

Short-Term Energy Outlook



Quarterly Projections

February 1983

Energy Information Administration
Washington, D.C.

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Preface

Quarterly Energy Information Administration (EIA) forecasts of short-term energy supply, demand, and prices are produced for publication in February, May, August, and November. Methodology volumes of the Short-Term Energy Outlook (Outlook), published with the May and November issues, contain descriptions of the forecasting system and detailed analyses of current issues that affect EIA's short-term energy forecasts. The principal users of the Outlook are managers and energy analysts in private industry and government. This quarter's projections extend through the second quarter of 1984.

The forecasts are produced using the Short-Term Integrated Forecasting System (STIFS). The principal driving variables in the STIFS model are the macroeconomic and world oil price projections. The macroeconomic forecast, which is produced by Data

Resources, Inc. (DRI), is adjusted by EIA in cases where EIA projections of the world price of crude oil differ from DRI estimates. EIA's Oil Market Simulation Model is used to project the world oil prices.

The three projections for petroleum supply and demand are based on low, medium, and high world oil price scenarios. In general, the following discussion of the forecast refers to the medium price, or base case, scenario. Forecast sensitivity cases, using varying assumptions about the level of economic activity, new-car efficiency, weather, stock change, and preliminary data uncertainty, are included for petroleum demand and oil imports.

The forecasts are based on EIA data published in the Monthly Energy Review, the Petroleum Supply Monthly, the Electric Power Monthly, and other EIA publications.

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Highlights

Developments During 1982

Despite falling world petroleum prices, the economic recession contributed to an unusually large 4.5-percent decline in total U.S. energy consumption between 1981 and 1982. This was the third consecutive year-to-year decline in total U.S. energy consumption since energy use reached its all-time high in 1979. During 1982:

- Total petroleum consumption was 15.3 million barrels per day, 5 percent lower than in 1981, for the fourth consecutive year-to-year decline since petroleum consumption peaked in 1978. The consumption of motor gasoline and distillate and residual fuel oils declined between 1981 and 1982, with the largest decline occurring in residual fuel oil.
- Domestic crude oil production was 8.7 million barrels per day, up 1.2 percent from the 1981 level.
- Net petroleum imports (including those for the Strategic Petroleum Reserve) were 4.2 million barrels per day, 21.7 percent lower than in 1981. This net import level is the lowest since 1971 and about half the level of net imports in the peak year of 1977. Total petroleum imports cost \$61.2 billion, 21 percent less than in 1981. (The cost of total petroleum imports is estimated on a customs' basis, that is, as the cost of all oil imports to the United States and its territories measured free alongside ship at the exporting country.) As a result of the low level of

petroleum imports, net energy imports accounted for only 10.4 percent of gross U.S. energy consumption.

- Natural gas consumption fell by 8.0 percent between 1981 and 1982 to 17.8 trillion cubic feet. Domestic production declined by 8.7 percent to 17.5 trillion cubic feet. Natural gas imports increased slightly, while gas held in underground storage rose by 4.7 percent.
- Domestic coal consumption declined by 3.3 percent between 1981 and 1982. This decline was led by a 32-percent drop in consumption at coke plants in the depressed iron and steel industry. Coal exports fell 5.6 percent from the record high set in 1981.
 - Despite the declines in consumption and exports, domestic coal production set a new record of 833 million tons, up 1.2 percent from 1981.
- For the first time since World War II, electric utility generation declined, on a year-to-year basis, to 2,242 billion kilowatt-hours, 2.3 percent below the 1981 level. Declines were sharpest in generation from oil and gas; coal-fired generation declined by 0.9 percent.
 - Nuclear generation was 283 billion kilowatt-hours, up 3.7 percent from 1981, surpassing the previous record set in 1978.
 - Hydroelectric generation set a

new record of 309 billion kilowatt-hours, up more than 18 percent from 1981 as a result of higher than average precipitation.

The Outlook

As this forecast was prepared, spot prices for crude oil had fallen well below the official export price levels previously set by the Organization of Petroleum Exporting Countries (OPEC). Although considerable uncertainty must be attached to any projection of world oil prices, the EIA base case short-term projection embodies the assumption that world oil prices will decline by \$2 to \$3 per barrel from late-1982 levels. As a result, the price of imported crude oil to U.S. refiners is assumed to fall to \$30.50 per barrel on April 1, 1983, then remain at that level. The other principal assumption underlying this forecast is that the economic recovery will begin slowly in the first quarter of 1983 and accelerate thereafter; Gross National Product (GNP) increases by 1.7 percent between 1982 and 1983. The base case projection for petroleum is summarized in Table 1.

- Total 1983 petroleum consumption is projected to be 15.4 million barrels per day, 0.7 percent above the 1982 level. By the first half of 1984, petroleum consumption is projected to be 4.3 percent above year-earlier levels.
- As a result of a slight decline in domestic crude oil production and a sharp slowdown in the rate of withdrawals from primary petroleum inventories:
 - Net oil imports in 1983 are projected to be 4.7 million barrels per day, up 11.6 percent from 1982. Total oil imports (measured on a customs' basis) are projected to cost

\$57.8 billion, 5.5 percent less than in 1982.

- In the first half of 1984, net oil imports are forecast to be 5.2 million barrels per day, 21 percent above year-earlier levels.

- Natural gas consumption is projected to increase by 0.3 percent between 1982 and 1983, then rise to 5.2 percent above year-earlier levels as the economic recovery continues into the first half of 1984. A further decline in gas production of 3 percent, to 17 trillion cubic feet, is projected for 1983, with production 4 percent above year-earlier levels in the first half of 1984. Natural gas imports are projected to continue to provide about 5 percent of total U.S. gas consumption.

Table 1. Summary of Base Case Petroleum Projections

Forecast Variable	Million Barrels per Day (percent change from prior year)				
	History		Projections		
	1981	1982	Full Year 1983	1983	First Half 1984
Petroleum Consumption					
Motor Gasoline	6.59	6.54	6.36	6.27	6.23
	(-3.9)	(-0.8)	(-2.7)	(-3.6)	(-0.6)
Distillate Fuel Oil...	2.83	2.67	2.75	2.83	3.03
	(-4.7)	(-5.7)	(3.0)	(-2.2)	(7.1)
Residual Fuel Oil ...	2.09	1.70	1.73	1.75	1.94
	(-18.4)	(-18.7)	(1.8)	(-6.4)	(10.9)
Total Petroleum ^a	16.06	15.26	15.37	15.25	15.91
	(-5.9)	(-5.0)	(0.7)	(-1.9)	(4.3)
Net Imports ^b	5.40	4.23	4.72	4.31	5.23
	(-15.2)	(-21.7)	(11.6)	(8.3)	(21.3)
Crude Oil Production ...	8.57	8.67	8.64	8.65	8.60
	(-0.3)	(1.2)	(-0.3)	(0.0)	(-0.6)
 Billion 1972 Dollars (percent change from prior year)					
Gross National Product	1,503	1,476	1,501	1,487	1,551
	(1.9)	(-1.8)	(1.7)	(0.8)	(4.3)
 Nominal Dollars per Barrel (percent change from prior year)					
Average Cost of Imported Crude Oil ...	37.05	33.59	30.89	31.27	30.50
	(25.5)	(-9.3)	(-8.0)	(-8.2)	(-2.5)

^aTotal product supplied including "other" petroleum products.

^bIncludes Strategic Petroleum Reserve.

Note: Minor discrepancies with published EIA historical data are due to rounding.

Sources: U.S. Department of Energy, Energy Information Administration, 1981 Petroleum Supply Annual DOE/EIA-340(81/2), and Petroleum Supply Monthly DOE/EIA-0109(83/01). Historical data for December 1982 are preliminary.

- Domestic coal consumption is forecast to rise by 4 percent between 1982 and 1983, led by a 4.3-percent rise in electric utility consumption. Although coal exports are projected to decline by 8 percent between 1982 and 1983, domestic coal production is forecast to set a new record of 837 million tons in 1983. All categories of coal consumption, together with exports, are projected to increase in early 1984, leading to coal production that is 3.9 percent above year-earlier levels in the first half of 1984.
- Electric utility generation is projected to rise by 2.5 percent between 1982 and 1983, to 2,298 billion-kilowatt hours, and be 4.7 percent above year-earlier levels in the first half of 1984. Increases are forecast for generation from coal, natural gas, and nuclear power through the forecast period, while hydroelectric generation is expected to remain at above-normal levels. Oil-fired generation declines in 1983, then rises to above year-earlier levels in the first half of 1984.

It should be noted that the forecast given above summarizes this Outlook's base case forecast. Additional cases, based on alternative oil prices and economic growth rates, are included in the report. Should the imported crude oil prices and economic growth that occur during the forecast period differ from the base-case assumptions, it is estimated that, for 1983:

- For each 1-percent increase in GNP above the forecast levels, total petroleum consumption and imports would increase by approximately 130,000 barrels per day.
- For each \$1-per-barrel decline in the average price of imported crude oil during the last 3 quarters of 1983, total petroleum consumption and imports would increase by approximately 60,000 barrels per day.

1. Major Forecast Assumptions

World Oil Prices

The progressive weakening of oil demand in the past few years generated downward pressure on oil prices which gathered strength during 1982. By February 1983, this forced the beginning of reductions in official crude oil prices, both for OPEC member countries and other major oil-producing nations. Recent declines in contract prices highlighted the inability of the exporting countries to maintain oil prices based on a \$34-per-barrel Saudi Arabian marker crude oil price. OPEC members were under strong pressure to agree on a lower price structure or risk an international oil price war.

Warmer-than-usual winters in the industrial countries, inventory drawdowns, and weak economic activity have kept downward pressure on the spot prices for crude oils. From the beginning of November 1982 to late February 1983, spot prices for Arab Light crude fell from about \$33 per barrel to \$28 per barrel. Declines in spot market prices contributed strongly to the subsequent declines in contract prices for oil.

The restructuring of prices started in a country outside OPEC: The British National Oil Company proposed in mid-February 1983 that the prices for its major export crude oils be reduced by \$3 per barrel, retroactive to February 1; Norway immediately followed with a comparable price cut. To meet the British cuts, Nigeria followed by dropping its light crude oil prices by \$5.50 per barrel. (Nigeria produces light oil which competes closely with that of the United Kingdom.) Although Nigerian crude oil appears to have been signifi-

cantly overpriced, OPEC members viewed the Nigerian cut with alarm since it portended a possible price war. Thus, there were a series of meetings between the Arab countries and other OPEC countries to try to consolidate national positions in order to avoid a price war. OPEC ministers finally met in London in early March and agreed to cut the marker price of Saudi Light crude oil to \$29 per barrel. They also agreed to limit average OPEC crude oil production to 17.5 million barrels per day for the remainder of 1983.

Whether OPEC will be able to sustain this new set of prices is highly conjectural. The cultural and economic differences among OPEC countries were not of overwhelming consequence in early periods of growing demand for petroleum. However, high official prices and the prolonged downturn in world oil consumption have changed the circumstances and, in some instances, have exaggerated the tension among the members of OPEC.

Since spring of 1982, the weakening of the oil market has accelerated. The progressive erosion of the earlier OPEC production agreement, further cuts in the oil price differentials, the willingness of non-OPEC producers to reduce prices in order to maintain output, and little or no evidence of a near-term cyclical turnaround in demand were the principal factors contributing to the renewed slide in prices. Only the apparent willingness of Saudi Arabia to allow its own production to go well below 5.0 million barrels per day has prevented a major collapse in prices over the past few months.

To reflect the uncertainties in world

oil markets, three projections of domestic energy prices, which are based on differing price paths for world crude oil, are used (see Figure 1 and Table 2). (Prices are stated in nominal terms rather than in inflation-adjusted dollars.) For this February Outlook, the world crude oil price cases, in nominal U.S. dollars, are as follows:

Low = Continued price deterioration as a result of a weak market. Prices collapse to an effective OPEC marker price of \$25.00 per barrel by the beginning of the second quarter of 1983. Price differentials for other crudes are based on the estimated market values of the refined products produced from the crudes. As a result, the average U.S. refinery acquisition cost of imported oil declines to \$26.64 by April 1, 1983, and then remains level throughout the forecast period.

Base = Because of current market weakness and the general disarray within OPEC, average world oil prices decline by \$2 to \$3 per barrel from late-1982 levels. The decline causes the average U.S. refinery acquisition cost of imported oil to fall to \$30.50 per barrel by April 1, 1983, then remain constant for the remainder of the forecast period.

High = Beginning in February 1983, prices rise at twice the U.S. rate of inflation.

Macroeconomic Outlook

The macroeconomic forecast underlying the current Outlook projections is for an economic recovery that begins slowly in the first quarter of 1983, accelerates throughout the year, and is sustained in 1984. Real Gross National Product (GNP) is forecast to rise by 1.7

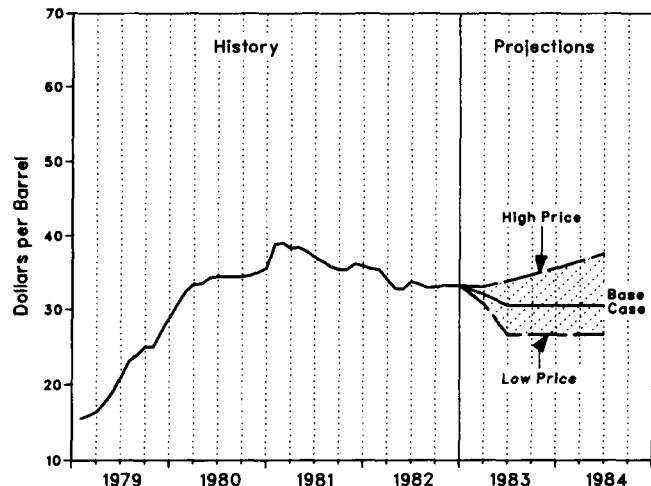


Figure 1. Imported Crude Oil Prices

percent between 1982 and 1983 and to be 4.3 percent above year-earlier levels in the first half of 1984 (see Table 2). This forecast, which is based on the Data Resources, Inc. (DRI) TRENDLONG forecast of February 1983, is for levels of GNP and rates of economic growth that are lower than those used for the forecasts in the November 1982 Outlook for all quarters of 1983. (Sensitivity-case assumptions for macroeconomic activity and other factors are given in Table 26.)

The projected levels and rates of growth for Real Disposable Personal Income (RDPI) and the index of manufacturing production are also lower than forecast in November 1982. RDPI is forecast to continue to increase more rapidly than GNP. Manufacturing activity, which declined by 8.5 percent between 1981 and 1982 and is more sensitive to changes in the economy than is GNP, is forecast to rise by only 1.8 percent between 1982 and 1983 but to be 9.2 percent above year-earlier levels in the first half of 1984.

Inflation, as measured by the rate of change in the GNP deflator, was 6.0 percent between 1981 and 1982 and is projected to be 4.6 percent between 1982 and 1983. Inflation is projected to accelerate slightly in early 1984.

Table 2. Macroeconomic, Price, and Weather Data Assumptions for Low, Base, and High Price Cases

Assumptions	History							Price	Projections						
	1980 Year	1981 Year	1st	2nd	1982 3rd	4th	Year		1st	2nd	3rd	4th	Year	1984 1st	1984 2nd
	(billion 1972 dollars)								Low	1,483	1,495	1,510	1,530	1,505	1,548
Macroeconomic								Base	1,482	1,492	1,506	1,525	1,501	1,542	1,560
Real Gross National Product ^a	1,474	1,503	1,471	1,478	1,481	1,472	1,476	High	1,481	1,490	1,503	1,519	1,498	1,534	1,550
Percent Change from Prior Year	-0.4	1.9	-2.0	1.6	-1.9	-1.2	-1.8	Low	0.8	1.2	2.0	3.9	2.0	4.4	4.8
GNP Implicit Price Deflator (Index, 1972=100)	178.6	195.5	203.7	206.0	208.5	210.7	207.2	Base	212.6	215.5	218.0	220.7	216.7	223.7	225.4
Percent Change from Prior Year	9.3	9.4	7.2	6.6	5.8	4.5	6.0	High	212.6	215.3	217.9	220.9	216.7	224.2	226.3
Real Disposable ^b Personal Income	1,018	1,043	1,047	1,055	1,058	1,057	1,054	Low	4.5	4.8	4.5	4.5	4.6	4.8	4.4
Percent Change from Prior Year	0.2	2.5	1.2	1.7	0.9	0.5	1.1	Base	4.4	4.6	4.6	4.7	4.6	5.2	5.0
Index of Industrial Production (MFG)	146.7	150.4	139.8	138.1	137.7	134.3	137.5	High	4.4	4.5	4.5	4.8	4.6	5.5	5.4
Percent Change from Prior Year	-4.5	2.4	-7.6	-9.4	-9.7	-7.4	-8.5	Low	1.1	1.1	2.6	4.1	2.3	5.1	5.6
Oil Price	(U.S. nominal dollars/barrel)							Base	1.1	0.9	2.4	3.6	2.0	4.5	5.3
Imported Crude Oil Prices ^c	33.89	37.05	35.03	33.13	33.14	33.07	33.59	High	1.1	0.7	2.0	3.2	1.8	4.0	4.7
U.S. Refiners' Cost ^d	28.07	35.24	33.05	31.20	31.53	31.58	31.84	Low	-2.8	0.0	2.9	8.7	2.1	9.6	10.5
Cooling Degree Days	1,281	1,167	36	294	703	61	1,094	Base	-2.9	0.0	2.5	7.9	1.8	8.8	9.6
Heating Degree Days	4,857	4,653	2,542	600	105	1,646	4,893	High	-2.9	-0.2	2.0	7.1	1.5	7.7	8.5
Weather ^e	(number of degree days)							Low	30.67	26.64	26.64	26.64	27.65	26.64	26.64
Heating Degree Days	2,398	539	88	1,669	4,694	2,398	539	Base	32.04	30.50	30.50	30.50	30.89	30.50	30.50
Cooling Degree Days	28	327	755	63	1,173	28	327	High	33.08	33.89	34.72	35.59	34.32	36.56	37.56

^aMacroeconomic projections from three DRI model forecasts are seasonally adjusted at annual rates, and modified as appropriate to the three world oil price cases.

^bSeasonally adjusted at annual rates.

^cCost of imported crude oil to U.S. refiners.

^dU.S. refiners' acquisition costs of foreign and domestic crude oil.

^eDegree day data weighted by population, revised December 1981.

Sources: U.S. Department of Energy, Energy Information Administration, Monthly Energy Review DOE/EIA-0035(83/02), Bureau of Economic Analysis, U.S. Department of Commerce, National Income and Product Accounts, as revised, October 1982; National Oceanic and Atmospheric Administration, U.S. Department of Commerce, State, Regional, and National Monthly and Seasonal Heating Degree Days Weighted by Population, January 1983; and the Federal Reserve System, Data Release G.12.3., January 1983. Macroeconomic forecasts based on modifications to Data Resources, Inc., forecasts TRENDLONG 0283.

Table 3. Short-Term Energy Prices (Nominal), History and Projections

Product	Year	History				Price	Projections				Year	1st	2nd	
		1981	1st	2nd	3rd		1983	2nd	3rd	4th				
		Year	1st	2nd	3rd		Year	1st	2nd	3rd				
Petroleum														
Gasoline ¹ (cents per gallon)	135.3	130.9	124.3	130.8	126.3	128.1	Low	119.7	111.6	111.0	110.7	113.2	108.5	108.6
							Base	121.3	119.2	121.4	122.2	121.0	119.7	119.8
							High	122.4	125.3	131.5	134.9	128.5	135.0	137.9
No. 2 Heating Oil, Wholesale (cents per gallon)	98.2	93.4	87.1	91.2	93.6	91.3	Low	87.2	77.4	76.5	76.7	79.4	76.8	76.4
							Base	90.1	86.4	85.9	86.0	87.1	86.1	85.8
							High	92.3	94.2	95.8	98.0	95.0	100.4	102.3
No. 2 Heating Oil, Retail (cents per gallon)	120.5	119.3	114.6	115.6	120.3	117.5	Low	116.5	105.5	103.2	103.5	107.2	104.0	103.0
							Base	119.1	115.0	113.3	113.8	115.3	114.4	113.3
							High	121.0	122.8	123.6	126.3	123.4	129.3	130.5
No. 6 Residual Fuel Oil ² (dollars per barrel)	32.50	29.78	28.91	26.73	28.89	29.08	Low	26.29	23.52	23.37	23.17	24.09	24.29	24.25
							Base	27.29	26.64	26.57	26.36	26.71	27.48	27.44
							High	28.05	29.34	30.01	30.53	29.48	32.43	33.22
Kerosene-Based Jet Fuel (cents per gallon)	103.1	100.7	95.9	95.3	95.9	97.0	Low	92.4	83.6	81.5	81.6	84.8	82.0	82.4
							Base	94.2	91.1	90.6	91.0	91.8	91.4	91.8
							High	95.4	97.4	99.9	102.6	98.9	105.3	108.1
Other														
Coal, Delivered to Utilities (cents per million Btu)	153.2	165.3	165.5	165.0	167.3	165.8	Low	164.1	165.7	175.2	173.8	169.7	174.0	175.4
							Base	168.1	169.7	179.4	178.0	173.8	178.2	179.6
							High	176.1	177.7	187.9	186.5	182.0	186.7	188.1
Natural Gas, Residential (cents per 1,000 cu. ft)	456.0	493.0	547.7	566.0	596.8	550.9	Low	597.3	602.5	629.8	638.9	617.1	642.9	674.9
							Base	607.4	634.2	663.0	672.5	644.3	676.7	710.4
							High	617.5	665.9	696.1	706.1	671.4	710.6	745.9
Natural Gas, to Utilities (cents per million Btu)	282.5	309.1	333.6	356.8	351.8	337.8	Low	332.2	341.1	372.6	370.9	354.2	374.4	385.1
							Base	349.7	359.1	392.3	390.5	372.9	394.1	405.3
							High	367.2	377.0	411.9	410.0	391.5	413.9	425.6
Electricity, Residential (cents per kilowatt hour)	6.20	6.38	6.91	7.19	7.02	6.88	Low	6.39	6.92	7.20	7.07	6.90	6.84	7.40
							Base	6.73	7.28	7.58	7.44	7.26	7.20	7.79
							High	7.07	7.65	7.96	7.82	7.62	7.56	8.18

¹Average for all grades and services.Note: The Bureau of Labor Statistics changed the methodology used to calculate average gasoline prices as of September 1981. See Short-Term Energy Outlook, Volume II, November 1981.²Petroleum residual fuel oil--average, all sulfur contents.Sources: Energy Information Administration, Monthly Energy Review, February 1983, and Monthly Petroleum Product Price Report, October 1982.

Energy Product Prices

Petroleum product prices are expected to follow the declining price path of crude oil (see Figure 2), while other energy prices rise (see Table 3).

Retail motor gasoline prices are expected to decline by nearly 6 percent between 1982 and 1983, despite a 5-cent-a-gallon federal tax increase effective on April 1, 1983. It is projected that retail customers will not see the full effect of this tax until the fall of 1983. Even then, prices at the pump are forecast to continue falling because of decreasing refiners' acquisition costs for crude oil and increasing competition at the pump, as dealers lower their margins in order to attract customers. The declining trend in motor gasoline price is projected to continue through the first half of 1984.

In 1983, retail heating oil prices are projected to decrease by less than 2 percent in the base case (and nearly 9 percent in the low price case), while wholesale heating oil prices are expected to decline by nearly 5 percent. Less price competition in the home heating market appears to be the reason for wholesale prices falling more than retail prices. Heating oil prices are expected to continue falling through the first half of 1984.

Retail residual fuel oil prices are projected to decrease about 8 percent between 1982 and 1983, following the decrease in the refiners' acquisition cost of crude oil. As residual fuel oil inventories decrease, in terms of days' supply, and the price difference between residual fuel and natural gas, a substitute fuel, narrows, the price of residual fuel oil is expected to rebound slightly during the first half of 1984.

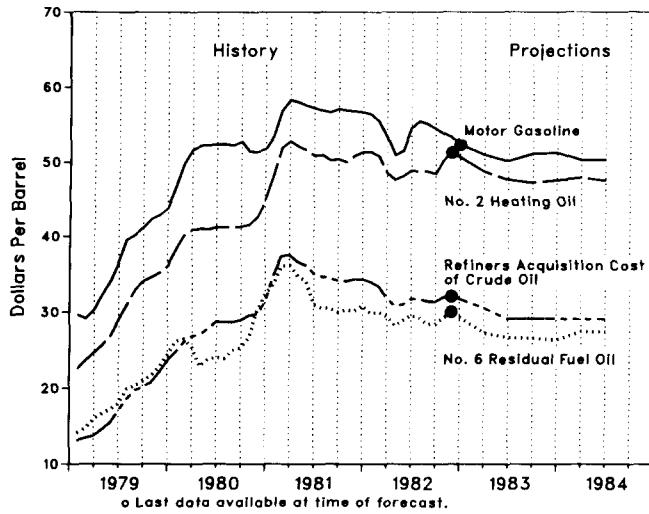


Figure 2. Retail Prices for Petroleum Products

The average price of natural gas to residential users is projected to increase by 16.7 percent between 1982 and 1983 and by 12.2 percent above year-earlier levels in the first half of 1984. All projections for the price of natural gas are based on a single forecast for the wellhead price of gas. The high and low natural gas price projections are based on recent variations in transmission and distribution margins.

Projections for prices of fuels delivered to electric utilities are as follows: coal prices increase by slightly more than the rate of inflation throughout the forecast period, residual fuel prices fall by the same percentage as retail residual fuel prices, and natural gas prices increase by 10.4 percent between 1982 and 1983.

In the base case, residential electricity prices are projected to increase by 5.5 percent between 1982 and 1983 and to be 7 percent above year-earlier levels in the first half of 1984. This increase results primarily from the forecast increase in fossil fuel prices to electric utilities.

2. World Petroleum Situation

In early 1983, worldwide demand for oil has been very weak, reflecting an estimated 0.5-percent decline in economic growth in the Organization for Economic Cooperation and Development (OECD) countries during 1982. A continued perception of plentiful petroleum supplies, the existence of excess inventories, and the persistence of official contract prices for OPEC oil that are well above the spot market prices have also contributed to the expectation that prices will decline further. This Outlook indicates no change in the low (about 45.4 million barrels per day) level of non-Communist world oil consumption between 1982 and 1983 (see Table 4). As part of this projection, it is assumed in the base case that world oil prices will decline by about \$3 per barrel between November 1982 and April 1983 and then remain level for the remainder of the forecast period. World oil inventories are projected to be further reduced, to around 4.5 billion barrels (92 days of projected consumption), at the end of 1983 (see Table 4). Petroleum supplies, the sum of production in non-Communist countries and net Communist exports, are projected to total 44.5 million barrels per day during 1983, up slightly from 1982.

World Oil Consumption

Following 3 consecutive years of significant declines in world oil consumption, petroleum demand for 1983 is projected to be the same as in 1982. Quarterly demands for 1983 are projected to be somewhat higher in each of the last three quarters than for the comparable periods in 1982. However, these small increases do not reflect the anticipation of a significant change in the weak international oil market. Although world oil prices are projected to

decline during 1983, the underlying influences of low economic growth, energy conservation, and substitution of other fuels for oil are projected to override the effects of lower oil prices in the short term.

Recent declines in petroleum consumption have been most pronounced in the industrialized countries. It is projected that OECD oil consumption in 1983 will be approximately 7 million barrels per day lower than in 1979. This represents a 4-year-average annual rate of decline of about 3.4 percent, while real Gross Domestic Product (GDP) advanced at a 0.9-percent average annual rate.

Outside the OECD area, the economic downturn, higher oil prices, and a stronger dollar appear to have had a significant negative impact on oil consumption growth rates. Based on partial data for 1982, it is estimated that, as a group, the non-OECD, non-Communist countries experienced almost no change in oil demand between 1981 and 1982. Some newly industrialized countries appear to be experiencing significant declines in oil consumption. The recent decline in world oil consumption caused OPEC oil production and exports to drop sharply. This decline has resulted in reduced revenues and scaled-back development plans in a number of oil-exporting countries. These factors contributed to a smaller increase in OPEC oil consumption, especially in 1982.

Much of what happens to oil demand in 1983 will depend on the timing and magnitude of the turnaround in economic activity. At the end of 1982, crude oil prices had been declining in real terms (that is, adjusted for inflation) for 2 years in a few countries, and for at

Table 4. International Petroleum Balance
(Million Barrels per Day, Except Closing Stocks)

	History						Projections						1984	
	1982						1983						1984	
	1st	2nd	3rd	4th	Year		1st	2nd	3rd	4th	Year		1st	2nd
Supply^a														
Production														
U.S. (50 States)	10.8	10.8	10.8	10.9	10.8		10.7	10.7	10.7	10.8	10.7		10.7	10.7
OPEC	20.8	18.5	19.3	20.4	19.8		17.5	19.0	20.1	21.8	19.6		20.7	22.1
Other Non-OPEC	11.7	12.2	12.4	12.6	12.2		12.5	12.7	12.8	13.0	12.8		13.0	13.2
Total Non-Communist World	43.3	41.5	42.5	43.9	42.8		40.7	42.4	43.6	45.6	43.1		44.4	46.0
Net Communist Exports	1.5	1.5	1.5	1.5	1.5		1.5	1.4	1.4	1.4	1.4		1.4	1.4
Total Supply	44.8	43.0	44.0	45.4	44.3		42.2	43.8	45.0	47.0	44.5		45.8	47.4
Net Stock Additions														
U.S. (50 States excl. SPR)	-1.1	-0.6	0.4	0.0	-0.3		-1.3	0.4	0.6	-0.2	-0.1		-0.4	0.2
U.S. SPR	0.2	0.2	0.2	0.2	0.2		0.2	0.3	0.2	0.1	0.2		0.1	0.1
Other Non-Communist	-2.7	-1.4	-0.4	-0.1	-1.0		-3.3	-0.6	0.2	0.4	-1.0		-2.7	1.8
Total Stock Additions	-3.6	-1.8	0.2	0.1	-1.1		-4.4	0.1	1.0	0.3	-0.9		-3.0	2.1
Normal Seasonal Stock Addition ...	-3.3	1.8	2.4	-1.1	0.0		-3.3	1.8	2.4	-1.1	0.0		-3.3	1.8
Product Supplied														
U.S. (50 States)	15.8	15.3	14.9	15.1	15.3		15.7	14.8	15.1	15.9	15.4		16.3	15.5
U.S. Territories	0.4	0.4	0.3	0.3	0.3		0.4	0.4	0.4	0.4	0.4		0.4	0.4
Japan	5.4	4.3	4.1	4.5	4.5		5.0	3.9	4.0	4.5	4.4		5.0	4.1
OECD Europe	13.2	11.4	11.1	12.0	11.9		12.3	11.2	11.0	12.2	11.7		13.2	11.6
Other Non-Communist World	13.6	13.4	13.3	13.4	13.4		13.2	13.4	13.5	13.7	13.5		13.9	13.7
Total Non-Communist World	48.4	44.8	43.8	45.3	45.4		46.6	43.7	44.0	46.7	45.4		48.8	45.3
Closing Stocks (billion barrels)	4.9	4.7	4.8	4.8	4.8		4.4	4.4	4.5	4.5	4.5		4.2	4.4

^aIncludes production of crude oil and natural gas liquids, other hydrogen and hydrocarbons for refinery feedstock, refinery gains, and net exports from Communist countries.

Note: Minor discrepancies with other published EIA historical data are due to rounding.

Sources: U.S. Department of Energy, Energy Information Administration, Monthly Energy Review, February 1983, and 1981 International Energy Annual DOE/EIA-0219(81); Organization for Economic Cooperation and Development, Quarterly Oil Statistics, Second Quarter 1982; and Petroleum Economics Limited's Quarterly Supply/Demand Outlook, January 1983.

least 1 year in many other countries. This decline in crude oil prices should continue in 1983 and may accelerate. Nevertheless, even though declining real oil prices are expected to stimulate economic activity, efficiency improvements and the substitution of coal, nuclear power, and (in a few countries) natural gas for oil should be sufficient to cause OECD oil demand to remain unchanged between 1982 and 1983 (see Figure 3). In this projection, it is assumed that OECD economic activity will follow a 1.4 percent annual growth path in 1983, although the current outlook for economic growth in 1983 is highly uncertain. Recent and projected 1983 economic growth rates for the U.S., Japan, Western Europe, and the OECD are given below.

Region	Annual Average		
	1970-1981	1982 ^a ^b	1983 ^b
OECD Total ^d	3.1	-0.5	1.4
United States ^c	3.0	-1.8	1.7
Western Europe ^d	2.7	0.2	0.5
Japan ^e	4.7	2.5	3.5
Other	3.7	-2.9	1.0

^a Preliminary estimates

^b Year-to-year rate of change

^c GNP

^d GDP

^e Canada, Australia, and New Zealand.

Source: Organization for Economic Co-operation and Development, Main Economic Indicators, February 1983 and Economic Outlook, December 1982. Bureau of Economic Analysis, U.S. Dept. of Commerce, Survey of Current Business, July 1982.

In summary, the 3 years of steady decline in world oil demand are projected to end in 1983. By early 1984, world oil demand is projected to be somewhat higher than in the comparable periods of 1982 and 1983 as a result of increasing economic activity and lower world oil prices. Oil demand could be stronger if the declines in oil prices stimulate economic activity in the OECD countries to grow more rapidly than projected.

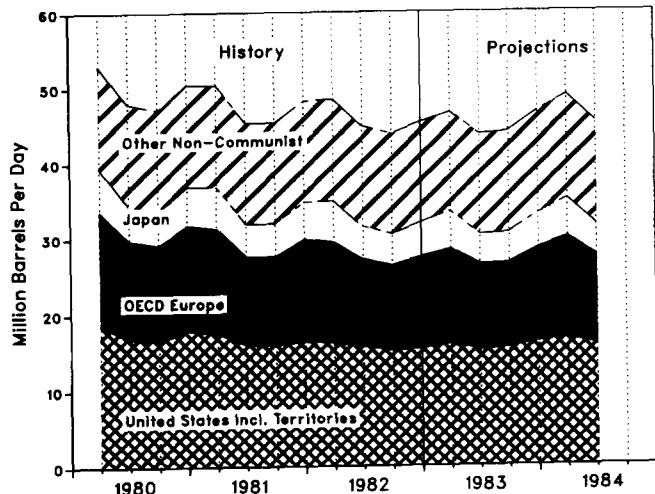


Figure 3. Non-Communist World Oil Consumption

World Oil Supply

Since 1979, there has been a major reduction in world oil production. From its peak of 52.3 million barrels per day in 1979, non-Communist oil production is now expected to fall to 43.1 million barrels per day in 1983, a reduction of 9.2 million barrels per day, averaging -4.4 percent per year. While the majority of this decline can be attributed to plummeting oil consumption in this period, recent, large counter-cyclical inventory drawdowns by oil consumers have also curtailed production requirements. Figure 4 shows non-Communist world oil supply.

The members of OPEC have acted as the marginal oil suppliers, suffering almost the entire brunt of reduced volumes of exports among major oil exporting countries. From its peak of 31.7 million barrels per day in 1979, OPEC production of crude oil and natural gas liquids fell rapidly to 27.8 million barrels per day in 1980, to 23.7 million barrels per day in 1981, and then to 19.8 million barrels per day in 1982. The decline in OPEC exports has actually exceeded the drop in world oil consumption because incremental supplies of over 2.0 million

barrels per day from non-OPEC producers, principally Mexico and the North Sea countries, have further reduced OPEC's market share. The reduced demand for OPEC exports, which began in 1980, is believed to have continued into the first quarter of 1983. This trend is expected to slow, then end, as the oil markets adjust to declining crude oil prices.

For 1983, OPEC production of crude oil and natural gas liquids is projected to average about 19.6 million barrels per day. This represents a decline of 12.1 million barrels per day over the past 4 years. As a result, 1983 is expected to be the 4th consecutive year in which OPEC production and oil revenues fall, as well as the 2nd year in a row that OPEC is expected to run a current account deficit.

Of key importance to OPEC and the oil market in 1983 will be whether, and to what extent, Mexico raises its oil production in an attempt to increase export earnings. Mexico is projected to increase production by 0.2 million barrels per day in 1983. Supplies of Mexican oil in excess of this level could heighten competition for available markets and lead to renewed downward pressure on prices.

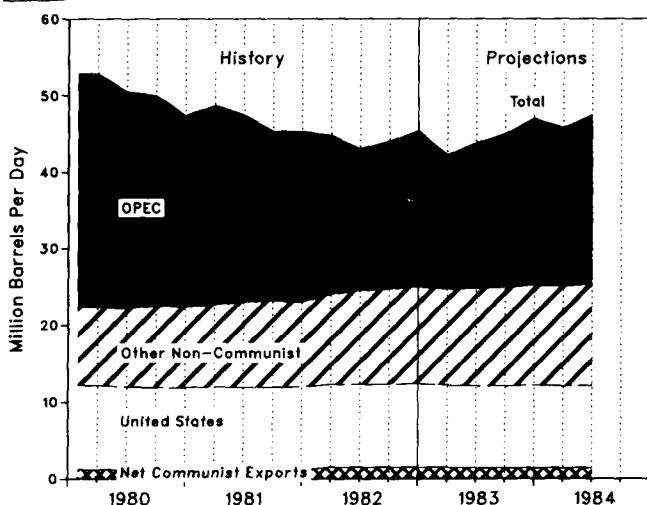


Figure 4. Non-Communist World Oil Supply

For 1983, as in 1981 and 1982, the pricing and production policies of Saudi Arabia, OPEC's largest producer, will be a key factor in oil market developments. Throughout 1982, the Saudis maintained moderate-to-low levels of production to help support its marker crude price and an overall price structure within OPEC. Should Saudi Arabia choose to return to high production and export levels in 1983, there could be dramatic shifts in producer market shares and significantly lower world oil prices. By early 1984, world oil supplies are projected to be somewhat higher in response to modest increases in demand and a return to normal patterns of inventory additions and drawdowns.

World Petroleum Inventories

Low levels of international oil consumption and the desire to reduce the cost of holding oil inventories have continued to induce oil companies to draw oil stocks down and to reduce liftings from foreign producers. An unusually prolonged inventory liquidation started in 1981 and has continued into 1983. Driven by high interest rates, low profits, weak product prices, and concern over possible further declines in oil prices, there was an abnormally low seasonal inventory build-up in the second half of 1982. Inventories are estimated to have been drawn down by over 1 million barrels per day in 1982; little change in the withdrawal rate is projected for 1983.

An unusually high rate of inventory reduction is projected for the first quarter of 1983 as oil companies wait in anticipation of reductions in world oil prices. By the last quarter of 1983, the liquidation of surplus inventories should be nearly completed; the present forecast includes near-normal seasonal inventory trends beginning in early 1984. Free world inventories at the end of 1982 are estimated to have declined to about 4.8 billion barrels,

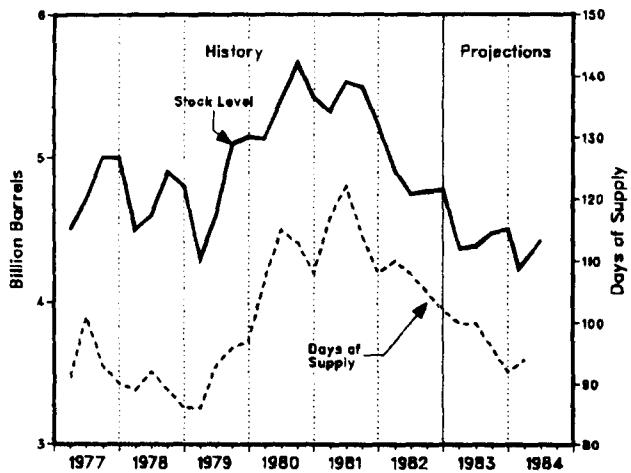


Figure 5. Non-Communist World Oil Stocks

down about 0.8 billion barrels from the peak reached during the summer of 1980 (see Figure 5). Nevertheless, this lower level of inventories would still equal about 102 days of projected consumption, as compared with the 85 days' inventories at the outbreak of the Iranian revolution near the end of 1978.

In the present projections, shown in Figure 5, inventories return to a near-normal seasonal pattern by the beginning of 1984. In the absence of an unexpected supply disruption, the large margin of unused production capacity, ample supplies of crude oil, expectations of stable oil prices, and the high costs of holding inventories provide a strong incentive to keep stocks near minimum operating levels and legal requirements.

3. U.S. Petroleum Outlook

Overview

Total petroleum consumed (product supplied) during 1982 was 15.3 million barrels per day, 5 percent below the 1981 level and 19 percent below the peak consumption level in 1978 (see Figure 6). Net petroleum imports fell to 4.2 million barrels per day in 1982, 22 percent lower than in 1981 and slightly less than half of the level of peak imports in 1977. As a result of the weak economy, the consumption of all major petroleum products declined between 1981 and 1982; the largest absolute and relative declines occurred in residual fuel oil.

Crude oil inputs to refineries declined from 12.5 million barrels per day in 1981 to 11.8 million barrels per day in 1982. However, refinery capacity utilization in 1982 averaged slightly less than 70 percent, marginally higher than in 1981 because of the closure of many less-efficient refineries. Between

early 1981 and the end of 1982, operable refinery capacity declined by about 8.6 percent, from 18.6 to 17.0 million barrels per day.

Three alternative forecasts of quarterly supply and disposition of petroleum, based on alternative assumptions for crude oil price, are given in Tables 5, 6, and 7. Although economic activity as measured by GNP is projected to rise by 1.7 percent between 1982 and 1983 while petroleum product prices decline significantly, total consumption is forecast to rise by only 0.7 percent to 15.4 million barrels per day in 1983. (The sensitivity of total petroleum consumption to uncertainty about economic activity, weather, and new-car efficiency is shown in Table 8.) Although motor gasoline consumption is projected to continue to decline, modest increases are forecast for the other major product categories. Total disposition of petroleum by product is shown in Figure 7.

Based on the assumptions that the economy will grow by 4.3 percent between the first halves of 1983 and 1984 and that petroleum prices will remain at late-1983 levels, total petroleum consumption is projected to rise by 4.4 percent over this period. The trends in the consumption of major products that are projected for the 1982 to 1983 period are forecast to continue.

Domestic Petroleum Production

Domestic crude oil production in 1982 is estimated at 8.67 million barrels per day, 100,000 barrels per day (1.2 percent) above the 1981 level. A substantial production increase occurred in Alaska, largely due to production from

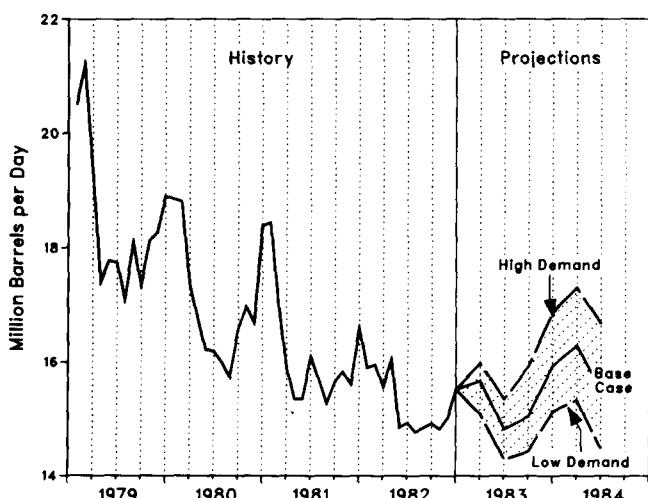


Figure 6. Total Petroleum Demand

Table 5. Quarterly Supply and Disposition of Petroleum: Base Case
(Million Barrels per Day, Except Stocks)

	History						Projections						
	1981			1982			1983			1984			
	Year	1st	2nd	3rd	4th	Year	1st	2nd	3rd	4th	Year	1st	2nd
Supply													
Production													
Crude Oil.....	8.57	8.65	8.66	8.69	8.68	8.67	8.65	8.65	8.63	8.63	8.64	8.61	8.58
North Slope.....	1.53	1.63	1.61	1.63	1.59	1.61	1.64	1.63	1.63	1.63	1.63	1.66	1.65
Subarctic.....	7.05	7.03	7.05	7.06	7.09	7.06	7.01	7.02	6.99	7.00	7.00	6.95	6.93
Natural Gas Liquids.....	1.61	1.55	1.54	1.53	1.60	1.55	1.53	1.52	1.51	1.59	1.54	1.56	1.55
Other Domestic.....	0.05	0.04	0.05	0.06	0.05	0.05	0.04	0.05	0.05	0.05	0.05	0.04	0.05
Processing Gain.....	0.51	0.51	0.50	0.53	0.57	0.53	0.46	0.49	0.51	0.50	0.49	0.49	0.50
Total Production.....	10.74	10.75	10.76	10.80	10.91	10.81	10.69	10.71	10.70	10.77	10.72	10.71	10.68
Imports (including SPR)													
Crude Oil.....	4.40	3.16	3.30	3.89	3.48	3.46	2.81	3.95	4.22	4.00	3.75	4.04	4.12
Refined Products.....	1.60	1.64	1.46	1.53	1.69	1.58	1.81	1.61	1.72	1.89	1.76	2.09	1.90
Total Imports.....	6.00	4.80	4.77	5.43	5.17	5.04	4.62	5.56	5.94	5.89	5.51	6.14	6.02
Exports													
Crude Oil.....	0.23	0.29	0.18	0.24	0.24	0.24	0.23	0.23	0.23	0.23	0.23	0.23	0.23
Refined Products.....	0.37	0.55	0.59	0.56	0.62	0.58	0.54	0.56	0.56	0.55	0.55	0.61	0.63
Total Exports.....	0.59	0.84	0.76	0.80	0.86	0.82	0.77	0.79	0.79	0.78	0.78	0.84	0.86
Net Imports (incl. SPR)....	5.40	3.96	4.00	4.63	4.31	4.23	3.85	4.77	5.15	5.11	4.72	5.30	5.16
Primary Stock Levels² (million barrels)													
Opening	1317.5	1253.3	1152.4	1098.1	1136.6	1253.3	1135.1	1016.2	1052.6	1103.1	1135.1	1084.8	1046.6
Closing.....	1253.3	1152.4	1098.1	1136.6	1135.1	1135.1	1016.2	1052.6	1103.1	1084.8	1084.8	1046.6	1061.7
Net Withdrawals.....	0.18	1.12	0.60	-0.42	0.02	0.32	1.32	-0.40	-0.55	0.20	0.14	0.42	-0.17
(million barrels per day)													
SPR Fill Rate Additions(-)....	-0.34	-0.20	-0.17	-0.15	-0.17	-0.17	-0.19	-0.26	-0.24	-0.14	-0.21	-0.14	-0.14
Total Primary Supply.....	15.98	15.63	15.18	14.87	15.06	15.18	15.67	14.82	15.05	15.93	15.37	16.29	15.53
Product Supplied													
Motor Gasoline	6.59	6.21	6.78	6.65	6.50	6.54	6.10	6.43	6.55	6.36	6.36	6.06	6.40
Distillate Fuel Oil.....	2.83	3.16	2.63	2.27	2.64	2.57	3.24	2.42	2.29	3.06	2.75	3.45	2.61
Residual Fuel Oil.....	2.09	2.10	1.64	1.49	1.55	1.70	1.90	1.60	1.62	1.81	1.73	2.08	1.80
Other Products.....	4.83	4.64	4.56	4.78	4.67	4.66	4.73	4.67	4.90	5.01	4.83	4.99	5.03
Total Reclassified.....	-0.27	-0.31	-0.34	-0.35	-0.24	-0.31	-0.30	-0.30	-0.30	-0.30	-0.30	-0.30	-0.30
Total Product Supplied.....	16.06	15.80	15.27	14.85	15.12	15.26	15.67	14.82	15.05	15.93	15.37	16.29	15.53
Discrepancy.....	-0.08	-0.17	-0.09	0.02	-0.07	-0.08	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total Disposition.....	15.98	15.63	15.18	14.87	15.06	15.18	15.67	14.82	15.05	15.93	15.37	16.29	15.53

SPR = Strategic Petroleum Reserve.

¹Lower-48 States and southern Alaska.

²Excludes crude oil for the Strategic Petroleum Reserve (SPR).

Note: Minor discrepancies with other EIA published historical data are due to rounding.

Sources: Energy Information Administration, U.S. Department of Energy, 1981 Petroleum Supply Annual, and Petroleum Supply Monthly, January 1983. Historical data for December 1982 are preliminary.

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

	History						Projections						
	1981		1982				1983		1984				
	Year	1st	2nd	3rd	4th	Year	1st	2nd	3rd	4th	Year	1st	2nd
Supply Production													
Crude Oil.....	8.57	8.65	8.66	8.69	8.68	8.67	8.65	8.65	8.63	8.63	8.64	8.61	8.58
North Slope.....	1.53	1.63	1.61	1.63	1.59	1.61	1.64	1.63	1.63	1.63	1.63	1.66	1.65
Subarctic ¹	7.05	7.03	7.05	7.06	7.09	7.06	7.01	7.02	6.99	7.00	7.00	6.95	6.93
Natural Gas Liquids.....	1.61	1.55	1.54	1.53	1.60	1.55	1.53	1.52	1.51	1.59	1.54	1.56	1.55
Other Domestic.....	0.05	0.04	0.05	0.06	0.05	0.05	0.04	0.05	0.05	0.05	0.05	0.04	0.05
Processing Gain.....	0.51	0.51	0.50	0.53	0.57	0.53	0.46	0.50	0.52	0.52	0.50	0.51	0.52
Total Production.....	10.74	10.75	10.76	10.80	10.91	10.81	10.69	10.72	10.71	10.78	10.73	10.73	10.70
Imports (including SPR)													
Crude Oil.....	4.40	3.16	3.30	3.89	3.48	3.46	2.81	4.19	4.61	4.39	4.00	4.44	4.59
Refined Products.....	1.60	1.64	1.46	1.53	1.69	1.58	1.87	1.71	1.95	2.09	1.91	2.31	2.15
Total Imports.....	6.00	4.80	4.77	5.43	5.17	5.04	4.68	5.90	6.56	6.48	5.91	6.75	6.74
Exports													
Crude Oil.....	0.23	0.29	0.18	0.24	0.24	0.24	0.23	0.23	0.23	0.23	0.23	0.23	0.23
Refined Products.....	0.37	0.55	0.59	0.56	0.62	0.58	0.54	0.56	0.56	0.55	0.55	0.61	0.63
Total Exports.....	0.59	0.84	0.76	0.80	0.86	0.82	0.77	0.79	0.79	0.78	0.78	0.84	0.86
Net Imports (incl. SPR)....	5.40	3.96	4.00	4.63	4.31	4.23	3.91	5.11	5.77	5.70	5.13	5.91	5.89
Primary Stock Levels² (million barrels)													
Opening.....	1317.5	1253.3	1152.4	1098.1	1136.6	1253.3	1135.1	1009.3	1046.2	1097.2	1135.1	1079.0	1040.9
Closing.....	1253.3	1152.4	1098.1	1136.6	1135.1	1135.1	1009.3	1046.2	1097.2	1079.0	1079.0	1040.9	1056.8
Net Withdrawals.....	0.18	1.12	0.60	-0.42	0.02	0.32	1.40	-0.40	-0.56	0.20	0.15	0.42	-0.17
(million barrels per day)													
SPR Fill Rate Additions(-)....	-0.34	-0.20	-0.17	-0.15	-0.17	-0.17	-0.19	-0.26	-0.24	-0.14	-0.21	-0.14	-0.14
(million barrels per day)													
Total Primary Supply.....	15.98	15.63	15.18	14.87	15.06	15.18	15.80	15.17	15.68	16.54	15.80	16.91	16.27
Product Supplied													
Motor Gasoline.....	6.59	6.21	6.78	6.65	6.50	6.54	6.11	6.48	6.64	6.42	6.17	6.51	
Distillate Fuel Oil.....	2.83	3.16	2.63	2.27	2.64	2.67	3.27	2.53	2.40	3.19	2.85	3.58	
Residual Fuel Oil.....	2.09	2.10	1.64	1.49	1.55	1.70	1.99	1.73	1.95	2.08	1.94	2.38	
Other Products.....	4.83	4.64	4.56	4.78	4.57	4.66	4.74	4.73	4.99	5.11	4.90	5.09	
Total Reclassified.....	-0.27	-0.31	-0.34	-0.35	-0.24	-0.31	-0.30	-0.30	-0.30	-0.30	-0.30	-0.30	
Total Product Supplied.....	16.06	15.80	15.27	14.85	15.12	15.26	15.80	15.17	15.68	16.54	15.80	16.91	16.27
Discrepancy.....	-0.08	-0.17	-0.09	0.02	-0.07	-0.08	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total Disposition.....	15.98	15.63	15.18	14.87	15.06	15.18	15.80	15.17	15.68	16.54	15.80	16.91	16.27

SPR = Strategic Petroleum Reserve.

¹Lower-48 States and southern Alaska.

²Excludes crude oil for the Strategic Petroleum Reserve (SPR).

Note: Minor discrepancies with other EIA published historical data are due to rounding.
Sources: Energy Information Administration, U.S. Department of Energy, 1981 Petroleum Supply Annual, and Petroleum Supply Monthly, January 1983. Historical data for December 1982 are preliminary.

Table 7. Quarterly Supply and Disposition of Petroleum: High Price Case
 (Million Barrels per Day, Except Stocks)

	History						Projections						
	1981		1982				1983		1984				
	Year	1st	2nd	3rd	4th	Year	1st	2nd	3rd	4th	Year	1st	2nd
Supply Production													
Crude Oil	8.57	8.65	8.66	8.69	8.68	8.67	8.65	8.65	8.63	8.63	8.64	8.61	8.58
North Slope	1.53	1.63	1.61	1.63	1.59	1.61	1.64	1.63	1.63	1.63	1.63	1.66	1.65
Subarctic	7.05	7.03	7.05	7.06	7.09	7.06	7.01	7.02	6.99	7.00	7.00	6.95	6.93
Natural Gas Liquids	1.61	1.55	1.54	1.53	1.60	1.55	1.53	1.52	1.51	1.59	1.54	1.56	1.55
Other Domestic	0.05	0.04	0.05	0.06	0.05	0.05	0.04	0.05	0.05	0.05	0.05	0.04	0.05
Processing Gain	0.51	0.51	0.50	0.53	0.57	0.53	0.46	0.49	0.50	0.49	0.48	0.48	0.48
Total Production	10.74	10.75	10.76	10.80	10.91	10.81	10.69	10.71	10.68	10.75	10.71	10.69	10.66
Imports (including SPR)													
Crude Oil	4.40	3.16	3.30	3.89	3.48	3.46	2.81	3.77	3.95	3.65	3.55	3.64	3.62
Refined Products	1.60	1.64	1.46	1.53	1.69	1.58	1.79	1.56	1.66	1.79	1.70	1.98	1.77
Total Imports	6.00	4.80	4.77	5.43	5.17	5.04	4.59	5.33	5.60	5.44	5.24	5.61	5.39
Exports													
Crude Oil	0.23	0.29	0.18	0.24	0.24	0.24	0.23	0.23	0.23	0.23	0.23	0.23	0.23
Refined Products	0.37	0.55	0.59	0.56	0.62	0.58	0.54	0.56	0.56	0.55	0.55	0.61	0.63
Total Exports	0.59	0.84	0.76	0.80	0.86	0.82	0.77	0.79	0.79	0.78	0.78	0.84	0.86
Net Imports (incl. SPR) ...	5.40	3.96	4.00	4.63	4.31	4.23	3.82	4.54	4.81	4.66	4.46	4.78	4.54
Primary Stock Levels¹													
(million barrels)													
Opening	1317.5	1253.3	1152.4	1098.1	1136.6	1253.3	1135.1	1020.5	1056.6	1106.7	1135.1	1088.2	1049.9
Closing	1253.3	1152.4	1098.1	1136.6	1135.1	1135.1	1020.5	1056.6	1106.7	1088.2	1088.2	1049.9	1049.9
Net Withdrawals	0.18	1.12	0.60	-0.42	0.02	0.32	1.27	-0.40	-0.54	0.20	0.13	0.42	-0.16
(million barrels per day)													
SPR Fill Rate Additions(-) ...	-0.34	-0.20	-0.17	-0.15	-0.17	-0.17	-0.19	-0.26	-0.24	-0.14	-0.21	-0.14	-0.14
(million barrels per day)													
Total Primary Supply	15.98	15.63	15.18	14.87	15.06	15.18	15.60	14.59	14.71	15.47	15.09	15.75	14.90
Product Supplied													
Motor Gasoline	6.59	6.21	6.78	6.65	6.50	6.54	6.09	6.39	6.48	6.26	6.31	5.94	6.25
Distillate Fuel Oil	2.83	3.16	2.63	2.27	2.64	2.67	3.21	2.32	2.16	2.88	2.64	3.24	2.39
Residual Fuel Oil	2.09	2.10	1.64	1.49	1.55	1.70	1.87	1.56	1.56	1.73	1.68	1.99	1.69
Other Products	4.83	4.64	4.56	4.78	4.67	4.66	4.72	4.62	4.82	4.91	4.77	4.87	4.87
Total Reclassified	-0.27	-0.31	-0.34	-0.35	-0.24	-0.31	-0.30	-0.30	-0.30	-0.30	-0.30	-0.30	-0.30
Total Product Supplied	16.06	15.80	15.27	14.85	15.12	15.26	15.60	14.59	14.71	15.47	15.09	15.75	14.90
Discrepancy	-0.08	-0.17	-0.09	0.02	-0.07	-0.08	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total Disposition	15.98	15.63	15.18	14.87	15.06	15.18	15.60	14.59	14.71	15.47	15.09	15.75	14.90

SPR = Strategic Petroleum Reserve.

¹Lower-48 States and southern Alaska.

²Excludes crude oil for the Strategic Petroleum Reserve (SPR).

Note: Minor discrepancies with other EIA published historical data are due to rounding.

Sources: Energy Information Administration, U.S. Department of Energy, 1981 Petroleum Supply Annual, and Petroleum Supply Monthly, January 1983. Historical data for December 1982 are preliminary.

the new Kuparuk field. Total production in the Lower-48 States held essentially constant.

Projected shares of petroleum sources in 1983 are shown in Figure 8. Between 1982 and 1983, crude oil production is projected to decline by about 0.3 percent, to 8.64 million barrels per day. Much of the recent slowdown in the decline of production in the Lower-48 States is believed to have resulted from the acceleration of withdrawals of reserves in older producing areas, rather than from the discovery of significant new reserves. From the second quarter of 1983 through the forecast period, oil production is projected to decline at an approximate, 0.7-percent annual rate.

Exploration and development activity has been depressed by the decline in the price of crude oil since early 1981, the expectation of continued price declines, and high interest rates that abated only in the latter half of 1982. Although the reported number of oil well completions during 1982 was 7 percent above year-earlier levels, the total number of rotary rigs in operation peaked in December 1981 and has been below year-earlier levels since April 1982. Rotary rig activity reached its lowest level in over 2 years in October 1982, then in-

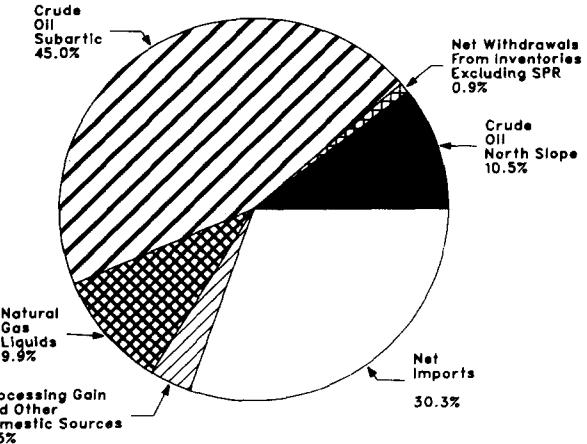


Figure 8. Sources of Petroleum Consumed in U.S., 1983

creased in November and December. Total oil, gas, and dry well completions have been below year-earlier levels since September 1982. The total number of crews engaged in seismic exploration peaked in September 1981 and declined almost continuously; in December 1982, the number of crews was 32 percent below year-earlier levels.

Petroleum Inventories

Total primary petroleum inventories, which have been below the last 3 years' average range since April 1982 (see Figure 9), experienced a less-than-normal seasonal buildup in the second half of 1982. At the end of 1982, total primary petroleum stocks were 1,135 million barrels, 9.4 percent below year-earlier levels. Since petroleum product supplied fell by 5 percent between 1981 and 1982, the decline in the number of days' supply represented by these inventories was only 4.6 percent. (Days' supply is measured as the ratio of inventories to the prior year's product supplied.) Most of the seasonal variation in stocks has occurred in products, rather than in crude oil, which has remained at or near the average levels of the last 3 years. Declines in major product stocks between the ends of 1981 and 1982 were as follows: motor gasoline (including blending components),

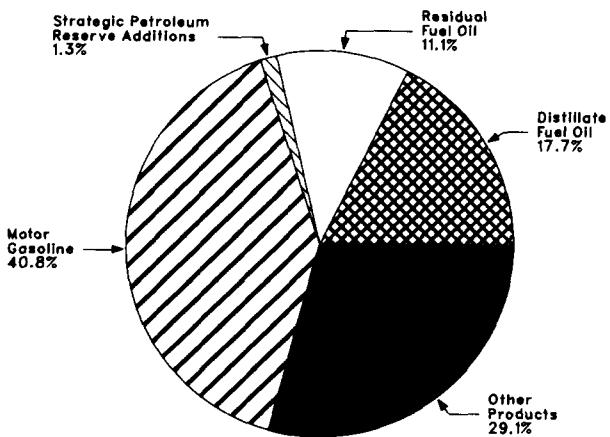
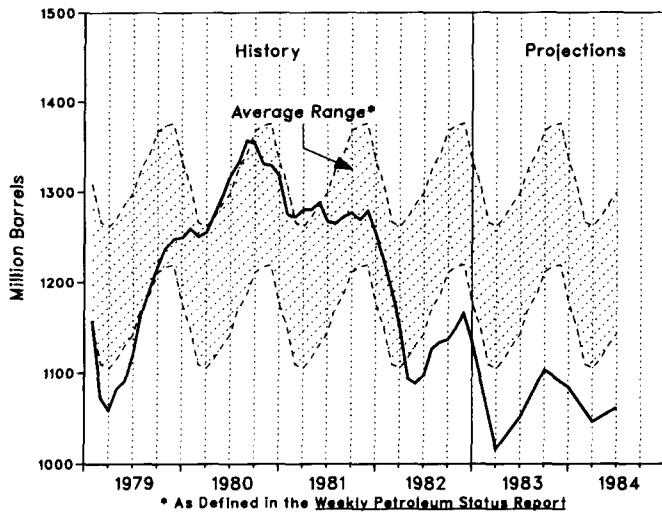


Figure 7. Disposition of Petroleum in U.S., 1983



**Figure 9. Total Petroleum Inventories,
Excluding SPR**

4.4 percent; distillate fuel oil, 6.8 percent; and residual fuel oil, 15.2 percent. In terms of days' supply, these changes were: motor gasoline, down 6.3 percent; distillate fuel oil, down 1.2 percent; and residual fuel oil, up 4.3 percent. The rise in days' supply for residual fuel oil was principally caused by the 18.7-percent decline in the use of this fuel between 1981 and 1982.

Throughout the forecast period, seasonal changes in petroleum product stocks are projected to be slightly less pronounced than in the past (see Table 9). Industry is assumed to adjust to lower-than-historical levels of product demand and the expectation of stable or declining prices but to attempt to avoid extremely low levels of stocks for individual products. In terms of both total inventories and days' supply, product inventories are projected to be lower than during the period of unusually high inventories that followed the major increase in petroleum prices in 1979.

A comparison of projected end-of-1983 stocks with year-earlier levels (in terms of days' supply) is as follows: motor gasoline, 35.2 days (down 2.2 percent); distillate fuel oil, 60.9 days (down 8.9 percent); and residual fuel oil, 32.8 days (down 15.7 percent). Although seasonal swings in total petroleum inventories are expected to continue to be dominated by product stocks, crude oil is the principal component of the projected decline in total inventories through the forecast period. Crude oil inventories are projected to

**Table 8. Petroleum Demand: Alternative Cases and Sensitivity Differentials
(Million Barrels per Day, Except Stocks)**

Sensitivities	1st	2nd	1983			Year	1984	
			3rd	4th	1st		2nd	1st
Demand in 50 States								
Low Price	15.80	15.17	15.68	16.54	15.80	16.91	16.27	
Base Case	15.67	14.82	15.05	15.93	15.37	16.29	15.53	
High Price	15.60	14.59	14.71	15.47	15.09	15.75	14.90	
Weather Sensitivity								
Adverse Weather	0.16	0.04	0.08	0.12	0.10	0.17	0.05	
Favorable Weather	-0.16	-0.03	-0.07	-0.11	-0.10	-0.18	-0.04	
Economic Sensitivity								
High Economic Activity	0.08	0.17	0.22	0.30	0.19	0.34	0.38	
Low Economic Activity	-0.08	-0.16	-0.22	-0.29	-0.19	-0.35	-0.38	
New Car Efficiency								
Low MPG	0.02	0.04	0.06	0.07	0.05	0.09	0.12	
High MPG	-0.03	-0.07	-0.10	-0.12	-0.08	-0.14	-0.18	
Preliminary Data Adjustment	-0.47	-0.24	-0.13	-0.06	-0.23	-0.03	-0.02
Combined Sensitivity Differentials								
High Demand	0.18	0.18	0.24	0.33	0.22	0.39	0.40	
Low Demand	0.51	0.30	0.28	0.34	0.32	0.42	0.42	
Range of Projected Demand								
High Demand ¹	15.98	15.35	15.92	16.87	16.02	17.30	16.67	
Low Demand ²	15.09	14.29	14.43	15.13	14.77	15.33	14.48	

¹Low Price case demand plus the combined effects of adverse weather, high economic activity, and low MPG.

²High Price case demand less the combined effects of favorable weather, low economic activity, high MPG and preliminary data adjustment. See Appendix B for a detailed explanation.

Note: See Tables 2, 3, and 26 for assumed changes in variables for price, weather and economic sensitivities.

Table 9. Petroleum Inventories^a

Unit of Measure	End of 1979	End of 1980 ^b	End of 1981	Mid- 1982	End of 1982	Case 2 Projections		
						Mid- 1983	End of 1983	Mid- 1984
Million Barrels	1,250	1,318	1,253	1,098	1,135	1,053	1,085	1,062
Days' Supply ^c	67.5	77.2	78.0	70.1	74.4	69.6	70.6	67.6

^aEnd-of-year primary stocks (excluding Strategic Petroleum Reserve).

^bBecause of changes in EIA reporting in January 1981, inventory data since 1980 include approximately 34 million barrels of petroleum stocks (primarily Alaskan crude oil in transit by water) that was not counted before. (See Table 31 and Explanatory Notes, 1981 Petroleum Supply Annual.)

^cInventory level divided by the previous year's figure for product supplied.

Note: Minor discrepancies with published EIA historical data are due to rounding.

Note: Due to the different basis for petroleum inventories, the pre-1980 days' supply measure is not comparable to the post-1980 days' supply measure. Using the old basis, the 1980 statistic would have been 75.3 days' supply.

Source: U.S. Department of Energy, Energy Information Administration, Petroleum Supply Monthly, January 1983. Historical data for December 1982 are preliminary.

decline from 348 million barrels at the end of 1982 to 297 million barrels at the end of 1983. At the end of 1982, crude oil held in the Strategic Petroleum Reserve (SPR) totalled approximately 293 million barrels. SPR crude oil inventories are expected to surpass primary crude inventories before the end of 1983 (see Figure 10). The projection of crude oil fill rates for the Strategic Petroleum Reserve is based on SPR crude oil requirements and projected deliveries to support permanent SPR capacity.

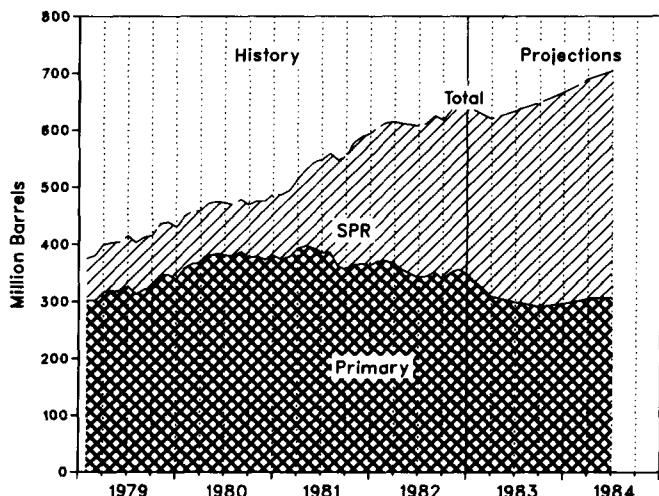


Figure 10. Crude Oil Stocks

Petroleum Imports

Net petroleum imports during 1982 are estimated at 4.23 million barrels per day (down 21.7 percent from 1981), which is the lowest level since 1971. As a result of the small projected increase in petroleum consumption in 1983 and the smaller rate of withdrawals from primary inventories in 1983 than in 1982, net imports in 1983 are projected to be 4.7 million barrels, 11.6 percent above the 1982 level. The sensitivity of net petroleum imports to uncertainty about factors underlying petroleum demand and inventory behavior is shown in Table 10.

During the first 11 months of 1982, U.S. petroleum imports from OPEC countries declined to 42.4 percent of total imports, down from 55.4 percent for all of 1981. For these 11 months, Mexico was the largest single source of U.S. petroleum imports, followed by Saudi Arabia and Nigeria; Saudi Arabia and Nigeria had been the largest sources of petroleum imported to the United States during the period from 1975 to 1981.

The cost of petroleum imports during 1982 declined by 21 percent, from the 1981 level, to \$61.2 billion. In the base case forecast, total 1983 oil imports are projected to cost \$57.8 billion, 5.5 percent less than in 1982. If the economic recovery continues as projected, imports in the first half of 1984 would cost \$31.2 billion, up 16 percent from year-earlier levels. (The total cost of oil imports is estimated on a customs' basis, that is, as the cost of oil delivered alongside ship at the exporting country, excluding the cost of transportation to the United States. Gross imports of both crude oil and products to the 50 States, U.S. territories, and the Strategic Petroleum Reserve are included.) If the price of imported oil should fall to the levels assumed in the low price case, the cost of oil imports during 1983 would be only slightly less than in the base case because of the projected increase in oil imports resulting from lower prices.

Motor Gasoline

Consumption of motor gasoline declined for the fourth consecutive year in 1982. Average 1982 consumption was less than 1 percent below 1981 levels at 6.54 million barrels a day. Between 1981 and 1982, the real fuel cost per mile of travel (real price per gallon divided by the average automobile stock efficiency in miles per gallon) fell by over 14 percent and consumers' income increased by slightly over 1 percent. This resulted in the first significant (1.4 percent) increase in miles traveled by passenger cars in several years. However, this increase in travel, which would be expected to lead to an increase in gasoline consumption, was more than offset in 1982 by an estimated 6-percent increase in the average efficiency of the stock of automobiles.

The projected declines in gasoline consumption for 1983 and the first half of

**Table 10. Net Petroleum Imports, Including SPR: Alternative Cases and Sensitivity Differentials
(Million Barrels per Day)**

Sensitivities	1983					1984	
	1st	2nd	3rd	4th	Year	1st	2nd
Total Net Imports							
Low Price	3.91	5.11	5.77	5.70	5.13	5.91	5.89
Base Case	3.85	4.77	5.15	5.11	4.72	5.30	5.16
High Price	3.82	4.54	4.81	4.66	4.46	4.78	4.54
Weather Sensitivity							
Adverse Weather	0.06	0.04	0.07	0.11	0.08	0.17	0.05
Favorable Weather	-0.06	-0.03	-0.07	-0.11	-0.07	-0.17	-0.04
Economic Sensitivity							
High Economic Activity	0.02	0.16	0.21	0.29	0.18	0.34	0.38
Low Economic Activity	-0.02	-0.16	-0.21	-0.29	-0.17	-0.34	-0.37
New Car Efficiency							
Low MPG	0.02	0.04	0.06	0.07	0.05	0.09	0.12
High MPG	-0.03	-0.07	-0.10	-0.12	-0.08	-0.14	-0.18
Stock Change Uncertainty							
Stock Additions	0.41	0.41	0.41	0.41	0.14	0.41	0.41
Stock Withdrawals	-0.41	-0.41	-0.41	-0.41	-0.14	-0.41	-0.41
Preliminary Data Adjustment	-0.47	-0.24	-0.13	-0.06	-0.23	-0.03	-0.02
Combined Sensitivity Differentials							
High Demand	0.42	0.44	0.47	0.52	0.25	0.57	0.57
Low Demand	0.63	0.51	0.49	0.53	0.33	0.58	0.58
Range of Projected Imports							
High Imports ¹	4.33	5.55	6.24	6.22	5.38	6.48	6.46
Low Imports ²	3.19	4.03	4.32	4.13	4.13	4.20	3.96

¹Low Price case imports plus the combined effects of adverse weather, high economic activity, low MPG, and stock additions.

²High Price case imports less the combined effects of favorable weather, low economic activity, high MPG, stock withdrawals and preliminary data adjustment. See Appendix B for a detailed explanation.

Note: See Tables 2, 3, and 26 for assumed changes in variables for price, weather and economic sensitivities.

Table 11. Quarterly Supply and Disposition of Motor Gasoline: Base Case
(Million Barrels per Day, Except Stocks)

	History						Projections						
	1981			1982			1983			1984			
	Year	1st	2nd	3rd	4th	Year	1st	2nd	3rd	4th	Year	1st	2nd
Supply													
Domestic Production ¹	6.40	6.04	6.40	6.59	6.35	6.35	5.86	6.14	6.30	6.28	6.15	5.97	6.07
Imports	0.16	0.14	0.18	0.23	0.19	0.19	0.18	0.22	0.22	0.21	0.21	0.20	0.24
Exports	0.00	0.02	0.02	0.02	0.01	0.02	0.01	0.01	0.01	0.01	0.01	0.02	0.02
Net Imports	0.16	0.12	0.15	0.21	0.18	0.17	0.17	0.20	0.21	0.20	0.20	0.18	0.22
Primary Stocks of Finished Motor Gasoline² (million barrels)													
Opening	213.54	203.47	198.82	177.84	191.33	203.47	194.44	188.62	180.29	176.57	194.44	188.06	195.97
Closing	203.47	198.82	177.84	191.33	194.44	194.44	188.62	180.29	176.57	188.06	188.06	195.97	186.33
Net Withdrawals (million barrels per day)	0.03	0.05	0.23	-0.15	-0.03	0.02	0.06	0.09	0.04	-0.12	0.02	-0.09	0.11
Total Primary Supply	6.58	6.21	6.78	6.65	6.50	6.54	6.10	6.43	6.55	6.36	6.36	6.06	6.40
Disposition													
Leaded	3.33	3.02	3.30	3.16	3.07	3.14	2.74	2.82	2.82	2.68	2.77	2.50	2.58
Unleaded	3.26	3.19	3.49	3.49	3.43	3.40	3.35	3.61	3.73	3.68	3.59	3.56	3.82
Total Product Supplied	6.59	6.21	6.78	6.65	6.50	6.54	6.10	6.43	6.55	6.36	6.36	6.06	6.40
Discrepancy	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.00	0.0	0.0	0.00	0.0	0.0
Total Disposition	6.58	6.21	6.78	6.65	6.50	6.54	6.10	6.43	6.55	6.36	6.36	6.06	6.40

¹Refinery production plus production at natural gas processing plants.

²Includes stocks at natural gas processing plants. Excludes stocks of Reclassified Motor Gasoline Blending Components.

Note: Minor discrepancies with other EIA published historical data are due to rounding.

Sources: Energy Information Administration, U.S. Department of Energy, 1981 Petroleum Supply Annual, and Petroleum Supply Monthly, January 1983. Historical data for December 1982 are preliminary.

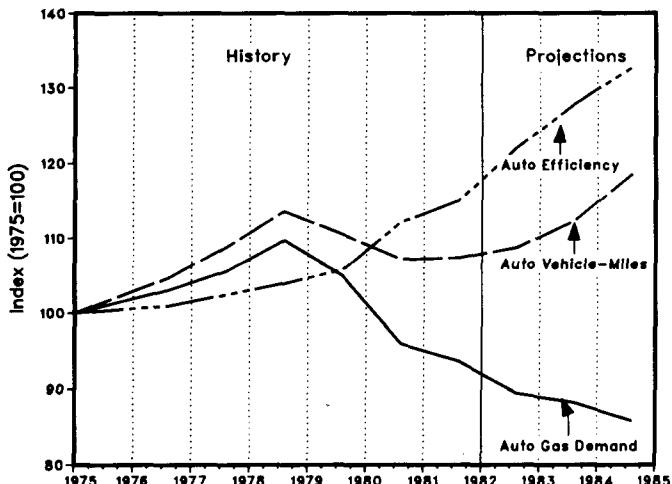


Figure 11. Motor Gasoline Market Indicators

1984 are expected to result from the effects of further auto efficiency increases which outweigh the effects of increased passenger-car travel. Figure 11 shows that changes in automobile gasoline demand (about 70 percent of total gasoline demand) can be explained by the change in passenger-car vehicle-miles less the change in auto stock efficiency.

Gasoline consumption in 1983 is expected to fall below the 1982 level by 2.8 percent to an average 6.36 million barrels per day (see Table 11). The forecasts for many of the determinants of gasoline demand point to an increase in 1983 consumption. For example, between 1982 and 1983, the projections are for a decrease of 13.4 percent in the real fuel cost per mile of travel, an increase in consumers' income of 2.0 percent, and an increase in industrial production, which affects nonauto gasoline demand, by almost 2 percent. Although the expected decline in cost of travel and rise in income contribute to a projected 2.2-percent increase in passenger-car vehicle-miles in 1983, the average auto stock efficiency is expected to increase by 4.7 percent over 1982 levels. The projected 1982 to 1983 increase in efficiency combined with a projected increase in unemployment (from

the 1982 average of 9.7 percent to 10.6 percent in 1983) is expected to more than offset the factors which stimulate gasoline consumption in 1983, and cause another decline.

During the first half of 1984, as shown below, the combined positive effects on consumption from changes in the cost of travel, income, and unemployment are more than offset by the effects of improvements in auto stock efficiency. The net effects of these factors is a slight decrease (0.5 percent) in the consumption of gasoline.

Demand Determinants	First-half 1983/1984 Percent Change	Change in Consumption (MMBD)
Real cost per mile	-10.4	+0.094
Macroeconomic Variables		
Real Disposable Income	+ 4.9	+0.108
Industrial Production	+ 9.2	+0.116
Unemployment	- 9.2	+0.033
Auto Stock Efficiency	+ 6.3	-0.389
Total Change in Consumption	- 0.5	-0.038

If the economy improves as forecast in 1984 and gasoline prices continue to fall, consumers are expected to dispose of their older, less efficient cars and buy new, more-efficient cars. The 1984 increase in auto stock efficiency is explained by the optimistic new-car sales forecast from Data Resources, Incorporated (DRI) for the first half of 1984. In this forecast, new-car sales increase by more than 13 percent from year-earlier levels.

Summer Outlook for Motor Gasoline

A substantial increase in travel could occur during this year's peak driving season as prices continue to fall and the economy improves. Vehicle-miles traveled by passenger cars during June through August of 1983 (here referred to as "summer") are expected to be more than 5 percent above year-earlier levels. However, because of auto-efficiency improvements, the projected average gasoline consumption of 6.60 million barrels per day during the summer of 1983 is still more than 2 percent below last summer's average consumption.

If, indeed, there is a "pent-up" demand for travel, will summer supplies be adequate to meet the range of forecast gasoline demands? By June of 1983, base case gasoline prices, adjusted for inflation, are projected to be 12 percent below year-earlier levels. During the May through September 1983 period, a slight seasonal increase of about 3 cents is projected in retail prices. Figure 12 shows that, in the low price case, average gasoline prices are actually projected to fall slightly during the summer. Even in the high demand case (see Table 12), consumption during the summer of 1983 is still projected to be below summer-1982 levels. Based on the range of demands projected in this report, supplies should be ample for this year's summer driving season.

The potential effects of some of the sources of uncertainty in today's unstable oil markets are estimated in the sensitivity analyses presented in Table 12. These analyses include the impacts on motor gasoline consumption that result from varying the assumed values of price, income, and auto stock efficiency. The combined effects of these sensitivity analyses on gasoline consumption are used to develop the high and low demand levels shown in Figure 13. In all cases, 1983 consumption of

Consumers' demand patterns and producers' supply and stock paths are difficult to project in the current unsettled petroleum market. At the end of May 1983, stocks of motor gasoline, including stocks of motor gasoline blending components, are expected to be slightly below the historical range. However, because of the lower forecast for gasoline consumption, inventories amounting to 35 days' supply of gasoline are projected for the end of May 1983 as compared to 32 days' supply a year earlier.

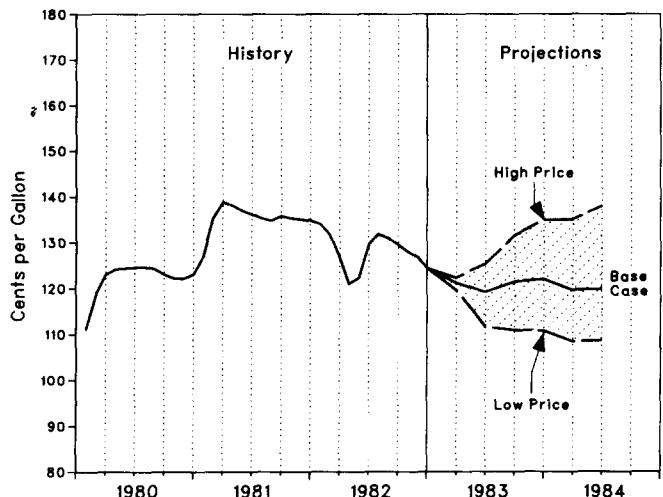


Figure 12. Retail Motor Gasoline Prices

motor gasoline is forecast to decrease from year-earlier levels to the range of 6.22 to 6.49 million barrels per day.

During the first half of 1984, there is the potential, at the high demand level, for a 3.3-percent increase in gasoline consumption over year-earlier levels to an average 6.49 million barrels per day. The lower range of demand shows a decrease in consumption of more than 5 percent from the first half of 1983.

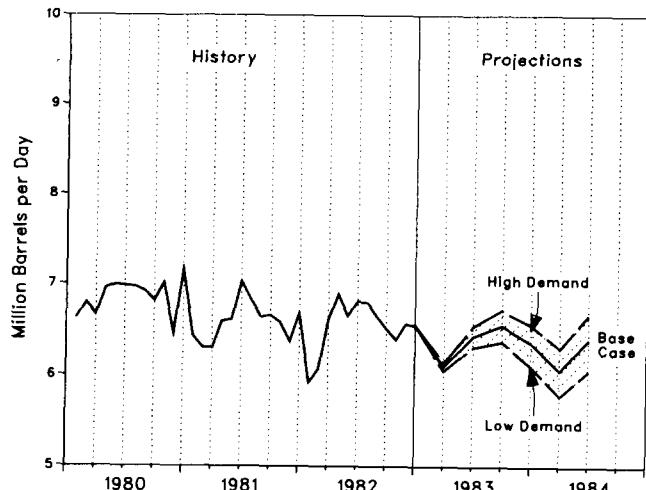


Figure 13. Motor Gasoline Demand

higher real disposable personal income. Continuing efforts at conservation, installation of more-efficient fuel-burning equipment, and switching to other fuels, especially wood and natural gas, have offset these upward pressures on demand. These trends, spurred largely by earlier price increases and concerns over distillate availability, have continued despite the narrowing of the price differential between natural gas and heating oil and despite adequate distillate supplies during the past several years.

In 1983, despite the expected continuation of conservation and fuel-switching activities, distillate demand is projected to reach 2.75 million barrels per day (3 percent above the 1982 level) (see Table 13). The increase is expected due to lower prices (down 6 percent in real terms) and higher real disposable income (up 2 percent) in 1983. This projected increase would represent the first upturn in distillate demand on an annual basis since 1978.

Because of the different uses for distillate fuel oil, separate analyses

Distillate Fuel Oil

Distillate fuel oil demand in 1982 was at its lowest level in 11 years--2.67 million barrels per day. This level represents a 5.7-percent decrease from 1981, despite somewhat colder weather, significantly lower prices, and slightly

Table 12. Motor Gasoline Demand: Alternative Cases and Sensitivity Differentials
(Million Barrels per Day)

Sensitivities	1st	2nd	1983			Year	1984	
			3rd	4th	1st		2nd	1st
Demand in 50 States								
Low Price	6.11	6.48	6.64	6.46	6.42	6.17	6.51	
Base Case	6.10	6.43	6.55	6.36	6.36	6.06	6.40	
High Price	6.09	6.39	6.48	6.26	6.31	5.94	6.25	
Economic Sensitivity								
High Economic Activity	0.02	0.05	0.06	0.07	0.05	0.09	0.10	
Low Economic Activity	-0.02	-0.05	-0.06	-0.08	-0.05	-0.08	-0.10	
New Car Efficiency								
Low MPG	0.02	0.04	0.06	0.07	0.05	0.09	0.12	
High MPG	-0.03	-0.07	-0.10	-0.12	-0.08	-0.14	-0.18	
Combined Sensitivity Differentials								
High Demand	0.03	0.06	0.08	0.10	0.07	0.13	0.16	
Low Demand	0.04	0.08	0.11	0.15	0.09	0.16	0.20	
Range of Projected Demand								
High Demand ¹	6.14	6.54	6.72	6.56	6.49	6.30	6.67	
Low Demand ²	6.05	6.31	6.37	6.11	6.22	5.78	6.05	

¹Low Price case demand plus the combined effects of high economic activity and low MPG.

²High Price case demand less the combined effects of low economic activity and high MPG.

Note: See Tables 2, 3, and 26 for assumed changes in variables for price, weather and economic sensitivities.

Table 13. Quarterly Supply and Disposition of Distillate Fuel Oil: Base Case
 (Million Barrels per Day, Except Stocks)

	History							Projections						
	1981		1982					1983		1984				
	Year	1st	2nd	3rd	4th	Year	1st	2nd	3rd	4th	Year	1st	2nd	
Supply														
Refinery Output.....	2.61	2.45	2.57	2.64	2.78	2.61	2.51	2.55	2.83	2.90	2.70	2.84	2.66	
Imports.....	0.17	0.09	0.08	0.09	0.12	0.09	0.08	0.07	0.07	0.08	0.07	0.09	0.08	
Exports.....	0.01	0.09	0.06	0.07	0.08	0.07	0.05	0.05	0.05	0.05	0.05	0.06	0.06	
Net Imports.....	0.17	0.00	0.01	0.02	0.04	0.02	0.03	0.02	0.02	0.02	0.02	0.02	0.03	0.02
Primary Stock Levels (million barrels)														
Opening.....	205.37	191.54	127.73	124.55	161.19	191.54	178.59	115.16	127.90	179.95	178.59	167.56	114.18	
Closing.....	191.54	127.73	124.55	161.19	178.59	178.59	115.16	127.90	179.95	167.56	167.56	114.18	120.36	
Net Withdrawals (million barrels per day).....	0.04	0.71	0.03	-0.40	-0.19	0.04	0.70	-0.14	-0.57	0.13	0.03	0.59	-0.07	
Total Primary Supply.....	2.82	3.16	2.62	2.26	2.63	2.67	3.24	2.42	2.29	3.06	2.75	3.45	2.61	
Product Supplied														
Nonutility Shipments.....	2.78	3.12	2.60	2.25	2.62	2.64	3.19	2.40	2.25	3.02	2.71	3.42	2.60	
Electric Utility Shipments.....	0.05	0.04	0.03	0.03	0.02	0.03	0.05	0.02	0.04	0.04	0.04	0.03	0.01	
Total Product Supplied.....	2.83	3.16	2.63	2.27	2.64	2.67	3.24	2.42	2.29	3.06	2.75	3.45	2.61	
Electric Utility Consumption.....	0.06	0.06	0.03	0.03	0.03	0.04	0.06	0.03	0.04	0.04	0.04	0.05	0.01	
Electric Utility Stock Levels (million barrels)														
Opening.....	21.30	18.81	17.25	16.87	16.84	18.81	16.48	15.73	15.49	15.49	15.24	16.48	15.00	13.67
Closing.....	18.81	17.25	16.87	16.84	16.48	16.48	15.73	15.49	15.24	15.00	15.00	13.67	14.00	
Net Additions (million barrels per day).....	-0.01	-0.02	0.00	0.00	0.00	-0.01	-0.01	0.00	0.00	0.00	0.00	-0.01	0.00	
Electric Utility Discrepancy..	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Discrepancy.....	-0.01	0.00	-0.01	-0.01	-0.01	-0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Total Disposition.....	2.82	3.16	2.62	2.26	2.63	2.67	3.24	2.42	2.29	3.06	2.75	3.45	2.61	

Note: Minor discrepancies with other EIA published historical data are due to rounding.
 Sources: Energy Information Administration, U.S. Department of Energy, 1981 Petroleum Supply Annual, the Petroleum Supply Monthly, January 1983, the Monthly Energy Review, February 1983, the Electric Power Monthly, December 1982, and the Cost and Quality of Fuels for Electric Utility Plants, October 1982.
 Historical data on utility shipments are estimated for December 1982.
 All other historical data for December 1982 are preliminary.

are made for distillate used for electricity generation, heating, and transportation. Between 1982 and 1983, electric utility shipments of distillate oil are expected to increase from 30,000 to 40,000 barrels per day while heating oil consumption rises from 1.24 to 1.28 million barrels per day. Diesel fuel demand is projected to rise from 1.40 to 1.43 million barrels per day between 1982 and 1983.

Given the projected decline in heating oil prices, together with increasing natural gas prices, it is expected that significant additional fuel switching away from oil in the residential and commercial sectors is unlikely in the short term. In the longer term, replacement boilers and furnaces are expected to be more efficient, perhaps dual-fired, leading to additional permanent conversions from oil and a resumption of the long-term decline in the nontransportation demand for distillate fuel oil.

In the transportation sector, recent increases in the penetration of diesel-fueled engines into the private automobile stock are expected to abate, at least temporarily, because drivers

are less concerned about the availability of gasoline supplies and because the difference between gasoline and diesel fuel prices has narrowed. In some areas, diesel fuel prices have recently been above those for gasoline. Nevertheless, growth in diesel fuel consumption in the transportation sector is projected for 1983, as prices fall and traditional usage, such as that for trucks, railroads, and farms, increases because of the improving economy. Distillate demand is expected to continue its rebound in the first half of 1984, primarily because of the strengthening economy. Table 14 shows the estimated impacts on demand, relative to the base case forecast, in response to variations in the price, income, and weather assumptions.

Residual Fuel Oil

Following a sharp 18.7-percent drop between 1981 and 1982, residual fuel oil demand is projected to rebound by 1.8 percent in 1983, as shown in Figure 14 and Table 15. A rise in demand is expected because of projections for an improved economy and falling residual fuel oil prices. The sensitivity of

Table 14. Distillate Fuel Oil Demand: Alternative Cases and Sensitivity Differentials
(Million Barrels per Day)

Sensitivities	1st	2nd	1983			Year	1984	
			3rd	4th	Year		1st	2nd
Demand in 50 States								
Low Price	3.27	2.53	2.40	3.19	2.85	3.58	2.74	
Base Case	3.24	2.42	2.29	3.06	2.75	3.45	2.61	
High Price	3.21	2.32	2.16	2.88	2.64	3.24	2.39	
Weather Sensitivity								
Adverse Weather	0.08	0.01	0.00	0.05	0.03	0.08	0.00	
Favorable Weather	-0.08	0.00	-0.01	-0.06	-0.03	-0.08	0.00	
Economic Sensitivity								
High Economic Activity	0.01	-0.03	-0.04	0.05	0.03	0.07	0.07	
Low Economic Activity	-0.01	-0.03	-0.04	-0.06	-0.03	-0.06	-0.06	
Combined Sensitivity Differentials								
High Demand	0.08	0.03	0.04	0.07	0.04	0.11	0.07	
Low Demand	0.08	0.03	0.04	0.08	0.04	0.10	0.06	
Range of Projected Demand								
High Demand ¹	3.35	2.56	2.44	3.26	2.89	3.69	2.81	
Low Demand ²	3.13	2.29	2.12	2.80	2.60	3.14	2.33	

¹Low Price case demand plus the combined effects of adverse weather and high economic activity.

²High Price case demand less the combined effects of favorable weather and low economic activity.
Note: See Tables 2, 3, and 26 for assumed changes in variables for price, weather and economic sensitivities.

Table 15. Quarterly Supply and Disposition of Residual Fuel Oil: Base Case
(Million Barrels per Day, Except Stocks)

	History						Projections							
	1981		1982				1983		1984					
	Year	1st	2nd	3rd	4th	Year	1st	2nd	3rd	4th	Year	1st	2nd	
Supply														
Refinery Output.....	1.32	1.15	1.12	1.01	0.99	1.07	1.11	1.09	1.03	1.10	1.08	1.23	1.10	1.10
Imports.....	0.80	0.88	0.71	0.65	0.78	0.76	0.88	0.72	0.82	0.88	0.83	1.11	0.95	
Exports.....	0.12	0.22	0.21	0.21	0.20	0.21	0.20	0.20	0.20	0.20	0.20	0.20	0.24	0.24
Net Imports.....	0.68	0.67	0.50	0.44	0.58	0.55	0.68	0.52	0.62	0.68	0.62	0.87	0.71	
Primary Stock Levels (million barrels)														
Opening.....	91.50	77.99	57.35	60.55	61.82	77.99	66.17	55.84	56.36	59.26	66.17	56.83	58.25	
Closing.....	77.99	57.35	60.55	61.82	66.17	66.17	55.84	56.36	59.26	56.83	56.83	58.25	59.36	
Net Withdrawals..... (million barrels per day)	0.04	0.23	-0.04	-0.01	-0.05	0.03	0.11	-0.01	-0.03	0.03	0.03	-0.02	-0.01	
Total Primary Supply.....	2.04	2.05	1.59	1.45	1.52	1.65	1.90	1.60	1.62	1.81	1.73	2.08	1.80	
Product Supplied														
Nonutility Shipments.....	1.21	1.30	1.12	0.90	1.05	1.09	1.30	1.11	1.03	1.18	1.15	1.38	1.20	
Electric Utility Shipments.....	0.88	0.80	0.52	0.59	0.51	0.60	0.61	0.49	0.59	0.63	0.58	0.70	0.60	
Total Product Supplied.....	2.09	2.10	1.64	1.49	1.55	1.70	1.90	1.60	1.62	1.81	1.73	2.08	1.80	
Electric Utility Consumption..	0.90	0.87	0.56	0.62	0.53	0.64	0.65	0.50	0.60	0.64	0.60	0.73	0.61	
Electric Utility Stock Levels (million barrels)														
Opening.....	113.49	108.76	104.23	104.45	104.01	108.76	101.87	97.99	96.66	95.33	101.87	94.00	90.60	
Closing.....	108.76	104.23	104.45	104.01	101.87	101.87	97.99	96.66	95.33	94.00	94.00	90.60	90.00	
Net Additions..... (million barrels per day)	-0.01	-0.05	0.00	0.00	-0.02	-0.02	-0.04	-0.01	-0.01	-0.01	-0.02	-0.04	-0.01	
Electric Utility Discrepancy..	0.01	0.02	0.04	0.02	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Discrepancy.....	-0.05	-0.06	-0.05	-0.05	-0.03	-0.05	0.00	0.00	0.00	0.0	0.00	0.00	0.00	
Total Disposition.....	2.04	2.05	1.59	1.45	1.52	1.65	1.90	1.60	1.62	1.81	1.73	2.08	1.80	

Note: Minor discrepancies with other EIA published historical data are due to rounding.
 Sources: Energy Information Administration, U.S. Department of Energy, 1981 Petroleum Supply Annual,
 the Petroleum Supply Monthly, January 1983, the Monthly Energy Review, February 1983, the Electric Power
 Monthly, December 1982, and the Cost and Quality of Fuels for Electric Utility Plants, October 1982.
 Historical data on utility shipments are estimated for December 1982.
 All other historical data for December 1982 are preliminary.

Table 16. Residual Fuel Oil Demand: Alternative Cases and Sensitivity Differentials
(Million Barrels per Day)

Sensitivities	1st	2nd	1983 3rd	4th	Year	1984	
						1st	2nd
Demand in 50 States							
Low Price	1.99	1.73	1.95	2.08	1.94	2.38	2.16
Base Case	1.90	1.60	1.62	1.81	1.73	2.08	1.80
High Price	1.87	1.56	1.56	1.73	1.68	1.99	1.69
Weather Sensitivity							
Adverse Weather	0.09	-0.04	0.07	-0.06	0.06	-0.09	0.04
Favorable Weather	-0.08	-0.03	-0.07	-0.06	-0.06	-0.09	-0.05
Economic Sensitivity							
High Economic Activity	0.03	-0.05	0.05	-0.09	0.06	-0.11	0.09
Low Economic Activity	-0.02	-0.04	-0.06	-0.09	-0.05	-0.11	-0.10
Combined Sensitivity							
High Demand	0.09	0.06	0.09	0.11	0.08	0.14	0.10
Low Demand	0.08	0.05	0.09	0.11	0.08	0.14	0.11
Range of Projected Demand							
High Demand ¹	2.08	1.79	2.04	2.19	2.02	2.52	2.26
Low Demand ²	1.79	1.51	1.47	1.62	1.60	1.85	1.58

¹Low Price case demand plus the combined effects of adverse weather and high economic activity.

²High Price case demand less the combined effects of favorable weather and low economic activity.

Note: See Tables 2, 3, and 26 for assumed changes in variables for price, weather and economic sensitivities.

residual fuel oil demand to changes in prices, weather, and economic activity is shown in Table 16. All of the projected increase in demand appears to be in the nonutility sector, while electric utility shipments of residual fuel remain relatively flat.

In the first half of 1984, residual fuel demand is projected to increase by nearly 11 percent over year-earlier levels. Unlike 1983, about half of this increase results from increased use in the utility sector. Utility shipments rise by 18.2 percent over year-earlier levels because of the projected increase for electricity generation.

Other Petroleum Products

The "other" petroleum products category consists of jet fuels, liquefied petroleum gases, petrochemical feedstocks, asphalt, petroleum coke, kerosene, ethane, waxes, road oil, lubricants, aviation gasoline, special naphthas, still gas, and miscellaneous products.

Jet fuel consumption is projected to remain flat between 1982 and 1983 at an

average of 1 million barrels per day. The forecast for consumption of kerosene-based jet fuel (that used by commercial airlines) through the end of 1983 reflects a 5-percent reduction in consumption below that which would otherwise occur. This reduction is based on Federal Aviation Administration (FAA) estimates of the impact of the 1981 Professional Air Traffic Controllers (PATCO) strike. The effects of the PATCO strike on jet fuel consumption

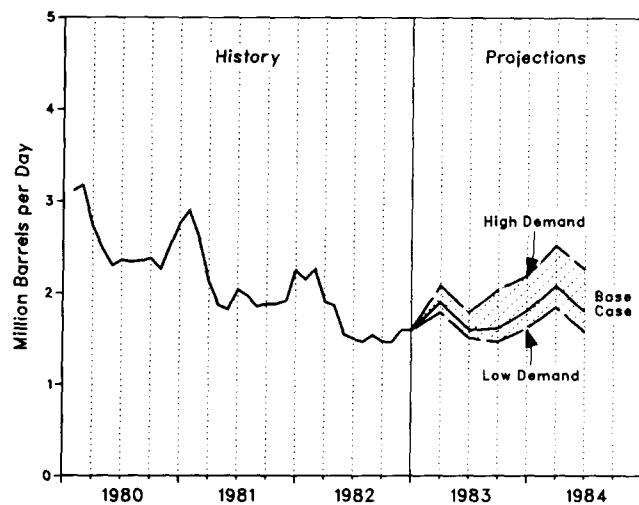


Figure 14. Residual Fuel Oil Demand

are projected to phase out by 1984, when the FAA expects air operations to return to normal levels. During the first half of 1984, jet fuel consumption is forecast to increase by 6 percent over year-earlier levels to an average of 1.06 million barrels per day.

For that portion of the "other" category excluding jet fuel and liquefied petroleum gases (LPG's), the most important products are petrochemical feedstocks, ethane, and asphalt. Consumption of each of these products is generally related to industrial and manufacturing uses, particularly in the petrochemical and refining sectors. As

a result of lower industrial production and refinery runs, consumption in this category declined 7 percent between 1981 and 1982, despite falling real prices.

Based primarily on a projected economic recovery, demand for "other" petroleum products (excluding jet fuel and LPG's) is projected to increase over the forecast period; a 6-percent increase over the 1982 level is forecast for 1983. In particular, chemical production is expected to rebound even more strongly than the economy as a whole, leading to substantial increases in the use of petrochemical feedstocks and ethane, which comprise about 30 percent of this category.

4. Projections for Other Major Domestic Energy Sources

Natural Gas

Total natural gas consumption declined by 8.0 percent between 1981 and 1982; an increase of 0.3 percent between 1982 and 1983 is projected (see Table 17). In the first half of 1984, natural gas consumption is projected to be 5.2 percent above year-earlier levels. This turnaround in natural gas demand is based on the projection that the effects of resumed economic growth will override the effects of high and rising natural gas prices.

Natural Gas Demand

Nonutility (industrial, residential, commercial, and transportation) gas consumption in 1982 was 14 trillion cubic feet, 7.5 percent lower than in 1981, for the third consecutive yearly decline. This downward trend in nonutility natural gas consumption is projected to continue through 1983: a 1-percent decline is projected for the year. A 3.8-percent year-to-year decline in the first half of 1983 is expected to nearly offset a 3.1-percent year-to-year increase in nonutility gas consumption during the second half of 1983. In the first half of 1984, total nonutility gas use is projected to be 3.5 percent above year-earlier levels.

Electric utility demand for natural gas declined by 11.3 percent between 1981 and 1982 because of the decline in electricity generation that resulted from the recession, high prices for gas, and higher-than-normal availability of hydroelectricity in the West. In 1983, electric utility demand for natural gas is projected to be 3.7 percent above the 1982 level, then to continue rising through the first half of 1984 as a result of the projected increase in total electricity generation and an

assumed return to average levels of hydroelectricity production by the end of 1983.

Natural Gas Supply

Domestic production of natural gas declined by 8.7 percent between 1981 and 1982. Despite the projected beginning of an economic upturn in 1983, the combination of higher natural gas prices and lower prices for petroleum continues to dampen prospects for a recovery in natural gas demand and to depress the forecast for natural gas production. Between 1982 and 1983, natural gas production is projected to decline again, to 17 trillion cubic feet, nearly 3 percent below the 1982 level. A particularly sharp drop, to 10 percent below year-earlier levels, is projected for the first quarter of 1983. In response to the strong economic growth forecast for the first half of 1984, natural gas production is projected to be 4 percent above year-earlier levels. Synthetic natural gas production is expected to remain at the 1982 level, a total of 120 billion cubic feet during 1983.

Pipeline imports of natural gas from Canada and Mexico are projected to continue providing about 5 percent of U.S. gas consumption throughout the forecast period. In 1982, liquefied natural gas (LNG) imports from Algeria and U.S. LNG exports to Japan offset each other. In the forecast period, U.S. LNG exports are expected to remain unchanged while LNG imports from Algeria increase sharply, as a result of previously negotiated contracts, leading to net imports of 130 billion cubic feet in 1983.

Natural gas in underground storage increased by 310 billion cubic feet in 1982 and is expected to rise by another 290 billion cubic feet, to 7.2 trillion

Table 17. Quarterly Supply and Disposition of Natural Gas
(Trillion Cubic Feet)

	History												Projections			
	1981						1982						1983			
	Year	1st	2nd	3rd	4th	Year	1st	2nd	3rd	4th	Year	1st	2nd	3rd	4th	1984
Supply																
Marketed Production of Dry Gas ¹	19.18	4.73	4.40	4.22	4.17	17.52	4.26	4.21	4.19	4.36	17.02	4.48	4.35			
Net Imports of Dry Gas.....	0.86	0.28	0.20	0.19	0.24	0.91	0.26	0.21	0.20	0.25	0.93	0.26	0.21			
Net Imports of LNG.....	-0.02	-0.01	-0.00	-0.01	0.01	0.00	0.03	0.03	0.03	0.03	0.13	0.03	0.03			
SNG Production.....	0.13	0.04	0.02	0.02	0.03	0.12	0.04	0.02	0.02	0.03	0.12	0.04	0.02			
Total New Supply.....	20.16	5.04	4.62	4.42	4.46	18.55	4.59	4.48	4.44	4.68	18.19	4.81	4.62			
Underground Storage																
Opening.....	6.30	6.57	5.37	6.15	7.03	6.57	6.88	5.50	6.26	7.15	6.88	7.17	5.76			
Closing.....	6.57	5.37	6.15	7.03	6.88	6.88	5.50	6.26	7.15	7.17	7.17	5.76	6.41			
Net Withdrawals.....	-0.27	1.20	-0.78	-0.89	0.15	-0.31	1.38	-0.76	-0.89	-0.02	-0.29	1.41	-0.65			
Total Primary Supply.....	19.89	6.24	3.85	3.54	4.62	18.24	5.97	3.72	3.55	4.66	17.90	6.22	3.97			
Consumption																
Electric Utilities.....	3.64	0.70	0.80	1.01	0.72	3.23	0.73	0.86	1.04	0.72	3.35	0.82	0.99			
Refinery Fuel.....	0.65	0.15	0.16	0.17	0.16	0.64	0.16	0.18	0.18	0.18	0.70	0.18	0.18			
All Other Uses ²	15.11	5.30	2.77	2.26	3.64	13.98	5.07	2.69	2.33	3.75	13.84	5.23	2.80			
Subtotal.....	19.40	6.16	3.73	3.44	4.52	17.84	5.97	3.72	3.55	4.66	17.90	6.22	3.97			
Discrepancy.....	0.48	0.09	0.11	0.10	0.10	0.40	0.00	0.00	0.0	0.00	0.00	0.00	0.00			
Total Disposition.....	19.89	6.24	3.85	3.54	4.62	18.24	5.97	3.72	3.55	4.66	17.90	6.22	3.97			

LNG=Liquefied Natural Gas.

SNG=Synthetic Natural Gas.

¹Excludes nonhydrocarbon gases removed.

²Includes residential, commercial, and industrial uses plus use of synthetic natural gas.

Note: Minor discrepancies with other EIA published historical data are due to rounding.

Sources: Energy Information Administration, U.S. Department of Energy, Monthly Energy Review, February 1983; U.S. Imports and Exports of Natural Gas, 1981, June 1982, and Electric Power Monthly, December 1982.

cubic feet, by the end of 1983. Most of the projected increase in underground storage of natural gas results from the recent low levels of gas demand that are expected to continue through the first half of 1983. The graph of the natural gas supply/demand balance shows the gradual buildup of natural gas inventories (see Figure 15).

Coal

Estimated coal production in 1982 reached another record high of 833.4 million tons (see Figure 16 and Table 18); the increase was due entirely to extremely high production during the first 6 months of the year. In fact, second-half 1982 production fell 71.9 million tons (-15.2 percent) below second-half 1981 production and 10.7 million tons (-2.6 percent) below production levels for late 1980, the year in which the previous high was established. The sudden decrease was due to the combined effects of weak domestic demand, sharply reduced exports, and extremely high levels of producer and user inventories.

The 1982 estimate for coal production exceeds the previous record by less than 4 million tons and reflects an average annual growth rate of only 0.2 percent for the 2-year period since 1980. The projection for 1983 shows little improvement, reflecting an average annual growth rate of 0.3 percent for 1980 through 1983. Domestic coal production in 1983 is projected to increase by only 3.2 million tons (0.4 percent), despite a 28.6-million-ton increase in domestic consumption, because exports are projected to fall while producer and consumer stocks decline.

Coal Consumption by Sector

Total coal consumption in 1982 fell below the previous year's level for the first time during a nonstrike year since 1967. Coal consumed by electric utilities decreased for the first time since 1958.

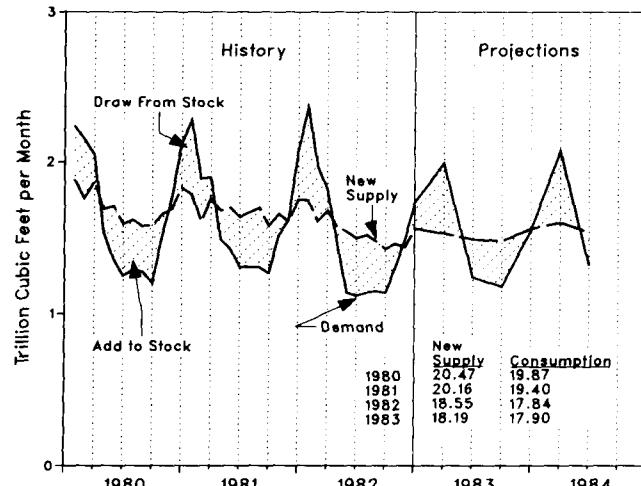


Figure 15. Natural Gas Supply and Demand

Slow economic activity, mild weather, and exceptionally high precipitation in areas where coal-fired generation competes with hydroelectric power severely constrained electric utility demand for coal during much of 1982. The weak economy and mild, wet weather patterns decreased the demand for electricity, delaying the commercial startup of new, baseload coal-fired generating units and extending the downtime of some units removed from commercial operation for normal maintenance.

The projections for electric utility coal consumption in 1983 and early 1984 are based on the assumption that baseload generating unit operations will be normal and planned, and coal-fired generating unit construction and completion will continue as reflected in EIA's Generating Unit Reference File. Electric utility coal consumption is projected to rise by 25.3 million tons (4.3 percent) in 1983. However, this increase represents an average annual growth rate of only 1.9 percent between 1981 and 1983.

According to the December 1982 issue of Blast Furnace and Raw Steel Production, AIS-7, published by the American Iron and Steel Institute, raw steel production in 1982 reached only 72.9 million tons, the lowest level since 1946. The estimated 19.7-million-ton (-32.2 per-

Table 18. Quarterly Supply and Disposition of Coal
(Million Short Tons)

	1981 Year	1982					1983					1984	
		1st	2nd	3rd	4th	Year	1st	2nd	3rd	4th	Year	1st	Year
Supply													
Production	823.77	218.74	213.79	198.02	202.85 ¹	833.41	198.56	214.03	204.74	219.23	836.56	209.07	219.46
Primary Stock Levels ²													
Opening	24.38	24.15	33.47	37.54	39.69	24.15	36.91	39.43	38.36	36.46	36.91	40.07	43.32
Closing	24.15	33.47	37.54	39.69	36.91 ³	36.91	39.43	38.36	36.46	40.07	40.07	43.32	38.96
Net Withdrawals	0.23	-9.33	-4.07	-2.14	2.78	-12.76	-2.52	1.06	1.91	-3.61	-3.16	-3.25	4.35
Imports	1.04	0.11	0.13	0.15	0.23	0.62	0.10	0.16	0.12	0.13	0.51	0.10	0.15
Exports	112.54	25.56	31.62	25.25	23.84	106.28	17.99	28.16	24.66	26.96	97.79	18.54	29.01
Total Domestic Supply ..	712.51	183.96	178.24	170.77	182.02 ³	714.99	178.15	187.09	182.10	188.78	736.12	187.38	194.96
Secondary Stock Levels⁴													
Opening	204.03	185.27	179.17	198.37	189.85	185.27	196.97	192.03	206.42	195.67	196.97	196.43	191.66
Closing	185.27	179.17	198.37	189.85	196.97 ³	196.97	192.03	206.42	195.67	196.43	196.43	191.66	205.97
Net Withdrawals	18.75	6.10	-19.20	8.52	-7.11 ³	-11.69	4.94	-14.40	10.75	-0.76	0.53	4.77	-14.31
Total Indicated Consumption	731.26	190.07	159.03	179.29	174.91 ³	703.30	183.09	172.70	192.85	188.02	736.66	192.16	180.65
Domestic Consumption													
Coke Plants	61.01	12.96	10.81	9.10	8.49 ³	41.36	8.86	11.37	11.13	12.15	43.52	12.83	14.58
Electric Utilities	596.80	154.05	136.54	158.47	145.04 ³	594.09	153.87	144.28	165.28	156.00	619.43	158.14	148.05
Retail and General Industry	74.82	20.17	16.70	16.58	19.20 ³	72.65	20.35	17.04	16.44	19.88	73.71	21.19	18.02
Total Domestic Consumption	732.63	187.17	164.05	184.15	172.73	708.10	183.09	172.70	192.85	188.02	736.66	192.16	180.65
Discrepancy ⁵	-1.37	2.90	-5.02	-4.86	2.17	-4.81	0.00	0.00	0.00	0.00	0.00	0.00	0.00

¹Estimated, based on preliminary revisions to published data for the fourth quarter of 1982. Source: Energy Information Administration, U.S. Department of Energy, Quarterly Coal Report, January 1983, p. 2.

²Primary stocks are those held at the mines, preparation plants, and distribution points.

³Estimated.

⁴Secondary stocks are those held by users. Most of the secondary stocks are held by electric utilities.

⁵Historical period discrepancy reflects unaccounted for shipper and receiver reporting discrepancies.

Note: Rows and columns may not add due to independent rounding.

Sources: Energy Information Administration, U.S. Department of Energy, Monthly Energy Review, February 1983, and Quarterly Coal Report, January 1983.

cent) decrease in coal carbonized at coke plants during 1982 is the result of the depressed condition of the iron and steel industry and improved efficiencies in the coke and steel making processes. Based on DRI's forecast of the production index for basic iron and steel, this downward trend is projected to continue through the first quarter of 1983. The effects of a relatively strong projected increase in raw steel production later in 1983 on coking coal consumption are expected to be dampened somewhat by the current high levels of coke inventories, so that comparable increases in coke production are delayed until very late in 1983 and the first 6 months of 1984. As a result, the consumption of coal at coke plants is projected to show only a 2.2-million-ton (5.2 percent) increase between 1982 and 1983, remaining well below the 1981 consumption level of 61 million tons.

Coal demand by commercial and general industrial consumers is estimated to have decreased during 1982 by 2.2 million tons (-2.9 percent) and is projected to show little change during 1983 and early 1984. Despite the expected return of "normal" weather in late 1983 and 1984 and increased economic activity, coal consumed by commercial and industrial users during the forecast period is not expected to deviate significantly from the trend that has existed since 1974.

Coal Exports

The current forecast for coal exports reflects a significant decrease from that published in the November 1982 issue of the *Outlook*. The steepness of the drop in exports during the last 6 months of 1982 had not been anticipated. During the last half of 1982, exports fell 8.1 million tons (-14.1 percent) below first-half 1982 and 20.7 million tons (-29.6 percent) below second-half 1981 levels. (U.S. coal exports are normally higher during the latter half of the year than during the first half of the year because some Great Lakes

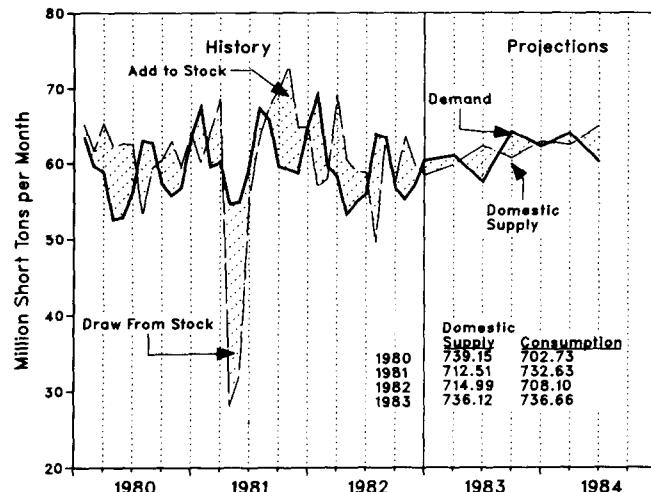


Figure 16. Coal Consumption and Supply

ports are often closed during part of the first half.) Total exports for the year 1982 fell 6.3 million tons below the 1981 record high. Most of the decrease was in steam coal shipments which decreased by 5.6 million tons (-11.9 percent).

During 1982, lower oil prices and the worldwide recession slowed the growth rate of coal-fired electricity generation capacity and conversions from petroleum to coal-fired electric generation. In addition, the weak world economy caused low coal consumption in the world iron and steel industry during 1982. Declining consumption contributed to increases in the already high coal inventories in Western Europe and Japan. Increased production and much lower delivered prices for Polish coal induced more European buyers to purchase coal from Poland. Labor stability in Australia allowed Japanese buyers to finalize contracts with Australian suppliers.

The continued strength of the U.S. dollar throughout most of 1982 increased the cost of U.S. coal to importing countries, making coal imports from competing suppliers more attractive. The effect of this was to reinforce the United States' disadvantage as the high-cost marginal supplier to Europe and the Pacific Rim. In the current forecast,

there is a further decrease in metallurgical coal exports, from 64.6 million tons in 1982 to 54.1 million tons in 1983, and a modest rebound in steam coal exports, to 43.7 million tons in 1983, up from 41.7 million tons in 1982. First-half 1984 export totals reflect continued, though modest, growth. (A more comprehensive analysis of the U.S. coal exports, from historical and international perspectives, and a description of the methodology and assumptions used in the current forecast are contained in the November 1982 Short-Term Energy Outlook, Volume 2, Methodology.)

Electric Power

The economic recession, continued conservation, and cooler summer relative to 1981 combined in 1982 to break the post-World-War-II trend of rising electricity generation. Total generation of electric power in 1982 was 2,242 billion kilowatt-hours (see Table 19), a decrease of 2.3 percent from the 1981 level. Industrial demand for electricity, which is more affected by the sluggish economy than other sectors, is expected to be about 10 percent below the 1981 level.

With a stronger economy forecast for 1983, total generation is expected to be 2,298 billion kilowatt-hours, about 2.5 percent above the 1982 level. Despite the projected resumption of growth in generation, it is estimated that electric utility generation during the first quarter of 1983 will be approximately 5 percent below the year-earlier level. Figure 17 shows the projected electricity generation by fuel source through 1983. Because of the delay in the economic recovery, the current electricity forecast is 0.6 percent lower than the 1983 forecast published in the November 1982 Outlook. Continued economic growth in the first half of 1984, reflected in the 5-percent increase expected for personal income over the same period a year earlier, is projected to result in a 4.8-percent

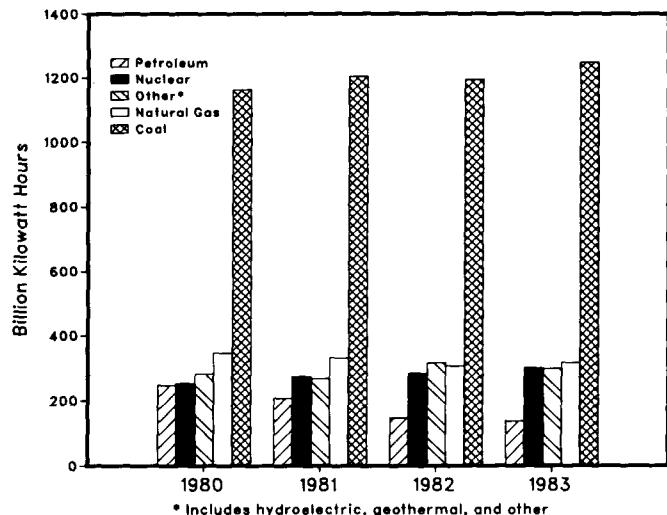


Figure 17. Electricity Generation by Fuel Source

increase in electricity generation between the first half of 1983 and the first half of 1984.

Following a 4.7-percent rise in the real price of electricity between 1981 and 1982, electricity prices are expected to moderate in 1983, increasing only 0.9 percent between 1982 and 1983 and about 2 percent from the first half of 1983 to the first half of 1984. In the recent past, electricity prices have been rising faster than the rate of increase in fuel costs alone. Reasons for this rapid increase include higher allowable rates of return authorized by utility commissions (reflecting, in part, the high interest rates of the last few years) and increased capital costs. The projected moderation of increases in electricity prices is based on several factors: rates for newly issued utility bonds are forecast to be considerably lower in 1983 and 1984 than in 1982; increases in fuel prices, as shown in Figure 18, are forecast to be lower than in the past few years; and capacity utilization is expected to increase as the demand for electricity increases.

Generation by Fuel Source

Electricity generated from nuclear power, which accounted for 283 billion kilowatt-hours in 1982, is forecast to be 300 billion kilowatt-hours in 1983.

Table 19. Quarterly Supply and Disposition of Electricity
(Billion Kilowatt-Hours)

	History												Projections				
	1981						1982						1983				
	Year	1st	2nd	3rd	4th	Year	1st	2nd	3rd	4th	Year	1st	2nd	3rd	4th	Year	1st
Generation																	
Coal.....	1203.20	308.35	276.44	317.45	290.30	1192.54	310.19	290.85	333.20	314.47	1248.71	318.80	298.46				
Petroleum.....	206.42	49.37	31.46	35.51	30.37	146.71	37.12	28.32	34.52	36.63	136.59	41.47	32.93				
Natural Gas.....	345.73	67.13	75.52	95.43	67.24	305.32	68.95	80.60	98.23	68.03	315.82	77.01	93.74				
Nuclear.....	272.67	68.62	67.45	75.84	70.86	282.78	73.21	66.98	81.41	78.08	299.68	83.94	76.06				
Hydroelectric.....	260.68	83.48	84.02	71.20	70.80	309.50	78.51	81.06	67.78	63.95	291.29	71.37	75.05				
Geothermal and Other.....	6.05	1.12	1.17	1.43	1.50	5.22	1.51	1.48	1.62	1.66	6.27	1.62	1.59				
Total Generation.....	2294.81	578.07	536.05	596.86	531.06	2242.05	569.49	549.27	616.76	562.80	2298.32	594.20	577.82				
Total Net Imports.....	22.84	5.56	5.75	5.78	5.75	22.84	4.81	4.93	4.94	4.93	19.61	4.81	4.93				
T & D Loss ²	147.71	29.23	44.23	45.26	36.89	155.62	37.59	36.25	40.71	37.15	151.69	39.22	38.14				
Total Consumption (Sales).....	2147.10	548.84	491.82	551.60	494.17	2086.43	531.90	513.02	576.05	525.66	2146.63	554.98	539.69				

¹Includes wood and waste.

²Transmission and distribution losses through the power network, calculated as total generation minus total sales.

Note: Minor discrepancies with other EIA published historical data are due to rounding.

Source: Energy Information Administration, U.S. Department of Energy, Monthly Energy Review, February 1983, and Electric Power Monthly, December 1982.

This forecast level of nuclear generation for 1983 is only slightly lower than the November 1982 forecast; for the first time in the last few forecasts, the nuclear projection was not revised sharply downward. Four new plants (Susquehanna 1 in the Northeast, Grand Gulf 1 and Summer 1 in the Southeast, and San Onofre 3 on the West Coast) are projected to achieve commercial operation in 1983.

The 14-percent increase in nuclear generation projected between the first half of 1983 and the first half of 1984 is based on the assumptions that 3 new plants (McGuire 2 and St. Lucie 2 in the Southeast and Diablo Canyon 1 in the West) will begin operation for the first time and that Three Mile Island 1 will be restarted. In addition, the average capacity factor for all nuclear plants is expected to improve by 1 percentage point between 1983 and 1984 as many retrofits, ordered as a result of the Three Mile Island accident, are completed.

The record level of 309 billion kilowatt-hours of hydroelectricity generated in 1982 was 12 percent above normal levels and exceeded the previous yearly high of 301 billion kilowatt-hours set in 1974. According to preliminary information, rainfall and snowpack levels during the winter of 1982-83 are again higher than normal, so water flows are expected to exceed normal levels through the spring of 1983. Total generation from hydropower is forecast to be about 291 billion kilowatt-hours in 1983 (almost 6 percent above normal), then return to normal levels during 1984.

Coal-fired generation dropped by nearly 1 percent between 1981 and 1982, the first decrease since 1978. As the demand for electricity picks up, coal-fired generation is expected to increase by over 4 percent between 1982 and 1983. Since the November 1982 forecast, the projection for 1983 coal-fired generation has been lowered by 16 billion

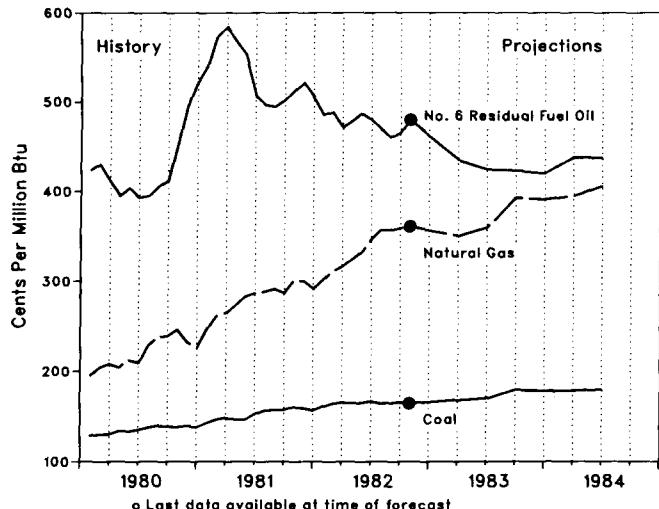


Figure 18. Prices for Utility Boiler Fuels

kilowatt-hours, to 1,249 billion kilowatt-hours, because levels of capacity utilization are lower. The rate of increase for coal-fired generation is projected to slow to less than 3 percent between the first half of 1983 and the first half of 1984, a rate much lower than the increase in total generation.

The 18-percent drop in the combined share of electricity generation from oil and natural gas in 1982 was due to increased levels of generation from coal and nuclear power, increased availability of inexpensive hydroelectricity, and decreased electricity demand. Electricity generation from oil and natural gas in 1982 was 452 billion kilowatt-hours, 8 billion kilowatt-hours less than was forecast in the November 1982 Outlook. Continuing the rapid downward trend since 1978, oil-fired generation fell by nearly 29 percent between 1981 and 1982 and gas-fired generation fell by almost 12 percent. Total generation from oil and gas is projected to remain constant in 1983, with natural gas gaining slightly and oil falling slightly from 1982 levels. Oil and natural gas are projected to be used as "swing" fuels for electricity generation. For the first half of 1984, generation from each of these fuels is expected to rise by about 14 percent above year-earlier levels, as the total demand for electricity increases.

5. Total Domestic Energy Balance

Overview

Total energy consumption in 1982 was 70.8 quadrillion Btu. The 3.3-quadrillion-Btu drop in consumption between 1981 and 1982 was the biggest year-to-year decline during the post-embargo period. This decline was considerably larger than in previous years because of the 1982 downturn in the economy, when real GNP declined by 1.8 percent from 1981. Most of the 4.5-percent decline in consumption occurred in the nonutility sector, where natural gas and coal incurred the largest proportionate drops from the previous year of 7.3 percent and 16.5 percent, respectively, while petroleum consumption declined by 3.4 percent (1.0 quadrillion Btu).

In 1982, net energy imports reached their lowest level since 1970 at 7.3 quadrillion Btu. This 23.8-percent drop from the previous year left net imports of energy accounting for only 10.4 percent of gross energy consumption. The decrease was primarily a result of the drop in total energy use and the large petroleum stock drawdowns to satisfy domestic demand.

In the utility sector, oil and gas use declined by 1.1 quadrillion Btu, while overall utility consumption declined by 0.6 quadrillion Btu. Oil and gas consumption declined by more than other fuels used at utilities, in part, because of further displacement of these fuels by hydroelectric generation (up 0.5 quadrillion Btu from 1981) and increased use of nuclear power (up 0.1 quadrillion Btu from 1981) (see Table 20).

Total Domestic Energy Outlook

Gross energy consumption is projected to show a year-to-year increase between 1982 and 1983 for the first time since 1979, with a modest 1.2 percent rise from the 1982 level to 71.7 quadrillion Btu (see Table 21). Increased consumption is projected for all major energy sources except hydroelectricity, which is expected to decline from its record 1982 output. The majority of the projected increase is accounted for by a 2.5-percent rise in electric utility consumption, with the largest percent increase occurring in utility coal consumption. A small increase in nonutility consumption is projected for petroleum, principally distillate fuel oil and "other" petroleum products.

Gross energy consumption is forecast to increase significantly as the projected economic turnaround becomes stronger in the third quarter of 1983 and continues throughout 1984. Energy consumption in the first half of 1984 is projected to be 4.9 percent higher than in the first half of 1983. Nonutility consumption is forecast to increase by 5.0 percent, while utility energy use rises by 4.8 percent. Within the utility sector, nuclear power's share is expected to increase while hydroelectric power consumption decreases from the relatively high levels projected for the first half of 1983.

Net energy imports in 1983 are projected to be above the previous year's level for the first time since 1977, reaching 8.6 quadrillion Btu. A further increase of 25 percent between the first half of

Table 20. Quarterly Supply and Disposition of Total Energy
(Quadrillion Btu)

	History										Projections				
	1981		1982				1983				1984				
	Year	1st	2nd	3rd	4th	Year	1st	2nd	3rd	4th	Year	1st	2nd		
Supply															
Production															
Petroleum ¹	20.44	5.06	5.12	5.19	5.21	20.58	5.06	5.11	5.15	5.17	20.49	5.10	5.08		
Natural Gas ²	19.68	4.86	4.51	4.33	4.28	17.98	4.37	4.32	4.30	4.48	17.46	4.60	4.47		
Coal	19.07	5.06	4.95	4.58	4.70	19.29	4.60	4.95	4.74	5.08	19.37	4.84	5.08		
Nuclear	2.90	0.73	0.72	0.81	0.75	3.01	0.78	0.71	0.87	0.83	3.19	0.89	0.81		
Hydroelectric ³	2.73	0.87	0.88	0.75	0.74	3.24	0.82	0.85	0.71	0.67	3.05	0.75	0.79		
Geothermal and Other ⁴	0.13	0.02	0.03	0.03	0.03	0.11	0.03	0.03	0.04	0.04	0.14	0.04	0.03		
Subtotal	64.97	16.61	16.20	15.68	15.71	64.21	15.66	15.97	15.80	16.27	63.69	16.22	16.26		
Net Imports															
Crude Oil	8.84	1.50	1.65	1.95	1.73	6.84	1.35	1.97	2.13	2.02	7.46	2.02	2.06		
Other Petroleum	2.61	0.57	0.47	0.52	0.56	2.11	0.54	0.53	0.60	0.69	2.46	0.77	0.65		
Natural Gas (Dry)	0.88	0.28	0.21	0.19	0.25	0.93	0.27	0.22	0.20	0.26	0.95	0.27	0.22		
Liquefied natural gas	-0.02	-0.01	-0.00	-0.01	0.01	0.00	0.03	0.03	0.03	0.03	0.13	0.03	0.03		
Coal and Coke	-2.94	-0.67	-0.83	-0.67	-0.62	-2.79	-0.47	-0.74	-0.65	-0.71	-2.57	-0.49	-0.76		
Electricity	0.24	0.06	0.06	0.05	0.06	0.24	0.05	0.05	0.05	0.05	0.20	0.05	0.05		
Subtotal	9.62	1.74	1.55	2.05	1.99	7.33	1.86	2.06	2.37	2.34	8.63	2.65	2.25		
Primary Stocks															
Net Withdrawals	0.12	1.56	-0.63	-1.18	-0.19	-0.06	2.03	-0.97	-1.15	-0.01	-0.09	1.56	-0.67		
SPR Fill Rate Additions(-)	-0.71	-0.11	-0.09	-0.08	-0.09	-0.37	-0.10	-0.14	-0.13	-0.08	-0.44	-0.08	-0.08		
Utility Stocks ⁵															
Net Withdrawals	0.46	0.17	-0.41	0.19	-0.14	-0.19	0.13	-0.30	0.24	-0.01	0.06	0.13	-0.30		
Total Supply ⁶	74.45	19.97	16.62	16.66	17.66	70.91	19.58	16.63	17.13	18.50	71.85	20.49	17.47		
Consumption															
Nonutility Uses															
Petroleum	29.92	7.29	7.25	7.05	7.30	28.89	7.32	7.05	7.17	7.61	29.15	7.69	7.36		
Natural Gas ⁷	16.17	5.59	3.01	2.49	3.90	14.99	5.37	2.94	2.57	4.04	14.92	5.55	3.06		
Coal	3.39	0.83	0.68	0.64	0.69	2.83	0.73	0.71	0.68	0.80	2.91	0.85	0.81		
Subtotal	49.48	13.71	10.94	10.18	11.83	46.66	13.42	10.69	10.43	12.44	46.98	14.08	11.23		
Electric Utility Inputs															
Petroleum	2.18	0.52	0.31	0.36	0.32	1.51	0.40	0.30	0.37	0.39	1.47	0.45	0.35		
Natural Gas	3.73	0.72	0.82	1.03	0.73	3.31	0.75	0.88	1.07	0.74	3.44	0.84	1.02		
Coal	12.71	3.28	2.91	3.38	3.09	12.65	3.28	3.07	3.52	3.32	13.19	3.37	3.15		
Nuclear	2.90	0.73	0.72	0.81	0.75	3.01	0.78	0.71	0.87	0.83	3.19	0.89	0.81		
Hydroelectric ⁸	2.97	0.93	0.94	0.81	0.80	3.48	0.87	0.90	0.76	0.72	3.25	0.80	0.84		
Geothermal and Other	0.13	0.02	0.03	0.03	0.03	0.11	0.03	0.03	0.04	0.04	0.14	0.04	0.03		
Subtotal	24.63	6.21	5.72	6.41	5.73	24.07	6.11	5.90	6.62	6.05	24.68	6.38	6.21		
Gross Energy Consumption ⁹	74.11	19.91	16.67	16.59	17.62	70.79	19.53	16.59	17.05	18.48	71.66	20.46	17.43		
Electric Utility Adjustments															
Conversion Loss ¹⁰	16.73	4.22	3.89	4.37	3.90	16.39	4.15	4.01	4.50	4.11	16.76	4.33	4.21		
Total Net Energy	57.39	15.69	12.77	12.22	13.66	54.35	15.38	12.59	12.55	14.38	54.90	16.13	13.22		
Discrepancy	0.34	0.06	-0.05	0.07	0.04	0.12	0.05	0.04	0.08	0.02	0.19	0.03	0.03		
Total Disposition	74.45	19.97	16.62	16.66	17.66	70.91	19.58	16.63	17.13	18.50	71.85	20.49	17.47		

SPR = Strategic Petroleum Reserve.

¹Includes crude oil and lease condensate; natural gas liquids; hydrogen, etc., input to oil refineries.

²Dry marketed natural gas excluding nonhydrocarbon gases removed.

³Includes industrial production.

⁴Includes wood and waste used to generate electricity.

⁵Includes natural gas used as refinery fuel.

⁶Includes all secondary coal stocks.

⁷Includes plant use.

⁸This total excludes approximately 2 quadrillion Btu of wood.

⁹Includes industrial hydroelectric production and net imports of electricity.

Note: The conversion from physical units to Btu is calculated by STIFS using a subset of *Monthly Energy Review* conversion factors. Consequently, the historical data will not precisely match that published in the *Monthly Energy Review*.

Source: Energy Information Administration, U.S. Department of Energy, *Monthly Energy Review*, February 1983, and *Electric Power Monthly*, December 1982.
See note above.

1983 and the first half of 1984 is projected. The bulk of these increases is expected to occur in petroleum imports, which are forecast to increase for two reasons: the projected increases in petroleum consumption in 1983 and 1984 and the decreased use of petroleum stock drawdowns for domestic consumption relative to 1982. Over half of the increase in petroleum imports in 1983 relative to 1982 can be attributed to the differing rates of petroleum stock drawdowns in the 2 years. Figure 19 shows the relationship of petroleum imports to the total supply of energy in 1983. Imported oil is projected to account for 13.8 percent of the total U.S. energy supply in 1983, an increase over its 12.6 percent share in 1982 but still lower than any other year since 1971.

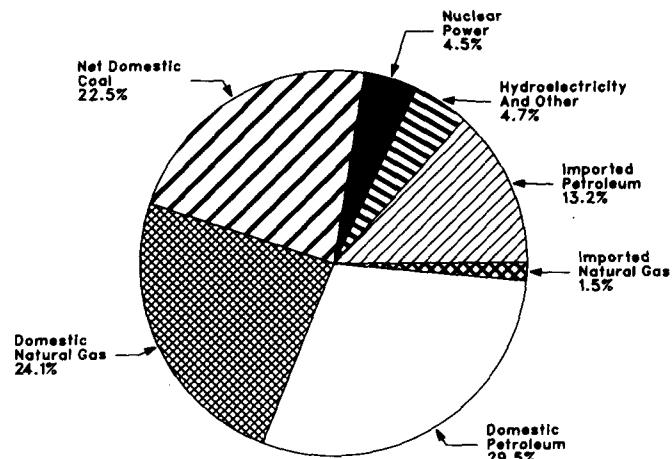


Figure 19. Total Supply of Energy for Domestic Use, 1983

Table 21. Gross Energy Consumption by Source (Quadrillion Btu)

Energy Source	History				Projections 1983
	1979	1980	1981	1982	
Petroleum	37.12	34.20	32.11	30.40	30.62
Natural Gas	20.67	20.39	19.91	18.31	18.36
Coal ^a	15.17	15.42	16.10	15.48	16.10
Nuclear Power	2.72	2.67	2.90	3.01	3.19
Hydroelectricity ^b	3.14	3.11	2.97	3.48	3.25
Geothermal and Other	0.09	0.11	0.13	0.11	0.14
Gross Energy Use	78.91	75.91	74.11	70.79	71.66

^aIncludes net imports of coal coke.

^bIncludes net imports of electricity plus industrial production of electricity.

Note: Minor discrepancies with published EIA historical data are due to rounding.

Source: U.S. Department of Energy, Energy Information Administration, *Monthly Energy Review*, DOE/EIA-0035(83/02), and *Electric Power Monthly*, DOE/EIA-0226(82/12). Historical data for December 1982 are preliminary.

Energy/GNP Ratio

The energy/GNP ratio, which has been declining since 1970, fell 2.7 percent in 1982 to 48,000 Btu per 1972 dollar. The projected 1.2-percent increase in total energy consumption in 1983, concurrent with an expected increase in real GNP of 1.7 percent, would result in a decline in this ratio of only 0.5 percent, the lowest year-to-year decline since 1976, a year when the economy was also rebounding from a recession. The total energy table (see Table 20) shows how the two consuming sectors are projected to react to the expected increase in GNP. Two-thirds of the projected increase in consumption in 1983 is in the utility sector, with the remainder occurring in nonutility petroleum.

Glossary

Barrel (bbl): A liquid measure equivalent to 42 U.S. gallons.

Base Case: The forecast based on the middle of three possible world oil price trends.

British Thermal Unit (Btu): The amount of heat required to raise the temperature of 1 pound of water at an initial state of 60 degrees Fahrenheit and atmospheric pressure by 1 degree Fahrenheit. See quadrillion Btu.

Coal--Consumption (also referred to as coal use or demand): The amount equal to total domestic consumption at coke plants, at electric utilities, and by retail and general industry consumers.

Coal--Price to Utilities: Delivered cost to Class A and Class B privately owned electric consumers. See Table 3.

Cooling Degree Day (CDD): a quantity that is calculated by computing the simple average of the daily minimum temperature and the daily maximum temperature and subtracting 65 degrees Fahrenheit from this average. Only positive values are used. The resulting number is correlated with the cooling requirements needed to cool and maintain an indoor environment at 65 degrees Fahrenheit.

Crude Oil Refinery Input: The total crude oil (including lease condensate) charged to crude oil distillation units and other units for processing.

Days' Supply: An indicator used to express the level of inventories of a fuel relative to the rate of consumption of the fuel. The inventory level

divided by the daily rate at which the fuel is consumed equals the number of days' supply.

Demand Sensitivity: The positive or negative variation in quantities demanded from the level demanded in a given forecast case in response to changes in variables that determine demand, such as economic growth, energy prices, and weather.

Disposable Personal Income (DPI): The income available to households for consumption or saving. It is computed from the GNP level by subtracting out depreciation, indirect business taxes, corporate taxes, corporate retained earnings, contributions for social insurance, and personal taxes and by adding in government transfer payments and net interest paid by the Government to households.

Disposition: The disposition of supply among alternative uses.

Distillate Fuel: A class of light fuels distilled from petroleum that includes, but is not limited to, products known as No. 1 and No. 2 heating oils, diesel fuels, and No. 4 fuel oil.

Elasticity of Demand: The percent change in a quantity demanded divided by an associated percent change in a determinant of demand such as price or income. It is a measure of how responsive demand is to one of its determinants. Unless otherwise specified, demand elasticity refers to the price elasticity of demand.

Electricity--Consumption (or Electricity Demand): The electricity sales to all

ultimate consumers. It is equal to total generation plus net imports of electricity minus transportation and distribution losses.

Electricity--Price (Residential): The average sales to residential consumers for selected Class A and Class B privately owned utilities. See Table 3.

Error Band: A range about an estimate that usually indicates the proportion of observed values that one would expect to fall within the band.

Fiscal Drag: The reduction in economic growth that results when taxes rise more rapidly than Government expenditures.

Free Alongside Ship (F.A.S.): The price of goods on the dock at the country of origin. The price does not include the cost of loading and shipping.

Free on Board (F.O.B.): The price of goods delivered aboard ship. The price does not include the cost of shipping.

Gross Domestic Product: GDP is the gross market value of goods and services attributable to labor and property located in a country. It equals GNP less the net inflow of labor and property incomes from abroad.

Gross Margins: The difference between the price for which a commodity is sold and the price of the raw material, e.g., the difference between the price for crude oil paid by a refiner and price paid for a petroleum product by a marketer. Gross margins refer to refiners' and marketers' margins which include labor, interest, processing costs, and profits.

Gross National Product (GNP): The market value of goods and services produced by residents of the United States before deduction of depreciation charges and other allowances for the consumption of fixed capital goods.

Heating Degree Day (HDD): A quantity

that is calculated by computing the simple average of the daily minimum temperature and the daily maximum temperature and subtracting this average from 65 degrees Fahrenheit. Only the results of this computation for days where the average is 65 degrees or below are used. The resulting number is correlated with the amount of heating needed to keep an indoor environment warmed to 65 degrees Fahrenheit.

Heating Oil (No. 2)--Retail Price: The average price of refiners' and large resellers' sales to residential customers. See Table 3.

Heating Oil (No.2)--Wholesale Price: An average of refiner's and large resellers' sale prices to wholesale distributors. See Table 3.

Implicit Price Deflator: The ratio of GNP in current prices to GNP in prices prevailing during a base period.

International Energy Agency (IEA): An international organization of 21 countries that includes most of the major industrial countries outside of the centrally planned economies of the Soviet bloc. Members are: Australia, Austria, Belgium, Canada, Denmark, West Germany, Greece, Ireland, Italy, Japan, Luxembourg, Netherlands, New Zealand, Norway, Portugal, Spain, Sweden, Switzerland, Turkey, United Kingdom, and the United States.

Joint Petroleum Reporting System: The system of reports and data summary for petroleum that is maintained by the Energy Information Administration of the U.S. Department of Energy.

Kerosene-Based Jet Fuel--Price: The average price of kerosene-based jet fuel. It is used primarily by commercial jet aircraft. See Table 3.

Kilowatt-Hour (kWh): A unit of energy equal to the energy expended at the rate of 1 kilowatt in 1 hour. It is equal to 3,412 Btu of heat energy.

Landed Cost: The cost of a commodity at the point of origin plus transportation cost to the United States.

Liquefied Natural Gas (LNG): A form of natural gas cooled to -259 degrees Fahrenheit so that it forms a liquid at approximately atmospheric pressure. By liquefying the gas, the volume is reduced, thus making transportation by water, truck, or rail less expensive.

Liquefied Petroleum Gas (LPG): A category of hydrocarbons (that includes propane and butane) that are gaseous under normal atmospheric conditions but can be liquefied under moderate pressure.

Marker Crude: Saudi Arabian Light 34 degree, API, crude oil. Marker crude is the benchmark crude for pricing other crudes by the Organization of Petroleum Exporting Countries (OPEC), relative to differences in API gravity, sulfur content, and transportation costs.

Metric Prefixes:

kilo (K) - 10 to the power of 3
mega (M) - 10 to the power of 6
giga (G) - 10 to the power of 9
tera (T) - 10 to the power of 12
peta (P) - 10 to the power of 15
exa (E) - 10 to the power of 18

Motor Gasoline--Prices: the average retail price for all grades and service levels of gasoline. See Table 3.

Natural Gas--Consumption (or natural gas use or demand): The amount of natural gas sold to end-use consumers.

Natural Gas--Price (Residential): U.S. city average price to residential consumers for utility (piped) gas based on consumption of 100 therms per month. See Table 3.

Natural Gas--Price to Utilities: Delivered cost to Class A and Class B privately owned electric utilities. See

Table 3.

Natural Gas--Supply (also total primary natural gas supply): An amount equal to the sum of marketed production of dry gas, synthetic natural gas production, the net imports of dry gas and LNG, and net withdrawals from underground storage for domestic use.

Natural Gas Liquids (NGL): The portions of reservoir gas that are liquefied at the surface in field facilities or natural gas processing plants. Natural gas liquids include natural gas plant liquids (e.g., ethane, LPG, natural gasoline).

Nominal Price: Market prices, not adjusted for inflation.

Organization for Economic Cooperation and Development (OECD): An international organization of most of the major industrial countries outside the centrally planned economies of the Soviet bloc. Members include IEA countries (see International Energy Agency) plus France, Finland, and Iceland.

Organization of Petroleum Exporting Countries (OPEC): An international organization of major petroleum producing countries. Members are: Algeria, Ecuador, Gabon, Indonesia, Iran, Iraq, Kuwait, Libya, Nigeria, Qatar, Saudi Arabia, United Arab Emirates, and Venezuela.

Petroleum: Crude oil (including lease condensate), refined petroleum products, and natural gas liquids.

Petroleum--Consumption (also referred to as petroleum use or demand): The amount recorded as "product supplied" or refinery production plus net imports and net withdrawals from primary stocks. (Petroleum consumption at electric utilities is reported as such.)

Petroleum--Supply (also referred to as total primary supply): The amount equal to the sum of domestic crude oil and

natural gas liquids production, net petroleum imports, and net withdrawals from primary stocks.

Petroleum Products--"Other" Products: the total amount of petroleum products supplied less motor gasoline and distillate and residual fuel oils supplied. The principal components of this category include: petrochemical feedstocks, asphalts, lubricants, petroleum coke, waxes, jet fuel, and liquified petroleum gas.

Petrochemical Feedstocks: The petroleum based raw materials used in the production of petrochemicals.

Primary Stocks: The stocks held by producers and large sellers. Primary petroleum stocks are those held at refineries, bulk terminals, and pipelines where storage capacity exceeds 50,000 barrels.

Product Supplied: A measure that equals domestic production plus net imports plus net withdrawals from primary stocks for specific petroleum products. For total petroleum products, product supplied equals input to refineries plus estimated refinery gain, hydrogen input, natural gas plant liquids production, direct use of crude oil as fuel, and product imports, minus product exports and the net increase in product stocks. Product supplied is used as an estimate of the quantity of petroleum consumed (petroleum demand).

Quadrillion Btu: An amount equal to 10 to the exponent 15 (a million billion) Btu. One quadrillion Btu is approximately equal to the energy content of one-half million barrels of petroleum per day for 1 year.

Real Dollar Terms: The prices, incomes, or other dollar amounts expressed in terms of the value of the dollar based on the purchasing power in some specified time period.

Real Income: a measure of income, such

as GNP, adjusted to eliminate the effects of increases in the prices from a base period, i.e., after removing the effects of inflation. For example, real GNP in 1972 dollars is computed by dividing GNP by the GNP implicit price deflator, an index of the U.S. price level with 1972 defined as the base period in which the index equals 1.

Real Price: A price that is adjusted to exclude the effects of inflation. The real (constant) price is contrasted with the nominal (current) price which does reflect increases due to inflation. See Real Income.

Refiners' Acquisition Cost: The cost of crude oil to refiners, including transportation and fees. It is the composite cost based on an average of domestic and imported crude oil costs.

Refinery Capacity Utilization: The ratio of the total amount of crude oil, unfinished oils, and natural gas plant liquids runs through crude oil distillation units to the operable capacity of the units.

Reserves: The amount of mineral fuels (coal, oil, natural gas, and uranium) that has been identified as economically recoverable under the current state of technology and market conditions.

Residual Fuel Oil: Heavy petroleum oils obtained by distilling crude oil until the lightest portions are removed. The class of residual fuel oils includes, but is not limited to, ASTM Grades Nos. 5 and 6, heavy diesel, Navy Special, and Bunker C. Residual fuel oils are used for heat and power generation, primarily in boilers.

Residual Fuel Oil (No. 6)--Price: The average retail selling price for heavy heating oil of all sulfur content levels. See Table 3.

Secondary Petroleum Stocks: A term referring to stocks held by jobbers, dealers, and independent marketers.

Secondary stocks of coal are principally those held by utilities.

Short Ton: A unit of measure equal to 2,000 pounds.

Spot Market (and spot market premium): The market for commodities (such as crude oil, coal, and petroleum products) available for immediate delivery. This does not include sales that recur under fixed term contracts. The difference between the spot market price and the price paid by long-term contract buyers is the spot market premium.

Still Gas: A mixture of gas, also known as refinery gas, that is produced in refineries as a byproduct of distillation, cracking, reforming, and other processes. It is primarily composed of methane and ethane and is used mainly as a refinery fuel.

Strategic Petroleum Reserve (SPR): The inventory of crude oil maintained by the Department of Energy. This oil is stored in salt caverns on the Gulf Coast of the United States for use during petroleum supply emergencies.

Synthetic Natural Gas (SNG): A gaseous product produced from petroleum which may be easily substituted for or interchanged with pipeline quality natural gas.

Windfall Profits Tax: An excise or severance tax on certain domestically produced crude oil, paid to the Federal Government by producers and royalty owners. This tax is paid on the difference between the sale price and the price that would have been paid under price controls for certain categories of domestically produced crude oil.

World Oil Price: The average price of crude oil in international markets.

Appendix A: Comparison With Other Forecasts

In this summary, the macroeconomic inputs and the energy forecasts in this report are compared with energy forecasts from the November 1982 Outlook, the Independent Petroleum Association of America (IPAA), Data Resources, Inc. (DRI), and the Oil and Gas Journal (OGJ).

In general, the macroeconomic assumptions in the current Outlook are similar to those in the November Outlook, but the world oil price is assumed to be sharply lower. Lower growth in both real GNP and RDPI, and a slightly lower inflation rate are now projected for 1983. Despite the lower oil prices, however, both petroleum consumption and total energy consumption in 1983 are now projected at lower levels than in the November report. In comparison with other forecasts, the current EIA forecast of petroleum demand is within the range of 1983 projections made by IPAA, DRI, and OGJ, but the EIA total energy consumption forecast for 1983 is the lowest of the four forecasts compared.

Comparison With Earlier EIA Forecasts

Due mainly to a reduction in the projected demand for natural gas, total energy consumption for 1983 in the current report is projected to be 71.66 quadrillion Btu, down 1.04 quadrillion Btu (1.4 percent) from the 1983 forecast in the November Outlook (Table 22). Natural gas demand projections have been revised downward due to sharply higher prices.

Petroleum consumption projected for 1983 has been lowered slightly from the November projection to 15.37 million barrels per day. Most of the reduction is due to revisions in the motor gasoline and distillate fuel oil projections to reflect continued conservation efforts and efficiency improvements in 1982. These declines are partially offset by the projected increase in the demand for residual fuel oil that is expected to result from much lower prices than previously projected and from a slowdown in the rate of utility and industrial conversions to natural gas.

Table 22. Comparison of Recent EIA Forecasts of Energy Consumption for 1983

Energy Source	History 1982	EIA Forecasts for 1983	
		Base Case Nov. 1982	Base Case Feb. 1983
(million barrels per day)			
Total Petroleum		6.46	6.36
Motor Gasoline	6.54	6.46	6.36
Distillate Fuel Oil	2.67	2.84	2.75
Residual Fuel Oil	1.70	1.66	1.73
Other Products	4.66	4.82	4.83
Total Reclassified	-0.31	-0.31	-0.30
Total	15.26	15.47	15.37
(trillion cubic feet)			
Natural Gas	17.84	18.96	17.90
(million short tons)			
Coal	708.1	741.5	736.7
(billion kilowatt-hours)			
Hydroelectricity	309.5	271.2	291.3
Nuclear Electricity	282.8	301.4	299.7
(quadrillion Btu)			
Total Energy	70.79	72.70	71.66

Note: Minor discrepancies with published EIA historical data are due to rounding.

Source: U.S. Department of Energy, Energy Information Administration, Monthly Energy Review, February 1983, Electric Power Monthly, December 1982, and Petroleum Supply Monthly, January 1983. Historical data for December 1982 are preliminary.

Although estimates for both years have been revised downward from the projections in the November forecast, total energy demand in 1983 is still projected to increase from 1982 levels, with increases expected for each of the major fuel sources, except hydroelectricity.

Comparison of EIA Projections With Other Forecasts

Comparisons are made between EIA's forecast and selected other forecasts for the following: the macroeconomic and price assumptions (Table 23); the low demand, base case, and high demand integrated petroleum forecasts (Table 24); and the total energy consumption forecast (Table 25).

Economic Activity

The assumptions for economic activity in 1983, as measured by real GNP, range from EIA's 1.7 percent growth rate to

IPAA's 3.0 percent growth rate. Although revised downward from growth rates in EIA's previous report, RDPI, a key driving variable for many of EIA's demand models, is projected by both EIA and DRI to grow in the 2.0- to 3.0-percent range in 1983. The inflation forecast, as measured by the GNP Implicit Price Deflator, has also been revised downward, and is now forecast to grow in the 4- to 6-percent range.

World and domestic crude oil prices in 1983 are seen by EIA to be sharply lower than in 1982, as a threatened crude oil "price war" and continued turbulence within OPEC increase downward pressure on the Saudi Arabian marker price. DRI projects only a slight decrease in oil prices, from the 1982 level, to about \$32.25 per barrel for the refiners' acquisition cost. (DRI's Winter 1982-83 Energy Review was completed prior to the round of oil price-cutting in late February.)

Table 23. Comparison of Forecast Assumptions for 1983 Changes
in Major Economic and Price Indicators
(Annual Percent Change from 1982)

Forecasters	Real Gross National Product	GNP Implicit Price Deflator	Real Disposable Personal Income	Nominal World Oil Price	Nominal U.S. Cost of Crude Oil ^a
Energy Information Administration					
November 1982					
Base Case	2.9	5.6	3.0	-0.9	-0.2
February 1983					
Base Case	1.7	4.6	2.0	-8.0	-7.3
Independent Petroleum Association of America					
May 1982					
Consensus	NA	NA	NA	NA	NA
October 1982					
Consensus	3.0	6.1	NA	NA	NA
Data Resources, Inc.					
Energy Review					
Autumn 1982	3.0	6.1	3.2	-0.6	-0.7
Winter 1982-83	2.9	5.6	3.0	-1.3	-0.7
Oil & Gas Journal					
July 26, 1982	NA	NA	NA	NA	NA
January 31, 1983	2.8	NA	NA	NA	NA

^aRefiners' acquisition cost of foreign and domestic crude oil.
NA = Not available.

Table 24. Comparison of EIA and IPAA Petroleum Projections for 1983
(Million Barrels per Day)

Forecast	EIA			IPAA		
	Low Demand	Base Case	High Demand	Low Forecast ^a	Consensus Forecast	High Forecast ^a
Product						
Motor Gasoline	6.22	6.36	6.49	6.38	6.50	6.76
Distillate Fuel Oil	2.60	2.75	2.89	2.91	2.92	3.01
Residual Fuel Oil	1.60	1.73	2.02	1.67	1.78	1.82
Other Products	4.65	4.83	4.92	4.50	4.57	4.79
Reclassified	-0.30	-0.30	-0.30	-0.24	-0.30	-0.33
Total Domestic Demand ^c	14.77	15.37	16.02	15.22	15.48	16.05
Stock Withdrawals	0.14	0.14	0.14	0.00	-0.02	0.08
SPR Fill Rate	-0.21	-0.21	-0.21	NA	NA	NA
Sources of Supply						
Domestic Production						
Crude Oil	8.64	8.64	8.64	8.53	8.55	8.74
Natural Gas Liquids	1.54	1.54	1.54	1.52	1.53	1.56
Total Production	10.18	10.18	10.18	10.05	10.08	10.30
Other Domestic Supply ^d	0.54	0.54	0.54	0.55	0.68	0.64
Imports						
Crude Oil ^e	NA	3.75	NA	3.88	3.83	3.48
Products	NA	1.76	NA	1.53	1.57	2.03
Total Imports	4.91	5.51	6.16	5.42	5.40	5.85
Exports	0.78	0.78	0.78	0.80	0.66	0.82
Net Imports ^e	4.13	4.72	5.38	4.62	4.74	5.03
Total Domestic Supply	14.77	15.37	16.02	15.22	15.48	16.05

^aRepresents balance for lowest and highest demand forecast within IPAA, rather than the lowest and highest values for a particular line item.

^bIPAA includes kerosene used for heating (about 150,000 barrels per day) with distillates. In the EIA forecasts, kerosene is included in "Other Products."

^cEIA uncertainty range for total is greater than sum of individual product uncertainties due to "preliminary data adjustment" only made to total.

^dIncludes refiners' processing gain and refinery input of hydrogen and hydrocarbons not derived from petroleum.

^eEIA cases include imports for the Strategic Petroleum Reserve; IPAA cases do not.

NA = Not available.

Petroleum Supply and Demand

EIA's range of petroleum forecasts and a range of petroleum forecasts prepared by the IPAA panel of forecasters are shown in Table 24. EIA's base case and IPAA's

consensus forecast for total demand are similar; EIA's forecast is only 110,000 barrels per day lower than the IPAA consensus. On a product basis, EIA projects lower demand for motor gasoline and residual fuel oil and higher demand for "other products." On the supply

side, EIA and IPAA projections for domestic oil production are very close. IPAA forecasts net imports at about 4.7 million barrels per day and EIA forecasts about 4.5 million barrels per day, net of imports for the SPR. EIA projects net stock withdrawals of about 140,000 barrels per day, while IPAA forecasts a slight stock buildup in 1983.

Total Energy Consumption

Forecasts for consumption by energy source from EIA's base case, IPAA's consensus forecasts, DRI's Winter 1982-83 Energy Review, and OGJ's most recent forecast (January 31, 1983) are compared in Table 25. In general, EIA projects

the lowest total energy consumption in 1983, but each of the forecasts shows an increase in total energy consumption over the prior year's level for the first time since 1979. Percentage increases range from EIA's 1.2 percent to IPAA's 3.2 percent, a difference of over 1.4 quadrillion Btu from the lowest to the highest forecast. The most striking difference between EIA's forecast and the other forecasts is in natural gas demand: IPAA and OGJ projections are each about 0.8 quadrillion Btu above EIA, and DRI is roughly in the midrange. EIA's petroleum demand projection is near the low end of the range in forecasts of between 15.3 and 15.7 million barrels per day.

Table 25. Comparison of EIA Forecast with Other Forecasts of Energy Consumption for 1983

Energy Source	History		Forecast for 1983		
	1982	EIA Base Case (Feb 1983)	IPAA Consensus ^a (Oct 1982)	DRI Energy Review (Winter 1982-1983)	Oil & Gas Journal ^c (Jan. 1983)
(million barrels per day)					
Petroleum					
Motor Gasoline ^d	6.54	6.36	6.50	6.39	6.51
Distillate Fuel Oil	2.67	2.75	2.92	2.84	2.74
Residual Fuel Oil	1.70	1.73	1.78	1.88	1.65
Other Products	4.66	4.83	4.57	4.54	4.42
Reclassified	-0.31	-0.30	-0.30	NA	NA
Total	15.26	15.37	15.48	15.66	15.32
(trillion cubic feet)					
Natural Gas	17.84	17.90	18.72	18.38	18.69
(million short tons)					
Coal	708.1	736.7	759.1	730.7	754.8
(billion kilowatt-hours)					
Hydroelectricity	309.5	291.3	286.1	286.5	286.1
Nuclear	282.8	299.7	305.5	336.9	302.5
(quadrillion Btu)					
Total Energy	70.79	71.66	73.07	72.43	72.87

^aIndependent Petroleum Association of America, "Report of the Supply and Demand Committee," Dallas, Texas, October 1982.

^bData Resources, Inc., "Energy Review," Winter 1982-1983.

^cOil & Gas Journal, January 31, 1983.

^dIPAA includes kerosene used for heating (about 150,000 barrels per day) with distillates. In the other forecasts, kerosene is included in "Other Products."

Note: Minor discrepancies with published EIA historical data are due to rounding.

Note: DRI and Oil and Gas Journal do not forecast "Reclassified"; the item is included in "Other Products."

NA = Not available.

Source: U.S. Department of Energy, Energy Information Administration, Petroleum Supply Monthly, January 1983 the Monthly Energy Review, February 1983, and Electric Power Monthly, December 1982. Historical data for 1982 are preliminary.

As with total energy, each of the forecasters is predicting an upturn in petroleum consumption in 1983, reversing a 4-year downward trend. The primary reasons for the reversal are an expected increase in economic activity and a continued slide in world oil prices. (Although EIA's forecast is based on lower crude oil prices than the other forecasts, it does not project the highest level of demand.) Other reasons for the upturn include a return to normal weather in 1983 (as compared to milder-than-normal weather for both summer and winter in 1982) and a reduction in the rate of increase of short-run, conservation-induced efficiencies, such as weatherstripping, fuel switching, and reduced driving. More gradual kinds of changes, such as replacement of older cars, installation of more efficient furnaces, and construction of coal-fired electric generating facilities, are presumed to put continued downward pressure on petroleum demand in the long term.

Conclusion

All the short-term energy forecasts in this comparison project an increase in both petroleum and total energy consumption in 1983 because the combined effects of increased economic activity and lower crude oil prices are expected to outweigh conservation efforts. EIA has the most conservative estimates of the group for total energy, however, primarily because of its lower projection for natural gas demand. EIA also tends to be somewhat more conservative than the other forecasters (excluding OGJ) in projecting petroleum demand increases, despite EIA's substantially lower crude oil price assumptions; EIA does not yet expect lower prices to totally offset the inertia of consumer and industry efforts in conservation.

Appendix B: Sensitivity Analysis Assumptions

The sensitivity of petroleum demand to deviations in the main determinants of demand (weather, economic growth, and petroleum prices) from those contained in the basic forecast assumptions is given in Chapter 3.

Except for the price cases (low, base, and high), the sensitivity cases presented in Table 26 do not represent forecasts. In particular, the weather sensitivity assumptions are based on the average variation around normal levels (5 percent for heating degree days and 7 percent for cooling degree days) over the past 30 years. The macroeconomic sensitivity assumptions reflect the quarterly forecast errors for the income projections made with the DRI quarterly macroeconomic model. Uncertainty surrounding the efficiency of the stock of automobiles is partially captured by varying assumptions on the efficiency of new cars. A lower efficiency (lower miles per gallon for new cars), everything else unchanged, implies a lowered efficiency of the stock of automobiles and, consequently, higher gasoline demand. An additional source of uncertainty affecting the overall forecast of total petroleum demand arises from preliminary data in the first quarter of the projections. This asymmetric (in this case, downward) adjustment is assumed to disappear as the forecast interval increases.

The petroleum price sensitivity cases (Tables 6 and 7) are based on the alternative forecasts of world oil prices presented in Table 2. Thus, the sensitivity of demand to price is treated differently from the sensitivity of demand to other determinants: each price path is used to generate a sep-

arate case (scenario) which has its own range of uncertainty defined in terms of the effects of variations in the other demand determinants. The aggregated effect of the latter uncertainties is referred to as the combined sensitivity differential.

The projected ranges of demand are formed by adding the combined sensitivity differentials to the high and low price cases. In particular, the high demand differential is added to the low price case projection to produce the upper end of the range (high demand) and the low demand differential is subtracted from the high price case projection to generate the lower end of the range (low demand).

The combined sensitivity differential is formed by taking the square root of the sum of squares of the 4 nonprice sensitivity differentials. For example, the combined sensitivity differentials for total petroleum demand (Table 8) in the first quarter of 1983, in millions of barrels per day, are:

Sensitivity Differential	High Demand	Low Demand
Weather	(0.16)2	(-0.16)2
Income	(0.08)2	(-0.08)2
New-Car Efficiency	(0.02)2	(-0.03)2
Preliminary Data	(0.00)2	(-0.47)2
Total	0.0324	0.2538
Square Root Gives:		
Combined Sensitivity Differential	0.18	0.51

Adding the high differential to the low price projection and subtracting the low demand differential from the high price

Table 26. Sensitivity Assumptions for Macroeconomic, Weather, and New-Car Efficiency Variations

Indicators	1st	2nd	1983			Year	1984	
	1st	2nd	3rd	4th	Year	1st	2nd	
(base case equals unity)								
Macroeconomic ^a								
Activity Factor								
High	1.006	1.013	1.017	1.021	1.014	1.025	1.028	
Low	0.994	0.987	0.983	0.979	0.986	0.975	0.972	
Weather Variations ^b								
			(number of degree days)					
Heating Degree Days								
Adverse	2,519	539	88	1,754	4,900	2,519	539	
Normal	2,398	539	88	1,669	4,694	2,398	539	
Favorable	2,276	539	88	1,584	4,487	2,276	539	
Cooling Degree Days								
Adverse	28	351	811	63	1,253	28	351	
Normal	28	327	755	63	1,173	28	327	
Favorable	28	303	699	63	1,093	28	303	
New-Car Efficiency ^c								
			(miles per gallon)					
High MPG	28.84	28.84	28.84	28.84	28.84	30.30	30.30	
Base MPG	24.55	24.55	24.55	24.55	24.55	26.02	26.02	
Low MPG	21.50	21.50	21.50	22.50	21.75	22.50	22.50	

^aThe high-low factor reflects average forecast errors observed over a 3-year period. To obtain the high (low) values for the various macroeconomic activity variables (real disposable personal income, index of industrial production, and index of chemical production), multiply the base case values (Table 2) by the factor.

^bDegree day data are weighted by population. "Normal" weather is based on a 30-year average. "Adverse" is one standard deviation above; "favorable" is one standard deviation below normal.

^cDefined as average miles per gallon (MPG) of current-model-year cars. Base MPG is from DOE, Office of Policy, Planning, and Analysis. High MPG corresponds to the Environmental Protection Agency (EPA) model-year ratings for domestic cars. Low MPG is from DRI TRENDLONG Model, version 0283, as modified by EIA for world oil prices.

projection yields the upper and lower ends of the range of projected demand (the range of uncertainty) for the forecasts. For the example above, the uncertainty range of the forecast for the first quarter of 1983 is:

Range of Projected Demand	Low/High Case	Combined Sensitivity Differential
High Demand	15.98 = 15.80 + 0.18	
Low Demand	15.09 = 15.60 - 0.51	

This particular uncertainty measure was chosen since it attempts to address the probability of the simultaneous occurrence of independent events; in this example, the simultaneous occurrence of unfavorable weather, high income, and low, new car efficiency in the high demand case.

If these events were to occur simultaneously, the sensitivity differential would equal the sum of those independent impacts which would yield a wider range of uncertainty than the measure presented above.

An additional source of uncertainty, reflected in the forecast range of petroleum imports, is uncertainty in the base case forecast assumption for petroleum stocks levels. Uncertainty about annual stock changes is less than for quarterly changes and quarterly uncertainty is less than that for monthly stock changes. This is the case because of compensating inventory adjustments. For instance, a larger-than-desired inventory drawdown is likely to be followed by a smaller drawdown (or a stock buildup) in order to achieve desired inventory levels. For a given forecast of petroleum demand, a larger

stock drawdown than is assumed in the base case could result in lower imports since imports must equal the difference between demand and the sum of domestic production plus inventory withdrawal. Conversely, smaller stock drawdowns would result in higher import requirements.

Finally, the reader is reminded that model uncertainty (i.e., uncertainty about the various demand models' structures or coefficient estimates) is not explicitly treated in the sensitivity cases. Consequently, the forecast uncertainty range given is only one part of the total range of uncertainty.

Appendix C: Changes in Short-Term Energy Demand and Price Forecasting Equations

Several changes have been made during the last quarter to the econometric demand and price models which generate the energy forecasts appearing in the Outlook. On a routine basis, additional data on prices, economic variables, and weather are evaluated, and their impacts on the demand for various fuels are incorporated into the econometric demand models. Actual data were available for most variables through November 1982. Therefore, the past impacts of prices, income, and weather on the quantities demanded of petroleum products and electricity through November are reflected in the coefficients of the econometric models used to make these forecasts. The significant changes made to the models in preparation for this report are discussed below.

Distillate and Residual Fuel Oil Demand

In order to account for the increasingly diverse nature of the use of distillate fuel oil, the nonutility distillate demand model has been disaggregated into submodels for heating oil and diesel fuel. The heating oil equation contains separate price terms for warm-weather months and cold-weather months, a cold weather shift dummy, and a term representing the effect of population-weighted heating degree days. The diesel fuel equation contains a single price term, and a shift dummy variable for the post-1978 period, coinciding with significant increases in the penetration of diesel-powered vehicles in the private automobile fleet. Each

equation uses real disposable personal income as a measure of economic activity and each contains a one-month lag term.

The nonutility residual fuel oil equation was modified to add a term representing the price of natural gas. As natural gas supplies have become more available in recent years, there has been greater opportunity for fuel switching (based on price differentials) in the commercial and industrial sectors. The addition of the natural gas price term measures the impact of this development and helps to explain the recent decline in demand for nonutility residual fuel oil.

Coal Forecast

The methodology used to project coal consumed by retail and general industry for earlier issues of the Outlook was a simple time-trend extrapolation, adjusted to capture seasonal variations. For this projection, retail and general industry coal consumption is assumed to be a function of disposable income (from DRI's monthly projections for disposable income YD72) "normal" weather (heating and cooling degree days), and "dummy" variables to adjust for changes in the number of respondent companies which occurred in 1980, 1981, and 1982. This procedure attempts to capture the effects of weather, the expected increases in economic activity, and the continued increases in the number of reporting consumers. The earlier methodology simply continued the flat to slowly decreasing trend which has existed over the past several years.

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Forecast Conversion Factors Used in STIFS

Most of the conversion factors used by the Short-Term Integrated Forecasting System (STIFS) are the 1981-1982 EIA standard conversion factors (found on the last page of the Monthly Energy Review). Special factors used in STIFS are derived from data in the Monthly Energy Review or from Energy Data Reports such as the Monthly Petroleum Statement.

Product Identification	Unit	Btu/Unit
A. Thermal Content of Fuels and Energy		
Crude Oil Production	barrel	5,800,000
Crude Oil Imports	"	5,810,000
Unfinished Oils	"	5,825,000
Total Petroleum Consumed	"	5,479,000
Total Petroleum Imports	"	5,810,000
Total Petroleum Exports	"	5,800,000
Motor Gasoline	"	5,253,000
Jet Fuel	"	5,615,000
Distillate Fuel Oil	"	5,825,000
Refinery Fuel (Liquids)	"	5,850,000
All Refinery Inputs	"	5,773,000
Residual Fuel Oil	"	6,287,000
LPG's and LRG's	"	4,130,000
Ethane	"	3,082,000
Hydrogen, etc. to Refineries	"	3,500,000
Natural Gas Liquids (Production)	"	3,914,000
Natural Gas (dry)	cubic foot	1,026
Natural Gas Imports	"	1,022
Natural Gas Exports	"	1,013
Synthetic Gas Production	"	1,000
Natural Gas Refinery Fuel	"	1,021
Bituminous Coal & Lignite Consumed	short ton	22,000,000
Coal to Electric Utilities	"	21,300,000
Coal Consumption, Excl. Utilities	"	25,060,000
Bituminous Coal and Lignite Prod.	"	22,460,000
Coking Coal	"	26,000,000
General Ind. and Retail Coal	"	25,060,000
Coke	"	26,000,000
Bituminous Coal and Lignite Exports	"	26,400,000
Bituminous Coal and Lignite Imports	"	25,000,000
B. Efficiency of Conversion Processes		
1. Electric Power Generation		
Fuel or Power Source:		Btu/KWh (heat rate)
Coal		10,492
Crude Oil		10,724
Distillate Fuel Oil		13,501
Residual Fuel Oil		10,724
Geothermal and Other Energy		21,629
Nuclear Energy		10,640
Natural Gas		10,887
Hydropower		10,353
2. Other Conversion Processes		
		Btu Out/Btu In
Coke		0.68
Synthetic Gas		0.95

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