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**OIL IN THE WORLD ENERGY BALANCE
IN THE 1980's**

By

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This paper attempts to give an overview of world energy supply and demand for the 1980's, with principal emphasis on the oil sector. The analysis excludes the Centrally Planned Economies (USSR, Eastern Europe and the People's Republic of China) except for their collective net foreign trade in energy.

Since energy demand is of course inter alia a function of general economic activity, we will start our analysis with a speculation about the real global GNP growth rate in the 1980's. In the period 1973-1980 the world economy grew at an average annual rate of 3%. There seems to be a convergence among forecasts around a growth rate on the same order of magnitude for the 1980's. However, since the GNP growth rate in the 1980-82 period will clearly be substantially lower--about 1.5% annually--due to the recession in Europe and the U.S., we expect the 1982-90 rate to be slightly higher, perhaps 3.2% annually.

Globally, the relationship between energy growth and economic growth--the so-called energy coefficient--was approximately 1.0 in the period 1965-73, i.e. both real GNP and energy consumption grew at about the same rate of just over 5% annually. In the 1973-80 period the relationship changed drastically: for each one percent increase in global GNP, energy demand rose about 0.5%. However, this 7-year average was influenced significantly by the decline in energy consumption in 1980 while the GNP continued to rise. This was the first time in at least 20 years that energy and GNP had moved in opposite directions. It happened

again in 1981.

Another illustration of the relationship between energy and economic activity is the ratio of physical energy consumption to the real dollar level of GNP, or energy use per dollar of real GNP. In the OECD countries, this ratio fell substantially over the period, as shown in the table below. In the years 1976-1979, the period of relative stability between the two oil crisis, energy demand increased but energy use per unit of GNP continued to fall, indicating structural improvements in energy efficiency. However, the substantial further reductions in the ratio in 1980 and 1981 must be assessed in light of the special circumstances prevailing in those years--the oil price shock and economic stagnation. Hence, the most recent rate of reduction in the Energy/GNP ratio cannot be expected to continue.

OECD ENERGY USE AND GNP, 1973-1981

	Energy Use (Million Tons Oil Equivalent)	GNP (Billion Dollars)*	Energy Use/ GNP (Tons Per Thousand Dollars of GNP)	Index, Energy Use/GNP (1976 = 100)
1973	3,638.5	4,040.2	.900	105.6
1974	3,560.3	4,063.9	.876	102.8
1975	3,460.9	4,080.6	.848	99.5
1976	3,640.9	4,272.5	.852	100.0
1977	3,711.9	4,449.5	.834	97.9
1978	3,790.4	4,619.0	.820	96.2
1979	3,883.6	4,776.1	.813	95.4
1980	3,760.3	4,835.2	.777	91.2
1981	3,670.3	4,895.0	.750	88.0

Source: Energy use: BP Statistical Review of World Energy.
 GNP: Gross Domestic Product as reported in OECD,
 Main Economic Indicators.

*Constant 1975 dollars

Since 1981, OECD energy consumption has also been negatively affected by the general economic recession which has hit particularly hard the high energy component industries such as steel, metals, petrochemicals, automobiles and electric power. Thus, the industrial countries' energy demand will probably decline again somewhat this year. But much of this drop is probably not of a structural, i.e. enduring nature.

Assuming a general economic recovery from next year on, and, as a working hypothesis, no drastic changes in real energy prices, we can expect OECD energy demand to start rising again, with the growth rate likely to be faster in the recovery period 1983-85 than in the remainder of the 1980's.

What will be the energy coefficient in the OECD area during the 1982-90 period? In the period 1976-79, which may be considered relatively undistorted in that both GNP and energy consumption grew moderately in each year, the OECD's energy coefficient was about 0.6. Since the move towards energy conservation, which started in 1974 and was drastically boosted in 1980, has by no means reached its realistically attainable potential, we estimate that there will be a 10-15 percent improvement during the forecast period under our working assumption for energy prices. In other words, we may have a coefficient of less than 0.55 by the late 1980's. In the U.S., the coefficient will be below the OECD average; in Japan, it will be above it; and in Europe, about in line with it.

In the less developed countries (LDC's) the energy coefficient has of course been very different from that of the industrial countries. In the 1973-80 period it was generally above 1.0, and in the 1976-79 period energy consumption in the LDC's grew by 20%, or about 40% faster than the GNP.

If we assume an energy coefficient in the LDC's of about 1.0 for the 1980's, their share of total world energy demand will rise from last year's 21% to about 27% by 1990. The rising energy consumption of these countries reflects population increase, industrialization, mechanization of their transportation and agricultural sectors and the shift from non-commercial to commercial energy sources.

Combining our industrial and developing country assumptions gives us an estimated global energy coefficient of approximately 0.65 for the period 1982-90. If we apply this coefficient to our estimated world GNP growth rate of 3.2%, we arrive at a world energy demand growth rate of 2.1%. This compares to a growth rate of 1.3% during the period 1974-82. Thus, in the next eight years world energy demand will grow much faster than in the last eight. This year's estimated total energy consumption of about five billion tons oil-equivalent will increase under our assumption to 5.9 billion tons by 1990. This would represent an increase of 18 million B/D oil-equivalent energy.

The forecast demand increase will of course not be equally distributed among the various energy sources. In the period 1978-81, oil demand declined by 8.5% while non-oil energy demand collectively grew by 9.1%. In the rest of the 1980's we also expect a substantial disparity between these two sectors. Both will grow but oil at a much slower rate than other energy sources collectively (see table p.6).

WORLD* OIL AND NON-OIL
ENERGY DEMAND GROWTH RATES

(Percent Per Annum)

	<u>1978-81</u> (actual)	<u>1982-90</u> (projected)
Oil	-2.9	0.9
Non-Oil	3.0	3.1
Total Energy	0.2	2.1

*Excludes Centrally Planned Economies (CPE's)

I believe it is reasonable to assume that the non-oil energy sources will be collectively available to meet the projected demand growth over the next eight years. Let us therefore concentrate on the availability of oil between now and 1990.

The first comment to be made regarding our oil scenario is that demand will not grow evenly throughout the period at the projected growth rate. As the figures below show, we expect the rate to be fairly rapid in the next three years and then rise only minimally to 1990.

WORLD* OIL DEMAND

	<u>MMB/D</u>	<u>Annual Percentage Changes from Previous Period Shown</u>
1980 (actual)	49.6	
1981 (actual)	47.6	-4.0
1982	46.0	-3.4
1985	49.0**	2.1
1990	49.5**	0.2

*Excludes CPE's

**Midpoints of estimates shown in table, p. 14.

The principal reason for this highly uneven growth rate is that demand for all energy sources is likely to increase relatively rapidly during the coming economic recovery period (if there is one). Oil, as the energy sector's swing fuel, may actually increase slightly faster, just as it dropped much faster during the recession period. Another reason is that over time, non-oil energy sources (principally coal and nuclear power) will continue to encroach on oil's share of the energy market. In the post-1985 period this trend will be more visible than in the preceding economic recovery phase. As will be discussed later, this scenario assumes a decline in the real price of oil this year and next, followed by approximate real price maintenance for the remainder of the decade.

The oil growth rate will also be very unevenly distributed among the two majors groups of countries--industrialized and developing. The former group is likely to show some increase in oil demand during the recovery period but will resume its structural decline thereafter because of continuing energy conservation and oil substitution measures. The developing countries will need more oil throughout the decade but some of the net oil importers among this group will find it increasingly difficult to pay hard currency for rising import requirements.*

Altogether, we expect all of the growth in world oil demand (outside the CPE's) to go to the LDC's--about 3 million B/D--while

*Of course, not all of the LDC's demand increase will take the form of imports, since this group includes the oil exporters as well as existing and potential producers for the domestic market.

demand in the OECD area in 1990 is expected to be no higher than last year's 36 million. World oil trade will decline significantly during this period since much of the demand growth in the LDC's will be supplied from newly developed local oil sources.

Our projected oil demand for 1990 will be about 2 million B/D below the world peak demand reached in 1979. Since substantial additional marketable oil supplies have been developed in the interim and more will be developed in the future, our forecast suggests strongly that the world oil market will be in surplus for the remainder of this decade, absent a new major physical supply interruption. Let us analyze this surplus.

First of all, what do we mean by surplus? Essentially, substantially more crude oil will be physically, technically and commercially available than will be required throughout the remainder of this decade. This definition, whatever its accuracy for the future, is of course a correct description of the present excess capacity of some 13 million B/D, or 32%, above current (2nd and 3rd quarter 1982) production of about 40 million B/D. All of it is technically available and a substantial amount also commercially.

It may seem strange that the producers of crude oil should have built this enormous, costly, excess capacity. But it was planned and undertaken when the industry still considered itself to be a growth industry. Actually, until quite recently it was. The oil industry's growth phase ended less than 3 years ago, following the second oil price shock, not the first one. From

1975 to 1979 world oil demand registered an annual growth rate of 3.4%. True, this rate was less than half that of the pre-1974 period. But if oil demand had grown at just 3% annually from 1979 on, which then was considered a very reasonable projection, demand this year would be 56 million B/D, or about 10-11 million B/D more than will actually be needed. Thus, had the price explosion of 1979/80, with its impact on demand, not occurred, world excess producing capacity today would be just about right. Three years ago this was the accepted outlook for 1982. The historically unique decline in demand which occurred during these three years was neither foreseen nor foreseeable. But it has changed everything. And it left us with an excess capacity that will still be substantial in 1990.

This is where we turn again from facts to forecasts and forecasts are based on assumptions. The most important assumption underlying any supply and demand forecast is of course the price of the commodity. As we have seen, the price explosion of 1979/80 has rendered all previous forecasts meaningless, no matter how reasonable they seemed at the time. The same thing may of course happen again. For instance, any extraneous political-military event blocking Saudi export ability for a period of time is likely to send prices soaring once more, although we are now probably better prepared, psychologically, organizationally and physically (emergency stocks) to deal with an interruption than we were in 1979.

Perhaps, the next time prices will return approximately to their previous level once the interruption is over. If not, the economic hardship of the next price explosion, if there is one, is unlikely to be limited to the oil importing countries. The negative impact of the price increase on demand and the positive impact on new supplies would certainly increase whatever underlying excess capacity exists at the time, thereby endangering the prevailing price structure.

Thus, the oil producers could unexpectedly see their comfortable and historically correct assumption regarding the price elasticity of demand turned upside down. So far, the oil price-demand relationship has always remained below unity, assuring oil exporters a higher total revenue from any price increase. However, given a high enough price increase over a long enough period, the relationship could move above unity which would reduce total revenue as the price rises.

OPEC's price/revenue relationship has already undergone substantial changes in the recent past. This year its collective oil export revenue in nominal dollars will probably be only 4-5% above the \$197 billion collected in 1979 despite a 75% increase in the average annual export price during this period. Underlying this disproportion is a staggering 40% decline in OPEC's export volume.

It would therefore be in the oil exporters' own longer term interest to let prices return toward the previous level, following a temporary supply interruption. Whether such longer term considerations would actually prevail over short term desires for

revenue maximization under these circumstances is one of the uncertainties in price forecasting. We do know, however, that the governments of the principal exporting countries were surprised, even shocked, by the strength and length of consumer reaction to the last price surge. They may have learned from this experience. The reduction of the average official OPEC sales price from its peak of \$35.50 in the first quarter of 1981 to about \$33 by the third quarter of 1982 may reflect this learning process.

In the absence of a major interruption we expect OPEC to continue to play an important role in determining the price of oil. This becomes clear from our assumption of a surplus throughout the 1980's. If OPEC were to lose its price setting ability, the nominal price of oil would drop rapidly and drastically. Over a period of time this would significantly restimulate demand and deter the development of new supplies, both alternate energy sources and oil. We have already seen what a relatively minor price drop and expectations of further reduction have done to the U.S. and Canadian synfuels industries. The inevitable eventual result of a price decline of such dimensions would be an end to excess producing capacity and a consequent market oriented price increase. If a "free fall" of OPEC prices were to occur this year or next, as a result of the Cartel coming apart, I believe the end of the oil surplus would come within two to four years.

The possibility of such a development can no longer be dismissed. Politically and economically, OPEC is currently facing

the most serious crisis in its history. Some analysts believe it will not survive it. Our analysis leads us to the conclusion that it probably will but with greatly reduced strength. We believe that of the various possible scenarios, approximate maintenance of the existing nominal contract price of the OPEC marker crude near \$34 and of the average OPEC contract price at about \$32-33 remains most likely this year and next, always absent a new major military-political interruption. Our reason for this conclusion, stated in its simplest terms, is that in the present market environment any other collective or individual price policy by OPEC members would tend to yield less revenue and/or be less tenable.

Beyond 1983, we assume an imprecise but modest nominal price increase, trying to approximate the world inflation rate, possibly rising a bit faster in the post-1985 period. By 1990 the real price could still be below the 1981 level. This is the price structure underlying our assumption of an oil surplus for the remainder of the current decade. OPEC's inability to raise the real price during this period would be a measure of its reduced strength, while its ability to maintain a floor price substantially in excess of the free market price would be an indication that the Cartel is down but by no means out.

Since March 1982 OPEC has attempted, with only limited success, to support its sagging price structure through an arrangement of jointly agreed production ceilings for each member. This approach to support a price in the face of excess capacity is reminiscent of the functions of the Texas Railroad Commission in the U.S. in the 1950's and 1960's, keeping in mind the limitation of historical

comparisons. The Commission's production allocation scheme succeeded in keeping Texas' huge excess producing capacity off the market, thereby protecting the state's and the nation's oil price structure. OPEC which is now carrying nearly all the world's oil surplus producing capacity is attempting to do the same.

However, the Texas Railroad Commission also had the support of the U.S. government which controlled and restricted the flow of imported oil. OPEC has no way to control the impact of non-OPEC production on its markets. Between 1979 and 1981 the non-OPEC share of world production (outside the Centrally Planned Economics) has grown from 40% to 48%. These countries price their oil at their own discretion. Over the last year, they have tended to underprice OPEC oil in order to maximize their output. Their impact is likely to continue to curb or at least restrain attempts by OPEC to raise its price in the absence of an underlying real economic need.

The big question is of course when that economic need will reassert itself. Currently there are two forces working on it in opposite directions. On the one hand, there is the basic fact that oil is a depleting resource with an inherent increasing cost structure. On the other hand, the present price of oil is such that further oil conservation, further substitution of oil by other fuels and the development of additional relatively high cost conventional oil sources remain economically attractive, and hence, will be undertaken. For the time being the second force is likely to exert stronger influence on prices than the first. Beyond 1990 the relationship could reverse itself.

WORLD⁽¹⁾ OIL SUPPLY DEMAND
(Million Barrels Per Day)

	<u>1981</u>	<u>1985</u>	<u>1990</u>
Oil Consumption	47.6	48.0-50.0	49-50
Adjustments ⁽²⁾	-1.3	+0.2	+0.2
Total Requirements	46.3	48.2-50.2	49.2-50.2
Non-OPEC Supplies ⁽³⁾	22.8	24.4	26.3
Required OPEC Production ⁽⁴⁾	23.5	23.8-25.8	22.9-23.9

(1) Excluding Centrally Planned Economies.

(2) Stock changes (Commercial and Strategic) and crude losses.

(3) Includes U.S. processing gain.

(4) Includes natural gas liquids.