEPENDENT ROUNDING. FOR TABLE FOOTNOTES AND SOURCES SEE PAGE 219.

TABLE B.1.2. SUPPLY/DEMAND BALANCE
CASE B: LOW WORLD OIL PRICE
(QUADRILLION BTU PER YEAR)

	1975	1980	1985	1986	1987	1988	1989	1990
DOMESTIC SUPPLY								
COAL..................	15.2	19.2	20.3	20.8	21.3	21.9	22.7	23.7
NATURAL GAS...........	19.6	19.9	14.9	14.2	14.0	14.3	14.8	15.3
PETROLEUM.............	20.1	20.5	20.1	19.9	19.6	19.4	19.1	18.2
NUCLEAR...............	1.9	2.7	4.1	4.7	5.3	5.8	6.1	6.3
OTHER(1)..............	3.2	3.0	3.1	3.1	3.2	3.2	3.2	3.2
TOTAL DOMESTIC SUPPLY..................	60.0	65.3	62.5	62.7	63.2	64.5	65.8	66.8
NATURAL GAS IMPORTS...	0.9	1.0	1.2	1.2	1.2	1.2	1.2	1.2
SUPPLEMENTAL GAS(2)...	0.0	0.2	0.1	0.6	0.8	0.7	0.4	0.0
PETROLEUM IMPORTS.....	12.5	13.5	18.4	19.5	19.6	19.5	19.2	20.1
TOTAL SUPPLY(3).........	73.4	80.0	82.2	84.0	84.9	85.9	86.6	88.2
DISPOSITION								
RESIDENTIAL...........	9.6	9.3	9.3	9.4	9.4	9.5	9.6	9.6
COMMERCIAL............	5.5	5.9	6.7	6.8	7.0	7.0	7.1	7.2
INDUSTRIAL(4).........	21.3	23.0	23.1	23.8	24.2	24.6	24.7	25.3
TRANSPORTATION........	17.7	19.7	19.3	19.3	18.9	18.5	18.1	17.9
TOTAL END-USE CONSUMPTION............	54.1	57.9	58.3	59.3	59.5	59.6	59.4	59.9
DISCREPANCY............	0.2	-0.1	-0.1	-0.1	-0.2	-0.3	-0.4	-0.4
ADJUSTMENTS............	19.1	22.2	24.0	24.8	25.6	26.6	27.6	28.7
UTILITY GENERATION....	13.7	16.5	18.4	19.1	19.7	20.4	21.0	21.7
UTILITY TRANSMISSION..	0.6	0.7	0.9	0.9	0.9	1.0	1.0	1.0
REFINERY(5)...........	0.0	0.0	0.2	0.2	0.2	0.3	0.3	0.3
GAS PIPELINE(6).......	0.6	0.6	1.0	1.0	1.0	1.0	1.0	1.1
LEASE/PLANT FUEL(7)...	1.4	1.0	1.1	1.1	1.0	1.1	1.1	1.2
COAL EXPORTS..........	1.7	2.4	2.9	3.0	3.2	3.4	3.6	3.8
SPR ADDITIONS.........	0.0	0.1	0.3	0.3	0.3	0.3	0.3	0.3
STOCK WITHDRAWALS.....	1.1	1.8	0.0	0.0	0.0	0.0	0.0	0.0
RECLASSIFIED..........	0.0	-0.9	-0.7	-0.7	-0.7	-0.7	-0.7	-0.7
ADJUSTED CONSUMPTION....	73.4	80.0	82.2	84.0	84.9	85.9	86.6	88.2
ELECTRIC UTILITY FUEL								
COAL..................	8.8	12.1	14.1	14.5	14.7	15.1	15.6	16.3
PETROLEUM.............	3.2	2.7	4.3	4.5	4.5	4.6	4.7	4.9
NATURAL GAS...........	3.2	3.8	1.6	1.6	1.6	1.7	1.7	1.7
TOTAL FOSSIL...........	15.2	18.6	20.1	20.6	20.9	21.4	22.0	22.9
NUCLEAR...............	1.9	2.7	4.1	4.7	5.3	5.8	6.1	6.3
OTHER.................	3.2	3.0	3.1	3.1	3.2	3.2	3.2	3.2
TOTAL..................	20.3	24.3	27.3	28.4	29.3	30.4	31.3	32.4
GENERATION..............	6.6	7.8	9.0	9.3	9.6	10.0	10.3	10.7

NOTE: TOTALS MAY NOT EQUAL SUM OF COMPONENTS DUE TO INDEPENDENT ROUNDING. FOR TABLE FOOTNOTES AND SOURCES SEE PAGE 219.

TABLE B.1.3. CONSUMPTION SUMMARY
CASE B: LOW WORLD OIL PRICE
(QUADRILLION BTU PER YEAR)

	1975	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990
RESIDENTIAL	9.571	9.335	9.104	9.236	9.143	9.208	9.281	9.370	9.446	9.506	9.553	9.594
STEAM COAL............	0.091	0.065	0.080	0.082	0.071	0.078	0.076	0.074	0.073	0.071	0.069	0.068
NATURAL GAS...........	5.022	4.866	4.654	4.793	4.710	4.652	4.594	4.545	4.501	4.460	4.424	4.391
DISTILLATE(1)..........	1.923	1.417	1.375	1.303	1.230	1.329	1.369	1.409	1.438	1.455	1.459	1.458
LIQUID PETROLEUM GAS...	0.528	0.539	0.536	0.570	0.590	0.572	0.592	0.611	0.625	0.632	0.635	0.635
ELECTRICITY	2.007	2.448	2.459	2.488	2.530	2.577	2.649	2.730	2.810	2.888	2.966	3.042
COMMERCIAL	5.513	5.892	5.818	5.866	6.182	6.467	6.666	6.833	6.950	7.026	7.109	7.189
STEAM COAL............	0.135	0.095	0.107	0.122	0.086	0.097	0.095	0.093	0.091	0.088	0.086	0.083
NATURAL GAS...........	2.559	2.674	2.580	2.683	2.720	2.736	2.736	2.718	2.683	2.636	2.594	2.553
DISTILLATE(1)..........	0.622	0.556	0.540	0.511	0.670	0.749	0.800	0.848	0.888	0.917	0.941	0.959
LO-SULFUR RESIDUAL.....	0.506	0.566	0.470	0.376	0.490	0.550	0.587	0.623	0.652	0.674	0.691	0.704
LIQUID PETROLEUM GAS...	0.093	0.095	0.095	0.101	0.090	0.080	0.078	0.077	0.075	0.073	0.071	0.069
ELECTRICITY	1.598	1.906	2.026	2.074	2.150	2.254	2.370	2.475	2.563	2.639	2.726	2.821
INDUSTRIAL(2)	18.503	20.185	19.513	16.876	17.365	19.219	20.349	21.059	21.413	21.849	21.998	22.582
STEAM COAL............	1.619	1.388	1.570	1.626	1.501	1.766	1.791	1.829	1.873	1.935	2.007	2.094
METALLURGICAL COAL.....	2.178	1.793	1.647	1.057	1.132	1.263	1.304	1.327	1.340	1.355	1.360	1.375
NATURAL GAS...........	6.133	6.497	6.639	5.414	5.340	5.314	4.891	4.835	4.920	5.124	5.235	5.425
DISTILLATE............	1.272	1.569	1.285	1.212	1.340	1.916	2.606	2.857	2.833	2.739	2.588	2.533
LO-SULFUR RESIDUAL.....	0.428	0.554	0.423	0.367	0.390	0.511	0.609	0.653	0.663	0.669	0.655	0.671
HI-SULFUR RESIDUAL.....	0.856	0.713	0.531	0.484	0.530	0.760	0.965	1.058	1.079	1.076	1.042	1.053
LIQUID PETROLEUM GAS...	0.252	0.308	0.323	0.332	0.370	0.375	0.411	0.400	0.353	0.301	0.245	0.205
PET-CHEM FEEDSTOCK(3)..	1.519	2.401	2.111	1.862	1.980	2.219	2.380	2.521	2.635	2.748	2.839	2.990
OTHER(4)..............	1.900	2.180	2.166	1.977	2.240	2.249	2.332	2.374	2.392	2.404	2.410	2.434
ELECTRICITY	2.346	2.781	2.817	2.545	2.620	2.846	3.061	3.205	3.326	3.498	3.617	3.803
TRANSPORTATION(5)	17.725	19.655	18.715	18.129	17.910	18.922	19.307	19.267	18.935	18.491	18.091	17.893
DISTILLATE............	2.069	2.782	2.738	2.582	2.510	2.802	2.932	3.026	3.109	3.179	3.256	3.359
HI-SULFUR RESIDUAL.....	0.731	1.401	1.163	0.930	0.900	1.023	1.077	1.115	1.145	1.166	1.186	1.215
GASOLINE(6)...........	12.868	13.253	12.688	12.528	12.180	12.802	12.891	12.633	12.119	11.537	10.992	10.613
JET FUEL(7)...........	2.029	2.179	2.087	2.049	2.280	2.255	2.368	2.453	2.522	2.569	2.616	2.665
LIQUID PETROLEUM GAS...	0.016	0.014	0.014	0.015	0.020	0.015	0.015	0.015	0.015	0.015	0.015	0.015
OTHER.................	0.000	0.014	0.014	0.014	0.010	0.014	0.014	0.014	0.014	0.014	0.014	0.014
ELECTRICITY	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010
ELECTRIC UTILITY FUEL	20.360	24.243	24.462	24.203	24.480	25.973	27.325	28.383	29.289	30.354	31.278	32.442
STEAM COAL............	8.790	12.122	12.707	12.697	13.190	13.531	14.133	14.453	14.709	15.090	15.575	16.264
NATURAL GAS...........	3.240	3.807	3.764	3.336	3.440	2.631	1.598	1.625	1.643	1.679	1.705	1.746
DISTILLATE(8).........	0.350	0.121	0.077	0.048	0.090	0.216	0.496	0.568	0.575	0.652	0.702	0.835
LO-SULFUR RESIDUAL(9)..	2.860	1.611	1.251	0.980	0.780	1.853	2.646	2.694	2.725	2.741	2.751	2.785
HI-SULFUR RESIDUAL.....	NA	0.922	0.898	0.789	0.600	0.955	1.201	1.215	1.231	1.243	1.236	1.255
HYDRO/GEO/OTHER(10)....	3.220	2.988	2.864	3.340	3.190	3.115	3.133	3.149	3.153	3.169	3.194	3.227
NUCLEAR...............	1.900	2.672	2.901	3.013	3.190	3.671	4.118	4.678	5.253	5.782	6.114	6.331
REFINERY FUEL(11)	2.769	2.787	2.304	2.190	2.480	2.434	2.715	2.786	2.776	2.741	2.692	2.687
NATURAL GAS...........	0.975	0.846	0.668	0.574	0.720	0.407	0.251	0.216	0.216	0.236	0.260	0.284
DISTILLATE............	0.035	0.018	0.011	0.011	0.010	0.012	0.014	0.014	0.014	0.014	0.013	0.013
LO-SULFUR RESIDUAL.....	NA	NA	NA	NA	0.090	0.130	0.177	0.191	0.189	0.183	0.173	0.170
HI-SULFUR RESIDUAL.....	0.269	0.213	0.167	0.137	0.200	0.341	0.552	0.598	0.596	0.571	0.539	0.516
LIQUID PETROLEUM GAS...	0.050	0.043	0.024	0.038	0.030	0.026	0.029	0.030	0.030	0.030	0.029	0.029
OTHER(12).............	0.390	0.436	0.359	0.348	0.360	0.378	0.421	0.432	0.431	0.425	0.418	0.417
STILL GAS.............	1.050	1.231	1.073	1.085	1.080	1.139	1.271	1.304	1.299	1.283	1.260	1.258

NOTE: TOTALS MAY NOT EQUAL SUM OF COMPONENTS DUE TO INDEPENDENT ROUNDING. FOR TABLE FOOTNOTES AND SOURCES SEE PAGE 219.

TABLE B.1.4. PRICE SUMMARY
CASE B: LOW WORLD OIL PRICE
(1982 DOLLARS PER MILLION BTU)

	1975	1980	1985	1986	1987	1988	1989	1990
WORLD OIL PRICE.........	20.70	39.32	21.08	20.99	22.30	24.00	26.20	27.60
RESIDENTIAL	5.95	8.33	9.05	9.41	9.81	10.16	10.54	10.91
NATURAL GAS...........	2.75	4.16	6.39	6.89	7.28	7.64	7.95	8.33
DISTILLATE(1).........	4.75	8.59	5.24	5.22	5.54	5.95	6.49	6.84
LIQUID PETROLEUM GAS..	4.11	6.67	5.33	5.45	5.79	6.20	6.68	7.06
ELECTRICITY	15.61	16.78	16.66	16.84	17.12	17.21	17.41	17.58
COMMERCIAL	6.27	8.38	9.56	9.91	10.30	10.64	11.06	11.44
NATURAL GAS...........	2.17	3.84	6.16	6.69	7.12	7.50	7.87	8.27
DISTILLATE(1).........	4.30	8.06	4.96	4.94	5.24	5.64	6.15	6.48
LO-SULFUR RESIDUAL....	4.13	5.32	4.11	4.17	4.44	4.80	5.24	5.60
LIQUID PETROLEUM GAS..	NA	6.67	5.34	5.46	5.80	6.21	6.69	7.07
ELECTRICITY	15.55	17.21	16.83	17.00	17.28	17.41	17.65	17.83
INDUSTRIAL(2)	3.37	5.44	5.87	6.03	6.33	6.63	7.00	7.29
STEAM COAL............	1.81	1.55	2.10	2.13	2.16	2.19	2.23	2.31
METALLURGICAL COAL....	2.80	2.51	2.56	2.59	2.61	2.63	2.66	2.72
NATURAL GAS...........	1.49	2.90	5.33	5.85	6.22	6.45	6.75	7.00
DISTILLATE............	4.24	7.99	4.87	4.86	5.15	5.55	6.05	6.38
LO-SULFUR RESIDUAL....	4.11	5.14	4.05	4.11	4.38	4.73	5.17	5.52
HI-SULFUR RESIDUAL....	2.93	NA	3.50	3.56	3.83	4.19	4.64	5.00
LIQUID PETROLEUM GAS..	3.83	6.34	5.16	5.27	5.60	6.00	6.45	6.81
PET-CHEM FEEDSTOCK(3).	NA	7.88	5.62	5.59	5.93	6.38	6.96	7.33
OTHER(4)..............	NA	NA	4.36	4.34	4.59	4.93	5.37	5.67
ELECTRICITY	9.42	11.67	13.75	13.91	14.18	14.28	14.47	14.65
TRANSPORTATION(5)	6.72	9.91	6.61	6.55	6.84	7.21	7.70	7.96
DISTILLATE............	5.85	8.39	5.18	5.16	5.48	5.89	6.43	6.78
HI-SULFUR RESIDUAL....	2.93	3.97	3.04	3.10	3.35	3.68	4.09	4.42
GASOLINE(6)...........	7.57	11.32	7.43	7.39	7.73	8.15	8.68	8.94
JET FUEL(7)...........	3.69	7.51	5.52	5.47	5.80	6.23	6.78	7.13
LIQUID PETROLEUM GAS..	NA	NA	5.10	5.22	5.55	5.95	6.41	6.78
ELECTRICITY	NA	NA	16.19	16.35	16.64	16.80	17.06	17.23
ELECTRIC UTILITY FUEL	2.04	1.84	1.95	1.99	2.05	2.11	2.19	2.28
STEAM COAL............	1.58	1.71	1.74	1.75	1.77	1.79	1.81	1.86
NATURAL GAS...........	1.14	2.80	5.23	5.80	6.19	6.34	6.66	6.83
DISTILLATE(8).........	3.28	7.22	4.88	4.87	5.17	5.56	6.07	6.40
LO-SULFUR RESIDUAL(9).	3.27	5.90	4.10	4.16	4.43	4.79	5.25	5.61
HI-SULFUR RESIDUAL....	NA	4.55	3.08	3.13	3.38	3.71	4.11	4.44
NUCLEAR...............	NA	.85	0.85	0.85	0.85	0.85	0.85	0.85
REFINERY FUEL	NA	NA	1.96	1.98	2.13	2.31	2.54	2.71
NATURAL GAS...........	NA	3.08	4.45	4.89	5.26	5.52	5.81	6.03
DISTILLATE............	NA	6.09	4.27	4.26	4.53	4.88	5.34	5.63
LO-SULFUR RESIDUAL....	NA	NA	3.54	3.59	3.84	4.16	4.56	4.89
HI-SULFUR RESIDUAL....	NA	4.89	2.88	2.94	3.18	3.51	3.90	4.23
LIQUID PETROLEUM GAS..	NA	NA	4.54	4.66	4.97	5.33	5.75	6.09
OTHER(10).............	NA	NA	4.24	4.23	4.48	4.82	5.26	5.55

NOTE: TOTALS MAY NOT EQUAL SUM OF COMPONENTS DUE TO INDEPENDENT ROUNDING. FOR TABLE FOOTNOTES AND SOURCES SEE PAGE 219.

TABLE B.3.1. NATIONAL MACROECONOMIC INDICATORS
CASE B: LOW WORLD OIL PRICE

	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990
REAL GROSS NATIONAL PRODUCT(1).....	2408.8	2455.6	2411.2	2445.9	2559.5	2673.9	2765.1	2853.2	2924.8	2999.0	3088.3
GROSS NATIONAL PRODUCT DEFLATOR(2).	1.0931	1.1964	1.2681	1.3293	1.3951	1.4672	1.5471	1.6434	1.7576	1.8790	2.0058
REAL GROWTH(3)....................	-0.41	1.98	-1.81	1.16	4.65	4.47	3.41	3.18	2.51	2.54	2.98
INFLATION(3)......................	9.31	9.45	5.99	7.17	4.95	5.17	5.45	6.22	6.95	6.91	6.74
REAL PERSONAL DISPOSABLE INCOME(1).	1663.6	1704.6	1723.3	1746.4	1829.5	1900.4	1962.2	2008.4	2042.0	2089.4	2140.9
UNEMPLOYMENT RATE(3)..............	7.1	7.6	9.7	10.62	9.52	8.32	7.82	7.53	7.47	7.54	7.41
POPULATION(5).....................	222.138	224.175	226.219	228.160	230.305	232.344	234.480	236.597	238.760	240.846	242.977
REAL PERS DISP INCOME PER CAPITA(6)	7487.0	7603.9	7617.8	7654.4	7943.8	8179.4	8368.3	8488.8	8552.7	8675.2	8811.2
RESIDENTIAL HOUSING STARTS(5)......	1.292	1.084	1.060	1.457	1.668	1.869	1.876	1.889	1.866	1.806	1.753
AAA BOND RATE(3)..................	11.94	14.17	13.79	11.12	10.34	10.26	10.35	10.37	10.34	10.12	9.83
MORTGAGE RATE(3)..................	12.66	14.70	15.14	8.34	8.85	9.25	9.67	9.05	9.03	9.17	8.91
FEDERAL RESERVE PRODUCTION INDEX(4)	147.0	151.0	138.6	140.19	153.23	164.14	170.88	177.14	182.54	188.78	196.95

(1) BILLIONS OF 1979 DOLLARS.
(2) INDEX EQUAL TO 1.0 IN 1979.
(3) PERCENTAGE.
(4) INDEX EQUAL TO 100 IN 1967.
(5) MILLIONS OF UNITS.
(6) 1979 DOLLARS.
NOTE: ENTRIES FOR 1980, 1981 AND 1982 ARE HISTORICAL DATA.
SOURCES: ON PAGE 222, SEE 9, PAGE 164, TABLE B-2; 9, PAGE 166, TABLE B-3; 9, PAGE 191, TABLE B-24; 9, PAGE 201, TABLE B-33; 9, PAGE 216, TABLE B-47; 9, PAGE 240, TABLE B-67; AND 9, PAGE 210, TABLE B-42.

TABLE B.4.1. RESIDENTIAL SECTOR FUEL CONSUMPTION BY END-USE SERVICE
CASE B: LOW WORLD OIL PRICE
(TRILLIONS OF BTU PER YEAR)

	1980	1985	1986	1987	1988	1989	1990
SPACE HEATING							
ELECTRICITY(1).....	201.	245.	260.	276.	291.	307.	322.
NATURAL GAS........	3225.	3003.	2951.	2902.	2856.	2813.	2773.
FUEL OIL...........	1172.	1131.	1169.	1197.	1213.	1218.	1217.
LIQUID GAS.........	390.	425.	438.	449.	455.	457.	457.
COAL...............	65.	76.	74.	73.	71.	69.	68.
MARKET TOTAL.......	5054.	4879.	4893.	4896.	4886.	4864.	4837.
WOOD...............	818.	1124.	1145.	1162.	1175.	1185.	1193.
WATER HEATING							
ELECTRICITY........	286.	319.	330.	341.	352.	363.	374.
NATURAL GAS........	1055.	1031.	1034.	1038.	1044.	1049.	1056.
FUEL OIL...........	244.	239.	240.	241.	241.	241.	241.
LIQUID GAS.........	149.	167.	172.	176.	178.	178.	178.
MARKET TOTAL.......	1734.	1755.	1776.	1796.	1815.	1832.	1848.
AIR CONDITIONING							
ELECTRICITY........	351.	382.	392.	402.	412.	422.	432.
NATURAL GAS........	12.	13.	13.	13.	13.	13.	14.
MARKET TOTAL.......	363.	394.	404.	415.	425.	436.	446.
OTHER END-USES(2)							
ELECTRICITY........	1610.	1705.	1749.	1791.	1833.	1874.	1914.
NATURAL GAS........	574.	548.	548.	547.	548.	548.	549.
MARKET TOTAL.......	2185.	2253.	2296.	2339.	2380.	2422.	2463.
FOR ALL END USES							
ELECTRICITY........	2448.	2649.	2731.	2810.	2888.	2966.	3042.
NATURAL GAS........	4866.	4595.	4545.	4501.	4460.	4424.	4391.
FUEL OIL...........	1417.	1369.	1409.	1438.	1455.	1459.	1458.
LIQUID GAS.........	539.	592.	611.	625.	632.	635.	635.
COAL...............	65.	76.	74.	73.	71.	69.	68.
MARKET TOTAL.......	9335.	9281.	9370.	9446.	9506.	9553.	9594.
WOOD...............	818.	1124.	1145.	1162.	1175.	1185.	1193.

(1) ELECTRIC SPACE HEATING INCLUDES BOTH ELECTRIC RESISTANCE AND HEAT PUMPS.
(2) SOME OF THE MAJOR USES ARE LIGHTING, COOKING, REFRIGERATION, WASHING, AND DRYING.
NOTE: ENTRIES FOR 1980 ARE A COMBINATION OF HISTORICAL AND ESTIMATED VALUES.
SOURCES: ON PAGE 222, SEE 1, PAGE 15; AND 19, PAGE 101, TABLE A4.

TABLE B.4.2. COMMERCIAL SECTOR ENERGY CONSUMPTION AND FLOORSPACE BY BUILDING CATEGORY
CASE B: LOW WORLD OIL PRICE
(CONSUMPTION IN QUADRILLION BTU PER YEAR, FLOORSPACE IN BILLIONS OF SQUARE FEET)

		1980	1985	1986	1987	1988	1989	1990
ALL CATEGORIES...	ALL FUELS.......	5.892	6.666	6.833	6.950	7.026	7.109	7.189
	NATURAL GAS.....	2.674	2.736	2.718	2.683	2.636	2.594	2.553
	ELECTRICITY.....	1.907	2.370	2.475	2.563	2.639	2.726	2.821
	FUEL OIL(1).....	1.122	1.387	1.471	1.540	1.591	1.632	1.664
	OTHER FUELS(2)..	0.190	0.173	0.170	0.165	0.161	0.156	0.152
	FLOORSPACE......	44.75	51.36	52.90	54.20	55.33	56.66	58.11
WAREHOUSE........	ALL FUELS.......	0.826	0.945	0.972	0.994	1.010	1.028	1.045
	NATURAL GAS.....	0.376	0.379	0.376	0.370	0.363	0.357	0.350
	ELECTRICITY.....	0.254	0.323	0.336	0.348	0.360	0.373	0.386
	FUEL OIL(1).....	0.167	0.216	0.235	0.250	0.262	0.274	0.286
	OTHER FUELS(2)..	0.028	0.026	0.026	0.025	0.025	0.024	0.023
	FLOORSPACE......	6.29	7.30	7.52	7.72	7.91	8.11	8.33
INSTITUTION(3)...	ALL FUELS.......	0.675	0.732	0.751	0.763	0.768	0.772	0.775
	NATURAL GAS.....	0.392	0.363	0.356	0.346	0.334	0.323	0.312
	ELECTRICITY.....	0.108	0.135	0.141	0.145	0.150	0.155	0.161
	FUEL OIL(1).....	0.155	0.217	0.238	0.256	0.269	0.279	0.287
	OTHER FUELS(2)..	0.019	0.017	0.017	0.016	0.016	0.015	0.014
	FLOORSPACE......	1.65	1.90	1.95	2.00	2.04	2.09	2.14
OFFICE...........	ALL FUELS.......	1.935	2.209	2.270	2.314	2.344	2.378	2.412
	NATURAL GAS.....	0.755	0.770	0.764	0.754	0.741	0.729	0.717
	ELECTRICITY.....	0.726	0.903	0.945	0.980	1.008	1.041	1.078
	FUEL OIL(1).....	0.393	0.479	0.505	0.527	0.543	0.556	0.567
	OTHER FUELS(2)..	0.062	0.056	0.055	0.054	0.053	0.051	0.050
	FLOORSPACE......	15.74	18.15	18.72	19.19	19.58	20.06	20.59
HOTEL AND MOTEL..	ALL FUELS.......	0.299	0.345	0.352	0.357	0.358	0.362	0.365
	NATURAL GAS.....	0.142	0.150	0.149	0.147	0.144	0.141	0.138
	ELECTRICITY.....	0.114	0.147	0.153	0.159	0.163	0.168	0.174
	FUEL OIL(1).....	0.033	0.039	0.041	0.043	0.044	0.044	0.044
	OTHER FUELS(2)..	0.010	0.009	0.009	0.009	0.008	0.008	0.008
	FLOORSPACE......	2.12	2.43	2.51	2.57	2.62	2.68	2.75
RETAIL/WHOLESALE.	ALL FUELS.......	1.552	1.823	1.874	1.910	1.936	1.963	1.989
	NATURAL GAS.....	0.733	0.796	0.799	0.796	0.789	0.785	0.780
	ELECTRICITY.....	0.545	0.684	0.717	0.745	0.770	0.798	0.828
	FUEL OIL(1).....	0.223	0.294	0.310	0.322	0.331	0.336	0.338
	OTHER FUELS(2)..	0.051	0.048	0.047	0.046	0.045	0.044	0.043
	FLOORSPACE......	13.18	15.40	15.92	16.36	16.74	17.19	17.69
MISCELLANEOUS(4).	ALL FUELS.......	0.606	0.614	0.614	0.612	0.609	0.606	0.604
	NATURAL GAS.....	0.276	0.277	0.274	0.270	0.265	0.260	0.255
	ELECTRICITY.....	0.160	0.179	0.182	0.185	0.188	0.191	0.194
	FUEL OIL(1).....	0.151	0.142	0.142	0.142	0.142	0.142	0.141
	OTHER FUELS(2)..	0.019	0.016	0.016	0.015	0.014	0.014	0.013
	FLOORSPACE......	5.76	6.20	6.29	6.37	6.45	6.53	6.61

(1) FUEL OIL CONSISTS OF LOW SULFUR RESIDUAL OIL AND DISTILLATE OIL.
(2) OTHER FUELS CONSIST OF LIQUID PETROLEUM GASES AND COAL.
(3) INCLUDES MAINLY HEALTH FACILITIES AND PENAL INSTITUTIONS.
(4) INCLUDES MAINLY RELIGIOUS FACILITIES, ASSEMBLEY HALLS, PARKING GARAGES, AND RECREATIONAL FACILITIES.
NOTE: ENTRIES FOR 1980 ARE A COMBINATION OF HISTORICAL AND ESTIMATED VALUES.
SOURCES: ON PAGE 222, SEE 1, PAGE 16.

TABLE B.4.3. INDUSTRIAL SECTOR ENERGY CONSUMPTION
CASE B: LOW WORLD OIL PRICE
(TRILLIONS OF BTU PER YEAR)

	1980	1985	1986	1987	1988	1989	1990
COAL....................	1387.88	1790.67	1829.03	1872.56	1934.71	2007.03	2094.22
NATURAL GAS.............	6497.36	4891.28	4835.37	4919.70	5124.44	5234.63	5419.67
(RAW MATERIALS(1).....	650.77	499.35	493.75	493.63	497.08	499.87	501.00)
DISTILLATE..............	1568.69	2606.04	2856.97	2832.71	2738.54	2587.98	2532.81
HI-SULFUR RESIDUAL......	713.20	964.69	1058.36	1078.91	1076.28	1042.15	1053.45
LO-SULFUR RESIDUAL......	553.58	608.56	652.91	663.30	668.66	655.24	671.15
ELECTRICITY.............	2780.85	3061.42	3204.97	3325.59	3498.04	3616.91	3802.58
LIQUID PETROLEUM GAS....	307.88	410.79	399.60	353.46	300.84	245.30	204.92
PET-CHEM FEEDSTOCKS(2)..	2401.48	2379.71	2521.37	2634.99	2748.19	2838.68	2987.58
METALLURGICAL COAL......	1793.34	1303.94	1327.22	1339.68	1355.35	1360.15	1375.07
OTHER(3)................	2180.32	2331.71	2373.66	2392.45	2403.74	2409.82	2434.26
TOTAL ENERGY............	20184.57	20348.80	21059.45	21413.34	21848.77	21997.87	22575.68

(1) NATURAL GAS CONSUMED AS A FEEDSTOCK BY THE CHEMICAL INDUSTRY (ALREADY INCLUDED IN THE NATURAL GAS TOTAL).
(2) CONSISTS OF STILL GAS USED FOR FEEDSTOCK PUROPSES, NAPTHAS LESS THAN 400 DEGREES, OTHER FUELS GREATER THAN 400 DEGREES, AND LIQUID PETROLEUM GASES USED FOR GAS UTILITY FUEL AND FOR CHEMICAL FEEDSTOCKS.
(3) ASPHALT, PETROLEUM COKE, LUBRICANTS, INDUSTRIAL KEROSENE, WAXES AND MISCELLANEOUS PETROLEUM PRODUCTS.
NOTE: INDUSTRIAL SECTOR TOTAL DIFFER FROM THOSE SHOWN IN THE "MONTHLY ENERGY REVIEW" BY EXCLUDING ELECTRICITY LOSSES, GASOLINE, NATURAL GAS USED AS A LEASE AND PLANT FUEL, AND ALL REFINERY FUELS EXCEPT COAL AND ELECTRICITY, AND BY INCLUDING LUBRICANTS CONSUMED BY THE TRANSPORTATION SECTOR. IN 1980 ONLY, THE RESIDUAL AND DISTILLATE DETAIL HAS BEEN CONVERTED TO THE NEW BASIS FOR CONSISTENCY WITH THE PETROLEUM BALANCE TABLE AND WITH 1980 FUEL DETAIL USED IN THE "SHORT-TERM ENERGY OUTLOOK."
NOTE: ENTRIES FOR 1980 ARE HISTORICAL DATA.
SOURCES: ON PAGE 222, SEE 1, PAGE 17; 15, PAGE 11, TABLE 5; AND 15, PAGE 127, TABLE 55.

TABLE B.4.4. TRANSPORTATION SECTOR ENERGY CONSUMPTION BY MODE
CASE B: LOW WORLD OIL PRICE

	1980	1985	1986	1987	1988	1989	1990
FUEL CONSUMPTION, ALL MODES							
GASOLINE(1)	13.253	12.891	12.633	12.119	11.537	10.992	10.613
DISTILLATE(1)	2.782	2.932	3.026	3.109	3.179	3.256	3.359
JET FUEL(1)	2.179	2.368	2.453	2.522	2.569	2.616	2.665
RESIDUAL(1)	1.401	1.077	1.115	1.145	1.166	1.186	1.215
LIQUID GAS(1)	0.014	0.015	0.015	0.015	0.015	0.015	0.015
FUEL USE IN LIGHT DUTY VEHICLES							
SALES:LIGHT DUTY VEHICLES(3)	10.750	13.254	13.644	14.123	14.702	15.081	15.004
VEHICLE-MILES:TOTAL(2)	1383.	1636.	1680.	1707.	1725.	1749.	1780.
FLEET-MILES PER GALLON:TOTAL	14.17	16.16	16.88	17.82	18.85	19.96	20.93
PERCENT FLEET VMT DIESEL	0.010	0.019	0.023	0.027	0.033	0.041	0.048
VEHICLE-MILES:GAS(2)	1368.	1605.	1642.	1660.	1668.	1678.	1694.
FLEET-MILES PER GALLON:GAS	13.95	15.98	16.67	17.56	18.53	19.55	20.44
FUEL USE:GAS(4)	98.080	100.427	98.502	94.535	90.041	85.839	82.888
VEHICLE-MILES:DIESEL(2)	14.	31.	38.	47.	57.	71.	86.
FLEET-MILES PER GALLON:DIESEL	25.34	26.59	27.26	28.19	29.19	30.28	31.19
FUEL USE:DIESEL(4)	0.564	1.173	1.387	1.652	1.966	2.346	2.760
FUEL USE IN HEAVY TRUCKS							
SALES:HEAVY TRUCKS(3)	0.487	0.644	0.675	0.706	0.736	0.756	0.734
VEHICLE-MILES:TOTAL(2)	105.	127.	132.	136.	139.	142.	146.
FLEET-MILES PER GALLON:TOTAL	5.82	6.85	7.07	7.29	7.52	7.75	7.94
PERCENT FLEET VMT DIESEL	0.591	0.656	0.669	0.683	0.697	0.710	0.722
VEHICLE-MILES:GAS(2)	43.	44.	44.	43.	42.	41.	41.
FLEET-MILES PER GALLON:GAS	6.84	8.29	8.60	8.92	9.25	9.56	9.78
FUEL USE:GAS(4)	6.266	5.289	5.092	4.849	4.569	4.306	4.148
VEHICLE-MILES:DIESEL(2)	62.	83.	89.	93.	97.	101.	106.
FLEET-MILES PER GALLON:DIESEL	5.09	6.09	6.31	6.54	6.77	7.01	7.23
FUEL USE:DIESEL(4)	12.168	13.705	14.034	14.242	14.331	14.402	14.595
FUEL USE IN AIR							
REVENUE PASSENGER-MILES(3)	265.	352.	376.	395.	409.	422.	437.
AVERAGE FLIGHT SIZE	158.	167.	170.	173.	175.	177.	179.
LOAD FACTOR	0.62	0.64	0.65	0.65	0.66	0.66	0.66
FUEL BURNED PER SEAT-MILE(5)	0.023	0.022	0.021	0.021	0.021	0.020	0.020
TOTAL JET FUEL(4)	16.543	19.324	20.021	20.583	20.971	21.354	21.751
FUEL USE IN OTHER							
NON-HWY DSL(1)	4.438	4.704	4.789	4.871	4.936	5.003	5.082
RESIDUAL(1)	1.550	1.833	1.898	1.950	1.985	2.019	2.069

(1) QUADRILLION BTU PER YEAR.
(2) BILLIONS PER YEAR.
(3) MILLIONS PER YEAR.
(4) BILLIONS OF GALLONS PER YEAR.
(5) GALLONS PER YEAR.
NOTE: ENTRIES FOR 1980 ARE A COMBINATION OF HISTORICAL AND ESTIMATED VALUES.

TABLE B.5.1. ELECTRIC UTILITY FUEL PRICES AND CONSUMPTION
CASE B: LOW WORLD OIL PRICE
(1982 DOLLARS PER MILLION BTU; TRILLIONS OF BTU PER YEAR)

YEARS	COAL	NATURAL GAS	DISTILLATE	LO-S RESID	HI-S RESID	FOSSIL FUEL	NUCLEAR	HYDRO	ALL FUELS
FUEL PRICES									
1980	1.71	2.80	7.22	5.90	4.55	NA	NA	--	NA
1985	1.74	5.23	4.85	4.10	3.07	2.48	0.85	--	1.95
1986	1.75	5.80	4.86	4.15	3.13	2.56	0.85	--	1.99
1987	1.77	6.19	5.16	4.43	3.38	2.65	0.85	--	2.04
1988	1.79	6.34	5.55	4.79	3.71	2.76	0.85	--	2.11
1989	1.81	6.66	6.06	5.25	4.11	2.88	0.85	--	2.19
1990	1.86	6.83	6.39	5.61	4.44	3.00	0.85	--	2.28
FUEL CONSUMPTION									
1980	12122.	3807.	121.	1611.	922.	18583.	2672.	2988.	24243.
1985	14133.	1598.	496.	2646.	1201.	20073.	4118.	3133.	27325.
1986	14453.	1625.	568.	2694.	1215.	20555.	4678.	3149.	28383.
1987	14709.	1643.	575.	2725.	1231.	20883.	5253.	3153.	29289.
1988	15090.	1679.	652.	2741.	1243.	21403.	5782.	3169.	30354.
1989	15575.	1705.	702.	2751.	1236.	21969.	6114.	3194.	31278.
1990	16264.	1746.	835.	2785.	1255.	22884.	6331.	3227.	32442.

NA=NOT AVAILABLE.
--=NOT APPLICABLE.
NOTE: ENTRIES FOR 1980 ARE HISTORICAL DATA.
SOURCES: ON PAGE 222, SEE 1; 2, PP 160-170, TABLES B1, B2, B3, AND B4; 2, PP 253-255, TABLE C9; 2, PP 262-263, TABLE C13; 2, PP 270-271, TABLE C17; AND 2, PP 290-291, TABLE C27.

TABLE B.5.2. END-USE ELECTRICITY PRICES AND CONSUMPTION
CASE B: LOW WORLD OIL PRICE
(1982 MILLS PER KWH; BILLION KWH PER YEAR)

YEARS	RESIDENTIAL	COMMERCIAL	TRANSPORTATION	INDUSTRIAL	AVG./TOTAL
END-USE PRICES					
1980	57.25	58.72	NA	39.82	50.82
1985	56.85	57.43	55.23	46.92	53.26
1986	57.45	58.00	55.80	47.47	53.81
1987	58.41	58.97	56.79	48.39	54.75
1988	58.73	59.41	57.33	48.72	55.05
1989	59.41	60.21	58.21	49.37	55.75
1990	60.00	60.84	58.80	49.98	56.30
END-USE CONSUMPTION					
1980	717.50	558.91	0.00	815.06	2091.47
1985	776.46	694.72	3.05	897.30	2371.53
1986	800.29	725.40	3.05	939.38	2468.10
1987	823.51	751.11	3.05	974.73	2552.39
1988	846.48	773.36	3.05	1025.28	2648.17
1989	869.23	799.09	3.05	1060.12	2731.48
1990	891.62	826.70	3.05	1114.54	2835.90

NA=NOT AVAILABLE.
NOTE: ENTRIES FOR 1980 ARE HISTORICAL DATA.
SOURCES: ON PAGE 222, SEE 1, PP 15-18; AND 2, PP 229-40, TABLES C1, C2, C3, AND C4.

TABLE B.5.3. ELECTRIC UTILITY CAPACITY AND GENERATION
CASE B: LOW WORLD OIL PRICE
(CAPACITY IN GIGAWATTS; GENERATION IN BILLION KWH)

CAPACITY TYPE		1980	1985	1986	1987	1988	1989	1990
COAL STEAM	CAPACITY...	176.58	224.96	233.92	238.89	246.92	255.00	265.72
	GENERATION.	943.4	1147.5	1184.1	1211.5	1247.5	1290.2	1349.3
NATURAL GAS STEAM	CAPACITY...	40.99	40.99	40.99	40.99	40.99	40.99	40.99
	GENERATION.	158.2	74.7	76.8	78.2	77.8	75.6	73.9
OIL STEAM	CAPACITY...	32.27	35.07	35.07	35.07	35.12	35.12	35.12
	GENERATION.	113.0	126.6	128.1	128.3	128.7	129.0	131.0
NG/COAL STEAM	CAPACITY...	32.31	32.46	32.46	32.46	32.46	32.46	32.46
	GENERATION.	123.5	103.7	98.3	97.2	98.9	103.7	107.8
OIL/COAL STEAM	CAPACITY...	40.18	40.18	40.18	40.18	40.18	40.18	40.18
	GENERATION.	149.5	150.7	153.1	153.1	154.0	155.0	160.4
NG/OIL STEAM	CAPACITY...	69.81	69.81	69.81	69.81	69.81	69.81	69.81
	GENERATION.	233.0	244.5	249.0	253.4	252.0	251.8	260.2
NG COMBINED CYCLE	CAPACITY...	4.45	4.45	4.45	4.45	4.45	4.45	4.45
	GENERATION.	12.7	17.7	19.8	19.3	24.5	24.2	20.0
OIL COMBINED CYCLE	CAPACITY...	3.34	3.49	3.49	3.49	3.49	3.49	3.49
	GENERATION.	2.3	8.8	9.3	9.4	11.2	11.5	12.3
NATURAL GAS TURBINE	CAPACITY...	4.64	5.06	5.06	5.06	5.06	5.06	5.06
	GENERATION.	5.3	0.8	1.5	1.3	2.7	4.0	6.0
OIL TURBINE	CAPACITY...	46.51	48.09	48.20	48.28	48.34	48.51	48.58
	GENERATION.	5.6	14.4	18.0	18.3	20.5	21.5	27.6
NG/OIL TURBINE	CAPACITY...	52.62	52.68	52.68	52.68	52.68	52.68	52.68
	GENERATION.	8.1	8.5	7.3	7.5	9.3	13.6	16.1
NUCLEAR	CAPACITY...	50.18	77.94	88.30	99.06	106.37	112.76	113.93
	GENERATION.	251.0	387.1	439.7	493.8	543.5	574.8	595.1
PUMP STORAGE HYDRO(1)	CAPACITY...	88.20	14.25	15.82	18.66	19.50	20.28	20.54
	GENERATION.	282.0	13.4	17.9	23.9	28.3	32.7	38.1
PONDAGE HYDRO(1)	CAPACITY...	--	72.05	72.44	72.52	72.65	72.85	72.92
	GENERATION.	--	302.7	304.2	304.6	306.1	308.6	311.8
DOMESTIC TOTAL	CAPACITY...	642.08	721.48	742.87	761.60	778.02	793.64	805.93
	GENERATION.	2287.6	2601.1	2707.1	2799.8	2905.0	2996.2	3109.6
CANADIAN IMPORTS	GENERATION.	26.72	94.29	96.73	98.90	101.32	104.01	107.10

(1) IN 1980, PONDAGE HYDROPOWER IS INCLUDED IN PUMP STORAGE HYDROPOWER.
--=NOT APPLICABLE.
NOTE: "CAPACITY" INDICATES THE POTENTIAL AMOUNT OF ELECTRICAL POWER THAT COULD BE GENERATED IF POWERPLANTS OPERATED NONSTOP.
NOTE: "GENERATION" INDICATES THE AMOUNT OF ELECTRICITY PRODUCED FROM EACH CAPACITY TYPE.
NOTE: ENTRIES FOR 1980 ARE A COMBINATION OF HISTORICAL AND ESTIMATED VALUES.
SOURCES: ON PAGE 222, SEE 10, PP 273-287, TABLE 9; AND 11, PAGE 1, TABLE 1.

TABLE B.5.4. SCHEDULED ELECTRIC UTILITY CAPACITY ADDITIONS
CASE B: LOW WORLD OIL PRICE
(CAPACITY IN MEGAWATTS)

NEW CAPACITY TYPE	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	TOTAL
COAL STEAM........	13633.	9499.	9821.	7023.	8088.	10524.	4918.	6198.	7753.	9537.	9269.	96261.
OIL STEAM.........	987.	1895.	0.	0.	0.	10.	0.	0.	50.	0.	0.	2942.
NG/COAL STEAM.....	570.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	570.
OIL CC............	0.	0.	90.	60.	0.	0.	0.	0.	0.	0.	0.	150.
NG TURBINE........	76.	375.	8.	0.	0.	0.	0.	0.	0.	0.	0.	459.
OIL TURBINE.......	978.	238.	230.	320.	82.	154.	73.	97.	54.	140.	94.	2460.
NG/OIL TURBINE....	0.	60.	0.	0.	0.	0.	0.	0.	0.	0.	0.	60.
NUCLEAR...........	1819.	3912.	3296.	5250.	9269.	9183.	14455.	4910.	10063.	2355.	0.	64512.
PUMP STORAGE......	256.	0.	997.	531.	0.	1050.	2050.	2325.	0.	955.	150.	8314.
PONDAGE HYDRO.....	1373.	259.	772.	923.	679.	482.	187.	103.	232.	74.	0.	5083.
TOTAL NEW CAPACITY	19692.	16237.	15214.	14107.	18118.	21403.	21683.	13633.	18152.	13061.	9513.	180806.

SOURCES: ON PAGE 222, SEE 10, PP 27-259, TABLE 7; AND 10, PP 273-287, TABLE 9.

TABLE B.5.5. SUMMARY OF COMPONENTS OF ELECTRICITY PRICE
CASE B: LOW WORLD OIL PRICE
(1982 MILLS PER KWH)

	1980	1985	1986	1987	1988	1989	1990
PRIVATE UTILITIES							
CAPITAL COMPONENT...	10.21	10.11	10.36	10.18	10.34	10.07	9.72
FUEL COMPONENT......	26.14	25.28	25.61	26.13	26.69	27.55	28.48
O&M COMPONENT(1)....	8.33	8.68	8.68	8.67	8.63	8.61	8.50
OTHERS(2)...........	12.22	11.35	11.41	12.07	11.72	11.90	11.88
TOTAL PRICE.........	56.90	55.42	56.06	57.06	57.38	58.12	58.59
PUBLIC & PRIVATE UTILITIES							
CAPITAL COMPONENT...	10.51	10.59	10.70	10.50	10.50	10.18	9.90
FUEL COMPONENT......	25.32	24.30	24.65	25.17	25.79	26.69	27.68
O&M COMPONENT(1)....	8.06	8.41	8.41	8.41	8.36	8.34	8.25
OTHERS(2)...........	10.67	9.96	10.05	10.67	10.40	10.53	10.48
TOTAL PRICE.........	54.55	53.26	53.81	54.75	55.05	55.75	56.30

(1) OPERATION AND MAINTENANCE.
(2) INCLUDES DEPRECIATION AND TAXES.
NOTE: ENTRIES FOR 1980 ARE A COMBINATION OF HISTORICAL AND ESTIMATED VALUES.

TABLE B.6.1. ANNUAL SUPPLY AND DISPOSITION OF PETROLEUM
CASE B: LOW WORLD OIL PRICE
(MILLIONS OF BARRELS PER DAY)

	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990
SUPPLY											
PRODUCTION											
CRUDE OIL..................	8.60	8.57	8.67	8.64	8.69	8.63	8.58	8.47	8.34	8.17	7.71
NORTH SLOPE.............	1.52	1.53	1.61	1.63	1.70	1.71	1.78	1.78	1.78	1.82	1.73
SUBARCTIC(1)............	7.08	7.05	7.06	7.00	6.98	6.88	6.71	6.55	6.37	6.10	5.70
NATURAL GAS LIQUIDS........	1.57	1.61	1.55	1.54	1.35	1.19	1.13	1.11	1.14	1.17	1.22
OTHER DOMESTIC(2)..........	0.04	0.05	0.05	0.05	0.02	0.04	0.09	0.14	0.19	0.24	0.29
PROCESSING GAIN............	0.60	0.51	0.53	0.49	0.55	0.60	0.61	0.61	0.60	0.60	0.60
TOTAL PRODUCTION.........	10.81	10.74	10.81	10.72	10.58	10.41	10.32	10.19	10.08	9.94	9.53
IMPORTS(3)											
CRUDE OIL..................	5.26	4.40	3.46	3.75	5.69	7.39	7.84	7.90	7.83	7.72	8.13
REFINED PRODUCTS(4)........	1.65	1.60	1.58	1.76	2.06	2.15	2.20	2.21	2.21	2.20	2.21
TOTAL IMPORTS............	6.91	6.00	5.04	5.51	7.75	9.54	10.04	10.12	10.04	9.91	10.34
EXPORTS											
CRUDE OIL..................	0.29	0.23	0.24	0.23	0.25	0.25	0.25	0.25	0.25	0.25	0.25
REFINED PRODUCTS(4)........	0.26	0.37	0.58	0.55	0.62	0.62	0.62	0.62	0.62	0.62	0.62
TOTAL EXPORTS............	0.54	0.59	0.82	0.78	0.87	0.87	0.87	0.87	0.87	0.87	0.87
NET IMPORTS..........	6.37	5.40	4.23	4.72	6.88	8.67	9.17	9.25	9.17	9.04	9.47
PRIMARY STOCK CHANGES(5)											
NET WITHDRAWALS............	-0.09	0.18	0.32	0.14	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SPR FILL RATE ADDITIONS(6).	-0.05	-0.34	-0.17	-0.21	-0.15	-0.15	-0.15	-0.15	-0.15	-0.15	-0.15
TOTAL PRIMARY SUPPLY......	17.04	15.98	15.18	15.37	17.31	18.93	19.34	19.29	19.10	18.83	18.85
PRODUCT SUPPLIED											
MOTOR GASOLINE.............	6.86	6.59	6.54	6.36	6.68	6.73	6.59	6.33	6.02	5.74	5.54
DISTILLATE FUEL OIL........	2.97	2.83	2.67	2.75	3.30	3.87	4.10	4.17	4.21	4.21	4.31
RESIDUAL FUEL OIL..........	2.56	2.09	1.69	1.73	2.67	3.40	3.55	3.61	3.63	3.60	3.65
OTHER PRODUCTS(7)..........	5.11	4.83	4.66	4.83	4.97	5.28	5.45	5.53	5.58	5.61	5.70
TOTAL RECLASSIFIED(8)......	-0.44	-0.27	-0.31	-0.30	-0.31	-0.34	-0.34	-0.34	-0.34	-0.33	-0.33
TOTAL PRODUCT SUPPLIED...	17.06	16.06	15.25	15.37	17.32	18.94	19.35	19.29	19.11	18.83	18.86
DISCREPANCY..............	-0.02	-0.08	-0.07	0.00	-0.01	-0.01	-0.01	-0.00	-0.01	-0.00	-0.01
NET DISPOSITION..........	17.04	15.98	15.18	15.37	17.31	18.93	19.34	19.29	19.10	18.83	18.85

(1) INCLUDES LOWER-48 STATES AND SOUTHERN ALASKA.
(2) OTHER DOMESTIC REPRESENTS OTHER HYDROCARBON INPUT.
(3) INCLUDES IMPORTS FOR THE STRATEGIC PETROLEUM RESERVE.
(4) CONSISTS OF NATURAL GAS PLANT LIQUIDS, UNFINISHED OILS, AND REFINED PRODUCT IMPORTS.
(5) EXCLUDES CRUDE OIL FOR THE STRATEGIC PETROLEUM RESERVE.
(6) ADDITIONS TO THE STRATEGIC PETROLEUM RESERVE (SHOWN AS NEGATIVE ENTRIES).
(7) COMPOSED OF JET FUEL, LIQUEFIED GASES, AND OTHER PRODUCTS.
(8) PETROLEUM PRODUCTS REPROCESSED INTO OTHER PRODUCT CATEGORIES.

NOTE: IN 1980, GASOLINE SUPPLIED HAS BEEN ADJUSTED TO CORRECT UNDERESTIMATION OF PRODUCT SUPPLIED. DISTILLATE AND RESIDUAL FUEL OIL HAVE BEEN RESTATED INTO THE NEW BASIS FOR COMPARABILITY PURPOSES.

NOTE: ENTRIES FOR 1980 ARE A COMBINATION OF HISTORICAL AND ESTIMATED VALUES.

SOURCES: ON PAGE 222, SEE 4, PAGE 6, TABLE 1; AND 20, PAGE 18, TABLE 7.

TABLE B.7.1. NATURAL GAS SUPPLY/DEMAND BALANCE
CASE B: LOW WORLD OIL PRICE
(TRILLION BTU PER YEAR; 1982 DOLLARS PER MILLION BTU)

	1980	1985	1986	1987	1988	1989	1990
LOWER-48 ONSHORE SUPPLY	14435.	11003.	10164.	9780.	10118.	10749.	11665.
LOWER-48 OFFSHORE SUPPLY	5477.	3911.	4016.	4189.	4173.	4015.	3680.
TOTAL DOMESTIC SUPPLY	19912.	14914.	14180.	13969.	14291.	14764.	15345.
CATEGORY 102 (NEW GAS)	3439.	5950.	6183.	6686.	7438.	8412.	9161.
CATEGORY 104 (OLD INTERSTATE GAS)	8910.	5730.	4980.	4360.	3850.	3440.	3090.
CATEGORY 105 (OLD INTRASTATE GAS)	6899.	3050.	2750.	2550.	2370.	2110.	2000.
CATEGORY 107 (DEEP GAS)	664.	185.	268.	373.	634.	802.	1094.
SUPPLEMENTAL GAS(1)	159.	90.	630.	850.	731.	380.	32.
IMPORTS	957.	1230.	1230.	1230.	1230.	1230.	1230.
TOTAL SUPPLY	21028.	16234.	16041.	16048.	16253.	16375.	16607.
LEASE AND PLANT FUEL(2)	1045.	1119.	1064.	1048.	1072.	1107.	1151.
TRANSPORTATION LOSS(3)	647.	1045.	1038.	1037.	1044.	1050.	1058.
CONSUMPTION BY SECTOR							
RESIDENTIAL	4866.	4594.	4545.	4501.	4460.	4424.	4391.
COMMERCIAL(4)	2674.	2736.	2718.	2683.	2636.	2594.	2553.
REFINERY	846.	251.	216.	216.	236.	260.	284.
ELECTRIC UTILITY	3807.	1598.	1625.	1643.	1679.	1705.	1746.
INDUSTRIAL(5)	6497.	4891.	4835.	4920.	5124.	5235.	5425.
TOTAL END-USE CONSUMPTION	18690.	14070.	13939.	13963.	14135.	14218.	14398.
DISCREPANCY(6)	-646.	0.	0.	0.	0.	0.	0.
WELLHEAD PRICES							
AVERAGE PRICE	1.79	3.29	3.68	4.10	4.44	4.72	4.93
CATEGORY 102 (NEW GAS)	2.69	4.11	4.51	4.92	5.20	5.41	5.54
CATEGORY 104 (OLD INTERSTATE GAS)	1.32	2.08	2.24	2.35	2.44	2.51	2.55
CATEGORY 105 (OLD INTRASTATE GAS)	1.67	3.95	4.33	4.82	5.10	5.32	5.46
CATEGORY 107 (DEEP GAS)	4.78	4.11	4.51	4.92	5.20	5.41	5.54
DELIVERED PRICE BY SECTOR							
RESIDENTIAL	4.16	6.39	6.89	7.28	7.64	7.95	8.33
COMMERCIAL(4)	3.84	6.16	6.69	7.12	7.50	7.87	8.27
REFINERY	3.08	4.45	4.89	5.26	5.52	5.81	6.03
ELECTRIC UTILITY	2.80	5.23	5.80	6.19	6.34	6.66	6.83
INDUSTRIAL(5)	2.90	5.33	5.85	6.22	6.45	6.75	7.00

(1) INCLUDES INCREASED GAS OR OIL IMPORTS.
(2) REPRESENTS GAS USED AS A FUEL IN FIELD GATHERING AND PLANT PROCESSING MACHINERY.
(3) INDICATES GAS USED TO FUEL COMPRESSORS IN THE PIPELINE MACHINERY.
(4) COMMERCIAL IS AN AGGREGATE OF COMMERCIAL AND OTHER CATEGORIES.
(5) EXCLUDES LEASE AND PLANT FUEL CONSUMPTION.
(6) REPRESENTS IMBALANCES RESULTING FROM THE MERGER OF DATA REPORTING SYSTEMS WHICH VARY IN SCOPE, FORMAT, DEFINITIONS AND TYPE OF RESPONDANTS.
NOTE: ENTRIES FOR 1980 ARE A COMBINATION OF HISTORICAL AND ESTIMATED VALUES.
SOURCES: ON PAGE 222, SEE 1, PP 15-19; 12, PAGE 7, TABLE 1; 13, PAGE 133, TABLE A7.

TABLE B.8.1. COAL SUPPLY AND DISPOSITION
CASE B: LOW WORLD OIL PRICE
(MILLIONS OF SHORT TONS PER YEAR)

	1980	1985	1986	1987	1988	1989	1990
DOMESTIC SUPPLY							
EASTERN.............	579.	603.	618.	629.	645.	664.	688.
WESTERN.............	251.	309.	319.	330.	345.	361.	385.
NET IMPORTS(1)......	-91.	-108.	-114.	-120.	-127.	-135.	-143.
STOCK WITHDRAWALS...	-36.	0.	0.	0.	0.	0.	0.
TOTAL SUPPLY..........	703.	804.	823.	839.	862.	890.	930.
CONSUMPTION							
RESIDENTIAL/COMM....	7.	7.	7.	7.	7.	6.	6.
INDUSTRIAL..........	60.	76.	77.	79.	81.	84.	88.
METALLURGICAL.......	67.	49.	50.	50.	51.	51.	52.
ELECTRIC UTILITY....	569.	666.	683.	697.	718.	743.	779.
SYNTHETIC USE.......	0.	5.	5.	5.	5.	5.	5.
TOTAL CONSUMPTION.....	703.	804.	823.	839.	862.	890.	930.
TOTAL DISPOSITION.....	703.	804.	823.	839.	862.	890.	930.

(1) EXPORTS TO EUROPE AND JAPAN.
NOTE: EASTERN INCLUDES PENSYLVANIA, OHIO, MARYLAND, WEST VIRGINIA, VIRGINIA, KENTUCKY, TENNESSEE, ALABAMA, ILLINOIS, AND INDIANA. WESTERN INCLUDES IOWA, MISSOURI, KANSAS, ARKANSAS, OKLAHOMA, TEXAS, NORTH DAKOTA, SOUTH DAKOTA, MONTANA, WYOMING, COLORADO, UTAH, ARIZONA, NEW MEXICO, WASHINGTON, AND ALASKA.
NOTE: ENTRIES FOR 1980 ARE HISTORICAL DATA, AND STOCK WITHDRAWALS INCLUDES DISCREPANCY.

Case C
High World Oil Price Forecast

In the high price case (Case C), total energy demand would be about 3 percent lower in 1985. Total oil consumption would decline by 2.9 quadrillion Btu, but oil imports would decrease by 3.4 quadrillion Btu, while domestic oil production would increase by .6 quadrillion Btu. Domestic supplies of natural gas would also subsitute for oil imports as they would increase by about 2.6 percent.

This shift away from oil imports would continue to increase throughout the forecast horizon. By 1990, oil imports are projected to be about 30 percent lower in the high price case than in the midprice case. The high price path would also increase the projected production of both domestic oil and natural gas by about 6.4 percent.

THE FOLLOWING SECTION OF TABLES ARE FOR THE:

CASE C: HIGH WORLD OIL PRICE

THIS SECTION CONTAINS THE FOLLOWING TABLES:

TABLE C.1.1. YEARLY SUPPLY AND DISPOSITION OF TOTAL ENERGY
CASE C: HIGH WORLD OIL PRICE
(QUADRILLION BTU PER YEAR)

	1975	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990
SUPPLY												
PRODUCTION												
PETROLEUM..........	20.1	20.5	20.4	20.6	20.5	20.9	21.0	21.3	21.5	21.6	21.4	20.5
NATURAL GAS........	19.6	20.1	19.9	18.2	17.5	17.2	15.6	15.4	15.7	16.2	16.8	17.5
COAL...............	15.2	19.2	19.1	19.1	19.4	19.4	20.3	20.9	21.5	22.2	23.0	24.0
NUCLEAR............	1.9	2.7	2.9	3.0	3.2	3.7	4.1	4.7	5.3	5.8	6.1	6.3
HYDRO/GEO/OTHER....	3.2	3.0	2.9	3.3	3.2	3.1	3.1	3.1	3.2	3.2	3.2	3.2
SUBTOTAL.........	60.1	65.5	65.2	64.2	63.7	64.3	64.2	65.5	67.0	68.9	70.5	71.5
NET IMPORTS												
CRUDE OIL..........	8.7	10.6	8.8	6.8	7.5	8.4	9.7	8.8	8.0	7.5	7.0	7.5
OTHER PETROLEUM....	3.8	2.9	2.6	2.1	2.5	2.9	3.0	3.0	3.0	3.0	3.0	3.0
NG (CONTRACTED)(1).	0.9	1.0	.9	.9	1.1	1.2	1.2	1.2	1.2	1.2	1.2	1.2
OTHER GAS(2).......	0.0	0.0	0.0	0.0	0.0	0.6	0.0	0.0	0.0	0.0	0.0	0.0
COAL AND COKE......	-1.7	-2.4	-2.9	-2.8	-2.6	-2.7	-2.9	-3.0	-3.2	-3.4	-3.6	-3.8
ELECTRICITY........	0.1	.2	.2	.2	.2	0.3	0.3	0.3	0.3	0.3	0.4	0.4
SUBTOTAL.........	11.7	12.3	9.6	7.3	8.6	10.8	11.3	10.3	9.4	8.7	8.0	8.3
SPR ADDITIONS(3)....	0.0	-.1	-.7	-.4	-.4	-0.3	-0.3	-0.3	-0.3	-0.3	-0.3	-0.3
STOCK WITHDRAWALS...	-1.1	-1.8	0.0	-.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL SUPPLY.........	70.7	75.9	74.1	70.9	71.9	74.8	75.2	75.5	76.1	77.3	78.2	79.5
CONSUMPTION												
NON-ELEC UTILITY FUEL												
PETROLEUM..........	29.5	31.5	29.9	28.6	29.2	29.6	29.7	29.3	28.9	28.5	28.2	28.0
NATURAL GAS(4).....	16.7	16.6	16.1	15.0	14.9	14.6	13.7	13.5	13.5	13.8	13.9	14.2
COAL...............	4.0	3.4	3.4	3.0	2.9	3.2	3.3	3.4	3.5	3.6	3.7	3.9
SUBTOTAL.........	50.2	51.4	49.4	46.4	47.0	47.4	46.7	46.1	45.8	45.9	45.9	46.1
ELECTRIC UTILITY FUEL												
PETROLEUM..........	3.2	2.7	2.2	1.8	1.5	2.3	3.6	3.6	3.4	3.4	2.9	2.8
NATURAL GAS........	3.2	3.8	3.8	3.3	3.4	3.3	2.1	2.1	2.4	2.5	3.0	3.4
COAL...............	8.8	12.1	12.7	12.7	13.2	13.6	14.2	14.5	14.8	15.2	15.7	16.3
NUCLEAR............	1.9	2.7	2.9	3.0	3.2	3.7	4.1	4.7	5.3	5.8	6.1	6.3
HYDRO/GEO/OTHER(5).	3.4	3.2	3.1	3.5	3.4	3.4	3.5	3.5	3.5	3.5	3.5	3.6
SUBTOTAL.........	20.5	24.5	24.7	24.3	24.7	26.0	27.1	28.1	29.0	30.0	30.9	32.1
TOTAL CONSUMPTION....	70.7	75.9	74.1	70.7	71.7	73.3	73.9	74.2	74.8	76.0	76.9	78.2
ADJUSTMENTS												
REFINERY LOSSES(6).	0.0	0.0	0.0	0.0	-0.1	-0.1	0.1	0.1	0.1	0.2	0.1	0.1
DISCREPANCY(7).....	0.0	0.0	0.0	0.2	0.3	1.6	1.2	1.2	1.2	1.1	1.2	1.2
TOTAL DISPOSITION....	70.7	75.9	74.1	70.9	71.9	74.8	75.2	75.5	76.1	77.3	78.2	79.5

NOTE: THE "ANNUAL ENERGY REVIEW" FOR 1982 WILL CONTAIN LATER REVISIONS TO HISTORICAL DATA FOR 1975, 1980 AND 1982.
NOTE: TOTALS MAY NOT EQUAL SUM OF COMPONENTS DUE TO INDEPENDENT ROUNDING. FOR TABLE FOOTNOTES AND SOURCES SEE PAGE 219.

TABLE C.1.2. SUPPLY/DEMAND BALANCE
CASE C: HIGH WORLD OIL PRICE
(QUADRILLION BTU PER YEAR)

	1975	1980	1985	1986	1987	1988	1989	1990
DOMESTIC SUPPLY								
COAL	15.2	19.2	20.3	20.9	21.5	22.2	23.0	24.0
NATURAL GAS	19.6	19.9	15.6	15.4	15.7	16.2	16.8	17.5
PETROLEUM	20.1	20.5	21.0	21.3	21.5	21.6	21.4	20.5
NUCLEAR	1.9	2.7	4.1	4.7	5.3	5.8	6.1	6.3
OTHER(1)	3.2	3.0	3.1	3.1	3.2	3.2	3.2	3.2
TOTAL DOMESTIC SUPPLY	60.0	65.3	64.2	65.5	67.0	68.9	70.5	71.5
NATURAL GAS IMPORTS	0.9	1.0	1.2	1.2	1.2	1.2	1.2	1.2
SUPPLEMENTAL GAS(2)	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0
PETROLEUM IMPORTS	12.5	13.5	12.6	11.8	11.0	10.4	10.0	10.5
TOTAL SUPPLY(3)	73.4	80.0	78.1	78.5	79.3	80.6	81.7	83.2
DISPOSITION								
RESIDENTIAL	9.6	9.3	9.1	9.1	9.0	9.0	9.0	9.0
COMMERCIAL	5.5	5.9	6.5	6.6	6.6	6.6	6.6	6.6
INDUSTRIAL(4)	21.3	23.0	21.0	21.1	21.4	22.1	22.5	23.2
TRANSPORTATION	17.7	19.7	17.6	17.1	16.8	16.5	16.3	16.1
TOTAL END-USE CONSUMPTION	54.1	57.9	54.2	53.8	53.8	54.2	54.4	54.9
DISCREPANCY	0.2	-0.1	-0.1	-0.2	-0.2	-0.3	-0.3	-0.4
ADJUSTMENTS	19.1	22.2	24.0	24.9	25.7	26.7	27.6	28.7
UTILITY GENERATION	13.7	16.5	18.3	18.9	19.5	20.2	20.8	21.5
UTILITY TRANSMISSION	0.6	0.7	0.9	0.9	0.9	1.0	1.0	1.0
REFINERY(5)	0.0	0.0	0.1	0.1	0.1	0.2	0.1	0.1
GAS PIPELINE(6)	0.6	0.6	1.1	1.1	1.1	1.1	1.1	1.2
LEASE/PLANT FUEL(7)	1.4	1.0	1.2	1.2	1.2	1.2	1.3	1.3
COAL EXPORTS	1.7	2.4	2.9	3.0	3.2	3.4	3.6	3.8
SPR ADDITIONS	0.0	0.1	0.3	0.3	0.3	0.3	0.3	0.3
STOCK WITHDRAWALS	1.1	1.8	0.0	0.0	0.0	0.0	0.0	0.0
RECLASSIFIED	0.0	-0.9	-0.6	-0.6	-0.6	-0.6	-0.6	-0.6
ADJUSTED CONSUMPTION	73.4	80.0	78.1	78.5	79.3	80.6	81.7	83.2
ELECTRIC UTILITY FUEL								
COAL	8.8	12.1	14.2	14.5	14.8	15.2	15.7	16.3
PETROLEUM	3.2	2.7	3.6	3.6	3.4	3.4	2.9	2.8
NATURAL GAS	3.2	3.8	2.1	2.1	2.4	2.5	3.0	3.4
TOTAL FOSSIL	15.2	18.6	19.9	20.3	20.6	21.1	21.6	22.5
NUCLEAR	1.9	2.7	4.1	4.7	5.3	5.8	6.1	6.3
OTHER	3.2	3.0	3.1	3.1	3.2	3.2	3.2	3.2
TOTAL	20.3	24.3	27.1	28.1	29.0	30.0	30.9	32.1
GENERATION	6.6	7.8	8.9	9.2	9.5	9.9	10.2	10.6

NOTE: TOTALS MAY NOT EQUAL SUM OF COMPONENTS DUE TO INDEPENDENT ROUNDING. FOR TABLE FOOTNOTES AND SOURCES SEE PAGE 219.

TABLE C.1.3. CONSUMPTION SUMMARY
CASE C: HIGH WORLD OIL PRICE
(QUADRILLION BTU PER YEAR)

	1975	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990
RESIDENTIAL	9.571	9.335	9.104	9.236	9.143	9.132	9.099	9.059	9.022	9.005	8.997	8.994
STEAM COAL............	0.091	0.065	0.080	0.082	0.071	0.078	0.076	0.074	0.073	0.071	0.069	0.068
NATURAL GAS...........	5.022	4.866	4.654	4.793	4.710	4.648	4.570	4.492	4.424	4.376	4.338	4.306
DISTILLATE(1).........	1.923	1.417	1.375	1.303	1.230	1.279	1.268	1.248	1.223	1.196	1.166	1.135
LIQUID PETROLEUM GAS...	0.528	0.539	0.536	0.570	0.590	0.556	0.555	0.549	0.542	0.535	0.528	0.521
ELECTRICITY	2.007	2.448	2.459	2.488	2.530	2.571	2.631	2.696	2.761	2.827	2.896	2.964
COMMERCIAL	5.513	5.892	5.818	5.867	6.182	6.400	6.504	6.555	6.566	6.560	6.574	6.593
STEAM COAL............	0.135	0.095	0.107	0.122	0.086	0.097	0.094	0.092	0.089	0.086	0.084	0.082
NATURAL GAS...........	2.559	2.674	2.580	2.683	2.720	2.724	2.701	2.656	2.599	2.541	2.491	2.444
DISTILLATE(1).........	0.622	0.556	0.540	0.511	0.670	0.723	0.740	0.746	0.745	0.740	0.734	0.727
LO-SULFUR RESIDUAL.....	0.506	0.566	0.470	0.376	0.490	0.531	0.544	0.548	0.547	0.543	0.539	0.534
LIQUID PETROLEUM GAS...	0.093	0.095	0.095	0.101	0.090	0.080	0.078	0.076	0.073	0.071	0.069	0.067
ELECTRICITY	1.598	1.906	2.026	2.074	2.150	2.245	2.347	2.437	2.512	2.578	2.656	2.740
INDUSTRIAL(2)	18.503	20.185	19.513	16.876	17.365	18.533	18.629	18.802	19.186	19.912	20.372	21.054
STEAM COAL............	1.619	1.388	1.570	1.626	1.501	1.777	1.801	1.885	1.996	2.118	2.236	2.345
METALLURGICAL COAL.....	2.178	1.793	1.647	1.057	1.132	1.261	1.300	1.323	1.336	1.353	1.360	1.376
NATURAL GAS...........	6.133	6.497	6.639	5.414	5.340	5.380	4.873	4.776	4.886	5.275	5.412	5.691
DISTILLATE............	1.272	1.569	1.285	1.212	1.340	1.546	1.797	1.794	1.744	1.667	1.632	1.591
LO-SULFUR RESIDUAL.....	0.428	0.554	0.423	0.367	0.390	0.455	0.480	0.484	0.485	0.481	0.485	0.491
HI-SULFUR RESIDUAL.....	0.856	0.713	0.531	0.484	0.530	0.639	0.693	0.702	0.711	0.706	0.714	0.718
LIQUID PETROLEUM GAS...	0.252	0.308	0.323	0.332	0.370	0.358	0.353	0.329	0.292	0.252	0.210	0.174
PET-CHEM FEEDSTOCK(3)..	1.519	2.401	2.111	1.862	1.980	2.122	2.160	2.226	2.325	2.454	2.567	2.711
OTHER(4)..............	1.900	2.180	2.166	1.977	2.240	2.142	2.124	2.094	2.090	2.103	2.116	2.119
ELECTRICITY	2.346	2.781	2.817	2.545	2.620	2.851	3.047	3.189	3.322	3.504	3.642	3.838
TRANSPORTATION(5)	17.725	19.655	18.715	18.129	17.910	18.012	17.590	17.112	16.776	16.494	16.286	16.111
DISTILLATE............	2.069	2.782	2.738	2.582	2.510	2.752	2.835	2.905	2.990	3.073	3.166	3.275
HI-SULFUR RESIDUAL.....	0.731	1.401	1.163	0.930	0.900	0.998	1.022	1.045	1.073	1.098	1.126	1.156
GASOLINE(6)...........	12.868	13.253	12.688	12.528	12.180	12.017	11.420	10.818	10.328	9.895	9.514	9.150
JET FUEL(7)...........	2.029	2.179	2.087	2.049	2.280	2.204	2.273	2.304	2.344	2.388	2.440	2.490
LIQUID PETROLEUM GAS...	0.016	0.014	0.014	0.015	0.020	0.015	0.015	0.015	0.015	0.015	0.015	0.015
OTHER.................	0.000	0.014	0.014	0.014	0.010	0.014	0.014	0.014	0.014	0.014	0.014	0.014
ELECTRICITY	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010
ELECTRIC UTILITY FUEL	20.360	24.243	24.462	24.203	24.480	25.950	27.143	28.113	28.989	30.035	30.943	32.073
STEAM COAL............	8.790	12.122	12.707	12.697	13.190	13.559	14.200	14.548	14.812	15.177	15.660	16.341
NATURAL GAS...........	3.240	3.807	3.764	3.336	3.440	3.308	2.066	2.143	2.363	2.546	3.045	3.373
DISTILLATE(8).........	0.350	0.121	0.077	0.048	0.090	0.121	0.226	0.237	0.230	0.240	0.272	0.345
LO-SULFUR RESIDUAL(9)..	2.860	1.611	1.251	0.980	0.780	1.247	2.232	2.183	2.004	1.963	1.621	1.466
HI-SULFUR RESIDUAL.....	NA	0.922	0.898	0.789	0.600	0.929	1.169	1.175	1.175	1.160	1.048	1.008
HYDRO/GEO/OTHER(10)....	3.220	2.988	2.864	3.340	3.190	3.115	3.133	3.148	3.152	3.168	3.183	3.208
NUCLEAR...............	1.900	2.672	2.901	3.013	3.190	3.671	4.118	4.678	5.253	5.782	6.114	6.331
REFINERY FUEL(11)	2.769	2.787	2.304	2.190	2.480	2.218	2.339	2.295	2.242	2.200	2.140	2.104
NATURAL GAS...........	0.975	0.846	0.668	0.574	0.720	0.459	0.348	0.325	0.329	0.380	0.381	0.412
DISTILLATE............	0.035	0.018	0.011	0.011	0.010	0.011	0.012	0.011	0.011	0.011	0.011	0.010
LO-SULFUR RESIDUAL.....	NA	NA	NA	NA	0.090	0.103	0.119	0.119	0.113	0.098	0.093	0.086
HI-SULFUR RESIDUAL.....	0.269	0.213	0.167	0.137	0.200	0.239	0.377	0.385	0.368	0.315	0.298	0.262
LIQUID PETROLEUM GAS...	0.050	0.043	0.024	0.038	0.030	0.024	0.025	0.025	0.024	0.024	0.023	0.023
OTHER(12).............	0.390	0.436	0.359	0.348	0.360	0.344	0.363	0.356	0.348	0.341	0.332	0.326
STILL GAS.............	1.050	1.231	1.073	1.085	1.080	1.038	1.095	1.074	1.050	1.030	1.002	0.985

NOTE: TOTALS MAY NOT EQUAL SUM OF COMPONENTS DUE TO INDEPENDENT ROUNDING. FOR TABLE FOOTNOTES AND SOURCES SEE PAGE 219.

TABLE C.1.4. PRICE SUMMARY
CASE C: HIGH WORLD OIL PRICE
(1982 DOLLARS PER MILLION BTU)

	1975	1980	1985	1986	1987	1988	1989	1990
WORLD OIL PRICE.........	20.70	39.32	33.81	38.24	41.13	42.92	44.94	47.69
RESIDENTIAL	5.95	8.33	10.43	11.41	11.96	12.03	12.31	12.66
NATURAL GAS...........	2.75	4.16	7.23	8.22	8.68	8.56	8.75	8.98
DISTILLATE(1).........	4.75	8.59	8.25	9.32	10.01	10.46	10.97	11.67
LIQUID PETROLEUM GAS..	4.11	6.67	7.39	8.31	8.89	9.21	9.56	10.09
ELECTRICITY	15.61	16.78	17.92	18.58	18.94	18.85	18.91	19.06
COMMERCIAL	6.27	8.38	11.02	12.03	12.61	12.74	13.07	13.48
NATURAL GAS...........	2.17	3.84	6.99	8.03	8.51	8.42	8.67	8.93
DISTILLATE(1).........	4.30	8.06	7.81	8.82	9.48	9.91	10.39	11.05
LO-SULFUR RESIDUAL....	4.13	5.32	6.04	6.83	7.36	7.74	8.07	8.62
LIQUID PETROLEUM GAS..	NA	6.67	7.41	8.34	8.92	9.23	9.59	10.12
ELECTRICITY	15.55	17.21	18.28	19.01	19.39	19.31	19.38	19.54
INDUSTRIAL(2)	3.37	5.44	7.47	8.26	8.70	8.80	9.05	9.38
STEAM COAL............	1.81	1.55	2.10	2.13	2.17	2.21	2.26	2.35
METALLURGICAL COAL....	2.80	2.51	2.57	2.59	2.61	2.64	2.66	2.72
NATURAL GAS...........	1.49	2.90	6.24	7.28	7.69	7.42	7.61	7.72
DISTILLATE............	4.24	7.99	7.71	8.71	9.36	9.79	10.27	10.92
LO-SULFUR RESIDUAL....	4.11	5.14	5.92	6.70	7.21	7.59	7.91	8.45
HI-SULFUR RESIDUAL....	2.93	NA	5.47	6.27	6.81	7.19	7.52	8.08
LIQUID PETROLEUM GAS..	3.83	6.34	7.12	8.01	8.57	8.86	9.20	9.70
PET-CHEM FEEDSTOCK(3).	NA	7.88	8.83	9.93	10.67	11.15	11.69	12.42
OTHER(4)..............	NA	NA	6.79	7.65	8.23	8.61	9.03	9.62
ELECTRICITY	9.42	11.67	14.84	15.41	15.75	15.71	15.80	15.98
TRANSPORTATION(5)	6.72	9.91	9.90	10.98	11.63	11.97	12.34	12.88
DISTILLATE............	5.85	8.39	8.19	9.25	9.95	10.40	10.90	11.59
HI-SULFUR RESIDUAL....	2.93	3.97	4.77	5.49	5.97	6.33	6.62	7.13
GASOLINE(6)...........	7.57	11.32	11.05	12.27	13.00	13.37	13.78	14.32
JET FUEL(7)...........	3.69	7.51	8.63	9.67	10.37	10.82	11.32	12.01
LIQUID PETROLEUM GAS..	NA	NA	7.08	7.97	8.53	8.84	9.18	9.69
ELECTRICITY	NA	NA	17.67	18.42	18.82	18.76	18.84	18.98
ELECTRIC UTILITY FUEL	2.04	1.84	2.28	2.44	2.50	2.51	2.56	2.65
STEAM COAL............	1.58	1.71	1.74	1.76	1.77	1.79	1.81	1.86
NATURAL GAS...........	1.14	2.80	6.34	7.40	7.83	7.46	7.63	7.67
DISTILLATE(8).........	3.28	7.22	7.75	8.75	9.39	9.82	10.30	10.95
LO-SULFUR RESIDUAL(9).	3.27	5.90	5.92	6.68	7.09	7.48	7.89	8.50
HI-SULFUR RESIDUAL....	NA	4.55	4.77	5.49	5.96	6.31	6.60	7.10
NUCLEAR...............	NA	.85	0.85	0.85	0.85	0.85	0.85	0.85
REFINERY FUEL	NA	NA	2.94	3.37	3.64	3.74	3.90	4.10
NATURAL GAS...........	NA	3.08	5.40	6.37	6.79	6.52	6.69	6.75
DISTILLATE............	NA	6.09	6.81	7.70	8.29	8.67	9.10	9.69
LO-SULFUR RESIDUAL....	NA	NA	5.20	5.91	6.38	6.72	7.00	7.50
HI-SULFUR RESIDUAL....	NA	4.89	4.55	5.25	5.72	6.06	6.35	6.84
LIQUID PETROLEUM GAS..	NA	NA	6.26	7.07	7.57	7.84	8.14	8.59
OTHER(10).............	NA	NA	6.68	7.54	8.12	8.50	8.93	9.51

NOTE: TOTALS MAY NOT EQUAL SUM OF COMPONENTS DUE TO INDEPENDENT ROUNDING. FOR TABLE FOOTNOTES AND SOURCES SEE PAGE 219.

TABLE C.3.1. NATIONAL MACROECONOMIC INDICATORS
CASE C: HIGH WORLD OIL PRICE

	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990
REAL GROSS NATIONAL PRODUCT(1).....	2408.8	2455.6	2411.2	2441.8	2552.0	2657.7	2744.9	2834.2	2910.0	2989.0	3081.7
GROSS NATIONAL PRODUCT DEFLATOR(2).	1.0931	1.1964	1.2681	1.3342	1.4067	1.4939	1.5884	1.6958	1.8187	1.9492	2.0882
REAL GROWTH(3)....................	-0.41	1.98	-1.81	1.16	4.51	4.14	3.28	3.25	2.67	2.71	3.10
INFLATION(3)......................	9.31	9.45	5.99	7.17	5.43	6.20	6.33	6.76	7.25	7.18	7.13
REAL PERSONAL DISPOSABLE INCOME(1).	1663.6	1704.6	1723.3	1743.4	1823.8	1887.6	1944.6	1988.5	2021.3	2067.6	2117.3
UNEMPLOYMENT RATE(3)..............	7.1	7.6	9.7	10.68	9.63	8.55	8.10	7.79	7.67	7.67	7.49
POPULATION(5).....................	222.138	224.175	226.219	228.160	230.305	232.344	234.480	236.597	238.760	240.846	242.977
REAL PERS DISP INCOME PER CAPITA(6)	7487.0	7603.9	7617.8	7640.9	7918.9	8124.0	8293.3	8404.7	8465.8	8584.8	8714.1
RESIDENTIAL HOUSING STARTS(5)......	1.292	1.084	1.060	1.455	1.663	1.860	1.866	1.884	1.865	1.805	1.751
AAA BOND RATE(3)..................	11.94	14.17	13.79	11.14	10.38	10.32	10.43	10.44	10.38	10.15	9.86
MORTGAGE RATE(3)..................	12.66	14.70	15.14	8.35	8.87	9.29	9.71	9.08	9.05	9.19	8.93
FEDERAL RESERVE PRODUCTION INDEX(4)	147.0	151.0	138.6	139.67	152.24	161.96	168.14	174.55	180.50	187.39	196.03

(1) BILLIONS OF 1979 DOLLARS.
(2) INDEX EQUAL TO 1.0 IN 1979.
(3) PERCENTAGE.
(4) INDEX EQUAL TO 100 IN 1967.
(5) MILLIONS OF UNITS.
(6) 1979 DOLLARS.
NOTE: ENTRIES FOR 1980, 1981 AND 1982 ARE HISTORICAL DATA.
SOURCES: ON PAGE 222, SEE 9, PAGE 164, TABLE B-2; 9, PAGE 166, TABLE B-3; 9, PAGE 191, TABLE B-24; 9, PAGE 201, TABLE B-33; 9, PAGE 216, TABLE B-47; 9, PAGE 240, TABLE B-67; AND 9, PAGE 210, TABLE B-42.

TABLE C.4.1. RESIDENTIAL SECTOR FUEL CONSUMPTION BY END-USE SERVICE
CASE C: HIGH WORLD OIL PRICE
(TRILLIONS OF BTU PER YEAR)

	1980	1985	1986	1987	1988	1989	1990
SPACE HEATING							
ELECTRICITY(1).....	201.	244.	258.	271.	284.	297.	310.
NATURAL GAS........	3225.	2982.	2903.	2833.	2781.	2736.	2697.
FUEL OIL...........	1172.	1034.	1015.	992.	966.	938.	908.
LIQUID GAS.........	390.	399.	395.	390.	385.	380.	374.
COAL...............	65.	76.	74.	73.	71.	69.	68.
MARKET TOTAL.......	5054.	4734.	4646.	4560.	4486.	4420.	4357.
WOOD...............	818.	1132.	1161.	1183.	1197.	1204.	1209.
WATER HEATING							
ELECTRICITY........	286.	316.	325.	334.	344.	354.	364.
NATURAL GAS........	1055.	1028.	1029.	1032.	1037.	1042.	1049.
FUEL OIL...........	244.	234.	233.	231.	230.	229.	228.
LIQUID GAS.........	149.	156.	154.	152.	150.	148.	147.
MARKET TOTAL.......	1734.	1734.	1741.	1749.	1761.	1774.	1787.
AIR CONDITIONING							
ELECTRICITY........	351.	378.	386.	393.	402.	411.	420.
NATURAL GAS........	12.	12.	12.	13.	13.	13.	13.
MARKET TOTAL.......	363.	391.	398.	406.	415.	424.	433.
OTHER END-USES(2)							
ELECTRICITY........	1610.	1693.	1728.	1762.	1797.	1834.	1870.
NATURAL GAS........	574.	548.	547.	546.	546.	547.	547.
MARKET TOTAL.......	2185.	2241.	2275.	2308.	2343.	2380.	2418.
FOR ALL END USES							
ELECTRICITY........	2448.	2631.	2697.	2761.	2828.	2896.	2964.
NATURAL GAS........	4866.	4570.	4492.	4424.	4376.	4338.	4306.
FUEL OIL...........	1417.	1268.	1248.	1223.	1196.	1166.	1135.
LIQUID GAS.........	539.	555.	549.	542.	535.	528.	520.
COAL...............	65.	76.	74.	73.	71.	69.	68.
MARKET TOTAL.......	9335.	9100.	9059.	9023.	9005.	8997.	8994.
WOOD...............	818.	1132.	1161.	1183.	1197.	1204.	1209.

(1) ELECTRIC SPACE HEATING INCLUDES BOTH ELECTRIC RESISTANCE AND HEAT PUMPS.
(2) SOME OF THE MAJOR USES ARE LIGHTING, COOKING, REFRIGERATION, WASHING, AND DRYING.
NOTE: ENTRIES FOR 1980 ARE A COMBINATION OF HISTORICAL AND ESTIMATED VALUES.
SOURCES: ON PAGE 222, SEE 1, PAGE 15; AND 19, PAGE 101, TABLE A4.

TABLE C.4.2. COMMERCIAL SECTOR ENERGY CONSUMPTION AND FLOORSPACE BY BUILDING CATEGORY
CASE C: HIGH WORLD OIL PRICE
(CONSUMPTION IN QUADRILLION BTU PER YEAR, FLOORSPACE IN BILLIONS OF SQUARE FEET)

		1980	1985	1986	1987	1988	1989	1990
ALL CATEGORIES...	ALL FUELS.......	5.892	6.504	6.555	6.566	6.560	6.574	6.593
	NATURAL GAS.....	2.674	2.701	2.656	2.599	2.541	2.491	2.444
	ELECTRICITY.....	1.907	2.347	2.437	2.512	2.578	2.657	2.740
	FUEL OIL(1).....	1.122	1.284	1.294	1.292	1.283	1.274	1.260
	OTHER FUELS(2)..	0.190	0.172	0.168	0.163	0.158	0.153	0.149
	FLOORSPACE......	44.75	51.15	52.61	53.88	54.99	56.30	57.72
WAREHOUSE........	ALL FUELS.......	0.826	0.923	0.935	0.942	0.946	0.953	0.961
	NATURAL GAS.....	0.376	0.374	0.367	0.358	0.350	0.342	0.335
	ELECTRICITY.....	0.254	0.320	0.332	0.342	0.352	0.363	0.375
	FUEL OIL(1).....	0.167	0.203	0.211	0.216	0.220	0.224	0.228
	OTHER FUELS(2)..	0.028	0.026	0.025	0.025	0.024	0.023	0.023
	FLOORSPACE......	6.29	7.28	7.49	7.69	7.88	8.08	8.30
INSTITUTION(3)...	ALL FUELS.......	0.675	0.696	0.690	0.678	0.663	0.652	0.641
	NATURAL GAS.....	0.392	0.356	0.344	0.329	0.315	0.303	0.292
	ELECTRICITY.....	0.108	0.134	0.139	0.143	0.147	0.152	0.157
	FUEL OIL(1).....	0.155	0.190	0.192	0.190	0.187	0.183	0.179
	OTHER FUELS(2)..	0.019	0.017	0.016	0.015	0.015	0.014	0.013
	FLOORSPACE......	1.65	1.89	1.94	1.99	2.03	2.07	2.12
OFFICE...........	ALL FUELS.......	1.935	2.159	2.185	2.198	2.203	2.216	2.231
	NATURAL GAS.....	0.755	0.762	0.749	0.733	0.717	0.702	0.689
	ELECTRICITY.....	0.726	0.893	0.930	0.960	0.985	1.015	1.048
	FUEL OIL(1).....	0.393	0.447	0.452	0.452	0.450	0.448	0.444
	OTHER FUELS(2)..	0.062	0.056	0.055	0.053	0.052	0.051	0.049
	FLOORSPACE......	15.74	18.06	18.60	19.05	19.44	19.91	20.42
HOTEL AND MOTEL..	ALL FUELS.......	0.299	0.337	0.339	0.338	0.336	0.337	0.337
	NATURAL GAS.....	0.142	0.148	0.145	0.141	0.138	0.135	0.131
	ELECTRICITY.....	0.114	0.145	0.150	0.155	0.158	0.163	0.168
	FUEL OIL(1).....	0.033	0.035	0.034	0.033	0.032	0.031	0.030
	OTHER FUELS(2)..	0.010	0.009	0.009	0.009	0.008	0.008	0.008
	FLOORSPACE......	2.12	2.41	2.49	2.55	2.59	2.66	2.72
RETAIL/WHOLESALE.	ALL FUELS.......	1.552	1.780	1.801	1.811	1.816	1.825	1.837
	NATURAL GAS.....	0.733	0.787	0.783	0.774	0.765	0.757	0.751
	ELECTRICITY.....	0.545	0.678	0.706	0.731	0.753	0.778	0.805
	FUEL OIL(1).....	0.223	0.268	0.265	0.260	0.253	0.247	0.239
	OTHER FUELS(2)..	0.051	0.048	0.047	0.046	0.045	0.044	0.043
	FLOORSPACE......	13.18	15.33	15.82	16.25	16.63	17.08	17.56
MISCELLANEOUS(4).	ALL FUELS.......	0.606	0.609	0.605	0.600	0.595	0.591	0.587
	NATURAL GAS.....	0.276	0.274	0.269	0.263	0.257	0.251	0.246
	ELECTRICITY.....	0.160	0.177	0.180	0.181	0.183	0.185	0.187
	FUEL OIL(1).....	0.151	0.142	0.141	0.141	0.141	0.141	0.141
	OTHER FUELS(2)..	0.019	0.016	0.016	0.015	0.014	0.014	0.013
	FLOORSPACE......	5.76	6.19	6.28	6.36	6.43	6.51	6.60

(1) FUEL OIL CONSISTS OF LOW SULFUR RESIDUAL OIL AND DISTILLATE OIL.
(2) OTHER FUELS CONSIST OF LIQUID PETROLEUM GASES AND COAL.
(3) INCLUDES MAINLY HEALTH FACILITIES AND PENAL INSTITUTIONS.
(4) INCLUDES MAINLY RELIGIOUS FACILITIES, ASSEMBLEY HALLS, PARKING GARAGES, AND RECREATIONAL FACILITIES.
NOTE: ENTRIES FOR 1980 ARE A COMBINATION OF HISTORICAL AND ESTIMATED VALUES.
SOURCES: ON PAGE 222, SEE 1, PAGE 16.

TABLE C.4.3. INDUSTRIAL SECTOR ENERGY CONSUMPTION
CASE C: HIGH WORLD OIL PRICE
(TRILLIONS OF BTU PER YEAR)

	1980	1985	1986	1987	1988	1989	1990
COAL....................	1387.88	1800.63	1885.19	1996.45	2117.53	2235.70	2345.39
NATURAL GAS.............	6497.36	4873.40	4775.75	4885.59	5274.62	5412.02	5686.42
(RAW MATERIALS(1).....	650.77	470.90	454.11	454.66	470.85	477.90	483.46)
DISTILLATE..............	1568.69	1797.22	1794.30	1744.43	1666.78	1631.73	1590.92
HI-SULFUR RESIDUAL......	713.20	692.83	701.94	710.84	705.74	713.80	718.25
LO-SULFUR RESIDUAL......	553.58	480.49	483.53	484.85	481.29	484.56	490.77
ELECTRICITY.............	2780.85	3046.84	3189.49	3321.64	3504.05	3641.66	3837.83
LIQUID PETROLEUM GAS....	307.88	353.12	328.59	291.93	252.22	209.83	173.67
PET-CHEM FEEDSTOCKS(2)..	2401.48	2159.98	2225.82	2324.69	2453.72	2567.46	2709.12
METALLURGICAL COAL......	1793.34	1300.23	1322.84	1335.63	1352.77	1359.54	1375.60
OTHER(3)................	2180.32	2123.98	2094.12	2090.30	2103.33	2115.63	2120.01
TOTAL ENERGY............	20184.58	18628.71	18801.57	19186.34	19912.02	20371.91	21047.97

(1) NATURAL GAS CONSUMED AS A FEEDSTOCK BY THE CHEMICAL INDUSTRY (ALREADY INCLUDED IN THE NATURAL GAS TOTAL).

(2) CONSISTS OF STILL GAS USED FOR FEEDSTOCK PUROPSES, NAPTHAS LESS THAN 400 DEGREES, OTHER FUELS GREATER THAN 400 DEGREES, AND LIQUID PETROLEUM GASES USED FOR GAS UTILITY FUEL AND FOR CHEMICAL FEEDSTOCKS.

(3) ASPHALT, PETROLEUM COKE, LUBRICANTS, INDUSTRIAL KEROSENE, WAXES AND MISCELLANEOUS PETROLEUM PRODUCTS.

NOTE: INDUSTRIAL SECTOR TOTAL DIFFER FROM THOSE SHOWN IN THE "MONTHLY ENERGY REVIEW" BY EXCLUDING ELECTRICITY LOSSES, GASOLINE, NATURAL GAS USED AS A LEASE AND PLANT FUEL, AND ALL REFINERY FUELS EXCEPT COAL AND ELECTRICITY, AND BY INCLUDING LUBRICANTS CONSUMED BY THE TRANSPORTATION SECTOR. IN 1980 ONLY, THE RESIDUAL AND DISTILLATE DETAIL HAS BEEN CONVERTED TO THE NEW BASIS FOR CONSISTENCY WITH THE PETROLEUM BALANCE TABLE AND WITH 1980 FUEL DETAIL USED IN THE "SHORT-TERM ENERGY OUTLOOK."

NOTE: ENTRIES FOR 1980 ARE HISTORICAL DATA.

SOURCES: ON PAGE 222, SEE 1, PAGE 17; 15, PAGE 11, TABLE 5; AND 15, PAGE 127, TABLE 55.

TABLE C.4.4. TRANSPORTATION SECTOR ENERGY CONSUMPTION BY MODE
CASE C: HIGH WORLD OIL PRICE

	1980	1985	1986	1987	1988	1989	1990
FUEL CONSUMPTION, ALL MODES							
GASOLINE(1)	13.253	11.420	10.818	10.328	9.895	9.514	9.150
DISTILLATE(1)	2.782	2.835	2.905	2.990	3.073	3.166	3.275
JET FUEL(1)	2.179	2.273	2.304	2.344	2.388	2.440	2.490
RESIDUAL(1)	1.401	1.022	1.045	1.073	1.098	1.126	1.156
LIQUID GAS(1)	0.014	0.015	0.015	0.015	0.015	0.015	0.015
FUEL USE IN LIGHT DUTY VEHICLES							
SALES:LIGHT DUTY VEHICLES(3)	10.750	13.254	13.644	14.123	14.702	15.081	15.004
VEHICLE-MILES:TOTAL(2)	1383.	1564.	1586.	1608.	1630.	1657.	1685.
FLEET-MILES PER GALLON:TOTAL	14.17	17.50	18.68	19.77	20.82	21.89	23.00
PERCENT FLEET VMT DIESEL	0.010	0.023	0.029	0.035	0.043	0.051	0.061
VEHICLE-MILES:GAS(2)	1368.	1528.	1540.	1551.	1560.	1572.	1581.
FLEET-MILES PER GALLON:GAS	13.95	17.23	18.34	19.35	20.30	21.26	22.23
FUEL USE:GAS(4)	98.080	88.650	83.964	80.181	76.866	73.962	71.126
VEHICLE-MILES:DIESEL(2)	14.	36.	46.	57.	70.	85.	103.
FLEET-MILES PER GALLON:DIESEL	25.34	28.45	29.72	30.82	31.80	32.81	33.87
FUEL USE:DIESEL(4)	0.564	1.280	1.549	1.849	2.186	2.587	3.048
FUEL USE IN HEAVY TRUCKS							
SALES:HEAVY TRUCKS(3)	0.487	0.644	0.675	0.706	0.736	0.756	0.734
VEHICLE-MILES:TOTAL(2)	105.	120.	123.	127.	130.	134.	138.
FLEET-MILES PER GALLON:TOTAL	5.82	6.85	7.07	7.29	7.52	7.75	7.94
PERCENT FLEET VMT DIESEL	0.591	0.656	0.669	0.683	0.697	0.710	0.722
VEHICLE-MILES:GAS(2)	43.	41.	41.	40.	40.	39.	38.
FLEET-MILES PER GALLON:GAS	6.84	8.29	8.60	8.92	9.25	9.56	9.78
FUEL USE:GAS(4)	6.266	5.004	4.747	4.517	4.277	4.055	3.908
VEHICLE-MILES:DIESEL(2)	62.	79.	83.	87.	91.	95.	99.
FLEET-MILES PER GALLON:DIESEL	5.09	6.09	6.31	6.54	6.77	7.01	7.23
FUEL USE:DIESEL(4)	12.168	12.966	13.083	13.268	13.415	13.564	13.751
FUEL USE IN AIR							
REVENUE PASSENGER-MILES(3)	265.	330.	341.	353.	365.	379.	393.
AVERAGE FLIGHT SIZE	158.	167.	169.	171.	172.	174.	177.
LOAD FACTOR	0.62	0.64	0.64	0.65	0.65	0.65	0.66
FUEL BURNED PER SEAT-MILE(5)	0.023	0.022	0.021	0.021	0.021	0.020	0.020
TOTAL JET FUEL(4)	16.543	18.549	18.809	19.135	19.488	19.917	20.321
FUEL USE IN OTHER							
NON-HWY DSL(1)	4.438	4.689	4.771	4.853	4.923	4.994	5.076
RESIDUAL(1)	1.550	1.741	1.778	1.827	1.870	1.917	1.968

(1) QUADRILLION BTU PER YEAR.
(2) BILLIONS PER YEAR.
(3) MILLIONS PER YEAR.
(4) BILLIONS OF GALLONS PER YEAR.
(5) GALLONS PER YEAR.
NOTE: ENTRIES FOR 1980 ARE A COMBINATION OF HISTORICAL AND ESTIMATED VALUES.

TABLE C.5.1. ELECTRIC UTILITY FUEL PRICES AND CONSUMPTION
CASE C: HIGH WORLD OIL PRICE
(1982 DOLLARS PER MILLION BTU; TRILLIONS OF BTU PER YEAR)

YEARS	COAL	NATURAL GAS	DISTILLATE	LO-S RESID	HI-S RESID	FOSSIL FUEL	NUCLEAR	HYDRO	ALL FUELS
FUEL PRICES									
1980	1.71	2.80	7.22	5.90	4.55	NA	NA	--	NA
1985	1.74	6.34	7.69	5.92	4.77	2.93	0.85	--	2.28
1986	1.76	7.40	8.73	6.68	5.49	3.18	0.85	--	2.44
1987	1.77	7.83	9.36	7.09	5.96	3.31	0.85	--	2.50
1988	1.79	7.46	9.81	7.48	6.31	3.34	0.85	--	2.51
1989	1.81	7.63	10.27	7.89	6.59	3.42	0.85	--	2.56
1990	1.86	7.67	10.90	8.51	7.10	3.53	0.85	--	2.65
FUEL CONSUMPTION									
1980	12122.	3807.	121.	1611.	922.	18583.	2672.	2988.	24243.
1985	14200.	2066.	226.	2232.	1169.	19893.	4118.	3133.	27143.
1986	14548.	2143.	237.	2183.	1175.	20286.	4678.	3148.	28113.
1987	14812.	2363.	230.	2004.	1175.	20584.	5253.	3152.	28989.
1988	15177.	2546.	240.	1963.	1160.	21085.	5782.	3168.	30035.
1989	15660.	3045.	272.	1621.	1048.	21646.	6114.	3183.	30943.
1990	16341.	3373.	345.	1466.	1008.	22534.	6331.	3208.	32073.

NA=NOT AVAILABLE.
--=NOT APPLICABLE.
NOTE: ENTRIES FOR 1980 ARE HISTORICAL DATA.
SOURCES: ON PAGE 222, SEE 1; 2, PP 160-170, TABLES B1, B2, B3, AND B4; 2, PP 253-255, TABLE C9; 2, PP 262-263, TABLE C13; 2, PP 270-271, TABLE C17; AND 2, PP 290-291, TABLE C27.

TABLE C.5.2. END-USE ELECTRICITY PRICES AND CONSUMPTION
CASE C: HIGH WORLD OIL PRICE
(1982 MILLS PER KWH; BILLION KWH PER YEAR)

YEARS	RESIDENTIAL	COMMERCIAL	TRANSPORTATION	INDUSTRIAL	AVG./TOTAL
END-USE PRICES					
1980	57.25	58.72	NA	39.82	50.82
1985	61.14	62.38	60.29	50.65	57.52
1986	63.39	64.86	62.85	52.57	59.68
1987	64.61	66.17	64.20	53.73	60.86
1988	64.32	65.90	63.99	53.59	60.56
1989	64.52	66.13	64.29	53.90	60.78
1990	65.05	66.67	64.76	54.54	61.29
END-USE CONSUMPTION					
1980	717.50	558.91	0.00	815.06	2091.47
1985	771.02	687.81	3.05	893.03	2354.91
1986	790.32	714.26	3.05	934.84	2442.46
1987	809.21	736.31	3.05	973.57	2522.14
1988	828.69	755.65	3.05	1027.04	2614.42
1989	848.79	778.62	3.05	1067.37	2697.82
1990	868.79	803.19	3.05	1124.83	2799.86

NA=NOT AVAILABLE.
NOTE: ENTRIES FOR 1980 ARE HISTORICAL DATA.
SOURCES: ON PAGE 222, SEE 1, PP 15-18; AND 2, PP 229-40, TABLES C1, C2, C3, AND C4.

TABLE C.5.3. ELECTRIC UTILITY CAPACITY AND GENERATION
CASE C: HIGH WORLD OIL PRICE
(CAPACITY IN GIGAWATTS; GENERATION IN BILLION KWH)

CAPACITY TYPE		1980	1985	1986	1987	1988	1989	1990
COAL STEAM	CAPACITY...	176.58	224.96	233.92	238.89	246.92	255.00	265.72
	GENERATION.	943.4	1149.9	1188.2	1216.2	1251.7	1294.2	1352.9
NATURAL GAS STEAM	CAPACITY...	40.99	40.99	40.99	40.99	40.99	40.99	40.99
	GENERATION.	158.2	63.4	61.0	62.3	64.5	63.5	134.7
OIL STEAM	CAPACITY...	32.27	35.07	35.07	35.07	35.12	35.12	35.12
	GENERATION.	113.0	118.1	119.7	119.6	119.3	119.2	121.2
NG/COAL STEAM	CAPACITY...	32.31	32.46	32.46	32.46	32.46	32.46	32.46
	GENERATION.	123.5	105.6	103.4	102.3	103.4	105.8	110.3
OIL/COAL STEAM	CAPACITY...	40.18	40.18	40.18	40.18	40.18	40.18	40.18
	GENERATION.	149.5	152.7	152.6	152.8	153.1	156.7	161.2
NG/OIL STEAM	CAPACITY...	69.81	69.81	69.81	69.81	69.81	69.81	69.81
	GENERATION.	233.0	238.3	240.2	243.1	242.9	247.0	179.5
NG COMBINED CYCLE	CAPACITY...	4.45	4.45	4.45	4.45	4.45	4.45	4.45
	GENERATION.	12.7	23.7	24.4	23.8	27.8	27.5	27.4
OIL COMBINED CYCLE	CAPACITY...	3.34	3.49	3.49	3.49	3.49	3.49	3.49
	GENERATION.	2.3	7.5	7.8	7.9	8.7	5.9	7.5
NATURAL GAS TURBINE	CAPACITY...	4.64	5.06	5.06	5.06	5.06	5.06	5.06
	GENERATION.	5.3	3.4	3.9	4.5	5.1	6.4	8.4
OIL TURBINE	CAPACITY...	46.51	48.09	48.20	48.28	48.34	48.51	48.58
	GENERATION.	5.6	8.7	9.5	9.8	9.4	10.9	14.0
NG/OIL TURBINE	CAPACITY...	52.62	52.68	52.68	52.68	52.68	52.68	52.68
	GENERATION.	8.1	10.0	10.0	8.5	12.7	15.4	18.7
NUCLEAR	CAPACITY...	50.18	77.94	88.30	99.06	106.37	112.76	113.93
	GENERATION.	251.0	387.1	439.7	493.8	543.5	574.8	595.1
PUMP STORAGE HYDRO(1)	CAPACITY...	88.20	14.25	15.82	18.66	19.50	20.28	20.54
	GENERATION.	282.0	12.1	14.8	18.1	20.2	25.0	30.3
PONDAGE HYDRO(1)	CAPACITY...	--	72.05	72.44	72.52	72.65	72.85	72.92
	GENERATION.	--	302.6	304.1	304.5	306.0	307.5	309.9
DOMESTIC TOTAL	CAPACITY...	642.08	721.48	742.87	761.60	778.02	793.64	805.93
	GENERATION.	2287.6	2583.1	2679.3	2767.2	2868.3	2959.8	3071.1
CANADIAN IMPORTS	GENERATION.	26.72	94.29	96.73	98.90	101.32	104.01	107.10

(1) IN 1980, PONDAGE HYDROPOWER IS INCLUDED IN PUMP STORAGE HYDROPOWER.
--=NOT APPLICABLE.
NOTE: "CAPACITY" INDICATES THE POTENTIAL AMOUNT OF ELECTRICAL POWER THAT COULD BE GENERATED IF POWERPLANTS OPERATED NONSTOP.
NOTE: "GENERATION" INDICATES THE AMOUNT OF ELECTRICITY PRODUCED FROM EACH CAPACITY TYPE.
NOTE: ENTRIES FOR 1980 ARE A COMBINATION OF HISTORICAL AND ESTIMATED VALUES.
SOURCES: ON PAGE 222, SEE 10, PP 273-287, TABLE 9; AND 11, PAGE 1, TABLE 1.

TABLE C.5.4. SCHEDULED ELECTRIC UTILITY CAPACITY ADDITIONS
CASE C: HIGH WORLD OIL PRICE
(CAPACITY IN MEGAWATTS)

NEW CAPACITY TYPE	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	TOTAL
COAL STEAM........	13633.	9499.	9821.	7023.	8088.	10524.	4918.	6198.	7753.	9537.	9269.	96261.
OIL STEAM.........	987.	1895.	0.	0.	0.	10.	0.	0.	50.	0.	0.	2942.
NG/COAL STEAM.....	570.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	570.
OIL CC............	0.	0.	90.	60.	0.	0.	0.	0.	0.	0.	0.	150.
NG TURBINE........	76.	375.	8.	0.	0.	0.	0.	0.	0.	0.	0.	459.
OIL TURBINE.......	978.	238.	230.	320.	82.	154.	73.	97.	54.	140.	94.	2460.
NG/OIL TURBINE....	0.	60.	0.	0.	0.	0.	0.	0.	0.	0.	0.	60.
NUCLEAR...........	1819.	3912.	3296.	5250.	9269.	9183.	14455.	4910.	10063.	2355.	0.	64512.
PUMP STORAGE......	256.	0.	997.	531.	0.	1050.	2050.	2325.	0.	955.	150.	8314.
PONDAGE HYDRO.....	1373.	259.	772.	923.	679.	482.	187.	103.	232.	74.	0.	5083.
TOTAL NEW CAPACITY	19692.	16237.	15214.	14107.	18118.	21403.	21683.	13633.	18152.	13061.	9513.	180806.

SOURCES: ON PAGE 222, SEE 10, PP 27-259, TABLE 7; AND 10, PP 273-287, TABLE 9.

TABLE C.5.5. SUMMARY OF COMPONENTS OF ELECTRICITY PRICE
CASE C: HIGH WORLD OIL PRICE
(1982 MILLS PER KWH)

	1980	1985	1986	1987	1988	1989	1990
PRIVATE UTILITIES							
CAPITAL COMPONENT...	10.21	10.24	10.55	10.38	10.54	10.25	9.90
FUEL COMPONENT......	26.14	29.20	30.98	31.69	31.61	32.03	32.88
O&M COMPONENT(1)....	8.33	8.74	8.76	8.77	8.73	8.70	8.60
OTHERS(2)...........	12.22	11.71	11.94	12.65	12.26	12.39	12.37
TOTAL PRICE.........	56.90	59.89	62.23	63.49	63.14	63.37	63.75
PUBLIC & PRIVATE UTILITIES							
CAPITAL COMPONENT...	10.51	10.72	10.89	10.69	10.70	10.36	10.08
FUEL COMPONENT......	25.32	28.07	29.81	30.50	30.53	31.03	31.97
O&M COMPONENT(1)....	8.06	8.47	8.49	8.50	8.46	8.44	8.34
OTHERS(2)...........	10.67	10.27	10.49	11.17	10.86	10.96	10.90
TOTAL PRICE.........	54.55	57.52	59.68	60.87	60.56	60.78	61.29

(1) OPERATION AND MAINTENANCE.
(2) INCLUDES DEPRECIATION AND TAXES.
NOTE: ENTRIES FOR 1980 ARE A COMBINATION OF HISTORICAL AND ESTIMATED VALUES.

TABLE C.6.1. ANNUAL SUPPLY AND DISPOSITION OF PETROLEUM
CASE C: HIGH WORLD OIL PRICE
(MILLIONS OF BARRELS PER DAY)

	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990
SUPPLY											
PRODUCTION											
CRUDE OIL..................	8.60	8.57	8.67	8.64	8.91	9.04	9.20	9.26	9.26	9.14	8.67
NORTH SLOPE.............	1.52	1.53	1.61	1.63	1.70	1.71	1.78	1.78	1.78	1.82	1.73
SUBARCTIC(1)............	7.08	7.05	7.06	7.00	7.19	7.29	7.33	7.34	7.30	7.07	6.66
NATURAL GAS LIQUIDS........	1.57	1.61	1.55	1.54	1.37	1.24	1.23	1.25	1.29	1.34	1.39
OTHER DOMESTIC(2)..........	0.04	0.05	0.05	0.05	0.02	0.04	0.09	0.14	0.19	0.24	0.29
PROCESSING GAIN............	0.60	0.51	0.53	0.49	0.51	0.53	0.52	0.51	0.50	0.49	0.49
TOTAL PRODUCTION.........	10.81	10.74	10.81	10.72	10.78	10.81	10.95	11.01	11.06	10.97	10.55
IMPORTS(3)											
CRUDE OIL..................	5.26	4.40	3.46	3.75	4.22	4.79	4.38	4.02	3.77	3.55	3.80
REFINED PRODUCTS(4)........	1.65	1.60	1.58	1.76	2.02	2.04	2.04	2.04	2.02	2.02	2.02
TOTAL IMPORTS............	6.91	6.00	5.04	5.51	6.24	6.83	6.41	6.06	5.79	5.56	5.82
EXPORTS											
CRUDE OIL..................	0.29	0.23	0.24	0.23	0.25	0.25	0.25	0.25	0.25	0.25	0.25
REFINED PRODUCTS(4)........	0.26	0.37	0.58	0.55	0.62	0.62	0.62	0.62	0.62	0.62	0.62
TOTAL EXPORTS............	0.54	0.59	0.82	0.78	0.87	0.87	0.87	0.87	0.87	0.87	0.87
NET IMPORTS..........	6.37	5.40	4.23	4.72	5.37	5.96	5.54	5.19	4.92	4.69	4.95
PRIMARY STOCK CHANGES(5)											
NET WITHDRAWALS............	-0.09	0.18	0.32	0.14	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SPR FILL RATE ADDITIONS(6).	-0.05	-0.34	-0.17	-0.21	-0.15	-0.15	-0.15	-0.15	-0.15	-0.15	-0.15
TOTAL PRIMARY SUPPLY......	17.04	15.98	15.18	15.37	16.00	16.62	16.34	16.05	15.83	15.51	15.35
PRODUCT SUPPLIED											
MOTOR GASOLINE.............	6.86	6.59	6.54	6.36	6.27	5.96	5.65	5.39	5.17	4.97	4.78
DISTILLATE FUEL OIL........	2.97	2.83	2.67	2.75	3.03	3.23	3.27	3.27	3.26	3.28	3.33
RESIDUAL FUEL OIL..........	2.56	2.09	1.69	1.73	2.24	2.90	2.89	2.82	2.77	2.58	2.49
OTHER PRODUCTS(7)..........	5.11	4.83	4.66	4.83	4.75	4.82	4.83	4.86	4.91	4.95	5.02
TOTAL RECLASSIFIED(8)......	-0.44	-0.27	-0.31	-0.30	-0.28	-0.29	-0.29	-0.28	-0.28	-0.27	-0.27
TOTAL PRODUCT SUPPLIED...	17.06	16.06	15.25	15.37	16.00	16.62	16.35	16.05	15.83	15.51	15.35
DISCREPANCY..............	-0.02	-0.08	-0.07	0.00	-0.00	-0.00	-0.01	-0.00	0.00	-0.00	-0.00
NET DISPOSITION..........	17.04	15.98	15.18	15.37	16.00	16.62	16.34	16.05	15.83	15.51	15.35

(1) INCLUDES LOWER-48 STATES AND SOUTHERN ALASKA.
(2) OTHER DOMESTIC REPRESENTS OTHER HYDROCARBON INPUT.
(3) INCLUDES IMPORTS FOR THE STRATEGIC PETROLEUM RESERVE.
(4) CONSISTS OF NATURAL GAS PLANT LIQUIDS, UNFINISHED OILS, AND REFINED PRODUCT IMPORTS.
(5) EXCLUDES CRUDE OIL FOR THE STRATEGIC PETROLEUM RESERVE.
(6) ADDITIONS TO THE STRATEGIC PETROLEUM RESERVE (SHOWN AS NEGATIVE ENTRIES).
(7) COMPOSED OF JET FUEL, LIQUEFIED GASES, AND OTHER PRODUCTS.
(8) PETROLEUM PRODUCTS REPROCESSED INTO OTHER PRODUCT CATEGORIES.

NOTE: IN 1980, GASOLINE SUPPLIED HAS BEEN ADJUSTED TO CORRECT UNDERESTIMATION OF PRODUCT SUPPLIED. DISTILLATE AND RESIDUAL FUEL OIL HAVE BEEN RESTATED INTO THE NEW BASIS FOR COMPARABILITY PURPOSES.

NOTE: ENTRIES FOR 1980 ARE A COMBINATION OF HISTORICAL AND ESTIMATED VALUES.

SOURCES: ON PAGE 222, SEE 4, PAGE 6, TABLE 1; AND 20, PAGE 18, TABLE 7.

TABLE C.7.1. NATURAL GAS SUPPLY/DEMAND BALANCE
CASE C: HIGH WORLD OIL PRICE
(TRILLION BTU PER YEAR; 1982 DOLLARS PER MILLION BTU)

	1980	1985	1986	1987	1988	1989	1990
LOWER-48 ONSHORE SUPPLY	14435.	11682.	11392.	11463.	12060.	12832.	13797.
LOWER-48 OFFSHORE SUPPLY	5477.	3911.	4016.	4189.	4173.	4015.	3680.
TOTAL DOMESTIC SUPPLY	19912.	15593.	15408.	15652.	16233.	16847.	17477.
CATEGORY 102 (NEW GAS)	3439.	6482.	7166.	8048.	8984.	10113.	10893.
CATEGORY 104 (OLD INTERSTATE GAS)	8910.	5730.	4980.	4360.	3850.	3440.	3090.
CATEGORY 105 (OLD INTRASTATE GAS)	6899.	3050.	2750.	2550.	2370.	2110.	2000.
CATEGORY 107 (DEEP GAS)	664.	331.	511.	694.	1029.	1184.	1494.
SUPPLEMENTAL GAS(1)	159.	0.	0.	0.	0.	0.	0.
IMPORTS	957.	1230.	1230.	1230.	1230.	1230.	1230.
TOTAL SUPPLY	21028.	16823.	16638.	16882.	17463.	18077.	18707.
LEASE AND PLANT FUEL(2)	1045.	1169.	1156.	1174.	1218.	1264.	1311.
TRANSPORTATION LOSS(3)	647.	1096.	1089.	1105.	1130.	1145.	1167.
CONSUMPTION BY SECTOR							
RESIDENTIAL	4866.	4570.	4492.	4424.	4376.	4338.	4306.
COMMERCIAL(4)	2674.	2701.	2656.	2599.	2541.	2491.	2444.
REFINERY	846.	348.	325.	329.	380.	381.	412.
ELECTRIC UTILITY	3807.	2066.	2143.	2363.	2546.	3045.	3373.
INDUSTRIAL(5)	6497.	4873.	4776.	4886.	5275.	5412.	5694.
TOTAL END-USE CONSUMPTION	18690.	14558.	14392.	14600.	15118.	15666.	16229.
DISCREPANCY(6)	-646.	0.	0.	0.	0.	0.	0.
WELLHEAD PRICES							
AVERAGE PRICE	1.79	4.26	5.22	5.70	5.50	5.66	5.70
CATEGORY 102 (NEW GAS)	2.69	5.54	6.63	6.85	6.39	6.42	6.35
CATEGORY 104 (OLD INTERSTATE GAS)	1.32	2.22	2.46	2.80	2.72	2.75	2.73
CATEGORY 105 (OLD INTRASTATE GAS)	1.67	5.24	6.26	6.70	6.26	6.31	6.26
CATEGORY 107 (DEEP GAS)	4.78	5.54	6.63	6.85	6.39	6.42	6.35
DELIVERED PRICE BY SECTOR							
RESIDENTIAL	4.16	7.23	8.22	8.68	8.56	8.75	8.98
COMMERCIAL(4)	3.84	6.99	8.03	8.51	8.42	8.67	8.93
REFINERY	3.08	5.40	6.37	6.79	6.52	6.69	6.75
ELECTRIC UTILITY	2.80	6.34	7.40	7.83	7.46	7.63	7.67
INDUSTRIAL(5)	2.90	6.24	7.28	7.69	7.42	7.61	7.72

(1) INCLUDES INCREASED GAS OR OIL IMPORTS.
(2) REPRESENTS GAS USED AS A FUEL IN FIELD GATHERING AND PLANT PROCESSING MACHINERY.
(3) INDICATES GAS USED TO FUEL COMPRESSORS IN THE PIPELINE MACHINERY.
(4) COMMERCIAL IS AN AGGREGATE OF COMMERCIAL AND OTHER CATEGORIES.
(5) EXCLUDES LEASE AND PLANT FUEL CONSUMPTION.
(6) REPRESENTS IMBALANCES RESULTING FROM THE MERGER OF DATA REPORTING SYSTEMS WHICH VARY IN SCOPE, FORMAT, DEFINITIONS AND TYPE OF RESPONDANTS.
NOTE: ENTRIES FOR 1980 ARE A COMBINATION OF HISTORICAL AND ESTIMATED VALUES.
SOURCES: ON PAGE 222, SEE 1, PP 15-19; 12, PAGE 7, TABLE 1; 13, PAGE 133, TABLE A7.

TABLE C.8.1. COAL SUPPLY AND DISPOSITION
CASE C: HIGH WORLD OIL PRICE
(MILLIONS OF SHORT TONS PER YEAR)

	1980	1985	1986	1987	1988	1989	1990
DOMESTIC SUPPLY							
EASTERN.............	579.	605.	622.	634.	650.	670.	695.
WESTERN.............	251.	311.	322.	334.	349.	367.	391.
NET IMPORTS(1)......	-91.	-108.	-114.	-120.	-127.	-135.	-144.
STOCK WITHDRAWALS...	-36.	0.	0.	0.	0.	0.	0.
TOTAL SUPPLY..........	703.	807.	830.	848.	873.	902.	942.
CONSUMPTION							
RESIDENTIAL/COMM....	7.	7.	7.	7.	7.	6.	6.
INDUSTRIAL..........	60.	76.	80.	84.	88.	93.	97.
METALLURGICAL.......	67.	49.	50.	50.	51.	51.	52.
ELECTRIC UTILITY....	569.	670.	688.	702.	722.	747.	782.
SYNTHETIC USE.......	0.	5.	5.	5.	5.	5.	5.
TOTAL CONSUMPTION.....	703.	807.	830.	848.	873.	902.	942.
TOTAL DISPOSITION.....	703.	807.	830.	848.	873.	902.	942.

(1) EXPORTS TO EUROPE AND JAPAN.

NOTE: EASTERN INCLUDES PENSYLVANIA, OHIO, MARYLAND, WEST VIRGINIA, VIRGINIA, KENTUCKY, TENNESSEE, ALABAMA, ILLINOIS, AND INDIANA. WESTERN INCLUDES IOWA, MISSOURI, KANSAS, ARKANSAS, OKLAHOMA, TEXAS, NORTH DAKOTA, SOUTH DAKOTA, MONTANA, WYOMING, COLORADO, UTAH, ARIZONA, NEW MEXICO, WASHINGTON, AND ALASKA.

NOTE: ENTRIES FOR 1980 ARE HISTORICAL DATA, AND STOCK WITHDRAWALS INCLUDES DISCREPANCY.

Case D
Higher Vehicle Efficiency

In the midprice case, it was assumed that the average fleet efficiency of light duty vehicles improved by 0.40 miles per gallon (mpg) per year. In this study, the fuel efficiency is assumed to increase by 0.48 mpg per year reflecting further improvements in fleet fuel efficiency of 0.08 mpg/year or 6 percent of 1990.

A higher fuel-efficiency would reduce total transportation fuel use. The difference in the fuel-effieiency improvement is projected to reduce gasoline consumption by 1.5 percent in 1985 and 4.1 percent in 1990 (see Table D.1.3). However, the higher efficiency would encourage greater use of light duty vehicles, resulting in a modest rise in total miles travelled (see Table D.4.4).

Assumed Average Light-Vehicle Fuel-Efficiency in Miles Per Gallon

Case	1980	1985	1990
A	14.15	16.68	21.98
D	14.15	17.17	23.29

Case D

THE FOLLOWING SECTION OF TABLES ARE FOR THE:

CASE D: HIGHER VEHICLE EFFICIENCY

THIS SECTION CONTAINS THE FOLLOWING TABLES:

TABLE D.1.1. YEARLY SUPPLY AND DISPOSITION OF TOTAL ENERGY
CASE D: HIGHER VEHICLE EFFICIENCY
(QUADRILLION BTU PER YEAR)

	1975	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990
SUPPLY												
PRODUCTION												
PETROLEUM..........	20.1	20.5	20.4	20.6	20.5	20.6	20.4	20.5	20.5	20.5	20.3	19.3
NATURAL GAS........	19.6	20.1	19.9	18.2	17.5	17.0	15.2	14.7	14.8	15.3	15.9	16.4
COAL...............	15.2	19.2	19.1	19.1	19.4	19.4	20.3	20.8	21.3	22.0	22.8	23.8
NUCLEAR............	1.9	2.7	2.9	3.0	3.2	3.7	4.1	4.7	5.3	5.8	6.1	6.3
HYDRO/GEO/OTHER....	3.2	3.0	2.9	3.3	3.2	3.1	3.1	3.1	3.2	3.2	3.2	3.2
SUBTOTAL.........	60.1	65.5	65.2	64.2	63.7	63.8	63.1	63.9	65.0	66.8	68.2	69.1
NET IMPORTS												
CRUDE OIL..........	8.7	10.6	8.8	6.8	7.5	10.3	12.7	12.4	11.6	10.9	10.5	11.3
OTHER PETROLEUM....	3.8	2.9	2.6	2.1	2.5	3.0	3.1	3.1	3.1	3.1	3.1	3.1
NG (CONTRACTED)(1).	0.9	1.0	.9	.9	1.1	1.2	1.2	1.2	1.2	1.2	1.2	1.2
OTHER GAS(2).......	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.2	0.0	0.0	0.0
COAL AND COKE......	-1.7	-2.4	-2.9	-2.8	-2.6	-2.7	-2.9	-3.0	-3.2	-3.4	-3.6	-3.8
ELECTRICITY........	0.1	.2	.2	.2	.2	0.3	0.3	0.3	0.3	0.3	0.4	0.4
SUBTOTAL.........	11.7	12.3	9.6	7.3	8.6	12.1	14.5	14.3	13.3	12.2	11.6	12.2
SPR ADDITIONS(3)....	0.0	-.1	-.7	-.4	-.4	-0.3	-0.3	-0.3	-0.3	-0.3	-0.3	-0.3
STOCK WITHDRAWALS...	-1.1	-1.8	0.0	-.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL SUPPLY.........	70.7	75.9	74.1	70.9	71.9	75.6	77.4	77.9	78.0	78.7	79.6	81.1
CONSUMPTION												
NON-ELEC UTILITY FUEL												
PETROLEUM..........	29.5	31.5	29.9	28.6	29.2	30.6	31.8	31.5	30.8	30.2	29.8	29.8
NATURAL GAS(4).....	16.7	16.6	16.1	15.0	14.9	14.5	13.7	13.5	13.4	13.7	13.8	14.1
COAL...............	4.0	3.4	3.4	3.0	2.9	3.2	3.3	3.3	3.4	3.5	3.7	3.8
SUBTOTAL.........	50.2	51.4	49.4	46.4	47.0	48.3	48.8	48.3	47.7	47.4	47.3	47.7
ELECTRIC UTILITY FUEL												
PETROLEUM..........	3.2	2.7	2.2	1.8	1.5	2.9	4.1	4.2	4.2	4.1	3.9	3.8
NATURAL GAS........	3.2	3.8	3.8	3.3	3.4	2.7	1.7	1.7	1.7	1.9	2.2	2.5
COAL...............	8.8	12.1	12.7	12.7	13.2	13.5	14.1	14.5	14.7	15.1	15.6	16.3
NUCLEAR............	1.9	2.7	2.9	3.0	3.2	3.7	4.1	4.7	5.3	5.8	6.1	6.3
HYDRO/GEO/OTHER(5).	3.4	3.2	3.1	3.5	3.4	3.4	3.5	3.5	3.5	3.5	3.5	3.6
SUBTOTAL.........	20.5	24.5	24.7	24.3	24.7	25.9	27.2	28.2	29.1	30.1	31.0	32.1
TOTAL CONSUMPTION....	70.7	75.9	74.1	70.7	71.7	74.2	76.0	76.6	76.8	77.5	78.3	79.8
ADJUSTMENTS												
REFINERY LOSSES(6).	0.0	0.0	0.0	0.0	-0.1	0.0	0.2	0.2	0.2	0.3	0.2	0.3
DISCREPANCY(7).....	0.0	0.0	0.0	0.2	0.3	1.4	1.2	1.1	1.0	0.9	1.1	1.0
TOTAL DISPOSITION....	70.7	75.9	74.1	70.9	71.9	75.6	77.4	77.9	78.0	78.7	79.6	81.1

NOTE: THE "ANNUAL ENERGY REVIEW" FOR 1982 WILL CONTAIN LATER REVISIONS TO HISTORICAL DATA FOR 1975, 1980 AND 1982.
NOTE: TOTALS MAY NOT EQUAL SUM OF COMPONENTS DUE TO INDEPENDENT ROUNDING. FOR TABLE FOOTNOTES AND SOURCES SEE PAGE 219.

TABLE D.1.2. SUPPLY/DEMAND BALANCE
CASE D: HIGHER VEHICLE EFFICIENCY
(QUADRILLION BTU PER YEAR)

	1975	1980	1985	1986	1987	1988	1989	1990
DOMESTIC SUPPLY								
COAL	15.2	19.2	20.3	20.8	21.3	22.0	22.8	23.8
NATURAL GAS	19.6	19.9	15.2	14.7	14.8	15.3	15.9	16.4
PETROLEUM	20.1	20.5	20.4	20.5	20.5	20.5	20.3	19.3
NUCLEAR	1.9	2.7	4.1	4.7	5.3	5.8	6.1	6.3
OTHER(1)	3.2	3.0	3.1	3.1	3.2	3.2	3.2	3.2
TOTAL DOMESTIC SUPPLY	60.0	65.3	63.1	63.9	65.0	66.8	68.2	69.1
NATURAL GAS IMPORTS	0.9	1.0	1.2	1.2	1.2	1.2	1.2	1.2
SUPPLEMENTAL GAS(2)	0.0	0.2	0.0	0.3	0.2	0.0	0.0	0.0
PETROLEUM IMPORTS	12.5	13.5	15.8	15.5	14.8	14.0	13.6	14.4
TOTAL SUPPLY(3)	73.4	80.0	80.2	80.9	81.2	82.0	83.1	84.8
DISPOSITION								
RESIDENTIAL	9.6	9.3	9.2	9.2	9.2	9.2	9.2	9.3
COMMERCIAL	5.5	5.9	6.6	6.7	6.8	6.8	6.8	6.9
INDUSTRIAL(4)	21.3	23.0	22.1	22.3	22.4	22.8	23.2	23.9
TRANSPORTATION	17.7	19.7	18.4	18.0	17.4	16.9	16.7	16.5
TOTAL END-USE CONSUMPTION	54.1	57.9	56.4	56.2	55.8	55.8	55.9	56.6
DISCREPANCY	0.2	-0.1	-0.2	-0.1	-0.2	-0.4	-0.3	-0.4
ADJUSTMENTS	19.1	22.2	24.0	24.8	25.6	26.6	27.5	28.6
UTILITY GENERATION	13.7	16.5	18.3	19.0	19.5	20.2	20.8	21.5
UTILITY TRANSMISSION	0.6	0.7	0.9	0.9	0.9	1.0	1.0	1.0
REFINERY(5)	0.0	0.0	0.2	0.2	0.2	0.3	0.2	0.3
GAS PIPELINE(6)	0.6	0.6	1.1	1.0	1.0	1.1	1.1	1.1
LEASE/PLANT FUEL(7)	1.4	1.0	1.1	1.1	1.1	1.2	1.2	1.2
COAL EXPORTS	1.7	2.4	2.9	3.0	3.2	3.4	3.6	3.8
SPR ADDITIONS	0.0	0.1	0.3	0.3	0.3	0.3	0.3	0.3
STOCK WITHDRAWALS	1.1	1.8	0.0	0.0	0.0	0.0	0.0	0.0
RECLASSIFIED	0.0	-0.9	-0.7	-0.7	-0.7	-0.6	-0.6	-0.6
ADJUSTED CONSUMPTION	73.4	80.0	80.2	80.9	81.2	82.0	83.1	84.8
ELECTRIC UTILITY FUEL								
COAL	8.8	12.1	14.1	14.5	14.7	15.1	15.6	16.3
PETROLEUM	3.2	2.7	4.1	4.2	4.2	4.1	3.9	3.8
NATURAL GAS	3.2	3.8	1.7	1.7	1.7	1.9	2.2	2.5
TOTAL FOSSIL	15.2	18.6	20.0	20.4	20.7	21.1	21.7	22.6
NUCLEAR	1.9	2.7	4.1	4.7	5.3	5.8	6.1	6.3
OTHER	3.2	3.0	3.1	3.1	3.2	3.2	3.2	3.2
TOTAL	20.3	24.3	27.2	28.2	29.1	30.1	31.0	32.1
GENERATION	6.6	7.8	8.9	9.3	9.6	9.9	10.2	10.6

NOTE: TOTALS MAY NOT EQUAL SUM OF COMPONENTS DUE TO INDEPENDENT ROUNDING. FOR TABLE FOOTNOTES AND SOURCES SEE PAGE 219.

TABLE D.1.3. CONSUMPTION SUMMARY
CASE D: HIGHER VEHICLE EFFICIENCY
(QUADRILLION BTU PER YEAR)

	1975	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990
RESIDENTIAL	9.571	9.335	9.104	9.236	9.143	9.173	9.206	9.228	9.232	9.233	9.243	9.262
STEAM COAL............	0.091	0.065	0.080	0.082	0.071	0.078	0.076	0.074	0.073	0.071	0.069	0.068
NATURAL GAS............	5.022	4.866	4.654	4.793	4.710	4.649	4.585	4.521	4.463	4.413	4.374	4.343
DISTILLATE(1)..........	1.923	1.417	1.375	1.303	1.230	1.308	1.327	1.335	1.330	1.317	1.300	1.284
LIQUID PETROLEUM GAS...	0.528	0.539	0.536	0.570	0.590	0.564	0.575	0.581	0.580	0.576	0.572	0.568
ELECTRICITY	2.007	2.448	2.459	2.488	2.530	2.574	2.642	2.716	2.787	2.856	2.928	3.000
COMMERCIAL	5.513	5.892	5.818	5.866	6.182	6.443	6.608	6.715	6.766	6.783	6.823	6.871
STEAM COAL............	0.135	0.095	0.107	0.122	0.086	0.097	0.095	0.092	0.090	0.087	0.085	0.082
NATURAL GAS............	2.559	2.674	2.580	2.683	2.720	2.731	2.723	2.692	2.643	2.587	2.541	2.498
DISTILLATE(1)..........	0.622	0.556	0.540	0.511	0.670	0.741	0.778	0.805	0.819	0.824	0.829	0.832
LO-SULFUR RESIDUAL.....	0.506	0.566	0.470	0.376	0.490	0.544	0.571	0.591	0.601	0.605	0.609	0.611
LIQUID PETROLEUM GAS...	0.093	0.095	0.095	0.101	0.090	0.080	0.078	0.076	0.074	0.072	0.070	0.068
ELECTRICITY	1.598	1.906	2.026	2.074	2.150	2.251	2.362	2.459	2.539	2.607	2.690	2.780
INDUSTRIAL(2)	18.503	20.184	19.512	16.876	17.365	18.888	19.585	19.806	19.971	20.448	20.867	21.598
STEAM COAL............	1.619	1.388	1.570	1.626	1.501	1.770	1.801	1.854	1.934	2.038	2.148	2.253
METALLURGICAL COAL.....	2.178	1.793	1.647	1.057	1.132	1.262	1.302	1.324	1.336	1.352	1.358	1.373
NATURAL GAS............	6.133	6.497	6.639	5.414	5.340	5.338	4.907	4.822	4.884	5.150	5.325	5.586
DISTILLATE.............	1.272	1.569	1.285	1.212	1.340	1.747	2.221	2.244	2.136	2.022	1.950	1.930
LO-SULFUR RESIDUAL.....	0.428	0.554	0.423	0.367	0.390	0.483	0.547	0.554	0.546	0.541	0.538	0.552
HI-SULFUR RESIDUAL.....	0.856	0.713	0.532	0.484	0.530	0.702	0.834	0.849	0.837	0.822	0.815	0.831
LIQUID PETROLEUM GAS...	0.252	0.308	0.323	0.332	0.370	0.366	0.382	0.357	0.312	0.264	0.218	0.181
PET-CHEM FEEDSTOCK(3)..	1.519	2.401	2.111	1.862	1.980	2.172	2.286	2.365	2.443	2.548	2.661	2.822
OTHER(4)...............	1.900	2.180	2.166	1.977	2.240	2.207	2.258	2.253	2.240	2.239	2.257	2.287
ELECTRICITY	2.346	2.781	2.817	2.545	2.620	2.843	3.047	3.183	3.302	3.473	3.598	3.781
TRANSPORTATION(5)	17.725	19.114	18.715	18.129	17.910	18.413	18.422	17.950	17.416	16.942	16.669	16.529
DISTILLATE.............	2.069	2.782	2.738	2.582	2.510	2.780	2.890	2.962	3.036	3.108	3.198	3.309
HI-SULFUR RESIDUAL.....	0.731	1.401	1.163	0.930	0.900	1.011	1.053	1.077	1.100	1.119	1.145	1.178
GASOLINE(6)............	12.868	12.712	12.688	12.528	12.180	12.348	12.108	11.481	10.806	10.206	9.770	9.431
JET FUEL(7)............	2.029	2.179	2.087	2.049	2.280	2.233	2.331	2.390	2.434	2.468	2.516	2.572
LIQUID PETROLEUM GAS...	0.016	0.014	0.014	0.015	0.020	0.015	0.015	0.015	0.015	0.015	0.015	0.015
OTHER..................	0.000	0.014	0.014	0.014	0.010	0.014	0.014	0.014	0.014	0.014	0.014	0.014
ELECTRICITY	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010
ELECTRIC UTILITY FUEL	20.360	24.243	24.462	24.203	24.480	25.943	27.225	28.239	29.080	30.097	30.996	32.121
STEAM COAL............	8.790	12.122	12.707	12.697	13.190	13.538	14.147	14.482	14.748	15.121	15.595	16.267
NATURAL GAS............	3.240	3.807	3.764	3.336	3.440	2.707	1.698	1.714	1.744	1.884	2.236	2.473
DISTILLATE(8)..........	0.350	0.121	0.077	0.048	0.090	0.181	0.346	0.373	0.322	0.334	0.372	0.458
LO-SULFUR RESIDUAL(9)..	2.860	1.611	1.251	0.980	0.780	1.784	2.598	2.646	2.657	2.605	2.306	2.179
HI-SULFUR RESIDUAL.....	NA	0.922	0.898	0.789	0.600	0.946	1.184	1.198	1.204	1.204	1.189	1.202
HYDRO/GEO/OTHER(10)....	3.220	2.988	2.864	3.340	3.190	3.115	3.133	3.149	3.153	3.168	3.185	3.211
NUCLEAR................	1.900	2.672	2.901	3.013	3.190	3.671	4.118	4.678	5.253	5.782	6.114	6.331
REFINERY FUEL(11)	2.769	2.787	2.304	2.190	2.480	2.345	2.545	2.526	2.465	2.401	2.344	2.329
NATURAL GAS............	0.975	0.846	0.668	0.574	0.720	0.438	0.300	0.281	0.289	0.326	0.346	0.376
DISTILLATE.............	0.035	0.018	0.011	0.011	0.010	0.012	0.013	0.013	0.012	0.012	0.012	0.012
LO-SULFUR RESIDUAL.....	NA	NA	NA	NA	0.090	0.117	0.149	0.149	0.140	0.128	0.120	0.115
HI-SULFUR RESIDUAL.....	0.269	0.213	0.167	0.137	0.200	0.292	0.469	0.482	0.460	0.412	0.380	0.349
LIQUID PETROLEUM GAS...	0.050	0.043	0.024	0.038	0.030	0.025	0.028	0.027	0.027	0.026	0.025	0.025
OTHER(12)..............	0.390	0.436	0.359	0.348	0.360	0.364	0.395	0.392	0.382	0.372	0.364	0.361
STILL GAS..............	1.050	1.231	1.073	1.085	1.080	1.098	1.191	1.183	1.154	1.124	1.097	1.090

NOTE: TOTALS MAY NOT EQUAL SUM OF COMPONENTS DUE TO INDEPENDENT ROUNDING. FOR TABLE FOOTNOTES AND SOURCES SEE PAGE 219.

TABLE D.1.4. PRICE SUMMARY
CASE D: HIGHER VEHICLE EFFICIENCY
(1982 DOLLARS PER MILLION BTU)

	1975	1980	1985	1986	1987	1988	1989	1990
WORLD OIL PRICE.........	20.70	39.32	25.47	28.24	31.53	34.11	35.68	36.71
RESIDENTIAL	5.95	8.33	9.53	10.28	10.95	11.31	11.53	11.77
NATURAL GAS...........	2.75	4.16	6.65	7.44	8.03	8.28	8.38	8.56
DISTILLATE(1).........	4.75	8.59	6.29	6.95	7.75	8.39	8.78	9.06
LIQUID PETROLEUM GAS..	4.11	6.67	6.07	6.72	7.43	7.97	8.29	8.58
ELECTRICITY	15.61	16.78	17.12	17.62	18.11	18.24	18.29	18.39
COMMERCIAL	6.27	8.38	10.07	10.83	11.52	11.92	12.19	12.47
NATURAL GAS...........	2.17	3.84	6.42	7.25	7.87	8.14	8.30	8.50
DISTILLATE(1).........	4.30	8.06	5.95	6.59	7.34	7.95	8.32	8.58
LO-SULFUR RESIDUAL....	4.13	5.32	4.81	5.34	5.96	6.49	6.82	7.13
LIQUID PETROLEUM GAS..	NA	6.67	6.09	6.74	7.45	7.99	8.31	8.60
ELECTRICITY	15.55	17.21	17.36	17.91	18.43	18.60	18.68	18.77
INDUSTRIAL(2)	3.37	5.44	6.45	7.03	7.59	7.92	8.12	8.30
STEAM COAL............	1.81	1.55	2.10	2.13	2.16	2.20	2.25	2.33
METALLURGICAL COAL....	2.80	2.51	2.56	2.59	2.61	2.63	2.66	2.72
NATURAL GAS...........	1.49	2.90	5.62	6.46	7.02	7.13	7.20	7.25
DISTILLATE............	4.24	7.99	5.86	6.49	7.24	7.84	8.21	8.47
LO-SULFUR RESIDUAL....	4.11	5.14	4.73	5.25	5.86	6.38	6.70	7.01
HI-SULFUR RESIDUAL....	2.93	NA	4.21	4.75	5.38	5.91	6.25	6.56
LIQUID PETROLEUM GAS..	3.83	6.34	5.87	6.49	7.17	7.69	8.00	8.28
PET-CHEM FEEDSTOCK(3).	NA	7.88	6.74	7.43	8.28	8.96	9.38	9.67
OTHER(4)..............	NA	NA	5.20	5.73	6.38	6.91	7.25	7.49
ELECTRICITY	9.42	11.67	14.16	14.60	15.05	15.18	15.25	15.38
TRANSPORTATION(5)	6.72	9.91	7.73	8.40	9.17	9.72	10.01	10.14
DISTILLATE............	5.85	8.39	6.22	6.89	7.69	8.32	8.72	8.99
HI-SULFUR RESIDUAL....	2.93	3.97	3.67	4.16	4.73	5.21	5.51	5.81
GASOLINE(6)...........	7.57	11.32	8.67	9.43	10.30	10.90	11.20	11.31
JET FUEL(7)...........	3.69	7.51	6.60	7.25	8.06	8.70	9.09	9.36
LIQUID PETROLEUM GAS..	NA	NA	5.81	6.44	7.13	7.65	7.97	8.25
ELECTRICITY	NA	NA	16.73	17.29	17.82	18.02	18.12	18.19
ELECTRIC UTILITY FUEL	2.04	1.84	2.07	2.20	2.30	2.36	2.41	2.48
STEAM COAL............	1.58	1.71	1.74	1.75	1.77	1.79	1.81	1.86
NATURAL GAS...........	1.14	2.80	5.53	6.45	7.02	7.03	7.18	7.25
DISTILLATE(8).........	3.28	7.22	5.88	6.52	7.27	7.87	8.24	8.50
LO-SULFUR RESIDUAL(9).	3.27	5.90	4.80	5.34	5.97	6.49	6.72	6.96
HI-SULFUR RESIDUAL....	NA	4.55	3.69	4.18	4.74	5.22	5.52	5.81
NUCLEAR...............	NA	.85	0.85	0.85	0.85	0.85	0.85	0.85
REFINERY FUEL	NA	NA	2.32	2.60	2.93	3.17	3.31	3.42
NATURAL GAS...........	NA	3.08	4.74	5.51	6.08	6.21	6.27	6.28
DISTILLATE............	NA	6.09	5.15	5.72	6.39	6.93	7.27	7.50
LO-SULFUR RESIDUAL....	NA	NA	4.15	4.62	5.18	5.65	5.94	6.23
HI-SULFUR RESIDUAL....	NA	4.89	3.49	3.97	4.52	4.99	5.29	5.58
LIQUID PETROLEUM GAS..	NA	NA	5.17	5.74	6.36	6.83	7.12	7.38
OTHER(10).............	NA	NA	5.09	5.62	6.27	6.80	7.14	7.38

NOTE: TOTALS MAY NOT EQUAL SUM OF COMPONENTS DUE TO INDEPENDENT ROUNDING. FOR TABLE FOOTNOTES AND SOURCES SEE PAGE 219.

TABLE D.4.4. TRANSPORTATION SECTOR ENERGY CONSUMPTION BY MODE
CASE D: HIGHER VEHICLE EFFICIENCY

	1980	1985	1986	1987	1988	1989	1990
FUEL CONSUMPTION, ALL MODES							
GASOLINE(1)	12.712	12.108	11.481	10.806	10.206	9.770	9.431
DISTILLATE(1)	2.782	2.890	2.962	3.036	3.108	3.198	3.309
JET FUEL(1)	2.179	2.331	2.390	2.434	2.468	2.516	2.572
RESIDUAL(1)	1.401	1.053	1.077	1.100	1.119	1.145	1.178
LIQUID GAS(1)	0.014	0.015	0.015	0.015	0.015	0.015	0.015
FUEL USE IN LIGHT DUTY VEHICLES							
SALES:LIGHT DUTY VEHICLES(3)	10.750	13.254	13.644	14.123	14.702	15.081	15.004
VEHICLE-MILES:TOTAL(2)	1384.	1614.	1642.	1661.	1679.	1710.	1746.
FLEET-MILES PER GALLON:TOTAL	14.15	17.17	18.38	19.68	20.97	22.17	23.29
PERCENT FLEET VMT DIESEL	0.010	0.021	0.025	0.032	0.039	0.046	0.054
VEHICLE-MILES:GAS(2)	1370.	1581.	1600.	1609.	1615.	1631.	1651.
FLEET-MILES PER GALLON:GAS	13.94	16.97	18.12	19.36	20.57	21.70	22.75
FUEL USE:GAS(4)	98.218	93.133	88.297	83.084	78.484	75.172	72.556
VEHICLE-MILES:DIESEL(2)	14.	33.	42.	52.	65.	79.	95.
FLEET-MILES PER GALLON:DIESEL	25.30	27.29	28.41	29.61	30.70	31.65	32.50
FUEL USE:DIESEL(4)	0.563	1.218	1.470	1.768	2.106	2.494	2.922
FUEL USE IN HEAVY TRUCKS							
SALES:HEAVY TRUCKS(3)	0.487	0.644	0.675	0.706	0.736	0.756	0.734
VEHICLE-MILES:TOTAL(2)	105.	124.	128.	131.	134.	137.	141.
FLEET-MILES PER GALLON:TOTAL	5.82	6.85	7.07	7.29	7.52	7.75	7.94
PERCENT FLEET VMT DIESEL	0.591	0.656	0.669	0.683	0.697	0.710	0.722
VEHICLE-MILES:GAS(2)	43.	43.	42.	41.	40.	40.	39.
FLEET-MILES PER GALLON:GAS	6.84	8.29	8.60	8.92	9.25	9.56	9.78
FUEL USE:GAS(4)	6.256	5.169	4.912	4.649	4.379	4.149	4.009
VEHICLE-MILES:DIESEL(2)	62.	82.	85.	89.	93.	97.	102.
FLEET-MILES PER GALLON:DIESEL	5.09	6.09	6.31	6.54	6.77	7.01	7.23
FUEL USE:DIESEL(4)	12.147	13.393	13.538	13.655	13.733	13.877	14.106
FUEL USE IN AIR							
REVENUE PASSENGER-MILES(3)	265.	343.	361.	374.	384.	397.	413.
AVERAGE FLIGHT SIZE	158.	167.	170.	172.	174.	176.	178.
LOAD FACTOR	0.62	0.64	0.64	0.65	0.65	0.66	0.66
FUEL BURNED PER SEAT-MILE(5)	0.023	0.022	0.021	0.021	0.021	0.020	0.020
TOTAL JET FUEL(4)	16.529	19.019	19.506	19.860	20.140	20.531	20.989
FUEL USE IN OTHER							
NON-HWY DSL(1)	4.436	4.696	4.777	4.856	4.922	4.991	5.072
RESIDUAL(1)	1.545	1.793	1.834	1.872	1.906	1.950	2.005

(1) QUADRILLION BTU PER YEAR.
(2) BILLIONS PER YEAR.
(3) MILLIONS PER YEAR.
(4) BILLIONS OF GALLONS PER YEAR.
(5) GALLONS PER YEAR.
NOTE: ENTRIES FOR 1980 ARE A COMBINATION OF HISTORICAL AND ESTIMATED VALUES.

Case E
High Utilization of Existing Powerplants

Due to forced outages, schedule maintenance, or insufficient demand, electric powerplants do not operate around-the-clock. Typically, a "baseload" plant generates electricity about 60 to 65 percent of the time. This study assumes a 2 percent increase in the utilization rate of existing steam and nuclear plants over the base assumption of 62 percent (based upon average usage in 1980 and 1981).

A higher utilization rate would enable utilities to produce more electricity using their more economical units, particularly coal-fired and nuclear plants. Projected utility coal consumption would increase by about 1 percent in 1985 and 2 percent in 1990. Similarly, fuel inputs to nuclear plants would rise by 5 percent in 1985 and 3 percent in 1990.

The increased use of the more economical coal and nuclear capacity would also lower prices and increase the electricity demand slightly. The additional output from the existing coal and nuclear plants would exceed the incremental electricity demand reduction, resulting in the displacement of some existing oil and natural gas capacity. Consequently, the combined utility oil and gas consumption would be about 3.5 percent lower in 1985 and 4.7 percent less in 1990.

THE FOLLOWING SECTION OF TABLES ARE FOR THE:

CASE E: HIGH UTILIZATION OF EXISTING POWERPLANTS

THIS SECTION CONTAINS THE FOLLOWING TABLES:

TABLE E.1.1. YEARLY SUPPLY AND DISPOSITION OF TOTAL ENERGY
CASE E: HIGH UTILIZATION OF EXISTING POWERPLANTS
(QUADRILLION BTU PER YEAR)

	1975	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990
SUPPLY												
PRODUCTION												
PETROLEUM..........	20.1	20.5	20.4	20.6	20.5	20.6	20.5	20.5	20.5	20.5	20.3	19.3
NATURAL GAS........	19.6	20.1	19.9	18.2	17.5	17.0	15.1	14.6	14.7	15.3	15.8	16.3
COAL...............	15.2	19.2	19.1	19.1	19.4	19.6	20.4	21.0	21.6	22.3	23.1	24.2
NUCLEAR............	1.9	2.7	2.9	3.0	3.2	3.8	4.3	4.9	5.5	6.0	6.3	6.5
HYDRO/GEO/OTHER....	3.2	3.0	2.9	3.3	3.2	3.0	3.1	3.0	3.0	3.0	3.0	3.1
SUBTOTAL.........	60.1	65.5	65.2	64.2	63.7	64.0	63.4	64.1	65.3	67.1	68.5	69.4
NET IMPORTS												
CRUDE OIL..........	8.7	10.6	8.8	6.8	7.5	10.4	12.9	12.6	11.9	11.3	10.9	11.8
OTHER PETROLEUM....	3.8	2.9	2.6	2.1	2.5	2.9	3.0	3.1	3.1	3.1	3.1	3.1
NG (CONTRACTED)(1).	0.9	1.0	.9	.9	1.1	1.2	1.2	1.2	1.2	1.2	1.2	1.2
OTHER GAS(2).......	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.2	0.0	0.0	0.0
COAL AND COKE......	-1.7	-2.4	-2.9	-2.8	-2.6	-2.7	-2.9	-3.0	-3.2	-3.4	-3.6	-3.8
ELECTRICITY........	0.1	.2	.2	.2	.2	0.3	0.3	0.3	0.3	0.3	0.4	0.4
SUBTOTAL.........	11.7	12.3	9.6	7.3	8.6	12.2	14.6	14.5	13.6	12.6	12.0	12.7
SPR ADDITIONS(3)....	0.0	-.1	-.7	-.4	-.4	-0.3	-0.3	-0.3	-0.3	-0.3	-0.3	-0.3
STOCK WITHDRAWALS...	-1.1	-1.8	0.0	-.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL SUPPLY.........	70.7	75.9	74.1	70.9	71.9	75.8	77.7	78.3	78.5	79.3	80.2	81.8
CONSUMPTION												
NON-ELEC UTILITY FUEL												
PETROLEUM..........	29.5	31.5	29.9	28.6	29.2	30.7	32.0	31.8	31.2	30.6	30.3	30.3
NATURAL GAS(4).....	16.7	16.6	16.1	15.0	14.9	14.5	13.7	13.5	13.5	13.7	13.9	14.1
COAL...............	4.0	3.4	3.4	3.0	2.9	3.2	3.3	3.3	3.4	3.5	3.6	3.8
SUBTOTAL.........	50.2	51.4	49.4	46.4	47.0	48.4	49.0	48.6	48.0	47.8	47.8	48.2
ELECTRIC UTILITY FUEL												
PETROLEUM..........	3.2	2.7	2.2	1.8	1.5	2.9	4.0	4.1	4.1	4.1	3.8	3.8
NATURAL GAS........	3.2	3.8	3.8	3.3	3.4	2.7	1.6	1.6	1.7	1.8	2.1	2.3
COAL...............	8.8	12.1	12.7	12.7	13.2	13.7	14.3	14.7	15.0	15.4	15.9	16.6
NUCLEAR............	1.9	2.7	2.9	3.0	3.2	3.8	4.3	4.9	5.5	6.0	6.3	6.5
HYDRO/GEO/OTHER(5).	3.4	3.2	3.1	3.5	3.4	3.3	3.4	3.4	3.4	3.4	3.4	3.4
SUBTOTAL.........	20.5	24.5	24.7	24.3	24.7	26.0	27.3	28.3	29.2	30.3	31.2	32.4
TOTAL CONSUMPTION....	70.7	75.9	74.1	70.7	71.7	74.4	76.3	77.0	77.3	78.1	79.0	80.6
ADJUSTMENTS												
REFINERY LOSSES(6).	0.0	0.0	0.0	0.0	-0.1	0.0	0.2	0.2	0.2	0.2	0.2	0.2
DISCREPANCY(7).....	0.0	0.0	0.0	0.2	0.3	1.4	1.2	1.1	1.0	1.0	1.0	1.0
TOTAL DISPOSITION....	70.7	75.9	74.1	70.9	71.9	75.8	77.7	78.3	78.5	79.3	80.2	81.8

NOTE: THE "ANNUAL ENERGY REVIEW" FOR 1982 WILL CONTAIN LATER REVISIONS TO HISTORICAL DATA FOR 1975, 1980 AND 1982.
NOTE: TOTALS MAY NOT EQUAL SUM OF COMPONENTS DUE TO INDEPENDENT ROUNDING. FOR TABLE FOOTNOTES AND SOURCES SEE PAGE 219.

TABLE E.1.2. SUPPLY/DEMAND BALANCE
CASE E: HIGH UTILIZATION OF EXISTING POWERPLANTS
(QUADRILLION BTU PER YEAR)

	1975	1980	1985	1986	1987	1988	1989	1990
DOMESTIC SUPPLY								
COAL..................	15.2	19.2	20.4	21.0	21.6	22.3	23.1	24.2
NATURAL GAS...........	19.6	19.9	15.1	14.6	14.7	15.3	15.8	16.3
PETROLEUM.............	20.1	20.5	20.5	20.5	20.5	20.5	20.3	19.3
NUCLEAR...............	1.9	2.7	4.3	4.9	5.5	6.0	6.3	6.5
OTHER(1)..............	3.2	3.0	3.1	3.0	3.0	3.0	3.0	3.1
TOTAL DOMESTIC SUPPLY.................	60.0	65.3	63.4	64.1	65.3	67.1	68.5	69.4
NATURAL GAS IMPORTS...	0.9	1.0	1.2	1.2	1.2	1.2	1.2	1.2
SUPPLEMENTAL GAS(2)...	0.0	0.2	0.0	0.3	0.2	0.0	0.0	0.0
PETROLEUM IMPORTS.....	12.5	13.5	15.9	15.7	15.0	14.3	14.0	14.9
TOTAL SUPPLY(3).........	73.4	80.0	80.5	81.3	81.7	82.6	83.8	85.6
DISPOSITION								
RESIDENTIAL...........	9.6	9.3	9.2	9.2	9.2	9.2	9.3	9.3
COMMERCIAL............	5.5	5.9	6.6	6.7	6.8	6.8	6.8	6.9
INDUSTRIAL(4).........	21.3	23.0	22.2	22.4	22.5	23.0	23.4	24.1
TRANSPORTATION........	17.7	19.7	18.6	18.2	17.7	17.3	17.0	16.9
TOTAL END-USE CONSUMPTION.............	54.1	57.9	56.6	56.5	56.2	56.3	56.5	57.2
DISCREPANCY.............	0.2	-0.1	-0.2	-0.1	-0.2	-0.4	-0.4	-0.4
ADJUSTMENTS.............	19.1	22.2	24.1	24.9	25.7	26.7	27.7	28.8
UTILITY GENERATION....	13.7	16.5	18.4	19.0	19.6	20.3	20.9	21.7
UTILITY TRANSMISSION..	0.6	0.7	0.9	0.9	0.9	1.0	1.0	1.0
REFINERY(5)...........	0.0	0.0	0.2	0.2	0.2	0.2	0.2	0.2
GAS PIPELINE(6).......	0.6	0.6	1.1	1.0	1.0	1.1	1.1	1.1
LEASE/PLANT FUEL(7)...	1.4	1.0	1.1	1.1	1.1	1.1	1.2	1.2
COAL EXPORTS..........	1.7	2.4	2.9	3.0	3.2	3.4	3.6	3.8
SPR ADDITIONS.........	0.0	0.1	0.3	0.3	0.3	0.3	0.3	0.3
STOCK WITHDRAWALS.....	1.1	1.8	0.0	0.0	0.0	0.0	0.0	0.0
RECLASSIFIED..........	0.0	-0.9	-0.7	-0.7	-0.7	-0.6	-0.6	-0.6
ADJUSTED CONSUMPTION....	73.4	80.0	80.5	81.3	81.7	82.6	83.8	85.6
ELECTRIC UTILITY FUEL								
COAL..................	8.8	12.1	14.3	14.7	15.0	15.4	15.9	16.6
PETROLEUM.............	3.2	2.7	4.0	4.1	4.1	4.1	3.8	3.8
NATURAL GAS...........	3.2	3.8	1.6	1.6	1.7	1.8	2.1	2.3
TOTAL FOSSIL............	15.2	18.6	20.0	20.4	20.7	21.3	21.8	22.8
NUCLEAR...............	1.9	2.7	4.3	4.9	5.5	6.0	6.3	6.5
OTHER.................	3.2	3.0	3.1	3.0	3.0	3.0	3.0	3.1
TOTAL...................	20.3	24.3	27.3	28.3	29.2	30.3	31.2	32.4
GENERATION..............	6.6	7.8	9.0	9.3	9.6	10.0	10.3	10.7

NOTE: TOTALS MAY NOT EQUAL SUM OF COMPONENTS DUE TO INDEPENDENT ROUNDING. FOR TABLE FOOTNOTES AND SOURCES SEE PAGE 219.

TABLE E.1.3. CONSUMPTION SUMMARY
CASE E: HIGH UTILIZATION OF EXISTING POWERPLANTS
(QUADRILLION BTU PER YEAR)

	1975	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990
RESIDENTIAL	9.571	9.335	9.104	9.236	9.143	9.173	9.208	9.233	9.239	9.242	9.255	9.275
STEAM COAL............	0.091	0.065	0.080	0.082	0.071	0.078	0.076	0.074	0.073	0.071	0.069	0.068
NATURAL GAS...........	5.022	4.866	4.654	4.793	4.710	4.650	4.587	4.524	4.465	4.415	4.377	4.346
DISTILLATE(1)..........	1.923	1.417	1.375	1.303	1.230	1.308	1.328	1.336	1.332	1.318	1.302	1.286
LIQUID PETROLEUM GAS...	0.528	0.539	0.536	0.570	0.590	0.565	0.576	0.582	0.582	0.578	0.574	0.570
ELECTRICITY	2.007	2.448	2.459	2.488	2.530	2.572	2.641	2.717	2.788	2.859	2.932	3.005
COMMERCIAL	5.513	5.892	5.818	5.866	6.182	6.436	6.601	6.709	6.760	6.778	6.819	6.867
STEAM COAL............	0.135	0.095	0.107	0.122	0.086	0.097	0.095	0.092	0.090	0.087	0.085	0.083
NATURAL GAS...........	2.559	2.674	2.580	2.683	2.720	2.731	2.724	2.694	2.646	2.590	2.544	2.502
DISTILLATE(1)..........	0.622	0.556	0.540	0.511	0.670	0.738	0.775	0.801	0.815	0.820	0.825	0.828
LO-SULFUR RESIDUAL.....	0.506	0.566	0.470	0.376	0.490	0.542	0.569	0.588	0.598	0.602	0.606	0.608
LIQUID PETROLEUM GAS...	0.093	0.095	0.095	0.101	0.090	0.080	0.078	0.076	0.074	0.072	0.070	0.068
ELECTRICITY	1.598	1.906	2.026	2.074	2.150	2.249	2.360	2.457	2.537	2.606	2.690	2.779
INDUSTRIAL(2)	18.503	20.185	19.513	16.876	17.365	18.921	19.637	19.865	20.043	20.534	20.973	21.732
STEAM COAL............	1.619	1.388	1.570	1.626	1.501	1.769	1.798	1.846	1.924	2.026	2.134	2.241
METALLURGICAL COAL.....	2.178	1.793	1.647	1.057	1.132	1.262	1.302	1.324	1.336	1.352	1.359	1.374
NATURAL GAS...........	6.133	6.497	6.639	5.414	5.340	5.348	4.934	4.837	4.903	5.171	5.360	5.629
DISTILLATE............	1.272	1.569	1.285	1.212	1.340	1.741	2.208	2.242	2.136	2.025	1.952	1.936
LO-SULFUR RESIDUAL.....	0.428	0.554	0.423	0.368	0.390	0.484	0.548	0.557	0.550	0.545	0.542	0.558
HI-SULFUR RESIDUAL.....	0.856	0.713	0.531	0.483	0.530	0.702	0.833	0.852	0.841	0.827	0.821	0.840
LIQUID PETROLEUM GAS...	0.252	0.308	0.323	0.332	0.370	0.365	0.381	0.357	0.312	0.265	0.219	0.182
PET-CHEM FEEDSTOCK(3)..	1.519	2.401	2.111	1.862	1.980	2.177	2.294	2.374	2.453	2.560	2.675	2.839
OTHER(4)...............	1.900	2.180	2.166	1.977	2.240	2.207	2.259	2.253	2.241	2.239	2.258	2.288
ELECTRICITY	2.346	2.781	2.817	2.545	2.620	2.867	3.081	3.222	3.347	3.522	3.653	3.846
TRANSPORTATION(5)	17.725	19.655	18.715	18.129	17.910	18.541	18.610	18.190	17.700	17.267	17.037	16.941
DISTILLATE............	2.069	2.782	2.738	2.582	2.510	2.781	2.892	2.964	3.039	3.111	3.201	3.312
HI-SULFUR RESIDUAL.....	0.731	1.401	1.163	0.930	0.900	1.013	1.055	1.079	1.102	1.122	1.149	1.182
GASOLINE(6)............	12.868	13.253	12.688	12.528	12.180	12.473	12.291	11.714	11.084	10.524	10.129	9.832
JET FUEL(7)............	2.029	2.179	2.087	2.049	2.280	2.234	2.332	2.392	2.435	2.470	2.518	2.574
LIQUID PETROLEUM GAS...	0.016	0.014	0.014	0.015	0.020	0.015	0.015	0.015	0.015	0.015	0.015	0.015
OTHER..................	0.000	0.014	0.014	0.014	0.010	0.014	0.014	0.014	0.014	0.014	0.014	0.014
ELECTRICITY	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010
ELECTRIC UTILITY FUEL	20.360	24.243	24.462	24.203	24.480	25.999	27.313	28.338	29.229	30.272	31.198	32.375
STEAM COAL............	8.790	12.122	12.707	12.697	13.190	13.687	14.307	14.691	14.962	15.386	15.884	16.597
NATURAL GAS...........	3.240	3.807	3.764	3.336	3.440	2.671	1.625	1.635	1.679	1.800	2.120	2.334
DISTILLATE(8)..........	0.350	0.121	0.077	0.048	0.090	0.159	0.307	0.310	0.265	0.279	0.318	0.403
LO-SULFUR RESIDUAL(9)..	2.860	1.611	1.251	0.980	0.780	1.775	2.583	2.639	2.655	2.616	2.343	2.255
HI-SULFUR RESIDUAL.....	NA	0.922	0.898	0.789	0.600	0.918	1.153	1.172	1.177	1.181	1.163	1.179
HYDRO/GEO/OTHER(10)....	3.220	2.988	2.864	3.340	3.190	3.003	3.064	3.036	3.039	3.022	3.037	3.062
NUCLEAR................	1.900	2.672	2.901	3.013	3.190	3.785	4.275	4.855	5.451	5.988	6.333	6.545
REFINERY FUEL(11)	2.769	2.787	2.304	2.190	2.480	2.355	2.559	2.546	2.489	2.431	2.380	2.373
NATURAL GAS...........	0.975	0.846	0.668	0.574	0.720	0.439	0.304	0.281	0.290	0.327	0.350	0.381
DISTILLATE............	0.035	0.018	0.011	0.011	0.010	0.012	0.013	0.013	0.012	0.012	0.012	0.012
LO-SULFUR RESIDUAL.....	NA	NA	NA	NA	0.090	0.118	0.149	0.151	0.142	0.130	0.122	0.118
HI-SULFUR RESIDUAL.....	0.269	0.213	0.167	0.137	0.200	0.293	0.470	0.487	0.466	0.420	0.387	0.358
LIQUID PETROLEUM GAS...	0.050	0.043	0.024	0.038	0.030	0.026	0.028	0.028	0.027	0.026	0.026	0.026
OTHER(12)..............	0.390	0.436	0.359	0.348	0.360	0.365	0.397	0.395	0.386	0.377	0.369	0.368
STILL GAS..............	1.050	1.231	1.073	1.085	1.080	1.102	1.198	1.192	1.165	1.138	1.114	1.111

NOTE: TOTALS MAY NOT EQUAL SUM OF COMPONENTS DUE TO INDEPENDENT ROUNDING. FOR TABLE FOOTNOTES AND SOURCES SEE PAGE 219.

TABLE E.1.4. PRICE SUMMARY
CASE E: HIGH UTILIZATION OF EXISTING POWERPLANTS
(1982 DOLLARS PER MILLION BTU)

	1975	1980	1985	1986	1987	1988	1989	1990
WORLD OIL PRICE.........	20.70	39.32	25.47	28.24	31.53	34.11	35.68	36.71
RESIDENTIAL	5.95	8.33	9.47	10.23	10.88	11.24	11.45	11.69
NATURAL GAS...........	2.75	4.16	6.61	7.42	8.00	8.25	8.33	8.52
DISTILLATE(1).........	4.75	8.59	6.27	6.93	7.72	8.35	8.75	9.02
LIQUID PETROLEUM GAS..	4.11	6.67	6.03	6.67	7.36	7.89	8.20	8.48
ELECTRICITY	15.61	16.78	17.01	17.51	17.97	18.09	18.14	18.24
COMMERCIAL	6.27	8.38	10.01	10.78	11.45	11.84	12.10	12.40
NATURAL GAS...........	2.17	3.84	6.37	7.23	7.84	8.11	8.25	8.46
DISTILLATE(1).........	4.30	8.06	5.93	6.56	7.31	7.91	8.29	8.54
LO-SULFUR RESIDUAL....	4.13	5.32	4.78	5.31	5.92	6.43	6.75	7.06
LIQUID PETROLEUM GAS..	NA	6.67	6.04	6.68	7.38	7.91	8.22	8.50
ELECTRICITY	15.55	17.21	17.26	17.79	18.29	18.46	18.53	18.64
INDUSTRIAL(2)	3.37	5.44	6.43	7.02	7.57	7.90	8.09	8.27
STEAM COAL............	1.81	1.55	2.10	2.13	2.16	2.20	2.25	2.34
METALLURGICAL COAL....	2.80	2.51	2.57	2.59	2.61	2.64	2.67	2.72
NATURAL GAS...........	1.49	2.90	5.57	6.44	6.99	7.10	7.16	7.21
DISTILLATE............	4.24	7.99	5.84	6.47	7.21	7.81	8.18	8.43
LO-SULFUR RESIDUAL....	4.11	5.14	4.70	5.22	5.82	6.32	6.64	6.94
HI-SULFUR RESIDUAL....	2.93	NA	4.19	4.72	5.34	5.86	6.18	6.49
LIQUID PETROLEUM GAS..	3.83	6.34	5.82	6.44	7.11	7.61	7.91	8.17
PET-CHEM FEEDSTOCK(3).	NA	7.88	6.72	7.41	8.25	8.92	9.34	9.63
OTHER(4)..............	NA	NA	5.18	5.71	6.35	6.88	7.21	7.45
ELECTRICITY	9.42	11.67	14.09	14.52	14.94	15.08	15.13	15.26
TRANSPORTATION(5)	6.72	9.91	7.75	8.43	9.21	9.78	10.07	10.21
DISTILLATE............	5.85	8.39	6.21	6.87	7.66	8.29	8.69	8.95
HI-SULFUR RESIDUAL....	2.93	3.97	3.64	4.13	4.68	5.16	5.45	5.74
GASOLINE(6)...........	7.57	11.32	8.69	9.47	10.35	10.97	11.29	11.41
JET FUEL(7)...........	3.69	7.51	6.59	7.23	8.04	8.68	9.08	9.34
LIQUID PETROLEUM GAS..	NA	NA	5.77	6.39	7.06	7.57	7.88	8.15
ELECTRICITY	NA	NA	16.62	17.17	17.68	17.88	17.96	18.05
ELECTRIC UTILITY FUEL	2.04	1.84	2.05	2.17	2.26	2.33	2.37	2.45
STEAM COAL............	1.58	1.71	1.74	1.76	1.78	1.79	1.82	1.86
NATURAL GAS...........	1.14	2.80	5.48	6.42	6.98	6.99	7.13	7.20
DISTILLATE(8).........	3.28	7.22	5.85	6.49	7.24	7.84	8.20	8.46
LO-SULFUR RESIDUAL(9).	3.27	5.90	4.79	5.32	5.94	6.46	6.69	6.95
HI-SULFUR RESIDUAL....	NA	4.55	3.67	4.15	4.70	5.16	5.45	5.74
NUCLEAR...............	NA	.85	0.85	0.85	0.85	0.85	0.85	0.85
REFINERY FUEL	NA	NA	2.30	2.59	2.90	3.14	3.28	3.39
NATURAL GAS...........	NA	3.08	4.69	5.49	6.05	6.18	6.22	6.23
DISTILLATE............	NA	6.09	5.14	5.70	6.36	6.90	7.23	7.46
LO-SULFUR RESIDUAL....	NA	NA	4.12	4.59	5.13	5.59	5.88	6.16
HI-SULFUR RESIDUAL....	NA	4.89	3.46	3.93	4.47	4.94	5.22	5.51
LIQUID PETROLEUM GAS..	NA	NA	5.12	5.69	6.29	6.75	7.02	7.28
OTHER(10).............	NA	NA	5.07	5.60	6.24	6.77	7.10	7.34

NOTE: TOTALS MAY NOT EQUAL SUM OF COMPONENTS DUE TO INDEPENDENT ROUNDING. FOR TABLE FOOTNOTES AND SOURCES SEE PAGE 219.

TABLE E.5.1. ELECTRIC UTILITY FUEL PRICES AND CONSUMPTION
CASE E: HIGH UTILIZATION OF EXISTING POWERPLANTS
(1982 DOLLARS PER MILLION BTU; TRILLIONS OF BTU PER YEAR)

YEARS	COAL	NATURAL GAS	DISTILLATE	LO-S RESID	HI-S RESID	FOSSIL FUEL	NUCLEAR	HYDRO	ALL FUELS
FUEL PRICES									
1980	1.71	2.80	7.22	5.90	4.55	NA	NA	--	NA
1985	1.74	5.48	5.83	4.79	3.67	2.61	0.85	--	2.05
1986	1.76	6.42	6.49	5.32	4.15	2.80	0.85	--	2.17
1987	1.78	6.98	7.22	5.94	4.70	2.97	0.85	--	2.26
1988	1.79	6.99	7.83	6.46	5.16	3.07	0.85	--	2.33
1989	1.82	7.13	8.17	6.69	5.46	3.14	0.85	--	2.37
1990	1.86	7.20	8.43	6.95	5.74	3.23	0.85	--	2.44
FUEL CONSUMPTION									
1980	12122.	3807.	121.	1611.	922.	18583.	2672.	2988.	24243.
1985	14307.	1625.	307.	2583.	1153.	19975.	4275.	3064.	27313.
1986	14691.	1635.	310.	2639.	1172.	20447.	4855.	3036.	28338.
1987	14962.	1679.	265.	2655.	1177.	20738.	5451.	3039.	29229.
1988	15386.	1800.	279.	2616.	1181.	21262.	5988.	3022.	30272.
1989	15884.	2120.	318.	2343.	1163.	21828.	6333.	3037.	31198.
1990	16597.	2334.	403.	2255.	1179.	22767.	6545.	3062.	32375.

NA=NOT AVAILABLE.
--=NOT APPLICABLE.
NOTE: ENTRIES FOR 1980 ARE HISTORICAL DATA.
SOURCES: ON PAGE 222, SEE 1; 2, PP 160-170, TABLES B1, B2, B3, AND B4; 2, PP 253-255, TABLE C9; 2, PP 262-263, TABLE C13; 2, PP 270-271, TABLE C17; AND 2, PP 290-291, TABLE C27.

TABLE E.5.2. END-USE ELECTRICITY PRICES AND CONSUMPTION
CASE E: HIGH UTILIZATION OF EXISTING POWERPLANTS
(1982 MILLS PER KWH; BILLION KWH PER YEAR)

YEARS	RESIDENTIAL	COMMERCIAL	TRANSPORTATION	INDUSTRIAL	AVG./TOTAL
END-USE PRICES					
1980	57.25	58.72	NA	39.82	50.82
1985	58.05	58.88	56.71	48.08	54.49
1986	59.73	60.70	58.57	49.55	56.11
1987	61.30	62.41	60.32	50.99	57.65
1988	61.74	62.99	61.01	51.44	58.07
1989	61.88	63.22	61.28	51.64	58.24
1990	62.24	63.59	61.59	52.07	58.57
END-USE CONSUMPTION					
1980	717.50	558.91	0.00	815.06	2091.47
1985	774.12	691.70	3.05	903.06	2371.93
1986	796.21	720.17	3.05	944.34	2463.77
1987	817.25	743.63	3.05	980.98	2544.91
1988	838.09	763.88	3.05	1032.37	2637.38
1989	859.36	788.32	3.05	1070.68	2721.40
1990	880.64	814.64	3.05	1127.20	2825.53

NA=NOT AVAILABLE.
NOTE: ENTRIES FOR 1980 ARE HISTORICAL DATA.
SOURCES: ON PAGE 222, SEE 1, PP 15-18; AND 2, PP 229-40, TABLES C1, C2, C3, AND C4.

Case F
Lower Switching Flexibility for Existing Powerplants

Some electric powerplants are capable of burning either of two input fuels, which allows the utility to choose the most economical one. This provides considerable flexibility since the input fuel can be switched in the event of changes in the relative prices of the fuels available to the utility.

In the midprice case, electric utilities in some regions are projected to begin switching from natural gas to oil as the relatively rapid escalation in the cost of natural gas causes its delivered price to utilities to approach, and even exceed, the corresponding residual fuel oil price. This study examines the effect of restricting such fuel switches. In the middle world oil price Case A, if there is evidence that in 1981 a utility burned two fuels and it is recorded as being duel fired then that capacity is allowed to use either fuel on the basis of economics.

In Case F, it is assumed that the present primary fuel must account for at least half of the total fuel inputs for each dual-fired unit for all future periods.

Currently, oil is the most expensive fossil fuel, so it generally serves as the alternate fuel. Coal is projected to maintain a significant economic advantage over both oil and natural gas, so it would not be involved in any fuel switching. However, limiting the dual-fired capability would have a considerable impact on utility oil and gas consumption. In 1985, it is projected that utility oil use would decline by 17 percent compared to the midprice case, while natural gas consumption would increase by 47 percent. This switch would continue throughout the decade and utility oil demand in 1990 would be 10 percent lower and natural gas consumption would be 17 percent higher.

Case F

THE FOLLOWING SECTION OF TABLES ARE FOR THE:

CASE F: LOWER SWITCHING FLEXIBILITY FOR EXISTING POWERPLANTS

THIS SECTION CONTAINS THE FOLLOWING TABLES:

TABLE F.1.1. YEARLY SUPPLY AND DISPOSITION OF TOTAL ENERGY
CASE F: LOWER SWITCHING FLEXIBILITY FOR EXISTING POWERPLANTS
(QUADRILLION BTU PER YEAR)

	1975	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990
SUPPLY												
PRODUCTION												
PETROLEUM..........	20.1	20.5	20.4	20.6	20.5	20.6	20.4	20.5	20.5	20.4	20.2	19.3
NATURAL GAS........	19.6	20.1	19.9	18.2	17.5	17.1	15.4	14.9	15.0	15.7	16.3	16.7
COAL...............	15.2	19.2	19.1	19.1	19.4	19.4	20.3	20.9	21.4	22.1	22.8	23.9
NUCLEAR............	1.9	2.7	2.9	3.0	3.2	3.7	4.1	4.7	5.3	5.8	6.1	6.3
HYDRO/GEO/OTHER....	3.2	3.0	2.9	3.3	3.2	3.0	3.0	3.1	3.1	3.0	3.1	3.1
SUBTOTAL.........	60.1	65.5	65.2	64.2	63.7	63.8	63.2	64.0	65.1	67.0	68.5	69.3
NET IMPORTS												
CRUDE OIL..........	8.7	10.6	8.8	6.8	7.5	10.2	12.5	12.2	11.5	11.0	10.8	11.7
OTHER PETROLEUM....	3.8	2.9	2.6	2.1	2.5	2.9	3.1	3.1	3.1	3.0	3.0	3.0
NG (CONTRACTED)(1).	0.9	1.0	.9	.9	1.1	1.2	1.2	1.2	1.2	1.2	1.2	1.2
OTHER GAS(2).......	0.0	0.0	0.0	0.0	0.0	0.3	0.5	0.7	0.7	0.3	0.0	0.0
COAL AND COKE......	-1.7	-2.4	-2.9	-2.8	-2.6	-2.7	-2.9	-3.0	-3.2	-3.4	-3.6	-3.8
ELECTRICITY........	0.1	.2	.2	.2	.2	0.3	0.3	0.3	0.3	0.3	0.4	0.4
SUBTOTAL.........	11.7	12.3	9.6	7.3	8.6	12.3	14.8	14.6	13.6	12.5	11.8	12.6
SPR ADDITIONS(3)....	0.0	-.1	-.7	-.4	-.4	-0.3	-0.3	-0.3	-0.3	-0.3	-0.3	-0.3
STOCK WITHDRAWALS...	-1.1	-1.8	0.0	-.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL SUPPLY.........	70.7	75.9	74.1	70.9	71.9	75.9	77.7	78.2	78.5	79.2	80.0	81.6
CONSUMPTION												
NON-ELEC UTILITY FUEL												
PETROLEUM..........	29.5	31.5	29.9	28.6	29.2	30.8	32.2	31.9	31.3	30.7	30.4	30.3
NATURAL GAS(4).....	16.7	16.6	16.1	15.0	14.9	14.4	13.5	13.4	13.3	13.5	13.7	14.1
COAL...............	4.0	3.4	3.4	3.0	2.9	3.2	3.3	3.3	3.4	3.5	3.6	3.7
SUBTOTAL.........	50.2	51.4	49.4	46.4	47.0	48.4	49.0	48.6	48.0	47.8	47.7	48.2
ELECTRIC UTILITY FUEL												
PETROLEUM..........	3.2	2.7	2.2	1.8	1.5	2.6	3.4	3.5	3.5	3.5	3.5	3.6
NATURAL GAS........	3.2	3.8	3.8	3.3	3.4	3.2	2.5	2.5	2.5	2.6	2.7	2.8
COAL...............	8.8	12.1	12.7	12.7	13.2	13.5	14.2	14.5	14.8	15.2	15.7	16.3
NUCLEAR............	1.9	2.7	2.9	3.0	3.2	3.7	4.1	4.7	5.3	5.8	6.1	6.3
HYDRO/GEO/OTHER(5).	3.4	3.2	3.1	3.5	3.4	3.3	3.4	3.4	3.4	3.4	3.4	3.5
SUBTOTAL.........	20.5	24.5	24.7	24.3	24.7	26.0	27.2	28.2	29.1	30.1	31.0	32.1
TOTAL CONSUMPTION....	70.7	75.9	74.1	70.7	71.7	74.4	76.2	76.8	77.1	77.9	78.7	80.3
ADJUSTMENTS												
REFINERY LOSSES(6).	0.0	0.0	0.0	0.0	-0.1	0.0	0.1	0.1	0.1	0.2	0.2	0.2
DISCREPANCY(7).....	0.0	0.0	0.0	0.2	0.3	1.5	1.4	1.3	1.3	1.1	1.1	1.1
TOTAL DISPOSITION....	70.7	75.9	74.1	70.9	71.9	75.9	77.7	78.2	78.5	79.2	80.0	81.6

NOTE: THE "ANNUAL ENERGY REVIEW" FOR 1982 WILL CONTAIN LATER REVISIONS TO HISTORICAL DATA FOR 1975, 1980 AND 1982.
NOTE: TOTALS MAY NOT EQUAL SUM OF COMPONENTS DUE TO INDEPENDENT ROUNDING. FOR TABLE FOOTNOTES AND SOURCES SEE PAGE 219.

TABLE F.1.2. SUPPLY/DEMAND BALANCE
CASE F: LOWER SWITCHING FLEXIBILITY FOR EXISTING POWERPLANTS
(QUADRILLION BTU PER YEAR)

	1975	1980	1985	1986	1987	1988	1989	1990
DOMESTIC SUPPLY								
COAL..................	15.2	19.2	20.3	20.9	21.4	22.1	22.8	23.9
NATURAL GAS...........	19.6	19.9	15.4	14.9	15.0	15.7	16.3	16.7
PETROLEUM.............	20.1	20.5	20.4	20.5	20.5	20.4	20.2	19.3
NUCLEAR...............	1.9	2.7	4.1	4.7	5.3	5.8	6.1	6.3
OTHER(1)..............	3.2	3.0	3.0	3.1	3.1	3.0	3.1	3.1
TOTAL DOMESTIC SUPPLY................	60.0	65.3	63.2	64.0	65.1	67.0	68.5	69.3
NATURAL GAS IMPORTS...	0.9	1.0	1.2	1.2	1.2	1.2	1.2	1.2
SUPPLEMENTAL GAS(2)...	0.0	0.2	0.5	0.7	0.7	0.3	0.0	0.0
PETROLEUM IMPORTS.....	12.5	13.5	15.6	15.3	14.6	14.0	13.8	14.8
TOTAL SUPPLY(3).........	73.4	80.0	80.5	81.2	81.6	82.5	83.5	85.3
DISPOSITION								
RESIDENTIAL...........	9.6	9.3	9.2	9.2	9.2	9.2	9.2	9.2
COMMERCIAL............	5.5	5.9	6.6	6.7	6.7	6.8	6.8	6.8
INDUSTRIAL(4).........	21.3	23.0	22.1	22.4	22.5	22.9	23.3	24.0
TRANSPORTATION........	17.7	19.7	18.6	18.2	17.7	17.3	17.0	16.9
TOTAL END-USE CONSUMPTION.............	54.1	57.9	56.5	56.5	56.2	56.1	56.3	57.1
DISCREPANCY.............	0.2	-0.1	0.0	-0.1	-0.2	-0.2	-0.3	-0.4
ADJUSTMENTS.............	19.1	22.2	24.0	24.8	25.6	26.6	27.5	28.6
UTILITY GENERATION....	13.7	16.5	18.3	18.9	19.5	20.2	20.8	21.5
UTILITY TRANSMISSION..	0.6	0.7	0.9	0.9	0.9	1.0	1.0	1.0
REFINERY(5)...........	0.0	0.0	0.1	0.1	0.1	0.2	0.2	0.2
GAS PIPELINE(6).......	0.6	0.6	1.1	1.1	1.1	1.1	1.1	1.1
LEASE/PLANT FUEL(7)...	1.4	1.0	1.2	1.1	1.1	1.2	1.2	1.3
COAL EXPORTS..........	1.7	2.4	2.9	3.0	3.2	3.4	3.6	3.8
SPR ADDITIONS.........	0.0	0.1	0.3	0.3	0.3	0.3	0.3	0.3
STOCK WITHDRAWALS.....	1.1	1.8	0.0	0.0	0.0	0.0	0.0	0.0
RECLASSIFIED..........	0.0	-0.9	-0.7	-0.7	-0.7	-0.6	-0.6	-0.6
ADJUSTED CONSUMPTION....	73.4	80.0	80.5	81.2	81.6	82.5	83.5	85.3
ELECTRIC UTILITY FUEL								
COAL..................	8.8	12.1	14.2	14.5	14.8	15.2	15.7	16.3
PETROLEUM.............	3.2	2.7	3.4	3.5	3.5	3.5	3.5	3.6
NATURAL GAS...........	3.2	3.8	2.5	2.5	2.5	2.6	2.7	2.8
TOTAL FOSSIL............	15.2	18.6	20.1	20.5	20.8	21.3	21.8	22.7
NUCLEAR...............	1.9	2.7	4.1	4.7	5.3	5.8	6.1	6.3
OTHER.................	3.2	3.0	3.0	3.1	3.1	3.0	3.1	3.1
TOTAL...................	20.3	24.3	27.2	28.2	29.1	30.1	31.0	32.1
GENERATION..............	6.6	7.8	8.9	9.3	9.6	9.9	10.2	10.6

NOTE: TOTALS MAY NOT EQUAL SUM OF COMPONENTS DUE TO INDEPENDENT ROUNDING. FOR TABLE FOOTNOTES AND SOURCES SEE PAGE 219.

TABLE F.1.3. CONSUMPTION SUMMARY
CASE F: LOWER SWITCHING FLEXIBILITY FOR EXISTING POWERPLANTS
(QUADRILLION BTU PER YEAR)

	1975	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990
RESIDENTIAL	9.571	9.335	9.104	9.236	9.143	9.168	9.193	9.216	9.219	9.215	9.225	9.246
STEAM COAL.............	0.091	0.065	0.080	0.082	0.071	0.078	0.076	0.074	0.073	0.071	0.069	0.068
NATURAL GAS............	5.022	4.866	4.654	4.793	4.710	4.645	4.572	4.510	4.449	4.395	4.355	4.326
DISTILLATE(1)..........	1.923	1.417	1.375	1.303	1.230	1.308	1.329	1.337	1.332	1.319	1.303	1.286
LIQUID PETROLEUM GAS...	0.528	0.539	0.536	0.570	0.590	0.565	0.577	0.583	0.584	0.580	0.576	0.572
ELECTRICITY	2.007	2.448	2.459	2.488	2.530	2.572	2.639	2.712	2.781	2.851	2.922	2.994
COMMERCIAL	5.513	5.892	5.818	5.866	6.182	6.432	6.590	6.694	6.742	6.754	6.791	6.839
STEAM COAL.............	0.135	0.095	0.107	0.122	0.086	0.097	0.095	0.092	0.090	0.087	0.084	0.082
NATURAL GAS............	2.559	2.674	2.580	2.683	2.720	2.727	2.715	2.682	2.631	2.571	2.523	2.481
DISTILLATE(1)..........	0.622	0.556	0.540	0.511	0.670	0.738	0.775	0.802	0.816	0.822	0.826	0.829
LO-SULFUR RESIDUAL.....	0.506	0.566	0.470	0.376	0.490	0.542	0.569	0.589	0.599	0.603	0.607	0.609
LIQUID PETROLEUM GAS...	0.093	0.095	0.095	0.101	0.090	0.080	0.078	0.076	0.074	0.072	0.070	0.068
ELECTRICITY	1.598	1.906	2.026	2.074	2.150	2.248	2.358	2.453	2.532	2.599	2.681	2.770
INDUSTRIAL(2)	18.503	20.185	19.513	16.876	17.365	18.918	19.626	19.868	20.037	20.491	20.914	21.686
STEAM COAL.............	1.619	1.388	1.570	1.626	1.501	1.766	1.789	1.839	1.914	2.010	2.112	2.220
METALLURGICAL COAL.....	2.178	1.793	1.647	1.057	1.132	1.262	1.302	1.325	1.337	1.353	1.359	1.375
NATURAL GAS............	6.133	6.497	6.639	5.414	5.340	5.297	4.785	4.762	4.831	5.041	5.261	5.591
DISTILLATE.............	1.272	1.569	1.285	1.212	1.340	1.767	2.299	2.291	2.180	2.090	1.997	1.952
LO-SULFUR RESIDUAL.....	0.428	0.554	0.423	0.368	0.390	0.493	0.570	0.574	0.566	0.565	0.555	0.565
HI-SULFUR RESIDUAL.....	0.856	0.713	0.531	0.483	0.530	0.715	0.871	0.879	0.867	0.860	0.843	0.850
LIQUID PETROLEUM GAS...	0.252	0.308	0.323	0.332	0.370	0.368	0.389	0.362	0.316	0.269	0.222	0.184
PET-CHEM FEEDSTOCK(3)..	1.519	2.401	2.111	1.862	1.980	2.178	2.293	2.378	2.458	2.561	2.676	2.841
OTHER(4)...............	1.900	2.180	2.166	1.977	2.240	2.207	2.259	2.254	2.241	2.240	2.258	2.288
ELECTRICITY	2.346	2.781	2.817	2.545	2.620	2.866	3.069	3.204	3.327	3.503	3.630	3.821
TRANSPORTATION(5)	17.725	19.655	18.715	18.129	17.910	18.545	18.615	18.195	17.704	17.272	17.040	16.942
DISTILLATE.............	2.069	2.782	2.738	2.582	2.510	2.781	2.892	2.964	3.039	3.111	3.201	3.312
HI-SULFUR RESIDUAL.....	0.731	1.401	1.163	0.930	0.900	1.014	1.057	1.082	1.105	1.124	1.150	1.183
GASOLINE(6)............	12.868	13.253	12.688	12.528	12.180	12.476	12.294	11.717	11.085	10.526	10.130	9.833
JET FUEL(7)............	2.029	2.179	2.087	2.049	2.280	2.234	2.332	2.392	2.435	2.470	2.518	2.574
LIQUID PETROLEUM GAS...	0.016	0.014	0.014	0.015	0.020	0.015	0.015	0.015	0.015	0.015	0.015	0.015
OTHER..................	0.000	0.014	0.014	0.014	0.010	0.014	0.014	0.014	0.014	0.014	0.014	0.014
ELECTRICITY	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010
ELECTRIC UTILITY FUEL	20.360	24.243	24.462	24.203	24.480	25.960	27.226	28.218	29.079	30.094	31.002	32.138
STEAM COAL.............	8.790	12.122	12.707	12.697	13.190	13.534	14.155	14.519	14.785	15.195	15.660	16.332
NATURAL GAS............	3.240	3.807	3.764	3.336	3.440	3.153	2.499	2.474	2.506	2.602	2.703	2.804
DISTILLATE(8)..........	0.350	0.121	0.077	0.048	0.090	0.194	0.366	0.426	0.400	0.376	0.408	0.496
LO-SULFUR RESIDUAL(9)..	2.860	1.611	1.251	0.980	0.780	1.511	2.013	2.039	2.047	2.064	2.035	2.057
HI-SULFUR RESIDUAL.....	NA	0.922	0.898	0.789	0.600	0.876	1.035	1.026	1.028	1.031	1.017	1.028
HYDRO/GEO/OTHER(10)....	3.220	2.988	2.864	3.340	3.190	3.022	3.040	3.056	3.060	3.044	3.066	3.090
NUCLEAR................	1.900	2.672	2.901	3.013	3.190	3.671	4.118	4.678	5.253	5.782	6.114	6.331
REFINERY FUEL(11)	2.769	2.787	2.304	2.190	2.480	2.339	2.523	2.507	2.451	2.396	2.361	2.359
NATURAL GAS............	0.975	0.846	0.668	0.574	0.720	0.415	0.250	0.247	0.256	0.281	0.317	0.364
DISTILLATE.............	0.035	0.018	0.011	0.011	0.010	0.012	0.013	0.012	0.012	0.012	0.012	0.012
LO-SULFUR RESIDUAL.....	NA	NA	NA	NA	0.090	0.124	0.160	0.157	0.149	0.139	0.128	0.121
HI-SULFUR RESIDUAL.....	0.269	0.213	0.167	0.137	0.200	0.306	0.500	0.500	0.479	0.444	0.407	0.367
LIQUID PETROLEUM GAS...	0.050	0.043	0.024	0.038	0.030	0.025	0.027	0.027	0.027	0.026	0.026	0.026
OTHER(12)..............	0.390	0.436	0.359	0.348	0.360	0.363	0.392	0.389	0.380	0.372	0.366	0.366
STILL GAS..............	1.050	1.231	1.073	1.085	1.080	1.095	1.181	1.174	1.147	1.122	1.105	1.104

NOTE: TOTALS MAY NOT EQUAL SUM OF COMPONENTS DUE TO INDEPENDENT ROUNDING. FOR TABLE FOOTNOTES AND SOURCES SEE PAGE 219.

TABLE F.1.4. PRICE SUMMARY
CASE F: LOWER SWITCHING FLEXIBILITY FOR EXISTING POWERPLANTS
(1982 DOLLARS PER MILLION BTU)

	1975	1980	1985	1986	1987	1988	1989	1990
WORLD OIL PRICE.........	20.70	39.32	25.47	28.24	31.53	34.11	35.68	36.71
RESIDENTIAL	5.95	8.33	9.71	10.40	11.06	11.49	11.64	11.79
NATURAL GAS...........	2.75	4.16	6.88	7.58	8.17	8.55	8.55	8.59
DISTILLATE(1).........	4.75	8.59	6.27	6.93	7.72	8.35	8.75	9.02
LIQUID PETROLEUM GAS..	4.11	6.67	6.04	6.63	7.32	7.88	8.20	8.46
ELECTRICITY	15.61	16.78	17.34	17.83	18.30	18.42	18.43	18.45
COMMERCIAL	6.27	8.38	10.25	10.96	11.63	12.08	12.30	12.50
NATURAL GAS...........	2.17	3.84	6.65	7.39	8.01	8.41	8.47	8.54
DISTILLATE(1).........	4.30	8.06	5.93	6.56	7.31	7.91	8.29	8.55
LO-SULFUR RESIDUAL....	4.13	5.32	4.71	5.22	5.82	6.34	6.69	7.00
LIQUID PETROLEUM GAS..	NA	6.67	6.05	6.65	7.33	7.90	8.22	8.48
ELECTRICITY	15.55	17.21	17.60	18.12	18.63	18.79	18.81	18.83
INDUSTRIAL(2)	3.37	5.44	6.54	7.09	7.64	8.02	8.19	8.32
STEAM COAL............	1.81	1.55	2.10	2.13	2.16	2.20	2.24	2.33
METALLURGICAL COAL....	2.80	2.51	2.56	2.59	2.61	2.63	2.66	2.72
NATURAL GAS...........	1.49	2.90	5.87	6.60	7.16	7.42	7.39	7.29
DISTILLATE............	4.24	7.99	5.84	6.46	7.21	7.81	8.18	8.43
LO-SULFUR RESIDUAL....	4.11	5.14	4.64	5.14	5.72	6.24	6.58	6.89
HI-SULFUR RESIDUAL....	2.93	NA	4.12	4.63	5.24	5.77	6.12	6.44
LIQUID PETROLEUM GAS..	3.83	6.34	5.83	6.40	7.06	7.60	7.90	8.15
PET-CHEM FEEDSTOCK(3).	NA	7.88	6.72	7.41	8.25	8.92	9.35	9.64
OTHER(4)..............	NA	NA	5.17	5.70	6.34	6.87	7.20	7.44
ELECTRICITY	9.42	11.67	14.37	14.79	15.22	15.35	15.39	15.45
TRANSPORTATION(5)	6.72	9.91	7.74	8.42	9.20	9.77	10.06	10.21
DISTILLATE............	5.85	8.39	6.20	6.87	7.66	8.29	8.69	8.96
HI-SULFUR RESIDUAL....	2.93	3.97	3.58	4.04	4.59	5.07	5.39	5.69
GASOLINE(6)...........	7.57	11.32	8.69	9.47	10.35	10.97	11.28	11.41
JET FUEL(7)...........	3.69	7.51	6.59	7.23	8.04	8.68	9.08	9.35
LIQUID PETROLEUM GAS..	NA	NA	5.78	6.35	7.02	7.57	7.87	8.13
ELECTRICITY	NA	NA	16.97	17.51	18.02	18.21	18.25	18.25
ELECTRIC UTILITY FUEL	2.04	1.84	2.14	2.25	2.35	2.42	2.45	2.50
STEAM COAL............	1.58	1.71	1.74	1.75	1.77	1.79	1.81	1.86
NATURAL GAS...........	1.14	2.80	5.93	6.68	7.25	7.43	7.39	7.24
DISTILLATE(8).........	3.28	7.22	5.87	6.49	7.24	7.84	8.21	8.47
LO-SULFUR RESIDUAL(9).	3.27	5.90	4.69	5.20	5.80	6.32	6.67	6.98
HI-SULFUR RESIDUAL....	NA	4.55	3.61	4.06	4.61	5.08	5.39	5.69
NUCLEAR...............	NA	.85	0.85	0.85	0.85	0.85	0.85	0.85
REFINERY FUEL	NA	NA	2.29	2.57	2.88	3.14	3.28	3.39
NATURAL GAS...........	NA	3.08	5.02	5.67	6.23	6.51	6.46	6.31
DISTILLATE............	NA	6.09	5.14	5.70	6.36	6.90	7.24	7.47
LO-SULFUR RESIDUAL....	NA	NA	4.05	4.50	5.03	5.50	5.81	6.11
HI-SULFUR RESIDUAL....	NA	4.89	3.40	3.85	4.38	4.85	5.16	5.45
LIQUID PETROLEUM GAS..	NA	NA	5.13	5.65	6.25	6.74	7.02	7.25
OTHER(10).............	NA	NA	5.06	5.59	6.23	6.76	7.09	7.33

NOTE: TOTALS MAY NOT EQUAL SUM OF COMPONENTS DUE TO INDEPENDENT ROUNDING. FOR TABLE FOOTNOTES AND SOURCES SEE PAGE 219.

TABLE F.5.1. ELECTRIC UTILITY FUEL PRICES AND CONSUMPTION
CASE F: LOWER SWITCHING FLEXIBILITY FOR EXISTING POWERPLANTS
(1982 DOLLARS PER MILLION BTU; TRILLIONS OF BTU PER YEAR)

YEARS	COAL	NATURAL GAS	DISTILLATE	LO-S RESID	HI-S RESID	FOSSIL FUEL	NUCLEAR	HYDRO	ALL FUELS
FUEL PRICES									
1980	1.71	2.80	7.22	5.90	4.55	NA	NA	--	NA
1985	1.74	5.93	5.87	4.69	3.61	2.73	0.85	--	2.14
1986	1.75	6.68	6.48	5.20	4.07	2.91	0.85	--	2.25
1987	1.77	7.25	7.18	5.80	4.61	3.07	0.85	--	2.35
1988	1.79	7.43	7.83	6.32	5.08	3.19	0.85	--	2.42
1989	1.81	7.39	8.18	6.67	5.40	3.24	0.85	--	2.45
1990	1.86	7.24	8.40	6.98	5.69	3.30	0.85	--	2.50
FUEL CONSUMPTION									
1980	12122.	3807.	121.	1611.	922.	18583.	2672.	2988.	24243.
1985	14155.	2499.	366.	2013.	1035.	20067.	4118.	3040.	27226.
1986	14519.	2474.	426.	2039.	1026.	20484.	4678.	3056.	28218.
1987	14785.	2503.	400.	2047.	1028.	20763.	5253.	3060.	29076.
1988	15195.	2602.	376.	2064.	1031.	21268.	5782.	3044.	30094.
1989	15660.	2703.	408.	2035.	1017.	21822.	6114.	3066.	31002.
1990	16332.	2804.	496.	2057.	1028.	22717.	6331.	3090.	32138.

NA=NOT AVAILABLE.
--=NOT APPLICABLE.
NOTE: ENTRIES FOR 1980 ARE HISTORICAL DATA.
SOURCES: ON PAGE 222, SEE 1; 2, PP 160-170, TABLES B1, B2, B3, AND B4; 2, PP 253-255, TABLE C9; 2, PP 262-263, TABLE C13; 2, PP 270-271, TABLE C17; AND 2, PP 290-291, TABLE C27.

TABLE F.5.2. END-USE ELECTRICITY PRICES AND CONSUMPTION
CASE F: LOWER SWITCHING FLEXIBILITY FOR EXISTING POWERPLANTS
(1982 MILLS PER KWH; BILLION KWH PER YEAR)

YEARS	RESIDENTIAL	COMMERCIAL	TRANSPORTATION	INDUSTRIAL	AVG./TOTAL
END-USE PRICES					
1980	57.25	58.72	NA	39.82	50.82
1985	59.18	60.05	57.92	49.01	55.57
1986	60.83	61.84	59.74	50.47	57.16
1987	62.43	63.55	61.50	51.93	58.72
1988	62.85	64.10	62.14	52.39	59.12
1989	62.89	64.19	62.28	52.51	59.19
1990	62.96	64.25	62.27	52.72	59.25
END-USE CONSUMPTION					
1980	717.50	558.91	0.00	815.06	2091.47
1985	773.50	691.02	3.05	899.58	2367.14
1986	794.75	719.06	3.05	939.11	2455.97
1987	815.17	742.01	3.05	975.22	2535.45
1988	835.60	761.86	3.05	1026.70	2627.21
1989	856.49	785.80	3.05	1063.95	2709.29
1990	877.63	811.85	3.05	1119.92	2812.45

NA=NOT AVAILABLE.
NOTE: ENTRIES FOR 1980 ARE HISTORICAL DATA.
SOURCES: ON PAGE 222, SEE 1, PP 15-18; AND 2, PP 229-40, TABLES C1, C2, C3, AND C4.

TABLE F.6.1. ANNUAL SUPPLY AND DISPOSITION OF PETROLEUM
CASE F: LOWER SWITCHING FLEXIBILITY FOR EXISTING POWERPLANTS
(MILLIONS OF BARRELS PER DAY)

	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990
SUPPLY											
PRODUCTION											
CRUDE OIL..................	8.60	8.57	8.67	8.64	8.76	8.76	8.82	8.81	8.76	8.63	8.17
NORTH SLOPE..............	1.52	1.53	1.61	1.63	1.70	1.71	1.78	1.78	1.78	1.82	1.73
SUBARCTIC(1).............	7.08	7.05	7.06	7.00	7.04	7.01	6.95	6.89	6.80	6.56	6.16
NATURAL GAS LIQUIDS........	1.57	1.61	1.55	1.54	1.36	1.22	1.19	1.19	1.25	1.29	1.33
OTHER DOMESTIC(2)..........	0.04	0.05	0.05	0.05	0.02	0.04	0.09	0.14	0.19	0.24	0.29
PROCESSING GAIN............	0.60	0.51	0.53	0.49	0.53	0.56	0.56	0.55	0.54	0.53	0.53
TOTAL PRODUCTION.........	10.81	10.74	10.81	10.72	10.65	10.54	10.56	10.55	10.55	10.45	10.04
IMPORTS(3)											
CRUDE OIL..................	5.26	4.40	3.46	3.75	5.08	6.15	5.99	5.68	5.41	5.34	5.78
REFINED PRODUCTS(4)........	1.65	1.60	1.58	1.76	2.01	2.08	2.08	2.07	2.05	2.03	2.04
TOTAL IMPORTS............	6.91	6.00	5.04	5.51	7.08	8.23	8.07	7.75	7.46	7.37	7.82
EXPORTS											
CRUDE OIL..................	0.29	0.23	0.24	0.23	0.25	0.25	0.25	0.25	0.25	0.25	0.25
REFINED PRODUCTS(4)........	0.26	0.37	0.58	0.55	0.62	0.62	0.62	0.62	0.62	0.62	0.62
TOTAL EXPORTS............	0.54	0.59	0.82	0.78	0.87	0.87	0.87	0.87	0.87	0.87	0.87
NET IMPORTS..........	6.37	5.40	4.23	4.72	6.21	7.36	7.20	6.88	6.59	6.50	6.95
PRIMARY STOCK CHANGES(5)											
NET WITHDRAWALS............	-0.09	0.18	0.32	0.14	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SPR FILL RATE ADDITIONS(6).	-0.05	-0.34	-0.17	-0.21	-0.15	-0.15	-0.15	-0.15	-0.15	-0.15	-0.15
TOTAL PRIMARY SUPPLY......	17.04	15.98	15.18	15.37	16.71	17.75	17.61	17.28	16.99	16.80	16.84
PRODUCT SUPPLIED											
MOTOR GASOLINE.............	6.86	6.59	6.54	6.36	6.54	6.42	6.12	5.79	5.50	5.29	5.13
DISTILLATE FUEL OIL........	2.97	2.83	2.67	2.75	3.20	3.61	3.68	3.66	3.64	3.65	3.71
RESIDUAL FUEL OIL..........	2.56	2.09	1.69	1.73	2.43	2.95	2.98	2.98	2.98	2.94	2.96
OTHER PRODUCTS(7)..........	5.11	4.83	4.66	4.83	4.87	5.09	5.15	5.16	5.18	5.23	5.34
TOTAL RECLASSIFIED(8)......	-0.44	-0.27	-0.31	-0.30	-0.30	-0.32	-0.31	-0.31	-0.30	-0.30	-0.30
TOTAL PRODUCT SUPPLIED...	17.06	16.06	15.25	15.37	16.72	17.76	17.62	17.28	16.99	16.81	16.84
DISCREPANCY..............	-0.02	-0.08	-0.07	0.00	-0.01	-0.01	-0.01	-0.00	-0.00	-0.01	-0.00
NET DISPOSITION..........	17.04	15.98	15.18	15.37	16.71	17.75	17.61	17.28	16.99	16.80	16.84

(1) INCLUDES LOWER-48 STATES AND SOUTHERN ALASKA.
(2) OTHER DOMESTIC REPRESENTS OTHER HYDROCARBON INPUT.
(3) INCLUDES IMPORTS FOR THE STRATEGIC PETROLEUM RESERVE.
(4) CONSISTS OF NATURAL GAS PLANT LIQUIDS, UNFINISHED OILS, AND REFINED PRODUCT IMPORTS.
(5) EXCLUDES CRUDE OIL FOR THE STRATEGIC PETROLEUM RESERVE.
(6) ADDITIONS TO THE STRATEGIC PETROLEUM RESERVE (SHOWN AS NEGATIVE ENTRIES).
(7) COMPOSED OF JET FUEL, LIQUEFIED GASES, AND OTHER PRODUCTS.
(8) PETROLEUM PRODUCTS REPROCESSED INTO OTHER PRODUCT CATEGORIES.
NOTE: IN 1980, GASOLINE SUPPLIED HAS BEEN ADJUSTED TO CORRECT UNDERESTIMATION OF PRODUCT SUPPLIED. DISTILLATE AND RESIDUAL FUEL OIL HAVE BEEN RESTATED INTO THE NEW BASIS FOR COMPARABILITY PURPOSES.
NOTE: ENTRIES FOR 1980 ARE A COMBINATION OF HISTORICAL AND ESTIMATED VALUES.
SOURCES: ON PAGE 222, SEE 4, PAGE 6, TABLE 1; AND 20, PAGE 18, TABLE 7.

TABLE F.7.1. NATURAL GAS SUPPLY/DEMAND BALANCE
CASE F: LOWER SWITCHING FLEXIBILITY FOR EXISTING POWERPLANTS
(TRILLION BTU PER YEAR; 1982 DOLLARS PER MILLION BTU)

	1980	1985	1986	1987	1988	1989	1990
LOWER-48 ONSHORE SUPPLY	14435.	11463.	10898.	10815.	11517.	12257.	13043.
LOWER-48 OFFSHORE SUPPLY	5477.	3911.	4016.	4189.	4173.	4015.	3680.
TOTAL DOMESTIC SUPPLY	19912.	15374.	14914.	15004.	15690.	16272.	16723.
CATEGORY 102 (NEW GAS)	3439.	6322.	6788.	7539.	8537.	9634.	10308.
CATEGORY 104 (OLD INTERSTATE GAS)	8910.	5730.	4980.	4360.	3850.	3440.	3090.
CATEGORY 105 (OLD INTRASTATE GAS)	6899.	3050.	2750.	2550.	2370.	2110.	2000.
CATEGORY 107 (DEEP GAS)	664.	272.	396.	555.	933.	1088.	1325.
SUPPLEMENTAL GAS(1)	159.	468.	740.	660.	252.	0.	0.
IMPORTS	957.	1230.	1230.	1230.	1230.	1230.	1230.
TOTAL SUPPLY	21028.	17073.	16884.	16894.	17172.	17502.	17953.
LEASE AND PLANT FUEL(2)	1045.	1153.	1119.	1125.	1177.	1220.	1254.
TRANSPORTATION LOSS(3)	647.	1099.	1095.	1094.	1102.	1118.	1139.
CONSUMPTION BY SECTOR							
RESIDENTIAL	4866.	4572.	4510.	4449.	4395.	4355.	4326.
COMMERCIAL(4)	2674.	2715.	2682.	2631.	2571.	2523.	2481.
REFINERY	846.	250.	247.	256.	281.	317.	364.
ELECTRIC UTILITY	3807.	2499.	2474.	2506.	2602.	2703.	2804.
INDUSTRIAL(5)	6497.	4785.	4762.	4831.	5041.	5261.	5585.
TOTAL END-USE CONSUMPTION	18690.	14820.	14674.	14674.	14890.	15159.	15560.
DISCREPANCY(6)	-646.	0.	0.	0.	0.	0.	0.
WELLHEAD PRICES							
AVERAGE PRICE	1.79	3.85	4.47	5.10	5.48	5.42	5.25
CATEGORY 102 (NEW GAS)	2.69	4.93	5.60	6.14	6.40	6.17	5.85
CATEGORY 104 (OLD INTERSTATE GAS)	1.32	2.16	2.36	2.63	2.72	2.69	2.62
CATEGORY 105 (OLD INTRASTATE GAS)	1.67	4.70	5.32	6.01	6.27	6.06	5.77
CATEGORY 107 (DEEP GAS)	4.78	4.93	5.60	6.14	6.40	6.17	5.85
DELIVERED PRICE BY SECTOR							
RESIDENTIAL	4.16	6.88	7.58	8.17	8.55	8.55	8.59
COMMERCIAL(4)	3.84	6.65	7.39	8.01	8.41	8.47	8.54
REFINERY	3.08	5.02	5.67	6.23	6.51	6.46	6.31
ELECTRIC UTILITY	2.80	5.93	6.68	7.25	7.43	7.39	7.24
INDUSTRIAL(5)	2.90	5.87	6.60	7.16	7.42	7.39	7.29

(1) INCLUDES INCREASED GAS OR OIL IMPORTS.
(2) REPRESENTS GAS USED AS A FUEL IN FIELD GATHERING AND PLANT PROCESSING MACHINERY.
(3) INDICATES GAS USED TO FUEL COMPRESSORS IN THE PIPELINE MACHINERY.
(4) COMMERCIAL IS AN AGGREGATE OF COMMERCIAL AND OTHER CATEGORIES.
(5) EXCLUDES LEASE AND PLANT FUEL CONSUMPTION.
(6) REPRESENTS IMBALANCES RESULTING FROM THE MERGER OF DATA REPORTING SYSTEMS WHICH VARY IN SCOPE, FORMAT, DEFINITIONS AND TYPE OF RESPONDANTS.
NOTE: ENTRIES FOR 1980 ARE A COMBINATION OF HISTORICAL AND ESTIMATED VALUES.
SOURCES: ON PAGE 222, SEE 1, PP 15-19; 12, PAGE 7, TABLE 1; 13, PAGE 133, TABLE A7.

Case G
Higher Coal Transportation Rates

In this study, it is assumed that the cost of transporting coal by rail is increased over the middle world oil price case by 10 percent per year, beginning in 1984. The higher rail costs would have little impact on total coal consumption, but it would have considerable effect on coal exports and the regional distribution of U.S. coal production.

The increase in rail transportation costs would lower projected domestic coal consumption by only 2.1 percent in 1990. Utility coal demand would remain about the same because coal would continue to be the least expensive fossil fuel despite the higher rail costs. Also, the relatively long construction periods for new powerplants would inhibit any substantial shift away from coal. Utilities would primarily respond by shifting procurement toward closer supply sources and emphasizing water transportation where feasible.

The major changes in the disposition of coal would occur in the industrial sector and the level of exports. Industrial users are generally more responsive than electric utilities because their planning horizon is shorter. In this study, industrial and metallurgical coal consumption in 1990 is about 5.5 percent lower than in the midprice case and accounts for virtually all of the slight decrease in total domestic consumption.

Importers of U.S. coal would react to higher rail rates by shifting to alternate sources of supply outside the United States. Consequently, projected U.S. exports of coal would decrease by about 21.5 percent in 1990.

The changing demands brought about by higher rail rates would principally effect coal production in the eastern and western regions. In 1990, eastern coal supply would be about 4.5 percent lower than in the midprice case while western coal production would decrease by about 5.2 percent. The decline in eastern coal production would be moderate compared to the western region because its lower exports are offset somewhat by an increase in its utility coal demand.

THE FOLLOWING SECTION OF TABLES ARE FOR THE:

CASE G: HIGHER COAL TRANSPORTATION RATES

THIS SECTION CONTAINS THE FOLLOWING TABLES:

TABLE G.1.1. YEARLY SUPPLY AND DISPOSITION OF TOTAL ENERGY
CASE G: HIGHER COAL TRANSPORTATION RATES
(QUADRILLION BTU PER YEAR)

	1975	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990
SUPPLY												
PRODUCTION												
PETROLEUM..........	20.1	20.5	20.4	20.6	20.5	20.6	20.4	20.5	20.5	20.5	20.3	19.3
NATURAL GAS........	19.6	20.1	19.9	18.2	17.5	17.0	15.2	14.7	14.7	15.3	15.8	16.3
COAL...............	15.2	19.2	19.1	19.1	19.4	19.2	19.9	20.3	20.7	21.2	21.8	22.6
NUCLEAR............	1.9	2.7	2.9	3.0	3.2	3.7	4.1	4.7	5.3	5.8	6.1	6.3
HYDRO/GEO/OTHER....	3.2	3.0	2.9	3.3	3.2	3.1	3.1	3.1	3.2	3.2	3.2	3.2
SUBTOTAL.........	60.1	65.5	65.2	64.2	63.7	63.7	62.7	63.3	64.3	65.9	67.2	67.8
NET IMPORTS												
CRUDE OIL..........	8.7	10.6	8.8	6.8	7.5	10.4	12.9	12.6	12.0	11.3	11.0	11.8
OTHER PETROLEUM....	3.8	2.9	2.6	2.1	2.5	3.0	3.1	3.1	3.1	3.1	3.1	3.1
NG (CONTRACTED)(1).	0.9	1.0	.9	.9	1.1	1.2	1.2	1.2	1.2	1.2	1.2	1.2
OTHER GAS(2).......	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.2	0.0	0.0	0.0
COAL AND COKE......	-1.7	-2.4	-2.9	-2.8	-2.6	-2.5	-2.5	-2.6	-2.6	-2.7	-2.9	-3.0
ELECTRICITY........	0.1	.2	.2	.2	.2	0.3	0.3	0.3	0.3	0.3	0.4	0.4
SUBTOTAL.........	11.7	12.3	9.6	7.3	8.6	12.4	15.1	15.0	14.2	13.2	12.8	13.5
SPR ADDITIONS(3)....	0.0	-.1	-.7	-.4	-.4	-0.3	-0.3	-0.3	-0.3	-0.3	-0.3	-0.3
STOCK WITHDRAWALS...	-1.1	-1.8	0.0	-.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL SUPPLY.........	70.7	75.9	74.1	70.9	71.9	75.8	77.5	78.0	78.2	78.9	79.7	81.1
CONSUMPTION												
NON-ELEC UTILITY FUEL												
PETROLEUM..........	29.5	31.5	29.9	28.6	29.2	30.7	32.1	31.8	31.2	30.6	30.3	30.3
NATURAL GAS(4).....	16.7	16.6	16.1	15.0	14.9	14.5	13.7	13.5	13.5	13.7	13.9	14.1
COAL...............	4.0	3.4	3.4	3.0	2.9	3.2	3.3	3.3	3.4	3.4	3.5	3.6
SUBTOTAL.........	50.2	51.4	49.4	46.4	47.0	48.4	49.0	48.6	48.0	47.7	47.7	48.0
ELECTRIC UTILITY FUEL												
PETROLEUM..........	3.2	2.7	2.2	1.8	1.5	2.9	4.1	4.2	4.1	4.1	3.8	3.8
NATURAL GAS........	3.2	3.8	3.8	3.3	3.4	2.7	1.7	1.7	1.7	1.8	2.1	2.3
COAL...............	8.8	12.1	12.7	12.7	13.2	13.5	14.1	14.4	14.7	15.0	15.4	16.1
NUCLEAR............	1.9	2.7	2.9	3.0	3.2	3.7	4.1	4.7	5.3	5.8	6.1	6.3
HYDRO/GEO/OTHER(5).	3.4	3.2	3.1	3.5	3.4	3.4	3.5	3.5	3.5	3.5	3.5	3.6
SUBTOTAL.........	20.5	24.5	24.7	24.3	24.7	25.9	27.2	28.1	28.9	29.9	30.7	31.7
TOTAL CONSUMPTION....	70.7	75.9	74.1	70.7	71.7	74.4	76.2	76.7	76.9	77.6	78.4	79.8
ADJUSTMENTS												
REFINERY LOSSES(6).	0.0	0.0	0.0	0.0	-0.1	0.0	0.2	0.2	0.2	0.2	0.2	0.2
DISCREPANCY(7).....	0.0	0.0	0.0	0.2	0.3	1.4	1.1	1.1	1.1	1.1	1.1	1.1
TOTAL DISPOSITION....	70.7	75.9	74.1	70.9	71.9	75.8	77.5	78.0	78.2	78.9	79.7	81.1

NOTE: THE "ANNUAL ENERGY REVIEW" FOR 1982 WILL CONTAIN LATER REVISIONS TO HISTORICAL DATA FOR 1975, 1980 AND 1982.
NOTE: TOTALS MAY NOT EQUAL SUM OF COMPONENTS DUE TO INDEPENDENT ROUNDING. FOR TABLE FOOTNOTES AND SOURCES SEE PAGE 219.

TABLE G.1.2. SUPPLY/DEMAND BALANCE
CASE G: HIGHER COAL TRANSPORTATION RATES
(QUADRILLION BTU PER YEAR)

	1975	1980	1985	1986	1987	1988	1989	1990
DOMESTIC SUPPLY								
COAL..................	15.2	19.2	19.9	20.3	20.7	21.2	21.8	22.6
NATURAL GAS...........	19.6	19.9	15.2	14.7	14.7	15.3	15.8	16.3
PETROLEUM.............	20.1	20.5	20.4	20.5	20.5	20.5	20.3	19.3
NUCLEAR...............	1.9	2.7	4.1	4.7	5.3	5.8	6.1	6.3
OTHER(1)..............	3.2	3.0	3.1	3.1	3.2	3.2	3.2	3.2
TOTAL DOMESTIC SUPPLY..................	60.0	65.3	62.7	63.3	64.3	65.9	67.2	67.8
NATURAL GAS IMPORTS...	0.9	1.0	1.2	1.2	1.2	1.2	1.2	1.2
SUPPLEMENTAL GAS(2)...	0.0	0.2	0.0	0.3	0.2	0.0	0.0	0.0
PETROLEUM IMPORTS.....	12.5	13.5	16.0	15.8	15.1	14.4	14.0	14.9
TOTAL SUPPLY(3).........	73.4	80.0	80.0	80.6	80.8	81.6	82.5	84.0
DISPOSITION								
RESIDENTIAL...........	9.6	9.3	9.2	9.2	9.2	9.2	9.2	9.2
COMMERCIAL............	5.5	5.9	6.6	6.7	6.8	6.8	6.8	6.8
INDUSTRIAL(4).........	21.3	23.0	22.1	22.3	22.4	22.8	23.1	23.8
TRANSPORTATION........	17.7	19.7	18.6	18.2	17.7	17.3	17.0	16.9
TOTAL END-USE CONSUMPTION............	54.1	57.9	56.6	56.5	56.1	56.1	56.2	56.8
DISCREPANCY............	0.2	-0.1	-0.2	-0.2	-0.3	-0.4	-0.3	-0.3
ADJUSTMENTS............	19.1	22.2	23.6	24.3	25.0	25.9	26.6	27.5
UTILITY GENERATION....	13.7	16.5	18.3	18.9	19.4	20.1	20.6	21.3
UTILITY TRANSMISSION..	0.6	0.7	0.9	0.9	0.9	0.9	1.0	1.0
REFINERY(5)...........	0.0	0.0	0.2	0.2	0.2	0.2	0.2	0.2
GAS PIPELINE(6).......	0.6	0.6	1.1	1.0	1.0	1.1	1.1	1.1
LEASE/PLANT FUEL(7)...	1.4	1.0	1.1	1.1	1.1	1.1	1.2	1.2
COAL EXPORTS..........	1.7	2.4	2.5	2.6	2.6	2.7	2.9	3.0
SPR ADDITIONS.........	0.0	0.1	0.3	0.3	0.3	0.3	0.3	0.3
STOCK WITHDRAWALS.....	1.1	1.8	0.0	0.0	0.0	0.0	0.0	0.0
RECLASSIFIED..........	0.0	-0.9	-0.7	-0.7	-0.7	-0.6	-0.6	-0.6
ADJUSTED CONSUMPTION....	73.4	80.0	80.0	80.6	80.8	81.6	82.5	84.0
ELECTRIC UTILITY FUEL								
COAL..................	8.8	12.1	14.1	14.4	14.7	15.0	15.4	16.1
PETROLEUM.............	3.2	2.7	4.1	4.2	4.1	4.1	3.8	3.8
NATURAL GAS...........	3.2	3.8	1.7	1.7	1.7	1.8	2.1	2.3
TOTAL FOSSIL...........	15.2	18.6	19.9	20.3	20.5	20.9	21.4	22.2
NUCLEAR...............	1.9	2.7	4.1	4.7	5.3	5.8	6.1	6.3
OTHER.................	3.2	3.0	3.1	3.1	3.2	3.2	3.2	3.2
TOTAL..................	20.3	24.3	27.2	28.1	28.9	29.9	30.7	31.7
GENERATION.............	6.6	7.8	8.9	9.2	9.5	9.8	10.1	10.5

NOTE: TOTALS MAY NOT EQUAL SUM OF COMPONENTS DUE TO INDEPENDENT ROUNDING. FOR TABLE FOOTNOTES AND SOURCES SEE PAGE 219.

TABLE G.1.3. CONSUMPTION SUMMARY
CASE G: HIGHER COAL TRANSPORTATION RATES
(QUADRILLION BTU PER YEAR)

	1975	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990
RESIDENTIAL	9.571	9.335	9.104	9.236	9.143	9.173	9.205	9.226	9.228	9.225	9.232	9.246
STEAM COAL............	0.091	0.065	0.080	0.082	0.071	0.078	0.076	0.074	0.073	0.071	0.069	0.068
NATURAL GAS............	5.022	4.866	4.654	4.793	4.710	4.650	4.586	4.523	4.465	4.415	4.378	4.348
DISTILLATE(1)..........	1.923	1.417	1.375	1.303	1.230	1.308	1.328	1.336	1.332	1.318	1.302	1.286
LIQUID PETROLEUM GAS...	0.528	0.539	0.536	0.570	0.590	0.565	0.576	0.582	0.582	0.579	0.575	0.571
ELECTRICITY	2.007	2.448	2.459	2.488	2.530	2.573	2.639	2.710	2.777	2.842	2.908	2.973
COMMERCIAL	5.513	5.892	5.818	5.866	6.182	6.437	6.600	6.706	6.754	6.768	6.805	6.849
STEAM COAL............	0.135	0.095	0.107	0.122	0.086	0.097	0.095	0.092	0.090	0.087	0.085	0.083
NATURAL GAS............	2.559	2.674	2.580	2.683	2.720	2.731	2.723	2.692	2.644	2.588	2.543	2.501
DISTILLATE(1)..........	0.622	0.556	0.540	0.511	0.670	0.738	0.775	0.801	0.815	0.820	0.824	0.827
LO-SULFUR RESIDUAL.....	0.506	0.566	0.470	0.376	0.490	0.542	0.569	0.588	0.598	0.602	0.605	0.608
LIQUID PETROLEUM GAS...	0.093	0.095	0.095	0.101	0.090	0.080	0.078	0.076	0.074	0.072	0.070	0.068
ELECTRICITY	1.598	1.906	2.026	2.074	2.150	2.250	2.360	2.455	2.533	2.599	2.678	2.763
INDUSTRIAL(2)	18.503	20.185	19.513	16.876	17.365	18.894	19.582	19.788	19.931	20.376	20.763	21.448
STEAM COAL............	1.619	1.388	1.570	1.626	1.501	1.770	1.791	1.826	1.884	1.963	2.044	2.114
METALLURGICAL COAL.....	2.178	1.793	1.647	1.057	1.132	1.257	1.292	1.307	1.312	1.321	1.319	1.324
NATURAL GAS............	6.133	6.497	6.639	5.414	5.340	5.340	4.911	4.834	4.981	5.167	5.359	5.626
DISTILLATE............	1.272	1.569	1.285	1.212	1.340	1.750	2.228	2.255	2.153	2.046	1.973	1.959
LO-SULFUR RESIDUAL.....	0.428	0.554	0.423	0.367	0.390	0.485	0.552	0.561	0.554	0.550	0.547	0.565
HI-SULFUR RESIDUAL.....	0.856	0.713	0.531	0.484	0.530	0.703	0.836	0.853	0.842	0.827	0.819	0.835
LIQUID PETROLEUM GAS...	0.252	0.308	0.323	0.332	0.370	0.366	0.384	0.359	0.313	0.266	0.219	0.183
PET-CHEM FEEDSTOCK(3)..	1.519	2.401	2.111	1.862	1.980	2.176	2.292	2.373	2.453	2.559	2.674	2.838
OTHER(4)..............	1.900	2.180	2.166	1.977	2.240	2.207	2.259	2.253	2.241	2.239	2.257	2.288
ELECTRICITY	2.346	2.781	2.817	2.545	2.620	2.840	3.038	3.167	3.278	3.438	3.551	3.717
TRANSPORTATION(5)	17.725	19.655	18.715	18.129	17.910	18.538	18.607	18.185	17.695	17.261	17.030	16.933
DISTILLATE............	2.069	2.782	2.738	2.582	2.510	2.781	2.892	2.964	3.038	3.110	3.199	3.310
HI-SULFUR RESIDUAL.....	0.731	1.401	1.163	0.930	0.900	1.012	1.054	1.079	1.102	1.122	1.148	1.181
GASOLINE(6)...........	12.868	13.253	12.688	12.528	12.180	12.471	12.289	11.711	11.080	10.521	10.125	9.828
JET FUEL(7)...........	2.029	2.179	2.087	2.049	2.280	2.234	2.331	2.391	2.435	2.469	2.517	2.574
LIQUID PETROLEUM GAS...	0.016	0.014	0.014	0.015	0.020	0.015	0.015	0.015	0.015	0.015	0.015	0.015
OTHER.................	0.000	0.014	0.014	0.014	0.010	0.014	0.014	0.014	0.014	0.014	0.014	0.014
ELECTRICITY	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010
ELECTRIC UTILITY FUEL	20.360	24.243	24.462	24.203	24.480	25.924	27.174	28.122	28.941	29.895	30.719	31.744
STEAM COAL............	8.790	12.122	12.707	12.697	13.190	13.528	14.120	14.431	14.671	15.010	15.449	16.078
NATURAL GAS............	3.240	3.807	3.764	3.336	3.440	2.700	1.687	1.674	1.715	1.829	2.137	2.331
DISTILLATE(8).........	0.350	0.121	0.077	0.048	0.090	0.180	0.343	0.365	0.314	0.313	0.344	0.414
LO-SULFUR RESIDUAL(9)..	2.860	1.611	1.251	0.980	0.780	1.784	2.592	2.635	2.642	2.598	2.313	2.195
HI-SULFUR RESIDUAL.....	NA	0.922	0.898	0.789	0.600	0.945	1.181	1.190	1.193	1.194	1.175	1.183
HYDRO/GEO/OTHER(10)....	3.220	2.988	2.864	3.340	3.190	3.115	3.133	3.149	3.153	3.168	3.185	3.212
NUCLEAR...............	1.900	2.672	2.901	3.013	3.190	3.671	4.118	4.678	5.253	5.782	6.114	6.331
REFINERY FUEL(11)	2.769	2.787	2.304	2.190	2.480	2.357	2.562	2.548	2.491	2.432	2.380	2.369
NATURAL GAS............	0.975	0.846	0.668	0.574	0.720	0.438	0.299	0.281	0.289	0.326	0.350	0.381
DISTILLATE............	0.035	0.018	0.011	0.011	0.010	0.012	0.013	0.013	0.012	0.012	0.012	0.012
LO-SULFUR RESIDUAL.....	NA	NA	NA	NA	0.090	0.118	0.151	0.151	0.143	0.130	0.122	0.118
HI-SULFUR RESIDUAL.....	0.269	0.213	0.167	0.137	0.200	0.295	0.475	0.488	0.467	0.421	0.387	0.356
LIQUID PETROLEUM GAS...	0.050	0.043	0.024	0.038	0.030	0.026	0.028	0.028	0.027	0.026	0.026	0.026
OTHER(12).............	0.390	0.436	0.359	0.348	0.360	0.366	0.397	0.395	0.387	0.377	0.369	0.367
STILL GAS.............	1.050	1.231	1.073	1.085	1.080	1.103	1.199	1.193	1.166	1.139	1.114	1.109

NOTE: TOTALS MAY NOT EQUAL SUM OF COMPONENTS DUE TO INDEPENDENT ROUNDING. FOR TABLE FOOTNOTES AND SOURCES SEE PAGE 219.

TABLE G.1.4. PRICE SUMMARY
CASE G: HIGHER COAL TRANSPORTATION RATES
(1982 DOLLARS PER MILLION BTU)

	1975	1980	1985	1986	1987	1988	1989	1990
WORLD OIL PRICE.........	20.70	39.32	25.47	28.24	31.53	34.11	35.68	36.71
RESIDENTIAL	5.95	8.33	9.57	10.35	11.04	11.44	11.68	11.99
NATURAL GAS...........	2.75	4.16	6.64	7.43	8.01	8.26	8.32	8.50
DISTILLATE(1).........	4.75	8.59	6.27	6.93	7.72	8.35	8.75	9.02
LIQUID PETROLEUM GAS..	4.11	6.67	6.04	6.67	7.36	7.89	8.19	8.47
ELECTRICITY	15.61	16.78	17.29	17.90	18.50	18.76	18.94	19.25
COMMERCIAL	6.27	8.38	10.13	10.92	11.64	12.09	12.40	12.77
NATURAL GAS...........	2.17	3.84	6.41	7.23	7.84	8.12	8.24	8.44
DISTILLATE(1).........	4.30	8.06	5.94	6.56	7.31	7.91	8.29	8.55
LO-SULFUR RESIDUAL....	4.13	5.32	4.78	5.30	5.91	6.43	6.74	7.05
LIQUID PETROLEUM GAS..	NA	6.67	6.05	6.68	7.38	7.90	8.21	8.49
ELECTRICITY	15.55	17.21	17.52	18.17	18.80	19.09	19.29	19.59
INDUSTRIAL(2)	3.37	5.44	6.49	7.10	7.69	8.07	8.30	8.55
STEAM COAL............	1.81	1.55	2.24	2.36	2.50	2.66	2.83	3.09
METALLURGICAL COAL....	2.80	2.51	2.65	2.74	2.82	2.92	3.02	3.19
NATURAL GAS...........	1.49	2.90	5.61	6.44	6.99	7.11	7.15	7.19
DISTILLATE............	4.24	7.99	5.84	6.47	7.21	7.81	8.18	8.43
LO-SULFUR RESIDUAL....	4.11	5.14	4.70	5.22	5.81	6.32	6.63	6.93
HI-SULFUR RESIDUAL....	2.93	NA	4.19	4.72	5.33	5.85	6.17	6.48
LIQUID PETROLEUM GAS..	3.83	6.34	5.83	6.44	7.10	7.61	7.90	8.16
PET-CHEM FEEDSTOCK(3).	NA	7.88	6.72	7.41	8.25	8.92	9.34	9.63
OTHER(4)..............	NA	NA	5.18	5.71	6.35	6.88	7.21	7.45
ELECTRICITY	9.42	11.67	14.33	14.89	15.44	15.70	15.91	16.25
TRANSPORTATION(5)	6.72	9.91	7.75	8.43	9.21	9.78	10.07	10.21
DISTILLATE............	5.85	8.39	6.21	6.87	7.66	8.29	8.69	8.96
HI-SULFUR RESIDUAL....	2.93	3.97	3.65	4.12	4.68	5.15	5.44	5.73
GASOLINE(6)...........	7.57	11.32	8.69	9.47	10.35	10.97	11.29	11.41
JET FUEL(7)...........	3.69	7.51	6.59	7.23	8.04	8.68	9.08	9.34
LIQUID PETROLEUM GAS..	NA	NA	5.78	6.39	7.06	7.57	7.87	8.14
ELECTRICITY	NA	NA	16.89	17.55	18.19	18.52	18.73	19.01
ELECTRIC UTILITY FUEL	2.04	1.84	2.12	2.26	2.39	2.49	2.57	2.70
STEAM COAL............	1.58	1.71	1.84	1.91	1.99	2.09	2.20	2.37
NATURAL GAS...........	1.14	2.80	5.52	6.43	6.99	7.00	7.12	7.19
DISTILLATE(8).........	3.28	7.22	5.87	6.50	7.24	7.84	8.21	8.47
LO-SULFUR RESIDUAL(9).	3.27	5.90	4.78	5.31	5.92	6.44	6.66	6.91
HI-SULFUR RESIDUAL....	NA	4.55	3.67	4.14	4.69	5.16	5.44	5.73
NUCLEAR...............	NA	.85	0.85	0.85	0.85	0.85	0.85	0.85
REFINERY FUEL	NA	NA	2.30	2.59	2.90	3.14	3.28	3.38
NATURAL GAS...........	NA	3.08	4.74	5.49	6.05	6.19	6.21	6.21
DISTILLATE............	NA	6.09	5.14	5.70	6.36	6.90	7.24	7.46
LO-SULFUR RESIDUAL....	NA	NA	4.12	4.58	5.13	5.59	5.87	6.15
HI-SULFUR RESIDUAL....	NA	4.89	3.46	3.93	4.47	4.93	5.21	5.49
LIQUID PETROLEUM GAS..	NA	NA	5.13	5.69	6.29	6.75	7.01	7.26
OTHER(10).............	NA	NA	5.07	5.60	6.24	6.77	7.10	7.34

NOTE: TOTALS MAY NOT EQUAL SUM OF COMPONENTS DUE TO INDEPENDENT ROUNDING. FOR TABLE FOOTNOTES AND SOURCES SEE PAGE 219.

TABLE G.8.1. COAL SUPPLY AND DISPOSITION
CASE G: HIGHER COAL TRANSPORTATION RATES
(MILLIONS OF SHORT TONS PER YEAR)

	1980	1985	1986	1987	1988	1989	1990
DOMESTIC SUPPLY							
EASTERN.............	579.	592.	604.	614.	627.	641.	661.
WESTERN.............	251.	305.	314.	322.	334.	349.	368.
NET IMPORTS(1)......	-91.	-95.	-97.	-100.	-104.	-108.	-113.
STOCK WITHDRAWALS...	-36.	0.	0.	0.	0.	0.	0.
TOTAL SUPPLY..........	703.	803.	820.	835.	857.	882.	916.
CONSUMPTION							
RESIDENTIAL/COMM....	7.	7.	7.	7.	7.	6.	6.
INDUSTRIAL..........	60.	76.	77.	79.	82.	85.	87.
METALLURGICAL.......	67.	49.	49.	49.	50.	50.	50.
ELECTRIC UTILITY....	569.	666.	681.	694.	713.	736.	767.
SYNTHETIC USE.......	0.	5.	5.	5.	5.	5.	5.
TOTAL CONSUMPTION.....	703.	803.	820.	835.	857.	882.	916.
TOTAL DISPOSITION.....	703.	803.	820.	835.	857.	882.	916.

(1) EXPORTS TO EUROPE AND JAPAN.
NOTE: EASTERN INCLUDES PENSYLVANIA, OHIO, MARYLAND, WEST VIRGINIA, VIRGINIA, KENTUCKY, TENNESSEE, ALABAMA, ILLINOIS, AND INDIANA. WESTERN INCLUDES IOWA, MISSOURI, KANSAS, ARKANSAS, OKLAHOMA, TEXAS, NORTH DAKOTA, SOUTH DAKOTA, MONTANA, WYOMING, COLORADO, UTAH, ARIZONA, NEW MEXICO, WASHINGTON, AND ALASKA.
NOTE: ENTRIES FOR 1980 ARE HISTORICAL DATA, AND STOCK WITHDRAWALS INCLUDES DISCREPANCY.

Case H
Low Industrial Electricity Demand

In this study it is assumed that the trend in electricity demand in the industrial sector will be similar to that experienced in the period 1963 to 1973 when the economy grew in a similar fashion.

However, there is substantial uncertainty about the amount of electricity needed to power the U.S. industrial sector throughout the projection period. This uncertainty stems from 2 different causes. First, cycles in the overall level of economic activity make it difficult to predict accurately which industrial activities will experience the most growth through 1990. Each type of activity uses a particular mix of energy, and energy intensity levels also differ across industries. Changes in the growth of individual industrial activities will change the overall demand for energy and electricity.

The second cause of uncertainty in the industrial electricity demand projections can be characterized as uncertainty with respect to the availability and rate of implementation of energy conservation measures by industrial concerns. Because trend variables are used in forecasting to capture these changes, an alternative specification of the rate at which they can be expected to occur was developed to show the implications of variations in these trends for industrial energy consumption. A "Low Industrial Electricity Demand" sensitivity case shows industrial electricity consumption may be as much as 290 trillion Btu lower in 1990. This would imply an alternative rate of growth in industrial electricity of 2.4 percent between 1980 and 1990. The full results of this sensitivity analysis are shown in Case H.

THE FOLLOWING SECTION OF TABLES ARE FOR THE:

CASE H: LOW INDUSTRIAL ELECTRICITY DEMAND

THIS SECTION CONTAINS THE FOLLOWING TABLES:

TABLE H.1.1. YEARLY SUPPLY AND DISPOSITION OF TOTAL ENERGY
CASE H: LOW INDUSTRIAL ELECTRICITY DEMAND
(QUADRILLION BTU PER YEAR)

	1975	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990
SUPPLY												
PRODUCTION												
PETROLEUM..........	20.1	20.5	20.4	20.6	20.5	20.6	20.4	20.5	20.5	20.5	20.2	19.3
NATURAL GAS........	19.6	20.1	19.9	18.2	17.5	17.1	15.3	14.8	14.8	15.5	16.0	16.5
COAL...............	15.2	19.2	19.1	19.1	19.4	19.3	20.1	20.6	21.1	21.7	22.5	23.5
NUCLEAR............	1.9	2.7	2.9	3.0	3.2	3.7	4.1	4.7	5.3	5.8	6.1	6.3
HYDRO/GEO/OTHER....	3.2	3.0	2.9	3.3	3.2	3.1	3.1	3.1	3.2	3.2	3.2	3.2
SUBTOTAL.........	60.1	65.5	65.2	64.2	63.7	63.8	63.1	63.7	64.8	66.6	68.0	68.9
NET IMPORTS												
CRUDE OIL..........	8.7	10.6	8.8	6.8	7.5	10.5	13.1	12.8	12.1	11.6	11.3	12.1
OTHER PETROLEUM....	3.8	2.9	2.6	2.1	2.5	3.0	3.1	3.1	3.1	3.1	3.0	3.1
NG (CONTRACTED)(1).	0.9	1.0	.9	.9	1.1	1.2	1.2	1.2	1.2	1.2	1.2	1.2
OTHER GAS(2).......	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.3	0.0	0.0	0.0
COAL AND COKE......	-1.7	-2.4	-2.9	-2.8	-2.6	-2.7	-2.9	-3.0	-3.2	-3.4	-3.6	-3.8
ELECTRICITY........	0.1	.2	.2	.2	.2	0.3	0.3	0.3	0.3	0.3	0.4	0.4
SUBTOTAL.........	11.7	12.3	9.6	7.3	8.6	12.3	14.9	14.8	13.9	12.9	12.3	13.0
SPR ADDITIONS(3)....	0.0	-.1	-.7	-.4	-.4	-0.3	-0.3	-0.3	-0.3	-0.3	-0.3	-0.3
STOCK WITHDRAWALS...	-1.1	-1.8	0.0	-.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL SUPPLY.........	70.7	75.9	74.1	70.9	71.9	75.8	77.6	78.2	78.4	79.1	80.0	81.6
CONSUMPTION												
NON-ELEC UTILITY FUEL												
PETROLEUM..........	29.5	31.5	29.9	28.6	29.2	30.8	32.3	32.1	31.5	30.9	30.6	30.7
NATURAL GAS(4).....	16.7	16.6	16.1	15.0	14.9	14.6	13.9	13.8	13.8	14.0	14.3	14.6
COAL...............	4.0	3.4	3.4	3.0	2.9	3.2	3.3	3.4	3.5	3.6	3.7	3.8
SUBTOTAL.........	50.2	51.4	49.4	46.4	47.0	48.6	49.4	49.2	48.7	48.6	48.6	49.1
ELECTRIC UTILITY FUEL												
PETROLEUM..........	3.2	2.7	2.2	1.8	1.5	2.9	4.0	4.0	4.0	4.0	3.8	3.7
NATURAL GAS........	3.2	3.8	3.8	3.3	3.4	2.7	1.6	1.6	1.6	1.6	1.9	2.1
COAL...............	8.8	12.1	12.7	12.7	13.2	13.5	14.0	14.2	14.4	14.7	15.2	15.8
NUCLEAR............	1.9	2.7	2.9	3.0	3.2	3.7	4.1	4.7	5.3	5.8	6.1	6.3
HYDRO/GEO/OTHER(5).	3.4	3.2	3.1	3.5	3.4	3.4	3.5	3.5	3.5	3.5	3.5	3.6
SUBTOTAL.........	20.5	24.5	24.7	24.3	24.7	25.8	26.8	27.7	28.4	29.3	30.2	31.2
TOTAL CONSUMPTION....	70.7	75.9	74.1	70.7	71.7	74.4	76.3	76.8	77.1	77.9	78.8	80.3
ADJUSTMENTS												
REFINERY LOSSES(6).	0.0	0.0	0.0	0.0	-0.1	0.0	0.2	0.2	0.2	0.2	0.2	0.3
DISCREPANCY(7).....	0.0	0.0	0.0	0.2	0.3	1.4	1.1	1.2	1.1	1.0	1.0	1.0
TOTAL DISPOSITION....	70.7	75.9	74.1	70.9	71.9	75.8	77.6	78.2	78.4	79.1	80.0	81.6

NOTE: THE "ANNUAL ENERGY REVIEW" FOR 1982 WILL CONTAIN LATER REVISIONS TO HISTORICAL DATA FOR 1975, 1980 AND 1982.
NOTE: TOTALS MAY NOT EQUAL SUM OF COMPONENTS DUE TO INDEPENDENT ROUNDING. FOR TABLE FOOTNOTES AND SOURCES SEE PAGE 219.

TABLE H.1.2. SUPPLY/DEMAND BALANCE
CASE H: LOW INDUSTRIAL ELECTRICITY DEMAND
(QUADRILLION BTU PER YEAR)

	1975	1980	1985	1986	1987	1988	1989	1990
DOMESTIC SUPPLY								
COAL..................	15.2	19.2	20.1	20.6	21.1	21.7	22.5	23.5
NATURAL GAS...........	19.6	19.9	15.3	14.8	14.8	15.5	16.0	16.5
PETROLEUM.............	20.1	20.5	20.4	20.5	20.5	20.5	20.2	19.3
NUCLEAR...............	1.9	2.7	4.1	4.7	5.3	5.8	6.1	6.3
OTHER(1)..............	3.2	3.0	3.1	3.1	3.2	3.2	3.2	3.2
TOTAL DOMESTIC SUPPLY....................	60.0	65.3	63.1	63.7	64.8	66.6	68.0	68.9
NATURAL GAS IMPORTS...	0.9	1.0	1.2	1.2	1.2	1.2	1.2	1.2
SUPPLEMENTAL GAS(2)...	0.0	0.2	0.0	0.3	0.3	0.0	0.0	0.0
PETROLEUM IMPORTS.....	12.5	13.5	16.2	15.9	15.2	14.6	14.3	15.2
TOTAL SUPPLY(3).........	73.4	80.0	80.5	81.1	81.5	82.4	83.5	85.3
DISPOSITION								
RESIDENTIAL...........	9.6	9.3	9.2	9.2	9.2	9.2	9.2	9.3
COMMERCIAL............	5.5	5.9	6.6	6.7	6.8	6.8	6.8	6.9
INDUSTRIAL(4).........	21.3	23.0	22.5	22.8	23.0	23.4	23.9	24.7
TRANSPORTATION........	17.7	19.7	18.6	18.2	17.7	17.3	17.0	16.9
TOTAL END-USE CONSUMPTION.............	54.1	57.9	56.9	56.9	56.7	56.7	57.0	57.7
DISCREPANCY.............	0.2	-0.1	-0.1	-0.2	-0.3	-0.4	-0.5	-0.4
ADJUSTMENTS.............	19.1	22.2	23.7	24.4	25.1	26.1	27.0	28.0
UTILITY GENERATION....	13.7	16.5	18.0	18.6	19.0	19.7	20.2	20.9
UTILITY TRANSMISSION..	0.6	0.7	0.8	0.9	0.9	0.9	1.0	1.0
REFINERY(5)...........	0.0	0.0	0.2	0.2	0.2	0.2	0.2	0.3
GAS PIPELINE(6).......	0.6	0.6	1.1	1.1	1.1	1.1	1.1	1.1
LEASE/PLANT FUEL(7)...	1.4	1.0	1.1	1.1	1.1	1.2	1.2	1.2
COAL EXPORTS..........	1.7	2.4	2.9	3.0	3.2	3.4	3.6	3.8
SPR ADDITIONS.........	0.0	0.1	0.3	0.3	0.3	0.3	0.3	0.3
STOCK WITHDRAWALS.....	1.1	1.8	0.0	0.0	0.0	0.0	0.0	0.0
RECLASSIFIED..........	0.0	-0.9	-0.7	-0.7	-0.7	-0.7	-0.6	-0.6
ADJUSTED CONSUMPTION....	73.4	80.0	80.5	81.1	81.5	82.4	83.5	85.3
ELECTRIC UTILITY FUEL								
COAL..................	8.8	12.1	14.0	14.2	14.4	14.7	15.2	15.8
PETROLEUM.............	3.2	2.7	4.0	4.0	4.0	4.0	3.8	3.7
NATURAL GAS...........	3.2	3.8	1.6	1.6	1.6	1.6	1.9	2.1
TOTAL FOSSIL............	15.2	18.6	19.6	19.8	20.0	20.4	20.9	21.7
NUCLEAR...............	1.9	2.7	4.1	4.7	5.3	5.8	6.1	6.3
OTHER.................	3.2	3.0	3.1	3.1	3.2	3.2	3.2	3.2
TOTAL...................	20.3	24.3	26.8	27.7	28.4	29.3	30.2	31.2
GENERATION..............	6.6	7.8	8.8	9.1	9.3	9.6	9.9	10.3

NOTE: TOTALS MAY NOT EQUAL SUM OF COMPONENTS DUE TO INDEPENDENT ROUNDING. FOR TABLE FOOTNOTES AND SOURCES SEE PAGE 219.

TABLE H.1.3. CONSUMPTION SUMMARY
CASE H: LOW INDUSTRIAL ELECTRICITY DEMAND
(QUADRILLION BTU PER YEAR)

	1975	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990
RESIDENTIAL	9.571	9.335	9.104	9.236	9.143	9.173	9.204	9.228	9.234	9.233	9.244	9.264
STEAM COAL............	0.091	0.065	0.080	0.082	0.071	0.078	0.076	0.074	0.073	0.071	0.069	0.068
NATURAL GAS...........	5.022	4.866	4.654	4.793	4.710	4.649	4.582	4.520	4.460	4.407	4.368	4.338
DISTILLATE(1).........	1.923	1.417	1.375	1.303	1.230	1.308	1.328	1.336	1.333	1.319	1.303	1.286
LIQUID PETROLEUM GAS...	0.528	0.539	0.536	0.570	0.590	0.565	0.576	0.582	0.583	0.579	0.575	0.570
ELECTRICITY	2.007	2.448	2.459	2.488	2.530	2.574	2.642	2.715	2.786	2.857	2.929	3.002
COMMERCIAL	5.513	5.892	5.818	5.867	6.182	6.437	6.599	6.707	6.758	6.773	6.813	6.862
STEAM COAL............	0.135	0.095	0.107	0.122	0.086	0.097	0.095	0.092	0.090	0.087	0.085	0.082
NATURAL GAS...........	2.559	2.674	2.580	2.683	2.720	2.730	2.720	2.689	2.640	2.582	2.536	2.493
DISTILLATE(1).........	0.622	0.556	0.540	0.511	0.670	0.738	0.775	0.801	0.815	0.820	0.825	0.828
LO-SULFUR RESIDUAL.....	0.506	0.566	0.470	0.376	0.490	0.542	0.569	0.588	0.598	0.602	0.605	0.608
LIQUID PETROLEUM GAS...	0.093	0.095	0.095	0.101	0.090	0.080	0.078	0.076	0.074	0.072	0.070	0.068
ELECTRICITY	1.598	1.907	2.026	2.074	2.150	2.251	2.362	2.460	2.540	2.610	2.693	2.783
INDUSTRIAL(2)	18.503	20.185	19.513	16.876	17.365	19.000	19.889	20.225	20.467	20.996	21.463	22.256
STEAM COAL............	1.619	1.388	1.570	1.626	1.501	1.771	1.811	1.877	1.970	2.082	2.203	2.321
METALLURGICAL COAL.....	2.178	1.793	1.647	1.057	1.132	1.262	1.303	1.325	1.338	1.354	1.360	1.376
NATURAL GAS...........	6.133	6.497	6.639	5.414	5.340	5.406	5.082	5.103	5.216	5.508	5.751	6.054
DISTILLATE............	1.272	1.569	1.285	1.212	1.340	1.789	2.347	2.392	2.314	2.233	2.150	2.146
LO-SULFUR RESIDUAL.....	0.428	0.554	0.423	0.368	0.390	0.491	0.569	0.582	0.580	0.582	0.577	0.596
HI-SULFUR RESIDUAL.....	0.856	0.713	0.531	0.483	0.530	0.718	0.881	0.909	0.909	0.905	0.896	0.919
LIQUID PETROLEUM GAS...	0.252	0.308	0.323	0.332	0.370	0.371	0.405	0.386	0.341	0.294	0.244	0.207
PET-CHEM FEEDSTOCK(3)..	1.519	2.401	2.111	1.862	1.980	2.175	2.290	2.374	2.454	2.559	2.675	2.839
OTHER(4)..............	1.900	2.180	2.166	1.977	2.240	2.207	2.259	2.254	2.241	2.240	2.258	2.288
ELECTRICITY	2.346	2.781	2.817	2.545	2.620	2.810	2.941	3.024	3.104	3.240	3.349	3.509
TRANSPORTATION(5)	17.725	19.655	18.715	18.129	17.910	18.539	18.611	18.192	17.704	17.273	17.043	16.948
DISTILLATE............	2.069	2.782	2.738	2.582	2.510	2.781	2.893	2.965	3.040	3.113	3.203	3.314
HI-SULFUR RESIDUAL.....	0.731	1.401	1.163	0.930	0.900	1.012	1.054	1.079	1.103	1.122	1.149	1.182
GASOLINE(6)...........	12.868	13.253	12.688	12.528	12.180	12.472	12.291	11.715	11.085	10.527	10.133	9.837
JET FUEL(7)...........	2.029	2.179	2.087	2.049	2.280	2.234	2.332	2.392	2.436	2.470	2.518	2.575
LIQUID PETROLEUM GAS...	0.016	0.014	0.014	0.015	0.020	0.015	0.015	0.015	0.015	0.015	0.015	0.015
OTHER.................	0.000	0.014	0.014	0.014	0.010	0.014	0.014	0.014	0.014	0.014	0.014	0.014
ELECTRICITY	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010
ELECTRIC UTILITY FUEL	20.360	24.243	24.462	24.203	24.480	25.824	26.847	27.656	28.389	29.305	30.155	31.204
STEAM COAL............	8.790	12.122	12.707	12.697	13.190	13.473	13.988	14.230	14.424	14.736	15.189	15.836
NATURAL GAS...........	3.240	3.807	3.764	3.336	3.440	2.673	1.615	1.586	1.601	1.649	1.914	2.099
DISTILLATE(8).........	0.350	0.121	0.077	0.048	0.090	0.178	0.312	0.316	0.272	0.266	0.292	0.348
LO-SULFUR RESIDUAL(9)..	2.860	1.611	1.251	0.980	0.780	1.778	2.532	2.557	2.557	2.567	2.350	2.254
HI-SULFUR RESIDUAL.....	NA	0.922	0.898	0.789	0.600	0.936	1.150	1.139	1.131	1.137	1.117	1.133
HYDRO/GEO/OTHER(10)....	3.220	2.988	2.864	3.340	3.190	3.115	3.133	3.149	3.152	3.168	3.179	3.203
NUCLEAR...............	1.900	2.672	2.901	3.013	3.190	3.671	4.118	4.678	5.253	5.782	6.114	6.331
REFINERY FUEL(11)	2.769	2.787	2.304	2.190	2.480	2.360	2.571	2.557	2.503	2.452	2.403	2.394
NATURAL GAS...........	0.975	0.846	0.668	0.574	0.720	0.433	0.287	0.277	0.285	0.318	0.348	0.379
DISTILLATE............	0.035	0.018	0.011	0.011	0.010	0.012	0.013	0.013	0.012	0.012	0.012	0.012
LO-SULFUR RESIDUAL.....	NA	NA	NA	NA	0.090	0.120	0.154	0.153	0.145	0.134	0.124	0.120
HI-SULFUR RESIDUAL.....	0.269	0.213	0.167	0.137	0.200	0.299	0.487	0.493	0.474	0.433	0.395	0.365
LIQUID PETROLEUM GAS...	0.050	0.043	0.024	0.038	0.030	0.026	0.028	0.028	0.027	0.027	0.026	0.026
OTHER(12).............	0.390	0.436	0.359	0.348	0.360	0.366	0.399	0.397	0.388	0.380	0.373	0.371
STILL GAS.............	1.050	1.231	1.073	1.085	1.080	1.105	1.203	1.197	1.172	1.148	1.125	1.121

NOTE: TOTALS MAY NOT EQUAL SUM OF COMPONENTS DUE TO INDEPENDENT ROUNDING. FOR TABLE FOOTNOTES AND SOURCES SEE PAGE 219.

TABLE H.1.4. PRICE SUMMARY
CASE H: LOW INDUSTRIAL ELECTRICITY DEMAND
(1982 DOLLARS PER MILLION BTU)

	1975	1980	1985	1986	1987	1988	1989	1990
WORLD OIL PRICE.........	20.70	39.32	25.47	28.24	31.53	34.11	35.68	36.71
RESIDENTIAL	5.95	8.33	9.58	10.28	10.95	11.34	11.51	11.74
NATURAL GAS...........	2.75	4.16	6.75	7.48	8.08	8.39	8.41	8.59
DISTILLATE(1).........	4.75	8.59	6.27	6.94	7.72	8.36	8.75	9.02
LIQUID PETROLEUM GAS..	4.11	6.67	6.07	6.68	7.38	7.93	8.23	8.51
ELECTRICITY	15.61	16.78	17.13	17.59	18.06	18.18	18.21	18.28
COMMERCIAL	6.27	8.38	10.12	10.83	11.52	11.94	12.17	12.45
NATURAL GAS...........	2.17	3.84	6.51	7.28	7.91	8.25	8.33	8.54
DISTILLATE(1).........	4.30	8.06	5.94	6.57	7.32	7.92	8.29	8.55
LO-SULFUR RESIDUAL....	4.13	5.32	4.79	5.31	5.92	6.45	6.77	7.08
LIQUID PETROLEUM GAS..	NA	6.67	6.08	6.70	7.39	7.95	8.25	8.53
ELECTRICITY	15.55	17.21	17.37	17.87	18.38	18.55	18.60	18.68
INDUSTRIAL(2)	3.37	5.44	6.41	6.94	7.48	7.81	7.98	8.15
STEAM COAL............	1.81	1.55	2.10	2.13	2.16	2.20	2.25	2.33
METALLURGICAL COAL....	2.80	2.51	2.56	2.59	2.61	2.63	2.66	2.71
NATURAL GAS...........	1.49	2.90	5.72	6.49	7.06	7.25	7.24	7.30
DISTILLATE............	4.24	7.99	5.85	6.47	7.21	7.81	8.18	8.43
LO-SULFUR RESIDUAL....	4.11	5.14	4.71	5.22	5.82	6.34	6.66	6.97
HI-SULFUR RESIDUAL....	2.93	NA	4.19	4.72	5.34	5.87	6.20	6.51
LIQUID PETROLEUM GAS..	3.83	6.34	5.86	6.45	7.12	7.65	7.93	8.20
PET-CHEM FEEDSTOCK(3).	NA	7.88	6.72	7.41	8.25	8.93	9.35	9.63
OTHER(4)..............	NA	NA	5.18	5.71	6.35	6.88	7.21	7.45
ELECTRICITY	9.42	11.67	14.17	14.58	15.01	15.14	15.20	15.30
TRANSPORTATION(5)	6.72	9.91	7.75	8.43	9.21	9.78	10.07	10.21
DISTILLATE............	5.85	8.39	6.21	6.87	7.66	8.30	8.69	8.96
HI-SULFUR RESIDUAL....	2.93	3.97	3.65	4.13	4.68	5.17	5.47	5.76
GASOLINE(6)...........	7.57	11.32	8.69	9.47	10.35	10.97	11.29	11.41
JET FUEL(7)...........	3.69	7.51	6.60	7.24	8.05	8.69	9.08	9.34
LIQUID PETROLEUM GAS..	NA	NA	5.81	6.40	7.08	7.62	7.91	8.18
ELECTRICITY	NA	NA	16.74	17.25	17.78	17.98	18.05	18.10
ELECTRIC UTILITY FUEL	2.04	1.84	2.05	2.15	2.24	2.30	2.34	2.41
STEAM COAL............	1.58	1.71	1.73	1.75	1.77	1.78	1.80	1.85
NATURAL GAS...........	1.14	2.80	5.65	6.47	7.06	7.13	7.17	7.23
DISTILLATE(8).........	3.28	7.22	5.87	6.50	7.25	7.85	8.21	8.47
LO-SULFUR RESIDUAL(9).	3.27	5.90	4.78	5.31	5.93	6.46	6.73	7.00
HI-SULFUR RESIDUAL....	NA	4.55	3.68	4.15	4.70	5.18	5.48	5.76
NUCLEAR...............	NA	.85	0.85	0.85	0.85	0.85	0.85	0.85
REFINERY FUEL	NA	NA	2.31	2.59	2.91	3.16	3.29	3.41
NATURAL GAS...........	NA	3.08	4.85	5.54	6.12	6.32	6.30	6.31
DISTILLATE............	NA	6.09	5.14	5.70	6.37	6.90	7.24	7.47
LO-SULFUR RESIDUAL....	NA	NA	4.13	4.59	5.13	5.60	5.90	6.18
HI-SULFUR RESIDUAL....	NA	4.89	3.47	3.93	4.47	4.95	5.24	5.53
LIQUID PETROLEUM GAS..	NA	NA	5.16	5.70	6.31	6.79	7.05	7.31
OTHER(10).............	NA	NA	5.07	5.60	6.24	6.77	7.10	7.34

NOTE: TOTALS MAY NOT EQUAL SUM OF COMPONENTS DUE TO INDEPENDENT ROUNDING. FOR TABLE FOOTNOTES AND SOURCES SEE PAGE 219.

TABLE H.4.3. INDUSTRIAL SECTOR ENERGY CONSUMPTION
CASE H: LOW INDUSTRIAL ELECTRICITY DEMAND
(TRILLIONS OF BTU PER YEAR)

	1980	1985	1986	1987	1988	1989	1990
COAL....................	1387.88	1811.09	1877.20	1969.59	2082.33	2202.86	2321.49
NATURAL GAS.............	6497.36	5081.96	5102.78	5215.94	5508.01	5751.31	6049.48
(RAW MATERIALS(1).....	650.77	486.53	475.06	470.38	475.56	486.82	493.30)
DISTILLATE..............	1568.70	2347.47	2391.57	2313.52	2232.71	2149.95	2146.17
HI-SULFUR RESIDUAL......	713.20	881.31	908.62	909.42	905.34	895.67	919.05
LO-SULFUR RESIDUAL......	553.58	569.32	581.70	580.44	581.82	576.93	596.11
ELECTRICITY.............	2781.00	2941.40	3024.23	3103.54	3240.47	3348.70	3509.19
LIQUID PETROLEUM GAS....	307.89	404.88	385.96	341.43	293.87	244.49	206.56
PET-CHEM FEEDSTOCKS(2)..	2401.48	2289.86	2374.27	2454.12	2558.74	2675.40	2837.12
METALLURGICAL COAL......	1793.34	1302.59	1325.37	1337.65	1353.56	1359.74	1375.68
OTHER(3)................	2180.32	2258.77	2253.63	2241.04	2239.57	2257.81	2289.04
TOTAL ENERGY............	20184.73	19888.64	20225.32	20466.67	20996.42	21462.84	22249.87

(1) NATURAL GAS CONSUMED AS A FEEDSTOCK BY THE CHEMICAL INDUSTRY (ALREADY INCLUDED IN THE NATURAL GAS TOTAL).

(2) CONSISTS OF STILL GAS USED FOR FEEDSTOCK PUROPSES, NAPTHAS LESS THAN 400 DEGREES, OTHER FUELS GREATER THAN 400 DEGREES, AND LIQUID PETROLEUM GASES USED FOR GAS UTILITY FUEL AND FOR CHEMICAL FEEDSTOCKS.

(3) ASPHALT, PETROLEUM COKE, LUBRICANTS, INDUSTRIAL KEROSENE, WAXES AND MISCELLANEOUS PETROLEUM PRODUCTS.

NOTE: INDUSTRIAL SECTOR TOTAL DIFFER FROM THOSE SHOWN IN THE "MONTHLY ENERGY REVIEW" BY EXCLUDING ELECTRICITY LOSSES, GASOLINE, NATURAL GAS USED AS A LEASE AND PLANT FUEL, AND ALL REFINERY FUELS EXCEPT COAL AND ELECTRICITY, AND BY INCLUDING LUBRICANTS CONSUMED BY THE TRANSPORTATION SECTOR. IN 1980 ONLY, THE RESIDUAL AND DISTILLATE DETAIL HAS BEEN CONVERTED TO THE NEW BASIS FOR CONSISTENCY WITH THE PETROLEUM BALANCE TABLE AND WITH 1980 FUEL DETAIL USED IN THE "SHORT-TERM ENERGY OUTLOOK."

NOTE: ENTRIES FOR 1980 ARE HISTORICAL DATA.

SOURCES: ON PAGE 222, SEE 1, PAGE 17; 15, PAGE 11, TABLE 5; AND 15, PAGE 127, TABLE 55.

TABLE H.5.1. ELECTRIC UTILITY FUEL PRICES AND CONSUMPTION
CASE H: LOW INDUSTRIAL ELECTRICITY DEMAND
(1982 DOLLARS PER MILLION BTU; TRILLIONS OF BTU PER YEAR)

YEARS	COAL	NATURAL GAS	DISTILLATE	LO-S RESID	HI-S RESID	FOSSIL FUEL	NUCLEAR	HYDRO	ALL FUELS
FUEL PRICES									
1980	1.71	2.80	7.22	5.90	4.55	NA	NA	--	NA
1985	1.74	5.65	5.87	4.78	3.68	2.63	0.85	--	2.05
1986	1.75	6.47	6.50	5.31	4.15	2.80	0.85	--	2.15
1987	1.77	7.06	7.24	5.93	4.70	2.96	0.85	--	2.24
1988	1.78	7.13	7.85	6.46	5.18	3.08	0.85	--	2.30
1989	1.80	7.17	8.21	6.73	5.47	3.14	0.85	--	2.34
1990	1.85	7.23	8.47	7.00	5.76	3.22	0.85	--	2.41
FUEL CONSUMPTION									
1980	12122.	3807.	121.	1611.	922.	18583.	2672.	2988.	24243.
1985	13988.	1615.	312.	2532.	1150.	19596.	4118.	3133.	26847.
1986	14230.	1586.	316.	2557.	1139.	19829.	4678.	3149.	27656.
1987	14424.	1601.	272.	2557.	1131.	19984.	5253.	3152.	28389.
1988	14736.	1649.	266.	2567.	1137.	20355.	5782.	3168.	29305.
1989	15189.	1914.	292.	2350.	1117.	20862.	6114.	3179.	30155.
1990	15836.	2099.	348.	2254.	1133.	21671.	6331.	3203.	31204.

NA=NOT AVAILABLE.
--=NOT APPLICABLE.
NOTE: ENTRIES FOR 1980 ARE HISTORICAL DATA.
SOURCES: ON PAGE 222, SEE 1; 2, PP 160-170, TABLES B1, B2, B3, AND B4; 2, PP 253-255, TABLE C9; 2, PP 262-263, TABLE C13; 2, PP 270-271, TABLE C17; AND 2, PP 290-291, TABLE C27.

TABLE H.5.2. END-USE ELECTRICITY PRICES AND CONSUMPTION
CASE H: LOW INDUSTRIAL ELECTRICITY DEMAND
(1982 MILLS PER KWH; BILLION KWH PER YEAR)

YEARS	RESIDENTIAL	COMMERCIAL	TRANSPORTATION	INDUSTRIAL	AVG./TOTAL
END-USE PRICES					
1980	57.25	58.72	NA	39.82	50.82
1985	58.43	59.25	57.11	48.34	54.94
1986	60.02	60.98	58.87	49.74	56.52
1987	61.61	62.72	60.67	51.22	58.12
1988	62.02	63.30	61.36	51.66	58.55
1989	62.13	63.48	61.59	51.86	58.70
1990	62.39	63.73	61.77	52.22	58.95
END-USE CONSUMPTION					
1980	717.50	558.91	0.00	815.06	2091.47
1985	774.23	692.42	3.05	862.12	2331.82
1986	795.89	721.04	3.05	886.40	2406.38
1987	816.58	744.56	3.05	909.65	2473.83
1988	837.30	764.85	3.05	949.78	2554.97
1989	858.49	789.26	3.05	981.50	2632.30
1990	879.83	815.71	3.05	1028.55	2727.13

NA=NOT AVAILABLE.
NOTE: ENTRIES FOR 1980 ARE HISTORICAL DATA.
SOURCES: ON PAGE 222, SEE 1, PP 15-18; AND 2, PP 229-40, TABLES C1, C2, C3, AND C4.

Endnotes to Table 1.1:

(1) Includes both pipeline natural gas and liquified natural gas.
(2) Includes increased gas or oil imports in the forecast years 1984-1990.
(3) Indicates strategic petroleum reserve fill rate additions (listed as negative in the table). Stock withdrawals is a balancing item.
(4) Nonutility consumption of natural gas includes lease and plant fuel and transportation use.
(5) Includes net imports of electricity.
(6) Refinery loss indicates cracking losses.
(7) Discrepancy indicates differences in independent estimates of supply and demand components.

Note: Totals may not equal components due to independent rounding.
Note: Other includes wood waste consumed by electric utilities.
Note: Industrial hydroelectric power is excluded from the supply and disposition balances.
Note: Entries for 1975, 1980, 1981, and 1982 are historical data taken from reference 21. Entries for 1983 are projected from the Short-Term Integrated Forecasting System, February 1983 base case.
Sources: On page 222, see 1; 4; 12; 14; and 21.

Endnotes to Table 1.2:

(1) Includes hydroelectric power, geothermal power, and wood waste consumed by electric utilities.
(2) Includes increased gas or oil imports.
(3) Total supply differs from that shown on Table A.1.1 by the exclusion of coal and electricity net imports and stock withdrawals.
(4) Includes refinery fuel use.
(5) Indicates cracking losses during the refining process.
(6) Indicates gas used to fuel compressors in the pipeline machinery.
(7) Represents gas used as a fuel in field gathering and plant processing machinery.

NA=Not Available.

Note: Totals may not equal to components due to independent rounding.
Note: Discrepancy is supply less consumption less adjustments.
Note: Entries for 1975 and 1980 are historical data.
Sources: On page 222, see 1; and 2.

Endnotes to Table 1.3:

(1) In the residential and commercial sectors, distillate also includes kerosene.

(2) Industrial fuel totals exclude refinery fuel consumption and lease and plant fuel consumption.

(3) Petrochemical feedstocks consists of still gas used for feedstock purposes, naphthas less than 400 degrees, other oils greater than 400 degrees, and liquid petroleum gases used for gas utility fuel and for chemical feedstocks.

(4) Consists of special naphthas, miscellaneous petroleum products, industrial kerosene, lubricants, waxes, unfractionated steam, plant condensate, natural gasoline, asphalt, road oil, nonrefinery and nonfeed-stock consumption of still gas, and petroleum coke excluding refinery and electrical utility product supplied.

(5) Transportation fuel totals exclude lubricants and natural gas used as a pipeline fuel.

(6) Includes aviation gasoline and motor gasoline reported as being consumed by the commercial and industrial sectors.

(7) Includes naphtha and kerosene type jet fuel.

(8) The 1975 entry includes small amounts of kerosene consumed by electric utilities.

(9) The 1975 entry includes small amounts of petroleum coke consumed by electric utilities.

(10) Other consists of wood wastes.

(11) Excludes coal, purchased steam, electricity, and crude petroleum used as a fuel.

(12) Consists of petroleum coke and the fuel category labeled "other" on the refinery fuel consumption table in the Petroleum Statement Annual.

NA=Not Available.

Note: Entries for 1975 and 1980 are historical data, however data for 1980 are transformed to new basis petroleum totals. Entries for 1981, 1982 and 1983 are projected from the Short-Term Integrated Forecasting System and IFFS. They may contain inconsistencies with Table 1.1 because of the additional detail and the inclusion of reclassified.

Sources: On page 222, see 1; 3, page 23, Table 25; 4, page 27, Table 21; and 5, Table 19.

Endnotes to Table 1.4:

(1) In the residential and commercial sectors, distillate also includes kerosene.

(2) Industrial fuel totals exclude refinery fuel consumption and lease and plant fuel consumption.

(3) Petrochemical feedstocks consists of still gas used for feedstock purposes, naphthas less than 400 degrees, other fuels greater than 400 degrees, and liquid petroleum cases used for gas utility fuel and for chemical feedstocks.

(4) Consists of special naphthas, miscellaneous petroleum products, industrial kerosene, lubricants, waxes, unfractionated steam, plant condensate, natural gasoline, asphalt, road oil, nonrefinery and nonfeedstock consumption of still gas, and petroleum coke excluding refinery and electrical utility product supplied.

(5) Transportation fuel totals exclude lubricants and natural gas used as a pipeline fuel.

(6) Includes aviation gasoline and motor gasoline reported as being consumed by the commercial and industrial sectors.

(7) Includes naphtha and kerosene type jet fuel.

(8) The 1975 entry includes small amounts of kerosene consumed by electric utilities.

(9) The 1975 entry includes small amounts of petroleum coke consumed by electric utilities.

(10) Consists of petroleum coke and the fuel category labeled "other" on the refinery fuel consumption table in the Petroleum Statement Annual.

NA=Not Available.

Note: Entries for 1975 and 1980 are historical data.

Sources: On page 222, see 6; 7, pp 28-29, Table 2; and 8, pp 16-17, Table 3.

Appendix Data Sources

1. Energy Information Administration, State Energy Data Report, 1960 through 1980, DOE/EIA-0214(80) (Washington, D.C., 1981).

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Appendix B
Sectoral Definitions and Fossil Fuel Terminology

Page

This appendix lists the sectoral definitions used in the Integrated Future Forecasting System (IFFS). These definitions provide an explanation of the conceptual differences between end-use sector fuel totals in this report and in other Energy Information Administration reports. The sector definitions are followed by a glossary of terms, organized by fossil fuels, which are used in the main body of the report and in the appendix tables, is then provided. The fossil fuel glossary is followed by an explanation of the thermal conversion factors used in IFFS.

Sectoral Definitions

Residential Sector: Energy consumed by private household establishments primarily for space heating, water heating, air conditioning, cooking, and clothes drying. This sector's consumption does not include consumption by individual households which are located in master metered apartment buildings.

Commercial Sector: Energy consumed by nonmanufacturing business establishments. Included are motels, restaurants, wholesale businesses, retail stores, laundries, and other service enterprises, as well as health, social, and educational institutions, and energy consumed by Federal, State and local government. This sector includes consumption by individual households which are located in master metered apartment buildings. The consumption of motor gasoline by this sector has been transferred to the transportation sector.

Industrial sector: Energy consumed by manufacturing, construction, mining, agriculture, fishing, and forestry establishments. Natural gas consumed as a lease and plant fuel, motor gasoline, jet fuel, industrial hydroelectric power and refinery fuel, except for electricity and coal, are excluded from this sector. Lubricants consumed by the industrial sector include transportation sector lubricants.

Transportation Sector: Energy consumed to move people and commodities in both private and public sectors included are military, railroad, vessel bunkering, and marine uses. Natural gas used as a pipeline fuel and lubricants are excluded from this sector.

Electric Utility Sector: Energy consumed by private and publicly owned establishments which generate electricity primarily for resale.

Refinery Sector: Fuels consumed by petroleum refineries for all purposes, except coal and electricity which are included in the industrial sector.

Coal Terminology

Anthracite - A hard, jet black coal with a high luster used for generating electricity and space heating. Its ignition temperature is about 900 degrees Fahrenheit. Anthracite is mined almost exclusively in northeastern Pennsylvania.

Bituminous Coal - The most common coal, also known as soft coal. It is dense, black, often with well-defined bands of bright and dull material, and is used for generating electricity, making coke, and space heating. The ignition temperature is 700 to 800 degrees Fahrenheit. Bituminous coal is mined chiefly in the Appalachian and interior coal fields.

Coal Producing Districts - A classification of coal fields defined in the Bituminous Coal Act of 1937. The districts were originally established to aid in formulating minimum prices of bituminous and subbituminous coal and lignite. Because much statistical information was compiled in terms of these districts, their use for statistical purposes has continued since the abandonment of that legislation in 1943.

Coal Producing Regions - A geographic classification of coal producing States. The States in the Appalachian regions are Alabama, Georgia, eastern Kentucky, Maryland, Ohio, Pennsylvania, Tennessee, Virginia, and West Virginia. The States in the Interior region are Arkansas, Illinois, Indiana, Iowa, Kansas, western Kentucky, Missouri, Oklahoma, and Texas. The States in the Western region are Alaska, Arizona, Colorado, Montana, New Mexico, North Dakota, Utah, Washington, and Wyoming.

Coal Rank/Group - A classification of coal based on fixed carbon, volatile matter, and heating value. It is an indication of the progressive alteration, or coalification, from lignite to anthracite.

F.O.B. Mine Price - The free on board mine price. This is the price paid for coal measured in dollars per short ton at the mining operation site and therefore does not include freight/shipping and insurance costs.

Lignite - A brownish black coal having a high moisture content and used mainly to generate electricity. It is mined in North Dakota, Montana, and Texas.

Subbituminous Coal - A type of coal having a dull black color. It is used for generating electricity and space heating and is mined in the western coal fields.

Blast Furnace - A furnace in which solid fuel (coke) is burned with an air blast to smelt iron ore.

Btu (British Thermal Unit) - A standard unit for measuring the quantity of heat energy equal to the quantity of heat required to raise the temperature of 1 pound of water by 1 degree Fahrenheit.

C.I.F. Cost - Cost including insurance and freight costs. The delivered cost of coal.

Coal Carbonized - The amount of coal that was decomposed into solid (coke and breeze), liquid, and gaseous products by heating it in a coke oven in a limited air supply or in the absence of air.

Coke - The strong porous residue consisting of carbon and mineral ash. It is formed when the volatile constituents of bitiminous coal are driven off by being heating in a limited air supply or in the absence of air. It is most often used as a fuel source in a blast furnace.

Coke Plants - Plants where coal is carbonized in slot or beehive ovens for the manufacture of coke.

F.A.S. Value - Free Alongside Ship value. This is the value of a commodity at the port of exportation. It generally includes the purchase price plus all charges incurred in placing the commodity alongside the carrier at the port of exportation in the country of exportation.

Short Ton - A unit of weight equal to 2,000 pounds.

Stocks - The supply of coal or coke at the mine, plant, or utility at the end of the quarter.

Natural Gas Terminology

Associated-dissolved Gas - Natural gas occurring in reservoirs with crude oil either as free gas (associated) or as gas in solution with the crude oil (dissolved).

Nonassociated Gas - Free natural gas not in contact with crude oil in the reservoir.

Proved Reserves - Geological deposits of gas known to exist and to be economically recoverable using current technology.

Interstate Gas - Natural gas that is dedicated to interstate commerce.

Intrastate Gas - Natural gas that is produced and consumed within one state's boundaries and transported by nonjurisdictional pipelines. As such, the gas was not subject to any Federal regulation until the enactment of the Natural Gas Policy Act of 1978.

Producer - That company or entity that drills, maintains, and operates the gas or gas/oil well. The producer may also perform the gathering and initial field handling and processing of the gas.

Pipeline - The company that receives the gas from the producer and transports it for delivery to either another pipeline, a local distribution company or to end-use consumers. The pipeline company generally purchases the gas from the producer after field handling of the gas or directly at the wellhead and resells it to a local distribution company. Whether or not the pipeline operates across State boundaries determines its classification as interstate or intrastate.

Natural Gas Policy Act of 1978 (NGPA) - Legislation providing: a broad range of price controls on domestically produced gas, with price regulations extended to gas that had not been regulated earlier; a schedule of price increases leading to decontrol at specified future dates; and a mechanism for shifting most of the burden for the higher cost, new gas supplies on industrial consumers who could potentially convert to coal.

Incremental Pricing - Those provisions of the NGPA written to pass the cost of higher priced gas to large industrial consumers. The industrial customers were required to pay the increased cost until their cost reached a level computed from the equivalent price of fuel oil. Due to the high number of exemptions granted, the incremental pricing provisions have had little impact on consumer prices.

Old Gas - Terminology used to encompass several of the NGPA categories, generally Section 103, 104, 105, 106, and 108 gas. This loosely defines old wells and reservoirs existing at the time of NGPA enactment.

New Gas - Terminology generally used to describe Section 102 gas or, less frequently, Section 102 and 107 gas.

High-Price Gas - Terminology used for expensive sources of gas, Section 107, most of which is either deregulated or benefits from relatively high ceiling prices.

Categories of gas - Natural gas as defined by the NGPA, designated by the section of the act in which they are defined:

Section 102 - New Natural Gas - New reservoir gas, new gas from both old and new offshore gas leases, and new onshore wells at least 2.5 miles from the nearest old well or 1,000 feet deeper than any well within 2.5 miles.

Section 103 - New Onshore Production Wells - Onshore wells with drilling started after February 19, 1977, but not qualifying as Section 102.

Section 104 - Gas Dedicated to Interstate Commerce before NGPA Enactment (November 9, 1978) - Including flowing gas and gas from certain designated locations.

Section 105 - Gas Under Existing Intrastate Contracts - Gas sold under such contracts in place at date of enactment.

Section 106 - Sales of Gas Made Under "Rollover" Contracts - Gas under contracts with rollover, price-renegotiation clauses.

Section 107 - High Cost Natural Gas - Gas from wells drilled after February 19, 1977, and 15,000 feet or deeper, gas from coal seams, Devonian shale, or tight sands, or from certain other high-cost sources.

Section 108 - Stripper Well Natural Gas - Nonassociated natural gas produced at low flow rates.

Section 109 - Other categories of natural gas - Largely Prudhoe Bay Alaskan gas, not projected to be a source be significant quantities through 1990.

Petroleum Terminology

Alcohol - The family name of a group of organic chemical compounds composed of carbon, hydrogen, and oxygen. The series of molecules vary in chain length and are composed of a hydrocarbon plus a hydroxyl group, CH-(CH)n-OH. "Alcohol" includes ethanol and methanol.

Asphalt - A dark-brown-to-black material, containing bitumens as the predominant constituents, obtained either naturally or by petroleum processing. It is the residue from the distillation of an asphaltic crude oil or the insoluble portion from an extraction process that utilizes propane or other suitable solvents. The definition includes crude asphalt as well as the following finished products: cements, fluxes, the asphalt content of emulsion (exclusive of water), and petroleum distillates blended with asphalt to make cutback asphalts. The conversion factor is 5.5 42-gallon barrels per short ton.

Aviation Gasoline (Finished) - All special grades of gasoline for use in aviation reciprocating engines, as given in ASTM Specification D 910 and Military Specification MIL-G-5572. "Aviation gasoline" includes all refinery products within the gasoline range that are to be marketed straight or in blends as aviation gasoline without further refinery processing.

Barrels - A volumetric unit of measure of crude oil and petroleum products equivalent to 42 U.S. gallons. This measure is used in most statistical reports. Factors for converting petroleum coke, asphalt, wax, and still gas to barrels are given in the definitions for these products.

Barrels Per Calendar Day - Represents the number of barrels per stream day of input to crude oil processing units that can be processed by a refinery in a average 24-hour period after making allowances for the following limitations: downstream limitations, environmental constraints, types and grades of input, planned and unplanned downtime, and types of grades of products.

Barrels Per Stream Day - Represents the amount a unit can process running at full capacity under optimal crude and product slate conditions.

Catalytic Cracking - Basically the same as thermal cracking since heat is used, but differs in its use of a catalyst to direct the cracking reaction to produce more of the higher octane hydrocarbons; provides a motor spirit of 10 to 15 octane numbers higher than that of the thermally cracked product and is more effective in producing isoparaffins and aromatics, all of which are of high anti-knock qualities or value. Modern cracking units are one of two types: the "fluid process" uses a finely powdered catalyst which is moved and circulated through the system by a "fluidized-solid" technique, and the other, "moving bed process," in which pellet catalysts are circulated by elevators or gas-lift method.

Catalytic Hydrocracking - A refining process for converting middle-boiling or residual material to high-octane gasoline, reformer charge stock, jet fuel, and/or high grade fuel oil. Hydrocracking is an efficient, relatively low-temperature process using hydrogen and catalyst.

Catalytic Hydrofining - A process for improving the quality of petroleum products, especially gasoline, by treating them with hydrogen in the presence of a catalyst, at a temperature below that at which decomposition occurs.

Catalytic Hydrotreating - A process of treating petroleum fractions and unfinished oils in the presence of catalysts and substantial quantities of hydrogen to upgrade their quality.

Catalytic Reforming - The use of controlled heat and pressure with catalysts to effect the rearrangement of certain hydrocarbon molecules without altering their composition appreciably; the conversion of low-octane gasoline fractions into higher octane stocks suitable for blending into finished gasoline; also the conversion of naphthas to obtain more volatile product of higher octane number.

Crude Distillation - The processing of separating crude oil components by heating and subsequent condensing of the fractions by cooling.

Crude Oil - A naturally occurring mixture of liquid hydrocarbons that remains liquid at atmospheric pressure after passing through surface separating facilities. Lease condensate is included. Drips are also included, but topped crude (residual) oil and other unfinished oils are excluded. Liquids produced at natural gas processing plants and mixed with crude oil are likewise excluded where identifiable.

Crude Oil Type

- Sweet - Under 0.5 wt. % sulfur
  Light Medium - 15% or less @ 1050°F. + residuum assay
  Heavy Medium - Greater than 15% @ 1050°F + residuum assay

- High Sulfur - in excess of 1.0 wt. % sulfur
  Light High - 15% or less @ 1050°F. + residuum assay
  Heavy High - Greater than 15% @ 1050°F. + residuum assay

- Domestic - Crude oil produced in the United States or from its outer continental shelf as defined in 43 U.S.C. 1331. Synthetic hydrocarbons such as shale oil and tar sand oil are included.

- Foreign - Crude oil produced outside the United States. Imported Athabasca hydrocarbons are reported as crude oil.

Distillate Fuel Oil - A general classification for one of the petroleum fractions which, when produced in conventional distillation operations, has a boiling range of 400 degrees Farenheit at the 10-percent point to 640 degrees Farenheit at the 90-percent point. It is used primarily for space heating, on- and off-highway diesel engine fuel (including railroad engine fuel and fuel for agricultural machinery), and electric power generation. Included are products known as No. 1 and No. 2 heating oils, diesel fuels, and No. 4 fuel oil.

Feedstocks - Crude oil or other hydrocarbons that are the basic materials for a refining or manufacturing process.

Field Production - Represents crude oil production on leases, natural gas liquids production at natural gas processing plants, and new supply of other hydrocarbons and alcohol.

Hydrogen - A colorless, highly flammable gaseous element, the lightest of all gases and the most abundant element in the universe, used in the production of synthetic ammonia and methanol, in petroleum refining, and in hydrogenation of organic materials.

Kerosene - A petroleum distillate that boils at a temperature between 300 and 550 degrees Farenheit, that has a flash point higher than 100 degrees Farenheit by ASTM Method D 56, that has a gravity range from 40 degrees to 46 degrees API, and that has a burning point in the range of 150 to 175 degrees Farenheit. It is a clean-burning product suitable for use as an illuminant when burned in wick lamps. Includes grades of kerosene called range oil having properties similar to No. 1 fuel oil, but with a gravity of about 43 degrees API and having a maximum end-point of 625 degrees Farenheit. Kerosene is used in space heaters, cook stoves, and water heaters.

Kerosene-Type Jet Fuel - A quality kerosene product with an average gravity of 40.7 degrees API, a 10-percent distillation temperature of 400 degrees Farenheit, and an endpoint of 572 degrees Farenheit. It is covered by ASTM Specification D 1655 and Military Specification MIL-T-5624L (Grade JP-5 and JP-8). It is used primarily for commercial turbojet and turboprop aircraft engines.

Lease Condensate - A natural gas liquid recovered from gas well gas (associated and nonassociated) in lease separators or natural gas field facilities. Lease condensate consists primarily of pentanes and heavier hydocarbons.

Lubricants - A substance used to reduce friction between bearing surfaces. Petroleum lubricants may be produced either from distillates or residues. Other substances may be added to impart or improve certain required properties. "Lubricants" includes all grades of lubricating oils from spindle oil to cylinder oil and those used in greases. The three categories reported are:

- Bright Stock - A refined, high viscosity lubricating oil base stock that is usually made from a residuum by a treatment such as deasphalting, acid treatment, or solvent extraction.

- Neutral - A distillate lubricating oil base stock with a viscosity that is usually not above 550 Saybolt Seconds Universal (SSU) at 100 degrees Farenheit. It is prepared by a treatment such a hydrofining, acid treatment, or solvent extraction.

- Other - A lubricating oil base stock used in finished lubricating oils and greases, including black, coastal, and red oils.

Miscellaneous Products - Includes all finished products not classified elsewhere. "Miscellaneous products" include petroleum, absorption oils, ram-jet fuel, petroleum rocket fuels, synthetic natural gas feedstocks, and naphthas.

Motor Gasoline (Finished) - A complex mixture of relatively volatile hydrocarbons, with or without small quantities of additives for use in spark-ignition engines. Specifications for motor gasoline, as given in ASTM Specification D 439 or Federal Specification VV-G-1690B, include a boiling range of 122 to 158 degrees Farenheit at the 10-percent point to 365 to 374 degrees Farenheit at the 90-percent point and a Reid vapor pressure range from 9 to 15 psi. "Motor gasoline" includes finished leaded gasoline, finished unleaded gasoline, and gasohol. Blendstock is excluded until blending has been completed. Alcohol that is to be used in the blending of gasohol is also excluded.

- Leaded Gasoline - Contains more than 0.05 grams of lead per gallon or more than 0.005 grams of phosphorus per gallon. The actual lead content of any given gallon, however, may vary as a function of the size of the producer and company according to specific Environmental Protection Agency waiver provisions. Premium and regular grades are included, depending on the octane rating.

- Unleaded Gasoline - Contains up to 0.05 grams of lead per gallon and 0.005 grams of phosphorus per gallon. Premium and regular grades are included, depending on the octane rating.

- Gasohol - A blend of alcohol and finished motor gasoline that is more than 90 percent of finished motor gasoline (leaded or unleaded are described above) and no less than 10 percent or more alcohol (ethanol or methanol).

Naphtha - A colorless flammable liquid, obtained from crude petroleum and used as a solvent and cleaning fluid and as a raw material for gasoline.

Naphtha-Type Jet Fuel - A fuel in the heavy naphtha boiling range with an average gravity of 52.8 percent API and 20 to 90 percent distillation temperatures of 290 to 470 degrees Farenheit, meeting Military Specification MIL-T-5624L (Grade JP-4). JP-4 is used for turbojet and turboprop aircraft engines, primarily by the military. This category excludes ram-jet and petroleum rocket fuels, which are included in the "Miscellaneous Products" category.

Natural Gas Plant Liquids - Natural gas liquids recovered from natural gas in gas processing plants and in some situations, from natural gas field facilities. Natural gas liquids extracted by fractionators are also included. These liquids are defined according to the published specifications of the Gas Processors Association and the American Society for Testing and Materials, and are classified as follows: ethane, propane, ethane-propane mix, isobutane, butane, butane-propane mix, isopentane, natural gasoline, plant condensate, unfractionated stream, and other products from natural gas processing plants (i.e., products meeting the standards of finished petroleum products produced at natural gas processing plants, such as finished motor gasoline, finished aviation gasoline, special naphthas, kerosene, distillate, fuel oil, and miscellaneous products).

Operable Capacity - Represents the status of processing units at a petroleum refinery. Operable capacity is the sum of operating and idle capacity.

- Operating capacity - Capacity that is in operation.

- Idle Capacity - Capacity not in operation but capable of being placed in operation within 90 days.

Permanently Shutdown - A classification for petroleum refineries which represents refineries which have ceased operation and/or are incapable of being placed in operation within 90 days.

Petroleum Products - Petroleum products obtained from the processing of crude oil (including lease condensate), natural gas, and other hydrocarbon compounds. Petroleum products include unfinished oils, natural gasoline and isopentane, plant condensate, unfractionated stream, ethane, liquefied petroleum gases, aviation gasoline, motor gasoline, naphtha-type jet fuel, kerosene-type jet fuel, kerosene, distillate fuel oil, residual fuel oil, naphtha-less than 400 degrees Farenheit end-point, other oils-over 400 degrees Farenheit end-point, special naphthas, lubricants, waxes, petroleum coke, asphalt, road oil, still gas, and miscellaneous products.

Petroleum Refinery - An installation that manufactures finished petroleum products from crude oil, unfinished oils, natural gas plant liquids, other hydrocarbons, and alcohol.

Primary Stocks - Stocks of crude oil or petroleum products held in storage by refineries, natural gas processing plants, pipelines, tankfarms, and bulk terminals. Crude oil that is in transit from Alaska or that is stored on Federal leases is included. Bulk terminals are facilities that can store at least 50,000 barrels of petroleum products or that can receive petroleum products by tanker, barge, or pipeline. "Primary Stocks" excludes stocks of foreign origin that are meant for domestic consumption but have not clear the United States Customs Service.

Residual Fuel Oil - Topped crude of refinery operations. "Residual Fuel Oil" includes No. 5 and No. 6 fuel oils as defined in ASTM, Specification D 396 and Federal Specification VV-F-815C; Navy Special fuel oil as defined in Military Specification MIL-F859E including Amendment 2; Bunker C fuel oil; and acid sludge used for refinery fuels. Residual fuel oil is used for the production of electric power, space heating, vessel bunkering, and various industrial purposes.

- Bunker C - A heavy residual fuel oil used by ships and industry and for heating large-scale installations; also referred to as No. 6 fuel oil.

Road Oil - Any heavy petroleum oil, including residual asphaltic oils, used as a dust palliative and surface treatment of roads and highways. It is generally produced in six grades, from 0, the most liquid, to 5, the most viscous.

Special Naphthas - All finished products within the gasoline range that are used as paint thinners, cleaners, and solvents. These products are refined to a specified flash point and have a boiling range of 90 to 220 degrees Farenheit.

Conversion Factors

The following table provides a list of conversion factors which are used in the demand model components of the Intermediate Future Forecasting System (IFFS) for the 1982 Annual Energy Outlook. These factors agree with those published in January 1983 Monthly Energy Review; with one exception, liquid petroleum gas (LPG), they agree with those published in February 1983 Short- Term Energy Outlook. In some cases the IFFS product contain two or more detailed products and in these cases the input Btu conversion factors and 1981 weights are provided.

Sector/Products	Conversion Factors	1981 Weights million barrels/year	IFFS Conversion Factors
Residential			
Electricity	3.412	NA	3.412
Natural Gas	1.026	NA	1.026
Distillate		NA	5.825
Kerosene	5.670	17	
Distillate	5.825	225	
Coal	25.060	NA	25.060
Liquid Gas	3.674	NA	3.674
Commercial			
Electricity	3.412	NA	3.412
Natural Gas	1.026	NA	1.026
Distillate	5.734	NA	5.825
Kerosene	5.670	7	--
Distillate	5.825	88	--
Coal	25.060	NA	25.060
Liquid Gas	3.674	NA	3.674
Industrial			
Electricity	3.412	NA	3.412
Natural Gas	1.026	NA	1.026
Distillate	5.825	NA	5.825
Residual	6.287	NA	6.287
Coal	25.060	NA	25.060
Liquid Gas	3.674	--	3.674
Metallurgical Coal	26.000	--	26.000
Petrochemicals Feedstocks	NA	--	4.589
Liquid Gas Feedstocks	3.674	--	3.674
Liquid Gas Raw Material	NA		5.607

Sector/Products	Conversion Factors	1981 Weights million barrels/year	IFFS Conversion Factors
Petroleum Feedstocks Naphtha 400°	5.248	83.940	--
Petroleum Feedstocks Other Oils 400°	5.825	124.421	--
Petroleum Feedstocks Still Gas	6.000	7.126	--
Industrial Other			5.951
Industrial Kerosene	5.670	19.015	--
Lubricants	6.065	55.958	
Petroleum Coke	6.024	91.860	
Unfractioned Stream	5.418	.189	
Plant Condensate	5.418	0.0	
Natural Gasoline	4.620	42.363	
Waxes	5.537	6.581	
Still Gas (Non-Feedstock use)	6.000	199.273	
Special Naphtha	5.248	--	5.248
Misc. Petro. Products	5.796	36.213	--
Asphalt	6.636	123.982	--
Road Oil	6.636	.760	--
Transportation Gasoline	5.253		5.253
Aviation Gasoline	5.048	11.147	--
Motor Gasoline	5.253	2,404.447	--

Sector/Products	Conversion Factors	1981 Weights million barrels/yea	IFFS Conversion Factors
Diesel/Distillate	5.825	--	5.825
Residual	6.287	--	6.287
Liquid Gas	3.674	--	3.674
Coal	25.060	--	25.060
Electricity	3.412	--	3.412
Jet Fuel			5.608
Naphtha	5.355	72.857	--
Kerosene	5.670	245.460	--

Note: = Not Applicable

The difference in the LPG conversion factor between IFFS and Short Term Integrated Forecasting (STIFS) reflects different product definitions. The LPG conversion factor used in STIFS excludes ethane which is a separate product in STIFS. While the LPG conversion factor used in IFFS is an average factor for all LPG's including ethane.

Note:

The conversion factors in this table represent demand model component conversion factors and with the exception of certain fuels in the industrial sectors these factors are equivalent to IFFS fuel categories. The industrial categories which must be weighted to form the IFFS categories are given in the following table.

Source: U.S. Department of Energy, Energy Information Administration, Petroleum Supply Annual 1981, DOE/EIA-0340 (81)/1. (Washington, D.C., 1982) page 36, Table 2; page 47.

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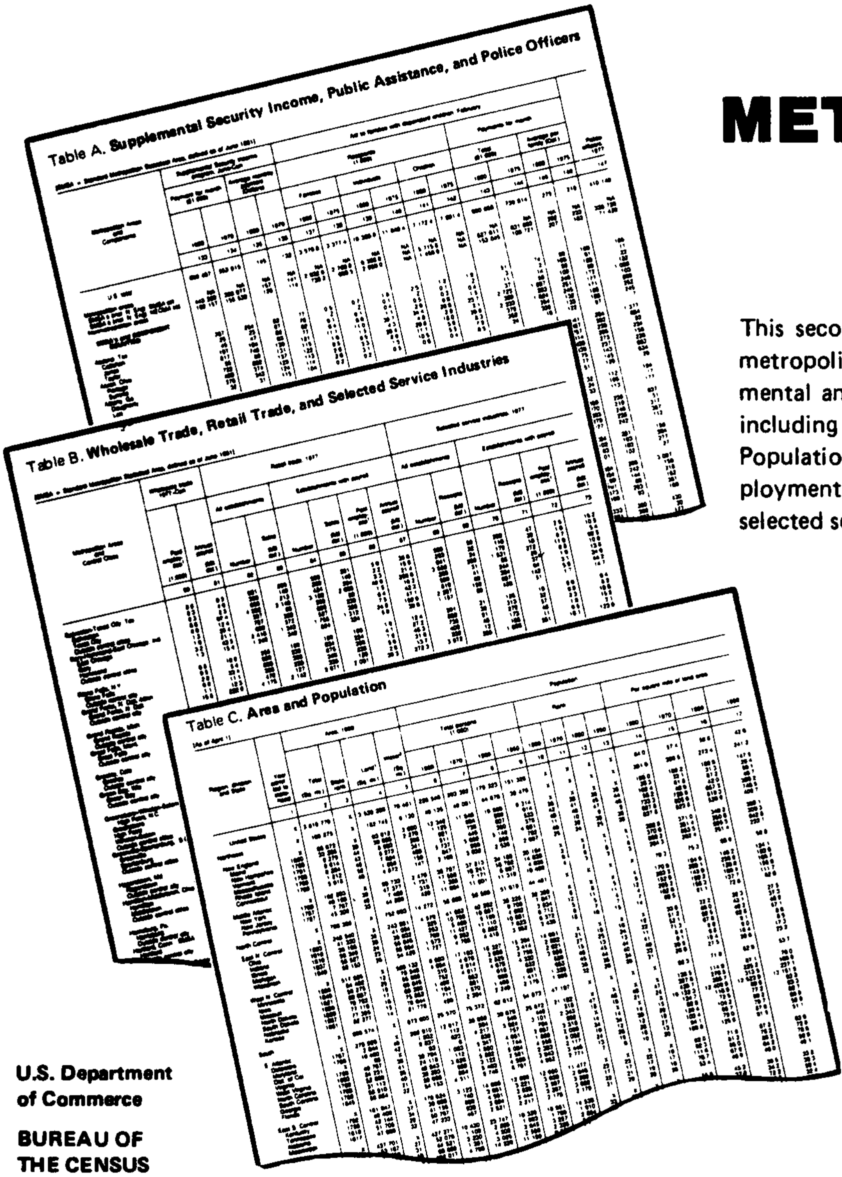

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Case E
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Lower Switching Flexibility for Existing Powerplants

Case G
Higher Coal Transportation Rates

Case H
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