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**OUTLOOK FOR REFINED PRODUCTS TO 2000**

by

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## **The Outlook for Refined Products to 2000**

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As recently as 18 months ago industry planners were concerned about how the U.S. refining industry could meet the growth in demand, particularly light products, expected in the 1990's. It was said that with refineries operating near 90% of capacity (and their conversion units at even higher rates), with no grass root refineries to be built, largely because of environmental risks and opposition, and with net capacity expansions of existing facilities limited for financial and environmental reasons, a substantial growth in products imports would be required to meet the projected demand increase of the 1990's.

### **Total Demand in the 1990's**

Much has changed since then. Demand was flat in 1989, declined in 1990 and will probably decline again this year. Refineries are now operating at 82-84% of capacity and even conversion units have spare capacity once again. What has happened? There is a recession and there has been an oil price shock. The recession will end, probably fairly soon. The price shock has already ended but its impact will linger on for some time. It has brought back all the talk of the 1970's and early 1980's about the need to reduce oil consumption through conservation and fuel switching to curb our oil import dependency. Some legislation in this direction can be expected even though the much vaunted National Energy Strategy contains very few legislative proposals. But the price shock together with the Middle East crisis which caused it have created a public psychology which is much more receptive towards such measures.

All of this has changed perceptions of the future. In its 1989 Long-Term Energy Outlook the Department of Energy's (DOE) Base Case projected total U.S. oil demand at 18.6 B/D in the year 2000. In its 1990 Outlook, issued in May of that year, it raised it to 18.8 B/D. But its 1991 forecast is expected to show a drop to 18.5 million B/D for the year 2000. Our own latest projection is very close to that figure. Under this scenario total U.S. oil demand would rise by about 1.6 million B/D between 1990 and 2000, an average annual growth rate of just 0.9%. By comparison, the annual growth rate during the period 1984-89 was 2%. It was this earlier growth rate that had caused the concern about how the U.S. market would be supplied in the second half of the 1990's, creating the vision of a major increase in refined products imports in that period. The vision still has some validity. There will be a growing products import market in the 1990's, but it will be much smaller than had been assumed in 1988-89 and the product mix will be different.

The crude price assumptions underlying our growth rates call for only a very small increase to the year 2000 in real 1990 dollars from the crisis-induced relatively high WTI price of \$24.40 in 1990. The DOE's latest forecast, quoted in its new National Energy Strategy Report, shows a much larger increase -- 3% annually in real dollars for the period 1990-2000. However, this may be lowered in the DOE's 1991 long-term forecast. Let us now analyze how the major oil products will fare under this scenario.

### **Residual Fuel Oil**

First, we will dispose of the one product whose growth will be supplied entirely from abroad without hurting the U.S. refining industry. I'm referring of course to residual fuel oil. Residual fuel oil demand dropped by 11% or 150 MB/D last year. Most of the decline occurred in the electric utility sector, for reasons of weather, the state of the economy, the increased availability of nuclear power and the continuing natural gas surplus. Nearly all of the drop was absorbed by reductions in imports. We expect a further decrease in consumption and imports this year for generally the same reasons. However, as we move towards the mid-1990's, residual fuel oil demand will start rising again. Both our's and the DOE's forecasts show this trend, though the DOE's growth is considerably slower than ours.

The increase is based primarily on the requirements for electric power which we expect to grow at an annual rate of about 2% in the 1990's. This growth will require a rising capacity utilization of existing fossil fuel power plants, many of which are designed for residual fuel or dual fuel use. We see total residual fuel oil demand, mostly low-sulfur, rising by 500-600 MB/D from 1990 to 2000. This would put residual fuel oil imports in the second half of the decade back into the one million B/D range they had held from 1965 to 1980. If the growth in electric generating capacity outside the U.S. is met primarily through gas, coal and nuclear power, as is currently planned, the required residual fuel oil volumes for the U.S. market should be available. However, there are currently indications that nuclear plant construction abroad may be curtailed while in Eastern Europe some existing plants will actually be permanently closed. This could increase foreign demand for residual fuel oil.

### **Gasoline**

Now let us turn to the light products, the refining industry's profit makers, at least in theory. First, gasoline, the industry's prime product. As you know, U.S. gasoline demand, after rising steadily from 1983 to 1988, remained flat in 1989, declined by 1.6% in 1990 and is expected to decline by another 1.5% this year. Last year's decrease was steepest in the 4th quarter, but some decline was registered in each of the first three quarter's, an indication that the gasoline market was weak even before the 3rd quarter

price hikes and 4th quarter recession. This year's drop will reflect primarily economic conditions, assuming crude prices follow our assumptions. Meanwhile gasoline octane requirements have also been lowered as customers down-shifted from premium and mid-grade to unleaded regular gasoline.

Over the next 10 years we see gasoline demand rising slightly in the post-1991 recovery period and then declining moderately to end the decade at about 7.1 million B/D, or 100 MB/D below the level of 1990. By contrast, the DOE's latest Base Case is expected to show an increase of some 250 MB/D during this period. Our projected decline in gasoline consumption will occur despite a continuing increase in the number of motor vehicles and in total vehicle-miles driven. It is the consequence of rising real gasoline prices, steadily increasing average fuel efficiency in cars and a modest but growing substitution of other fuels for gasoline.

Volumetrically, our demand decline implies a reduction in gasoline imports from the current level of about 350 MB/D, particularly since domestic capacity, including conversion and oxygenate units, will be expanded during this period, while some gasoline substitutes will enter the market. The question is how much of the imported gasoline will meet the mandated quality standards in the second half of the 1990's. I'm referring to "reformulated" gasoline under the new Clean Air legislation. Based on current trends and legislation, it is likely that about 2/3 of all U.S. gasoline consumption will still be outside the designated ozone non-attainment areas by the year 2000 and will therefore not require "reformulated" quality. However, in the Northeast market, the recipient of over 90% of U.S. gasoline imports, a large share of the market is likely to require reformulated gasoline in the second half of the 1990's. Hence, this historical market for gasoline imports, because of its long-term regional deficit, may well be partly shifted to domestic sources in the second half of the 1990's. However, it is quite possible that some foreign refiners will decide to make the necessary investment to produce reformulated gasoline in order to retain part of this market.

But while gasoline imports are likely to decline, imports of gasoline additives, such as oxygenates, may well rise in the 1990's. Oxygenates reduce the carbon monoxide emissions of gasoline. Under the Clean Air Act they are currently mandated in the winter months in a few carbon monoxide "non-attainment" areas but their use will be greatly expanded in late 1992 under the Act. Later, they will also play a role in the manufacture of reformulated gasoline; and they are currently used by refiners as a octane booster.

U.S. oxygenate demand is still quite small, about 100,000 B/D. However by 1995 the mandated seasonal peak demand could amount to 350-400 MB/D of MTBE equivalent capacity. By 2000 it could be still higher. The capacity to meet the volumes required in 1995 does not exist in the U.S. and while there are a number of domestic plants in the planning or construction stage, imports of MTBE will play an important

oxygenate requirements from 1993 on. Several MTBE plants designed to supply the U.S. market are currently under construction abroad. Ethanol and its derivatives also play a role in supplying oxygenates to the gasoline market. Currently their volume is less than half that of MTBE. Without the existing federal tax credit ethanol would not be commercial. Ethanol, like methanol, will benefit from the Clean Air Act. So will some other oxygenates currently being developed.

### Middle Distillates

Now let us examine the outlook for middle distillates. Distillate demand has been rising steadily from 1983 to 1989. Last year's decline of about 3.5% was due primarily to weather conditions. This year's slight demand growth, if any, will also be due to weather conditions. Transportation and non-heating industrial use will fall because of the state of the economy.

Over the next 10 years we expect distillate demand to grow 500-600,000 B/D from last year's level of about 3.1 million B/D. This is fairly close to the DOE's new Base Case forecast. Volumetrically most of the growth will be in the form of diesel oil in the transportation sector which accounts for about 60% of total middle distillate consumption. However, percentage-wise, sales to the electric utility sector for turbines, many of which are designed to run on gas or distillate oil, will grow the fastest. Industrial demand will also rise throughout the period, while residential and commercial heating demand will decline, both in share and volume, as it did during the 1980's. But by the end of the century it will still be a 600-650,000 B/D market, most of it in the Northeast.

Middle distillates will also require a quality change due to new environmental regulations. From October 1993 on, the sulfur content (in weight) of all *on-highway* diesel fuel cannot exceed 0.05%. This will require a radical reduction from the current level of 0.2-0.3% for all middle distillates and will make the on-highway product much more expensive than the other middle distillates. Nationally, on-highway diesel fuel accounts for about 45% of total U.S. middle distillate consumption. However, there are significant regional differences. Highway diesel consumption has its lowest share of the total distillate market in the Northeast (New England and Middle Atlantic) because of the continuing regional importance of heating oil. In 1989 only 25% of all middle distillates consumed in the region went into highway transportation. By 1993 it will be slightly higher but there will still be large regional market for the higher-sulfur product. This is of importance because most of the 300,000 B/D of U.S. middle distillate imports go into that region. Since foreign refiners are unlikely to make the substantial capital investment to desulfurize their middle distillates just to supply the U.S. market they will be limited to the non-highway market for this fuel after 1993. This could cause a temporary over-supply, lowering profitability. However, under our refinery capacity

assumption, not all of the 15-20% increase in demand can easily be supplied from domestic refineries. Thus, some increase in middle distillate imports can be expected in the 1990's.

### **Jet Fuel**

The last product I would like to discuss is jet fuel. Jet fuel has been the industry's growth product. In the last 10 years (1980-90) it grew at an impressive annual rate of nearly 3.5% while total U.S. oil consumption was flat. Last year's consumption amounted to 1.5 million B/D, including about 200,000 B/D of naphtha jet fuel. This year for the first time in 10 years jet fuel demand is declining, both because of the recession and the reduction in international commercial air traffic as a consequence of the Middle East crisis. Over the next 10 years we expect jet fuel demand to increase at an annual rate of 1.5%-2.0% to 1.7-1.8 million B/D by 2000. The DOE's Base Case forecast shows a similar growth. The growth will be driven by U.S. international air travel. Though domestic travel represents three-quarters of the airlines' business, it is largely saturated and if we assume fuel efficiency improvements, future jet fuel demand for domestic flights could be flat or slightly down. By contrast, the U.S. airlines' international business is growing by leaps and bounds. In 1989 it rose by 11% and last year by 15%. Jet fuel imports rose steadily from 30,000 B/D in 1985 to 100,000 B/D in 1989. Imports were maintained at that level in 1990 but would probably have been higher had it not been for the impact of the Middle East crisis on world jet fuel supply and demand. Since not all the expected increase in demand can readily be supplied by domestic refineries a rise in imports is likely in the 1990's, if demand keeps rising.

### **Summary of Demand Trends**

To sum up, total major light products demand (gasoline, middle distillates, jet fuels) will rise at a very slow annual rate of 0.5-0.6%, or from 11.8 million B/D to 12.5 million B/D, between 1990 and 2000. All of the growth will be in middle distillates and jet fuel while gasoline demand will decline somewhat. Most of the increase in middle distillates and jet fuel will be supplied from domestic refineries but some increase in imports is likely. Residual fuel oil demand, after declining for another couple of years, will rise rapidly throughout the rest of the decade. All of its 550-600 MB/D increase will be supplied from abroad.

If the market for light products were to grow much faster than we have forecast it might be difficult for the U.S. refining industry to provide the additional supplies because the enormous capital requirements to meet products quality standards mandated by the new Clean Air legislation and other environmental measures will leave little capital for expansion projects. In fact, some small refiners may find it difficult to operate under the new legislation.

## The Oil Market and NES

I would like to close with a brief comment on the recently released National Energy Strategy (NES) report. The report says that NES "initiatives are expected to decrease U.S. oil consumption by 1.3 million barrels per day below projected year-2000 levels...largely because of displacement of oil by alternative fuels in vehicles." This sounds ominous for gasoline sales in the 1990's until one realizes that the decrease is from a hypothetical "Current Policy Base" which is no longer realistic. In fact, the expected 1.3 million B/D decrease would put oil demand in the year 2000 into just the 18.5 million B/D range projected by us and also by the DOE Base Case. Thus, at least to the year 2000, the NES "Strategy" projections reflect largely current market forces and government policies and existing legislation, including the new Clean Air Act.

However, the NES report makes it clear that a policy decision in principle has been reached at the highest level of government to reduce gasoline consumption over time through a variety of legislative economic and exhortive actions as well as new technologies. It is an area where national security interests and environmental concerns overlap which gives it wide public support, at least in theory. We can expect the cost and inconvenience of reducing gasoline consumption to restrain the move away from it. But the goal of reducing gasoline consumption will be a permanent feature of our energy policy, one that has very little active public opposition. Thus, the NES long-term projection that oil use in the transportation sector will start declining from about 2005 on has to be taken seriously. In fact, we think the decline will start earlier.



**U.S. PETROLEUM PRODUCT DEMAND 1980-2000**

	<u>Gasoline</u>	<u>Distillate</u>	<u>Jet Fuel</u>	<u>Residual</u>	<u>Other</u>	<u>Total</u>
	-----Million Barrels Per Day-----					
<u>Historical</u>						
1980	6.58	2.87	1.07	2.51	4.03	17.06
1985	6.83	2.87	1.22	1.20	3.61	15.73
1990 Prelim	7.21	3.05	1.45	1.22	4.03	16.96
<u>Forecast</u>						
1995	7.4	3.4	1.6	1.4	4.2	18.0
2000	7.1	3.7	1.7	1.8	4.4	18.7
1980-1985	-0.8	0.0	2.7	-13.7	-2.2	-1.6
1985-1990	1.2	1.5	4.2	0.8	1.8	1.6
1990-1995	0.3	2.1	1.8	2.0	1.3	1.1
1995-2000	-0.8	1.4	1.1	5.7	0.9	0.8

Source: 1985-90 U.S. Department of Energy/Energy Information Administration  
 1995-2000 Petroleum Industry Research Associates (PIRA), *World Energy Forecast, Vol. I*, Nov. 1990.