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U.S. PETROLEUM PRODUCT DEMAND TRENDS AND REFINERY OPERATIONS

by

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The forecast presented here is for U.S. oil demand and refinery operations for the next five years. In order to do this we must also forecast the demand for other energy sources, the general level of economic activity and the approximate price of the crude oil processed by refineries.

The inherent uncertainties involved in all these forecasts are only too well known. They are sufficient to make even relatively short-term forecasts such as this one highly speculative. Anyone looking at forecasts made in 1975 for 1980 can see this demonstrated. Most 1975/76 forecasts for U.S. energy demand in 1980 centered around 90 quads (quadrillion BTU). Yet our actual energy consumption last year amounted to less than 77 quads. The difference is equal to 6 million B/D oil equivalent. Similarly, oil consumption for 1980 was projected to reach nearly 20 million B/D while the actual number was about 17 million B/D.

The reason for the poor record of these forecasts was of course the economic discontinuity in this period in the form of quantum jumps in oil prices in 1979 and 1980. These price increases and their consequences were not, and could not have been, considered in the forecasts preceding them. Should there be similar disjunction in the next five years, this forecast, too, will be rendered meaningless. On the other hand, if the period 1980-85 should be relatively normal, such as the 5-year period between the first and the second quantum price jump, we believe our demand projections have a reasonable chance of approximating actual oil market developments during this period.

Our idea of a relatively normal period would encompass an average annual real GNP growth rate of approximately 2.5% and a real increase in U.S. refiner crude oil costs averaging 2.0%-4.0% annually. It would assume some movement towards natural gas price decontrol prior to 1985, no major change in U.S. nuclear power policy and no major U.S. military involvement. Altogether, not too bad a period but hardly one of dynamic growth. In fact the indicated economic growth rate is undoubtedly well below present official U.S. government expectations.

Under these assumptions, we forecast total U.S. energy consumption to rise by about half the real GNP growth rate. Thus, the improvement in energy efficiency of the recent past will continue throughout the forecast period. Within this total we expect coal demand to continue to grow substantially faster than total energy, and nuclear power generation to nearly double from the 1980 level which was depressed by government constraints as a continuing consequence of the Three Mile Island accident. We expect natural gas consumption to show very little change from last year's level as new supplies from conventional domestic sources and additional imports approximately offset declining production from existing fields.

The only major energy source expected to register a decline in demand during the period will be petroleum, which might drop by half a million B/D between 1980 and 1985. The following table shows our petroleum forecast to 1985, by major products. If our projection is right, consumption in 1985 will not be very different from what it was 10 years earlier--a sobering thought, if one considers that in the ten years ending in 1975 demand grew at an

average annual rate of nearly 4%.

U.S. PETROLEUM PRODUCT DEMAND: 1975, 1980 AND PROJECTIONS TO 1985

(Thousand Barrels Per Day)

	1975		1980*		1985	
	Volume	% Share	Volume	% Share	Volume	% Share
Gasoline	6,675	40.9%	6,585	38.5%	5,850	35.4%
Distillate Fuel Oil	2,851	17.5	2,909	17.0	3,030	18.4
Residual Fuel Oil	2,462	15.1	2,529	14.8	2,220	13.4
Jet Fuel	1,001	6.1	1,063	6.2	1,000	6.1
Other	3,333	20.4	4,007	23.5	4,400	26.7
Total U.S.	16,322	100.0%	17,093	100.0%	16,500	100.0%

*Preliminary

Let me briefly discuss the demand changes for each of the products shown but first I would like to caution you again that we consider the projected trends much more reliable than the actual projected numbers

Gasoline demand will decline principally because automobiles will continue to become more fuel efficient. In the last seven years the average number of miles per gallon in the automobile fleet has risen from over 13 to just under 15. By 1985 we expect it to be between 18 and 19. The number of passenger cars will increase modestly during this period but not the miles driven per car. In fact, the latter should decline slightly. We also see a continuing shift to diesel cars but slower than had been expected earlier.

Distillate demand will show a very modest growth due entirely to its expansion in the transportation market. Demand in the residential, commercial and industrial markets for distillates will decline due principally to energy conservation and displacement by natural gas. Some of that gas will have been backed out from the electric power sector by coal and nuclear power.

Jet fuel demand will remain relatively unchanged since the expected decline in the fuel requirements of scheduled airlines, due to improvements in the fuel efficiency of their planes, will be largely offset by increased demand in the general aviation and non-scheduled airline fuel market.

Residual fuel oil demand, which reached its peak in 1978 and has dropped by half a million B/D since then, will continue to drop, but at a slower rate, over the next five years. Most of the decline will take place in the electric utility, industrial and residential/commercial sectors at the U.S. East Coast (PAD I).

The only product category expected to show a significant demand increase is that labelled "other" in our table. The growth here will come principally from the rising demand for petrochemical feedstocks.

Now let us turn to the essential question for U.S. refiners namely, how will this changed products demand slate be met during the next five years? The question has two interrelated components: what will be the role of products imports and what changes will domestic refineries have to make to meet the forecast demand?

Large volume products imports are practical only for the U.S. East Coast which traditionally has had a deficit in local supply of all products. This had to be made up by shipments from the U.S. Gulf Coast, the two U.S. Caribbean possessions (Puerto Rico and Virgin Islands) and foreign sources. Foreign source imports of light products have traditionally been quite marginal--last year, for example, they were less than 100,000 B/D. They have not, in general, been required nor has their availability been sufficient to support

substantial imports since the demand for these products outside the United States has been growing significantly, at times straining foreign refineries capability to meet demand. Even more important, U.S. product import protection either in the form of import quotas, fees or U.S. refiner access to lower cost domestic crude due to price controls has prevented foreign refineries from penetrating U.S. markets. With declining demand, foreign light products are now needed less than ever at the East Coast. But since January 28th of this year, when the price controls and the entitlement system ended, the U.S. refining industry, for the first time in 25 years, has had no government protection from foreign competition except the low statutory import duty of 1.25¢/gallon on gasoline and 0.25¢ on middle distillates. Let us assume this situation, which can be called a worst-case scenario for import protection, will continue.

The East Coast supply most vulnerable to foreign import competition would be light products shipped by tanker from the Gulf Coast because the Jones Act requirement for domestic flag transportation raises the shipping cost by several cents/gallon above that from Caribbean or European locations. However, light product tanker shipments from the Gulf Coast have declined substantially--nearly 200,000 B/D since 1979--as demand has declined on the East Coast and an increasing share of these products shipments have been shifted to pipeline transportation. We expect this trend to continue. In fact, even in the southeast, the only area where

tanker shipments from the Gulf Coast have not declined yet and which is now the destination for over 70% of total East Coast deliveries by tanker from the Gulf Coast, the installation of new pipeline facilities will greatly reduce tanker shipments over the next 2-3 years. Thus, the volume of domestic light products most sensitive to foreign competition because of its marginally high cost will decline substantially in the period under discussion. This should generally enable U.S. refiners to meet the newly strengthened foreign competition for light products at the East Coast.

The competitiveness of U.S. refiners vis-a-vis foreigners will be greater in gasoline than in middle distillates because of the rapidly growing share of unleaded gasoline in the U.S. market--currently 50% and expected to rise to 75% by 1985. Most foreign refiners do not produce unleaded gasoline with a high enough octane rating to make it marketable here and could not do so without substantial capital investment. This, plus the fact that non-U.S. Caribbean refineries produce much more distillate fuel oil than gasoline, is likely to cause any increase in light products imports to be in the form of middle distillates. Of course, our assessment of future likelihood of light products imports assumes reasonably balanced markets both in the U.S. and abroad. During temporary market imbalances these imports could rise or fall sharply, depending on the cause of imbalance.

The absence of a significant volumetric increase in light products imports would not mean that U.S. refiners have been unaffected by the end of virtually all import protection. The landed price of imported product will tend to set a ceiling on products prices in the East

and Gulf Coasts and obviously U.S. refiners no longer have the cost cushion of an import fee or controlled crude. Thus, if foreign prices fall because of a surplus abroad, U.S. prices will tend to follow suit. However, if foreign prices rise because the market abroad is tightening, U.S. prices may not follow in tandem since their ceiling (up to the level of the landed foreign price) is determined by competition among domestic refiners--all of which will have increasing spare capacity under normal marketing conditions. Consequently, in the absence of any new import restrictions U.S. refiners will not escape the impact of unrestricted foreign competition even if their sales volumes should not show it.

Residual fuel oil imports, which dropped by 425,000 B/D (or 31%) between 1978 and 1980, are likely to drop more this year but may return to approximately last year's level by 1985. The reason is that refinery output of residual fuel at the Gulf Coast will decline more rapidly than demand. Therefore, the Gulf Coast surplus of this product shipped up to the East Coast will drop sharply by 1985 from its 1980 level of about 225,000 B/D. As a result, offshore residual fuel oil suppliers may be able to approximately maintain their level of exports to the U.S. East Coast despite the substantial decline in demand.

The incentive for the expected reduction in residual fuel oil output at the Gulf Coast is found largely in the price determination of this product. As long as the Gulf Coast has a significant surplus, the local price will be determined by the cost of foreign residual fuel oil at the East Coast minus the shipping cost in domestic tankers back to the Gulf Coast. This netback makes residual fuel oil even less attractive to Gulf Coast refiners than to those on the East Coast.

(In general, residual fuel oil production is unattractive to all refiners since it sells below the cost of the crude from which it is made--a situation we expect to continue.)

Hence, Gulf Coast plants have a particularly strong incentive to build facilities for the conversion of residual fuel oil into lighter products. According to a recent Oil & Gas Journal survey, some 550,000 B/D of such conversion capacity has been recently completed, is under construction or is very likely to be built in the next 2-3 years in states bordering on the Gulf Coast. Some of the plants which can not build these conversion facilities may have to shut down because of unprofitable operations, further reducing excess residual fuel oil supply. We should also point out that many of the announced conversion projections are associated with refiner plans to process heavier and higher sulfur crudes which are expected to be increasingly available at possibly attractive prices in the 1980's.

The following table summarizes our supply and demand scenario for 1985 for the three major refined products.

U.S. SUPPLY/DEMAND FOR MAJOR PETROLEUM PRODUCTS: 1978, 1980 AND PROJECTIONS TO 1985

(Thousand Barrels Per Day)

	1978	1980	1985
Motor Gasoline			
Demand	7,412	6,585	5,825
Supply Sources			
Domestic Production(1)	7,170	6,515	5,700
Imports	190	139	125
Stock Changes	-54	68	-
Exports	1	1	-
Distillate Fuel Oil			
Demand	3,432	2,909	3,025
Supply Sources			
Domestic Production(1)	3,169	2,711	2,852
Imports	173	136	175
Stock Changes	-93	-66	-
Exports	3	4	2
Residual Fuel Oil			
Demand	3,023	2,529	2,225
Supply Sources			
Domestic Production(1)	1,680	1,615	1,300
Imports	1,355	930	940
Stock Changes	1	-9	-
Exports	13	25	15

(1) Includes NGL's and other hydrocarbon blends.

Source: U.S. DOE for 1978; DOE and API preliminary for 1980.

In conclusion, I would like to point out one obvious problem U.S. refiners will face during the next 5 years as a result of the expected changes in demand and crude oil quality. To meet these changes the industry will have to expend substantial amounts of capital for residual fuel oil conversion facilities, desulphurization plants and gasoline quality improvements. Yet, at the same time, their basic crude oil distillation facilities will become increasingly underutilized. In fact this is already happening. In 1978 U.S. refineries ran at 86.5% of capacity. By 1980 refinery capacity had increased by 1.2 million B/D while crude runs had decreased by about the same volume. As a result, plant utilization dropped to 74%. By 1985 refinery runs will undoubtedly be still lower while capacity is likely to be higher since plant expansions already under way will probably more than offset the closing of some of the least efficient plants currently in operation. This prospect of declining plant utilization and rising capital requirements for downstream facilities against a background of no more import protection--if the Administration maintains the current policy--presents a very different challenge to the U.S. refining industry than its historic task: expanding sufficiently to meet the country's growing requirements for oil products.