



Telephone: (212) 867-0052

Petroleum Industry Research Foundation, Inc.

122 EAST 42nd STREET

New York, N. Y. 10017

OIL IN THE U.S. ENERGY PERSPECTIVE--
A FORECAST TO 1990

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Introduction

This study projects U.S. oil supply and demand within the framework of total U.S. energy requirements from 1979 to 1985 and 1990. For the purpose of comparison the study also shows historic data for the periods 1963-73 and 1973-79.

We consider the actual data projected for our two forecast years less significant and less reliable than the trends they indicate. Petroleum supply and demand in any given year can be affected in either direction by unpredictable special circumstances, such as abnormal weather, temporary changes in the availability of oil or competitive energy supplies, swings in general economic activity, etc. A single-number forecast (in contrast to a high-low range forecast) can not reflect these possibilities. On the other hand, since the general direction in which oil supply and demand will move over the forecast period and the approximate rate at which they will do so are less affected by these irregular short-term factors, the projected trends provide a relatively reliable indicator of the basic changes likely to occur during the forecast period.

Assumptions

1. The U.S. GNP (in constant prices) will grow at an average annual rate of 2.3% during the 1980's. This would be approximately in line with the growth rate of the last six years (1973-79), but

substantially below that of the ten years ending in 1973.

The decline in the post-1973 economic growth rate reflects a number of structural changes such as the massive increase in energy cost, the slower population increase, and the declining growth rate in labor productivity. The forecast assumes two recessions in the 1980's: one in 1980/81 and the other during the 1985-90 period.

2. All U.S. oil prices will be decontrolled by October 1981 after which U.S. price movements will follow those of imported oil. Foreign oil prices will rise several percentage points faster on the average than the inflation rate in the industrial countries during the 1980's. This would approximately reflect the recent recommendation of OPEC's long-range planning committee that OPEC oil prices be periodically adjusted for inflation in the cost of its members' imports plus the economic growth rate in the industrial countries. Notwithstanding this new pricing philosophy, increases in the form of large increments at irregular intervals, induced by political or other temporary constraints on supplies, are likely to be more important in setting prices than OPEC's contemplated gradual upward movement.

3. U.S. energy policy will continue to emphasize energy conservation and oil substitution in order to minimize required oil imports. However, as in the 1970's, the actual achievements of the government's policy, while not negligible, will fall short of the announced

goals, the latest of which, announced in July 1979, is an oil import level of 4-5 million B/D by 1990.

4. The required volume of oil imports in the 1980's will be available. This assumption is a necessary working hypothesis for our analysis. It is a reasonable and realistic assumption on the basis of current and expected recoverable world petroleum resources and producible supplies but perhaps not on the basis of current and expected world political developments.

U.S. Energy Demand

U.S. primary energy consumption has changed radically since 1973. In the 6-year period to 1979 its average annual growth rate was 0.7%, or just one-sixth of what it had been in the previous ten years. The change was even more pronounced in net energy consumption (fuels and electricity directly consumed by end users) which registered no increase at all between 1973 and 1979, compared to a 3.7% annual increase in the ten years prior.

The reasons for this massive decline since 1973 from the long-term pre-1974 U.S. energy growth rate are well known. They include short-term factors such as the shocks of the exceptional oil price increases in 1974 and 1979 and the physical oil shortages during part of both years, and longer-term factors such as consumer response to the price increases, the impact of the increases on the cost of other energy sources, and the government policy to conserve oil by improving the efficiency of its utilization.

In the 1980's U.S. energy demand is expected to grow at an average annual rate of about 1.4%. While this would be faster than the growth rate of the last six years, it would be only one-third of the long term pre-1974 rate. One reason for the projected acceleration in energy demand growth, relative to the most recent historic period, is that in the 1973-79 period overall energy demand growth was artificially lowered by the physical and economic impact of the Iranian crisis on U.S. oil demand in the end-year, 1979. Another, more important reason is that the "easy" part of energy conservation and improved utilization, that which can be achieved without substantial capital investment and/or new technology, has been accomplished on a rather large scale. In the industrial sector, in particular, a 2.7% annual increase in output was accompanied by a 1.4% decrease in reported energy consumption. Consequently, future progress in energy conservation will proceed more slowly.

Thus, the exceptionally low ratio of 0.2 between the growth rates in primary energy demand and in real GNP during the 1973-79 period cannot be expected to continue in the 1980's. The projected ratio of 0.6 (which implies that for each increase of one percent in the GNP, energy demand will increase by 0.6 percent) would still allow the efficiency of energy utilization to improve over time: from 54,000 Btu's of primary energy consumed per constant dollar of GNP in 1979 to 51,000 Btu's in 1985 and 49,000 Btu's in 1990.

Supplies and Requirements of Non-Oil Energy Sources

The fastest growing major energy source in the 1980's will be nuclear power, as it was in the 1970's. The forecast assumes that only those additional plants which were in an advanced stage of construction by the end of 1979 will be in operation by 1985 and only those that were at least 20% completed by the end of last year will be in operation by 1990. The sharp decline in the nuclear power growth rate between the first and the second half of the 1980's reflects the drastic drop in new nuclear plant orders after 1974 (13 in the period since 1974, compared to 115 in the previous 5 years).

U.S. coal consumption is expected to grow nearly twice as fast in the 1980's as in the 1973-79 period, with about 75% of the increase coming from the electric utility sector. Underlying this growth is coal's vast recoverable resource base, its continuing low price relative to fuel oil and new natural gas in most markets, and a government policy designed to increase the use of coal through selective restrictions on oil and gas burning in potential coal markets and proposed monetary incentives to electric utilities to convert to coal. The projected growth in coal demand will, however, fall considerably short of the potential supplies available from the existing resource base, principally because of continuing environmental constraints on coal burning.

In contrast to coal, U.S. natural gas demand will be limited by available supplies throughout the 1980's. Domestic natural gas production which in 1979 accounted for about 94% of total gas supplies, will continue to decline, since the amount of new gas found will not be sufficient to permit the maintenance of prevailing production levels. For the lower 48 states production is expected to drop from 19.4 trillion cubic feet (tcf) in 1979 to about 17 tcf in 1985 and to about 14.5 tcf in 1990. The decline will be almost fully offset by supplementary supplies from increased gas imports, and, after 1985, increased production of synthetic gas (up to 1 tcf by 1990) as well as about 1 tcf of gas annually shipped from Alaska by pipeline.

Gas demand will register a modest increase in the residential-commercial market (less than 10% between 1979 and 1990) but will not be supply-limited in that market, partly because significant conservation measures can be expected to keep growth in this sector relatively moderate and partly because priority treatment of residential consumers over other gas users is in the gas utilities' commercial interest and faces little political opposition. In the industrial market gas consumption will increase by about 14% between 1979 and 1990 but will be supply-limited--that is, if more gas were available the market would absorb it, assuming gas prices remain competitive with those of other fuels. The increases in the

residential/commercial and industrial markets will be more than offset by a government mandated decline in natural gas supplied to electric utilities, to be replaced by coal and nuclear power. By 1990 the use of gas for electric power generation will have declined by 60-65% from last year.

The energy category hydro and other is dominated by hydro-electricity which accounted for over 95% of the total in 1979. "Other" energy sources outside the electric utility sector consist primarily of solar energy which will contribute somewhat less than 1% of total U.S. energy by 1990, compared to a near-zero base in 1979. Wood burning which apparently is growing rapidly in some sections of the country is not included in the "other" category, nor in the total energy demand figures, since much of it does not flow through commercial channels and, hence, has no reliable statistical base.

Oil Demand

Total U.S. oil demand is expected to decline throughout the 1980's. This would be the reversal of a rising trend which has been maintained since the beginning of the century. The projected decline will not result from a physical limitation on supplies, as in the case of natural gas, since no limitation on the availability of imported oil has been specified in this forecast. Rather, demand will drop because of market responses and government policy. Of the two, market response is likely to be

the more important, since it is driven by the 750% increase in crude costs to U.S. refiners between early 1973 and early 1980 (compared to an increase of about 90% in the U.S. price level of producer goods). Consumer response to this increase has been evident: oil demand has been reduced from an annual growth rate of 4.7% in the period 1963-73 to 1% in the period 1973-79 and a drop of approximately 5% will probably be registered in 1980. The oil price increase has also stimulated coal production and is beginning to make synthetic fuels economically attractive. Government policy can, and does, support and strengthen these responses to the oil price increase, but the principal impetus for a reduction in conventional oil requirements in the 1980's, as in the 1970's, will come from market responses to past and future foreign price increases. A brief discussion of the demand outlook for the major oil products follows.

Gasoline

The principal contribution to the decline in U.S. oil demand in the 1980's will be made by gasoline which will register a 20% drop in consumption between 1979 and 1990. This is a reversal of a very long-term growth rate which reached its peak in 1978 when gasoline consumption amounted to 7.4 million B/D.

Contrary to some predictions, the decline in gasoline consumption may not significantly affect the life style of most Americans. The forecast assumes a 1.5% average annual increase

in total U.S. passenger car mileage and a 1.8% annual increase in the number of passenger cars to 1990. Both growth rates are well below historic levels but substantially above the projected increase in population. Thus, the number of cars per capita will continue to increase, while the annual number of miles driven per car will decline only slightly from the average of the last five years.

The 20% reduction in gasoline consumption will therefore be caused primarily by a switch to smaller and more efficient cars. This trend is of course already under way. For instance, full-size cars which accounted for about 40% of total car sales in 1972 dropped to 10% in 1978 and 4% in 1979. During the same years the share of small car sales rose from under 40% to 63% and 70% respectively. Increased fuel efficiency, as mandated by law, has also contributed to lowering gasoline consumption and will continue to do so, even if one assumes, on the basis of recent indications, that actual road performance will continue to fall about 15% short of the mandated efficiency standards.

Gasoline consumption will be further dampened by the growth in the sale of cars with diesel engines. Sales of diesel passenger cars are estimated to rise from 2.0% of total car sales in 1979 to about 10% by 1985. However, in the latter year the total U.S. diesel car population will still be only about 3.5% of all passenger automobiles on the road. By 1990 the share could be twice as high.

Hence, the impact of diesel car sales on gasoline consumption will be much more significant in the second half of the 1980's than in the first half.

Consumption of gasohol (a blend of about 10% ethanol and 90% unleaded gasoline) is included in the gasoline data. The generous subsidy granted by the government to gasohol sellers assures a rapid rise in the sale of this new product from its minute level of 1979. But by 1985 ethanol's displacement of gasoline made from crude oil will still be under 1% of total gasoline consumption. By 1990 the share could be substantially larger. On the whole, however, substitution by non-oil fuels will not be a significant factor in reducing the demand for oil-based gasoline in the 1980's.

Distillate Fuels

This category includes two major products--light heating oils and diesel fuel. They will move in opposite directions: heating oil consumption will decline while diesel consumption will rise. The projected decline in heating oil consumption will be brought about primarily by residential users who in 1978 accounted for about 27% of total distillate fuel consumption. Between 1973 and 1977 residential consumption of distillate heating oil declined by about 10%, after adjusting for weather (degree-day) fluctuations, according to the latest published data. Since then the decline has sharply accelerated, according to preliminary indications, particularly in response to the price

increases of 1979. The decline has been achieved through a variety of measures--lowered thermostat settings, additional home insulation, supplementary heating with wood, and switching to natural gas. All of these measures will be operative in the 1980's and will continue to reduce residential heating oil consumption.

Highway consumption of diesel oil, which last year accounted for about a quarter of total distillate fuel consumption, will rise modestly in the first half of the 1980's and more rapidly in the second half because of the aforementioned increase in diesel powered automobiles. Railroad requirements of diesel oil will also increase, reflecting in part higher volumes of coal shipments for domestic and export purposes.

The combined effect of these and other market developments will be to keep total distillate fuel oil consumption virtually unchanged between 1979 and 1985, after which it will rise at 1% a year to 1990.

Residual Fuel Oil

This is the other major oil product whose consumption will decline throughout the 1980's. Like gasoline, residual consumption has already peaked, reaching its maximum in 1977 with a volume of nearly 3.1 million B/D. The decline in the 1980's will be most pronounced in the electric utility sector, residual's largest market, which accounted last year for about 45% of total sales. Between

1979 and 1990 residual demand by electric utilities may be cut in half despite an expected 3.3% average annual increase in electric power output. The reason is of course fuel oil's displacement by coal and nuclear power, a process which has been under way since the early 1970's. Thus, between 1973 and 1979 the share of oil-fired electric power declined from about 17% to under 14% of total electric power output. During the 10-year period ending in 1973 it had nearly tripled.

The projected 50% reduction by 1990 of residual fuel oil consumption for electric power generation is in line with the target set by the Administration earlier this year when it proposed its Utility Oil and Gas Reduction legislation which consists of specific and general restrictions on the use of oil and gas in power generation as well as monetary incentives to encourage voluntary switching to other fuels. The proposed legislation would certainly speed up the decline in residual fuel oil consumption by utilities. But market factors, particularly coal's much lower price and higher security of supply than fuel oil as well as the expected slow growth in electric power demand, will also contribute effectively and substantially toward this goal.

Since most of the fuel oil burning utilities in the U.S. are located on the East Coast and since over 70% of the East Coast's residual fuel oil is imported, most of it from the Caribbean

region, the decline in utility oil consumption will particularly affect Caribbean refiners. However, U.S. Gulf Coast refiners, too, will be negatively affected, since their shipments to the East Coast will be under strong pressure from Caribbean competitors. Residual fuel oil consumption in the residential, commercial and industrial markets will also decline in the 1980's. Again, the bulk of these markets is located on the East Coast.

Jet Fuel

Last year 19% of the total demand of this product consisted of naphtha jet fuel for turbo-jets, used primarily by the armed forces. The balance was kerosine jet fuel. Naphtha jet fuel demand may decline slightly between 1979 and 1990, as it did during the 1970's, while kero-jet fuel demand is expected to increase at an annual rate of about 2%, reflecting the continuing growth in airline traffic.

Other Products

The overall growth rate in this category of products is due primarily to petrochemical feedstocks which accounted last year for nearly one-third of the total volume of 4.15 million B/D. Petrochemical feedstocks, which grew by about 8% annually between 1973 and 1979, are expected to grow at half that rate over the next 11 years. Since total oil demand will decline during this period, petrochemical feedstock requirements will become an increasingly important outlet for liquid petroleum products, such

as naphtha, gas oil and natural gas liquids, in the 1980's.

Domestic Oil Supplies

Present indications are that the decline in domestic crude oil production which began in 1971 will continue through the 1980's. Outside northern Alaska U.S. proved crude oil reserves have declined every single year since 1966. By 1978 these reserves were 40% below the 1966 level and the ratio of reserves to annual production had dropped from 11 to 7, i.e. crude oil reserves in the lower 48 states at the end of the 1978 were equal to less than 7 times the annual production in 1978.

Uncontrolled crude oil prices for new oil since June 1979 and a relatively moderate "windfall profits" tax on this category of oil as well as on oil produced through "enhanced" (tertiary) recovery methods is likely to slow down the decline (although very probably less than if no such tax had been imposed on these two categories of oil). But since most of the major U.S. oil fields which supply the bulk of production in the lower 48 states are relatively old and, thus, in an advanced state of natural decline, it is unlikely that the downward trend in crude production of the last 10 years will be reversed or even arrested during the 1980's. From 1973 to 1979 crude production in the lower 48 states dropped from 9.0 million to 7.2 million, an average annual decline of just over 300,000 B/D. The decline was maintained in 1979.

The forecast assumes that the improved economics resulting from price decontrol and higher world oil prices will reduce the

decline for the next six years (1979-85) to half that of the previous six years and that the rate will be cut in half again for the period 1985-90. The resulting "lower-48" output would be as follows:

1979 Crude Production (actual)	7.2 million B/D
1985 Crude Production	6.3 million B/D
1990 Crude Production	5.9 million B/D

To produce the projected volumes of crude oil without further reductions of the reserves/production ratio from the current level of seven years would require the location of 2.3-2.4 billion bbls of oil reserves annually, both through new discoveries and through improvements in the recovery of existing reserves. This compares with an average annual finding rate of not quite 2.0 billion bbls in the last eleven years. On a somewhat optimistic assumption, the substantially higher real prices, together with advances in recovery technology, will bring about the required improvement in the discovery and recovery rates.

Crude oil production in Northern Alaska, which reached a high of 1.5 million B/D in March 1980, is expected to rise only modestly above this level during the 1980's, since the principal producing field is now fully developed and may, in fact, start to decline in the late 1980's. There are indications of potentially large additional reserves in the Beaufort Sea but exploration there is still at a very early stage and has actually been suspended

under a court injunction since the beginning of 1980. Thus, substantial commercial production from this area is not likely during the 1980's.

Natural gas liquids (NGL's) production in the lower 48 states can be expected to decline in the 1980's, reflecting declining natural gas production as well as the likelihood that a growing share of new natural gas will come from deeper geological formations which generally contain less liquids per cubic foot of gas than shallower ones. The resource decline could be partially offset by more severe stripping of liquids at NGL processing plants, if this becomes economically attractive. In the second half of the 1980's NGL supplies should be coming from Northern Alaska as a by-product of the Alaskan gas pipeline project. Altogether, U.S. NGL production is forecast at 1.4 million B/D for 1990, compared to 1.7 million B/D last year.

Synthetic oil (shale oil and liquefied coal) will make only a very small contribution to oil supplies by 1985, all of it from pilot plants, since the required construction time of at least seven years for full scale plants makes it unlikely that any will be operating by then. By 1990 some 10-15 plants might produce approximately 600,000 B/D of synthetic oil. A constraint in the period to 1990 could be availability of capital, given the estimated cost of \$2.5-3.0 billion per plant, in 1980 dollars, and the unproven technology of the first generation of these plants. The 1990 projection is about half the Administration's target for that year.

Oil Imports

On the basis of the oil demand and domestic supply projected in this forecast, gross oil imports would have to be 8.2 million B/D in 1985 and 7.6 million B/D in 1990 to close the gap. The 1985 import volume would be about the same as last year's but higher than this year's expected 7.4-7.6 million B/D.

The projected import levels will make the U.S. volumetrically only slightly less dependent on foreign oil in the 1980's than it was in 1978-79. The share of foreign oil in total U.S. energy requirements also will decline only slightly: from 21% in 1979 to almost 17% in 1990. Hence, the economic and political risks and problems stemming from this dependency will continue over the next ten years. On the other hand, the seemingly relentless long-term growth in U.S. oil imports which continued until 1977 has finally been halted and will actually be reversed in the second half of the decade. Thus, the U.S.'s long held and widely criticized role as the prime factor in incremental foreign oil requirements may have permanently ended.

Net imports (gross imports minus exports) will be about 300,000 B/D below gross imports in both 1985 and 1990. This puts net imports in these years well below the 1977 level of 8.5 million B/D. Last July the President pledged that this would be the all-time ceiling for U.S. oil imports.

Regarding the composition of future imports, the share of crude oil will increase while refined products will decline in both share and volume. This would be the continuation of a trend which has been under way for some years. Thus, between 1974 and

1979, the share of products in total oil imports dropped from 43% to 23% and the volume of products imports declined by 18%. The two principal reasons for the expected continuation of this trend are the general decline in U.S. oil demand and the even more rapid decline in the demand for residual fuel oil, the major imported refined product.

According to a recent survey by the National Petroleum Council, U.S. refining capacity will grow by about 1 million B/D to 19.1 million B/D from the end of 1979 to the end of 1981. Assuming no further changes in capacity, domestic refineries could theoretically back out all of last year's 550,000 B/D of products imports other than residual fuel oil and natural gas liquids by 1985 without approaching capacity limitations. Nevertheless, some of these imports will continue, particularly those from the Virgin Islands which is outside U.S. customs territory but as a U.S. possession has preferential access over foreign refiners to the U.S. products market.

Residual fuel oil imports will decline from last year's level of 1.1 million B/D but by less than the drop in demand because domestic refinery yields and output of this product are expected to decline in response to market conditions. By contrast, NGL imports (220,000 B/D in 1979) will rise to offset the decline in domestic output and also because of the growing availability of foreign supplies.

Altogether, U.S. products imports are projected to decline from 1.9 million B/D in 1979 to 1.6 million B/D in 1985 and 1.4 million B/D in 1990. A major unknown in this forecast is what policy, if any, the U.S. government will adopt towards the domestic refining industry, following the scheduled phase-out of the crude oil entitlements program in September 1981. A highly protective policy could reduce products imports by several hundred thousand B/D below the forecast, while a policy of unrestricted imports could raise them by about that much above it. In either case crude oil imports would move in the opposite direction so that total oil imports would remain unchanged.

APPENDIX TABLES

TABLE 1

U.S. ENERGY DEMAND, AVERAGE ANNUAL
GROWTH RATES BY SECTOR, 1963-1990

(% Per Year Growth)

	<u>1963/1973</u>	<u>1973/1979</u>	<u>1979/1985</u>	<u>1985/1990</u>	<u>1979/1990</u>
Real GNP(a)	4.0	2.5	2.2	2.4	2.3
<u>Sectors</u>					
Residential/Commercial	3.6	0.1	1.2	1.2	1.2
Industrial	3.3	-1.4	1.9	1.6	1.7
Transportation	4.7	1.4	-0.6	-0.3	-0.4
Net Energy(b)	3.7	0.0	0.9	0.9	0.9
Primary Energy(c)	4.2	0.6	1.3	1.5	1.4
<u>Energy/GNP Ratios</u>					
Net (b)/(a)	0.9	0.0	0.4	0.4	0.4
Primary (c)/(a)	1.1	0.2	0.6	0.6	0.6

Note: Electricity use has been distributed to each of the end-use sectors.

* * * * *

TABLE 2

PRIMARY ENERGY CONSUMPTION PER DOLLAR
OF GNP, 1963-1990

	<u>Energy Consumption (Quadrillion BTU's)</u>	<u>GNP (Billion 1972 \$'s)</u>	<u>Energy/GNP (BTU's Per \$)</u>
1963	49.31	830.7	59,400
1973	74.61	1,235.0	60,400
1979	77.39	1,431.6	54,100
1985	83.59	1,631.3	51,200
1990	90.10	1,836.7	49,100

Sources: Historical data are from the Department of Energy and Department of Commerce; forecasts are those of PIRINC.

TABLE 3

U.S. ENERGY DEMAND BY PRIMARY FUEL SOURCE,
1973-1990

(10¹⁵ BTU)

	<u>1973</u>	<u>1979</u>	<u>1985</u>	<u>1990</u>
Natural Gas	22.51	19.82	19.62	19.41
Petroleum	34.84	36.86	35.93	34.94
Coal	13.30	15.10	18.83	23.36
Nuclear	0.91	2.72	5.81	8.51
Hydro/Other	<u>3.05</u>	<u>3.08</u>	<u>3.88</u>	<u>4.87</u>
Total Primary Energy Demand	74.61	77.39	83.59	90.10

AVERAGE ANNUAL GROWTH RATES

(Percent Per Year)

	<u>1963/1973</u>	<u>1973/1979</u>	<u>1979/1985</u>	<u>1985/1990</u>	<u>1979/1990</u>
Natural Gas	4.3	-2.1	-0.2	-0.2	-0.2
Petroleum	4.7	0.9	-0.4	-0.6	-0.5
Coal	2.2	2.1	3.7	4.4	4.0
Nuclear	38.6	20.0	13.6	7.9	10.9
Hydro/Other	<u>5.6</u>	<u>0.2</u>	<u>3.9</u>	<u>4.7</u>	<u>4.3</u>
Total	4.2	0.6	1.3	1.5	1.4

Note: Total primary energy demand is less than the sum of the individual fuels shown since it excludes the energy equivalent of the product made from the conversion of a primary fuel into another primary fuel as in the case of SNG production from petroleum and coal and also petroleum liquids production from coal. This is done to avoid double counting.

Source: 1973 data are from the Department of Energy, other years are PIRINC estimates.

TABLE 4

U.S. ENERGY CONSUMPTION FOR ELECTRIC POWER
GENERATION BY FUEL, 1973-1990

		<u>1973</u>	<u>1979</u>	<u>1985</u>	<u>1990</u>
Total Electric Output (BKHR)		1,861	2,248	2,725	3,202
Nuclear:	Capacity (000 MW)	18	54	97	137
	Output (BKHR)	83	255	545	798
Coal:	Use (MM Tons/Yr)	389	529	685	853
	Output (BKHR)	848	1,075	1,400	1,714
Natural Gas:	Use (TCF/Yr)	3.7	3.5	1.9	1.3
	Output (BKHR)	341	330	190	127
Oil:	Use (MM B/D)	1.5	1.4	1.2	0.9
	Output (BKHR)	314	304	249	177
Hydro & Other	Output (BKHR)	274	284	341	386
Average Annual Growth Rate in Total Electricity Output (%)		<u>1963/73</u> 7.3	<u>1973/79</u> 3.2	<u>1979/85</u> 3.3	<u>1985/90</u> 3.3

Note: The following abbreviations are used:

BKHR = Billion Kilowatt Hours
 MW = Megawatts
 MM = Millions
 TCF = Trillion Cubic Feet

Source: 1973 and 1979--Department of Energy, Monthly Energy Review, March 1980; 1985 and 1990--PIRINC forecast.

TABLE 5

OIL DEMAND BY CONSUMING SECTOR, 1973-1990

(Percent Distribution)

<u>Sector</u>	<u>1973</u>	<u>1979</u>	<u>1985</u>	<u>1990</u>
Residential/Commercial	19.2	15.4	15.8	15.5
Industrial ⁽¹⁾	17.4	19.9	21.0	22.4
Transportation	52.1	55.4	53.7	54.3
Electric Power	10.5	7.7	7.5	5.7
Synthetic Natural Gas Feedstocks	-	0.7	1.1	1.1
Miscellaneous	<u>0.8</u>	<u>0.9</u>	<u>0.9</u>	<u>0.9</u>
Total	100.0	100.0	100.0	100.0

(1) Includes industrial fuel raw material and petrochemical feedstocks.

TABLE 6

U.S. PETROLEUM PRODUCTS DEMAND, 1973-1990

(Million Barrels Daily)

	<u>1973</u>	<u>1979</u>	<u>1985</u>	<u>1990</u>
Gasolines ⁽¹⁾	6.72	7.07	6.30	5.65
Distillates ⁽²⁾	3.09	3.30	3.41	3.61
Residual Fuel Oil	2.82	2.79	2.39	1.95
Jet Fuel	1.06	1.07	1.16	1.26
Other ⁽³⁾	<u>3.61</u>	<u>4.15</u>	<u>4.73</u>	<u>5.03</u>
Total	17.30	18.38	17.99	17.50

AVERAGE ANNUAL GROWTH RATE

(% Per Year)

	<u>1963/1973</u>	<u>1973/1979</u>	<u>1979/1985</u>	<u>1985/1990</u>	<u>1979/1990</u>
Gasoline	4.2	0.8	-1.9	-2.2	-2.0
Distillates	4.2	1.1	0.5	1.1	0.8
Residual Fuel Oil	6.7	-0.2	-2.5	-4.0	-3.2
Jet Fuel	7.0	0.2	1.4	1.7	1.5
Other	<u>5.1</u>	<u>2.4</u>	<u>2.2</u>	<u>1.2</u>	<u>1.8</u>
Total	4.9	1.0	-0.4	-0.6	-0.5

(1) Includes aviation gasoline.

(2) Excludes petrochemical feedstock use of gasoil which is included in "Other."

(3) Includes petrochemical and synthetic natural gas feedstocks, liquid petroleum gas, asphalt/road oil, still gas, lubes and waxes and miscellaneous oils.

Source: Historical data are from the Department of Energy; forecasts are those of PIRINC.

TABLE 7

U.S. OIL SUPPLY AND DEMAND, 1979-1990

(Million Barrels Daily)

	<u>1979</u>	<u>1985</u>	<u>1990</u>
Production:			
Crude Oil			
Lower 48 States*	7.3	6.3	5.9
Northern Alaska	1.3	1.6	1.7
Total	8.6	7.9	7.6
NGL's	1.7	1.5	1.4
Synthetic Oil	-	0.1	0.6
Processing Gain	0.5	0.6	0.6
Stock Changes	-0.1	-	-
Total Domestic Oil Supplies	10.7	10.1	10.2
Domestic Oil Demand	18.4	18.0	17.5
Exports	0.5	0.3	0.3
Total Oil Demand	18.9	18.3	17.8
Required Oil Imports**	8.2	8.2	7.6
(of which: Products Imports)	(1.9)	(1.6)	(1.4)

*Includes South Alaskan oil production which amounted to 0.1 million B/D in 1979.

**Excluding imports into Strategic Petroleum Reserve.

Source: 1979--Department of Energy, Monthly Energy Review, March 1980; 1985 and 1990--PIRINC forecast.