

INTERNATIONAL FINANCE DISCUSSION PAPERS

NEW TRENDS IN THE ENERGY-PETROLEUM SITUATION
OF EUROPE AND JAPAN

by

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I.

New Trends in the Energy-Petroleum Situation
of Europe and Japan

The serious disruption of normal oil supplies in the world market following the outbreak of new hostilities in the Middle East has dramatically demonstrated the extreme dependence of Europe and Japan on oil imports. This sudden crisis came at a time when important new trends have been gathering momentum in the energy-petroleum situation and in national energy policies. The current crisis and the heightened public awareness in the industrialized nations of their dangerous vulnerability to vagaries of the international petroleum market, can now be expected to accelerate greatly the new trends, and may signify a major turning point in the world petroleum situation. It will be the objective of the following study to examine these trends, and their implications for future oil-import needs of Europe and Japan.

Changing Patterns of Europe's Energy Consumption

During the decade of 1960's, OECD Europe^{1/} underwent a change in its energy position which was more radical and rapid than anything ever experienced by the United States. As a result, Europe has lost most of its self-sufficiency in energy and has become highly dependent upon petroleum imports. The underlying factors were quite similar to those behind a more recent change in the U.S. position in energy and petroleum, although in the Europe's case their strength and the resulting consequences were considerably greater.

As in the U.S. case, one of the key factors was a very rapid growth in energy consumption that accompanied the acceleration of Europe's economic growth in the 1960's, and a major increase in the energy-intensiveness of its economy. (Table 2, Entry 6). Between 1960 and 1970, total energy consumption was growing at an average annual rate of about 5.5 per cent, compared to 4.2 per cent in the U.S. The average annual rate at which Europe's GNP grew in the 1960's was 4.8 per cent, meaning that there was a steady increase in energy consumption per unit of GNP.

An even greater impact on Europe's energy situation resulted from the radical shift in its energy demand mix. Within a short period of time, coal which had been traditionally the mainstay of Europe's energy supply was replaced in that role by oil. The decline of coal was both relative and absolute. Its indigenous production declined from 535 million tons in 1960 to 435 million tons in 1970^{2/} while its share in total energy consumption fell precipitously from over 60 per cent in 1960 to less than 30 per cent in 1970. (Table 1). Unlike in the United States, natural gas provided for only a minor portion of Europe's energy needs during the 1960's. The burden of meeting rapidly growing energy demand thus fell increasingly on petroleum, whose share in total energy consumption rose dramatically from under 33 per cent in 1960 to 60 per cent in 1970. (Table 1).

The European coal industry was in no position to meet the steeply rising energy demand. Although still plentiful in some of the producing countries, mainly in West Germany and Britain, most of

^{1/} Everywhere in this text, Europe (OECD Europe) is defined as including the following countries: Austria, Belgium, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland, Turkey and United Kingdom.

^{2/} OECD "Oil-The Present Situation and Future Prospects" a Report by the OECD Committee, p. 22, Paris, 1973.

Table 1

Share of Principal Energy Sources in the
OECD Europe's Energy Consumption
 (Percentage Distribution)

	<u>Coal</u>	<u>Petroleum</u>	<u>Gas</u>	<u>Hydropower</u>	<u>Nuclear Power</u>
1950	83.8	13.5	.3	2.4	
1955	75.6	20.8	1.0	2.7	
1960	61.2	32.6	1.8	4.2	.1
1961	58.1	35.4	2.0	4.3	.1
1962	55.4	38.3	2.1	4.0	.2
1963	52.7	40.8	2.0	4.1	.3
1964	48.6	44.8	2.2	3.8	.5
1965	44.7	48.0	2.3	4.1	.7
1966	40.7	51.5	2.6	4.3	.9
1967	37.8	53.8	3.2	4.1	1.0
1968	35.4	55.4	4.2	3.9	1.0
1969	32.9	57.2	5.3	3.5	1.1
1970	29.3	59.5	6.7	3.4	1.0
1980	13.6	63.3	13.1	2.7	7.1
<u>Enlarged EEC</u>					
1971	27.8	57.9	9.5	3.3	1.3
1972	25.4	59.2	11.5	3.4	1.6
1973	23.0	58.8	12.8	3.3	1.8

Sources: Data for 1950 and 1955 from J. Darmstadter "Energy in the World Economy" The Johns Hopkins Press, 1971; Data for 1960-1970 and projections for 1980 from: OECD Oil Committee "Oil-the Present Situation and Future Prospects" Table 2, p. 42, Paris, 1973.
Petroleum Press Service, August 1973, p. 302.

the remaining coal deposits were at deep levels and in small pockets, which made their mining highly labor-intensive. With lagging mechanization and soaring labor costs, the European coal industry rapidly lost its competitiveness both to oil and to imported coal.

Compared to coal, oil offered not only immediate price advantages, but also considerable conveniences in transportation, storage and use, which produced their own savings. With discovery and development of huge new oil deposits in the Middle East and North Africa in the 1950's and early 1960's, oil supplies to nearby Europe became plentiful and above all, quite reliable, under conditions of a strong buyer's market. In comparison, supplies of indigenous and imported coal were becoming less certain, in part due to rising labor problems, making it increasingly difficult for the industrial consumers to schedule production or to plan capacity expansion. Reliability of supplies is just as crucial a factor in determining demand for different energy sources as their relative prices. Not surprisingly, the process of oil substitution for coal had gathered momentum in Europe some years before 1966 when oil became fully competitive with indigenous and imported coal.

Still another factor responsible for the rapid growth of Europe's demand for oil in the 1960's was the development of the petrochemical industry in Europe. Between 1960 and 1970, non-fuel consumption of oil in Europe was growing on an average of 16 per cent a year, compared to a 12 per cent average annual growth rate of total oil consumption.

Europe's rising demand for oil in the 1960's was met almost entirely by imports. Indigenous production of oil remained of only marginal importance, and its volume had been declining for some years prior to 1971 when the exploitation of the North Sea deposits reached commercial quantities. Petroleum imports grew at an average annual rate of 11.4 per cent between 1961 and 1971. They accounted for 97 per cent of the apparent oil consumption in 1960, and for almost 100 per cent in 1971. (Table 2, Entry 2). The share of oil imports in Europe's total energy consumption, at the same time, increased from 30 per cent in 1960 to almost 60 per cent in 1970. In comparison, the share of oil imports in U.S. energy consumption even in 1972 was only 15 per cent.

Table 2

OECD Europe's Petroleum Production,
Imports, Exports and Consumption
(Millions of Barrels a Year)

	Annual Average			1970	1971	1972	1980	Annual Average 1972-80
	1961-63	1964-66	1967-69					
1. <u>Indigenous Production</u>	119	149	154	164	157	162	1,307	
Percentage change/year	+6.3	+5.8	+1.0	+7.1	-4.5	-3.2		+27.0
2. <u>Imports</u>	1,913	2,713	3,712	4,634	4,823	5,042 ^{a/}	6,818	
Percentage change/year	+15.2	+11.4	+11.0	+11.9	+4.1			+ 3.9
Crude Petroleum	1,610	2,407	3,430	4,367	4,549	4,910 ^{a/}		
Percentage change/year	+14.1	+14.0	+12.6	+12.7	+4.2			
Petroleum Products	303	306	282	267	289	132 ^{a/}		
3. <u>Exports</u>	69	50	111	149	123			
4. <u>Apparent Consumption</u>	1,963	2,812	2,755	4,649	4,858	5,204	8,125	
Percentage change/year	+15.8	+11.7	+10.9	+10.8	+4.5	+7.1		+ 5.4
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5. Share of imports in petroleum consumption	97.4	96.5	98.8	99.7	99.3	96.9	83.9	
6. Growth rate of total energy consumption	+7.3	+3.9	+6.1	+7.1				+ 5.4

Sources: 1. OECD "Oil Statistics, 1971" Paris 1972;
2. OECD "Oil Statistics, 1968" Paris 1969;
3. Data for 1972 from Petroleum Press Service, June 1973, p. 218 and
OECD "Provisional Oil Statistics by Quarters, 4th Quarter 1972;"
4. Projections for 1980 and data for total energy consumption from
OECD "Oil-The Present Situation and Future Prospects" p. 42,
Paris 1973.

^{a/} Net imports

A New Trend

There are strong indications that the period of rapid growth of European oil imports is over, and that from now on Europe's requirements for oil import will be growing at a much slower rate than in the past decade, or may even remain static. A number of important new elements have appeared in European energy situation just in the past year, giving rise to a new trend substantially different from the one that prevailed during the 1960's.

One of the new developments has been the emergence of a wholly new perspective for the indigenous oil production; as a result of recent discoveries in the North Sea and offshore Spain. At the end of 1972, the Commission of the European Community predicted that production from the North Sea deposits would reach some 1.1 billion barrels a year by 1980,^{3/} equivalent to about 13 per cent of Europe's consumption of oil in that year as projected by the OECD Oil Committee. (Table 2, Entry 4). Petroleum industry sources at that time predicted an even higher level of production: about 300 million barrels a year by 1975, 550 million barrels by 1978, and between 1460 and 1820 million barrels a year by 1980,^{4/} equivalent to 18-22 per cent of the projected oil demand.

As a result of additional discoveries in the first half of 1973, both official and industry sources have sharply revalued their projections. Thus, some industry sources now predict that the oil production in the North Sea may go as high as 2.2 billion barrels a year in early 1980's.^{5/} This would be equivalent to more than 40 per cent of the volume consumed in Europe in 1972, and to almost 30 per cent of the projected consumption in 1980. On the basis of these optimistic projections alone, the average annual rate of growth of oil imports by OECD Europe as a whole would thus be reduced to 2.9 per cent during the rest of this decade, compared to 3.9 per cent projected by the OECD Oil Committee. (Table 2, Entry 2).

It costs at least 20 times more to produce oil in the North Sea than in the Middle East and North Africa, more than enough to offset savings resulting from smaller shipping costs for the North Sea oil. That oil, however, offers an increasing advantage of supply reliability. Increasing uncertainty of oil imports has forced the European governments to take a new look at the evolving energy situation and at their own energy policies. In a rather sharp departure from the complacent attitude towards growing dependence upon oil imports, the European governments have recently begun searching for ways to reduce this dependence.

3/ "Oil for the 'Eighties" in Petroleum Press Service, January 1973, p. 6.

4/ "Europe's Energy Balance" in Petroleum Press Service, December 1972, p. 445.

5/ "North Sea's Latest Estimates" in Petroleum Press Service, June 1973, p. 204.

A substantial change, for example has taken place in their attitude towards the coal industry. In the past two years, indigenous coal production has continued to decline despite heavy governmental subsidies and rising prices of oil imports. Recent changes in monetary parities have further eroded competitiveness of European coal. In hard business logic, it may seem more practical to close most of the remaining coal mines. Indeed, until early 1973 it had been taken as a virtual certainty that the indigenous coal production in Europe would continue its precipitous decline. The OECD Oil Committee has predicted that coal production in Europe would drop by almost 40 per cent by 1980 from the 1970 level,^{6/} and that the share of coal in total energy consumption would fall from almost 30 per cent in 1970 to 13.6 per cent in 1980. (Table 1).

It appears now, however, that the expected decline in domestic coal production may be significantly slowed down. Energy costs are increasingly becoming a secondary consideration after those of supply security and reliability. Since early 1973, both the U.K. and West Germany have adopted a new policy aimed at stabilizing domestic coal production at somewhat below the current level, and other coal-producing countries, with exception of the Netherlands, would probably follow the suit.^{7/} If coal production in Europe as a whole is indeed stabilized at the level of about 250 million tons (about 300 million tons were mined in 1972), then the share of coal in Europe's total energy consumption in 1980 will be about 14.7 per cent, rather than 13.6 per cent as projected by the OECD Oil Committee, and correspondingly the share of oil would be 62.2 per cent, 1.1 percentage point lower than currently projected. Together with expected oil production in the North Sea, this would reduce the average annual rate of growth of oil imports to 2.1 per cent.

The levelling off of European oil imports is also the result of the growing role of natural gas. Over the past two years, natural gas production in the enlarged EEC, for example, has jumped 44.5 per cent while consumption of natural gas increased more than 47 per cent.^{8/} Western Europe's proven natural gas reserves, both off-shore and inland, are equivalent to about one-tenth of the world total. It was predicted at the end of 1972 that production from these deposits would reach some 200 billion cubic meters by 1975, compared to 80 billion cubic meters produced in 1970, while an additional 40 billion cubic meters would be imported each year under already concluded long-term agreements.^{9/} The OECD Oil Committee predicts a slower rate of expansion of indigenous gas production, bringing the volume of production to 225 billion cubic meters by 1980, and the share of natural gas in Europe's total energy consumption from 6.7 per cent in 1970 to 13.1 per cent by 1980.^{10/} In the light of more recent discoveries of additional oil and gas deposits in the North Sea, both projections now appear too low. For example, production projections for the Dutch mainland have been revised sharply upward. Only a year

6/ OECD "Oil-The Present Situation and Future Prospects" a Report by the OECD Oil Committee, Paris, 1973, p. 42.

7/ Journal of Commerce, August 30, 1973.

8/ Petroleum Press Service, August 1973, p. 302.

9/ Petroleum Press Service, December 1972, p. 445.

10/ OECD "Oil-The Present Situation and Future Prospects" op. cit. Ibid.

ago, it was expected that output from Dutch natural gas deposits would reach 90 billion cubic meters a year not earlier than 1980-85. More recently this date has been advanced to 1975.^{11/}

Europe's energy demand mix is being further altered by the rising role of nuclear power. Its contribution to energy supplies has been marginal so far, but the rising costs of fossil fuels, especially petroleum, have made nuclear power stations quite competitive with those fired by coal and oil. The share of nuclear power in total energy consumption is thus expected to jump from a mere 1 per cent in 1970 to 7 per cent in 1980. (Table 1). Under the conditions of increasing uncertainty over future oil imports, this projection may prove to be too conservative.

As a result of the sharp increase in demand for other than oil energy resources, the growth rate of Europe's oil consumption has dropped almost half in the past 3 years, from the annual average of 11 per cent in the second half of 1960's to slightly below 6 per cent in 1971-73. (Table 2, Entry 4). The growth of oil consumption will most probably continue to decelerate in years to come, with the average annual rate through the end of this decade falling considerably below the projected 5.9 per cent. It is highly significant that in 1973, for the first time in two decades, the long-run historical trend of a rising petroleum share in total energy consumption of principal European countries (members of the enlarged EEC) is being reversed, mainly due to rapidly rising use of natural gas and nuclear power. (Table 1).

The rising share of other energy resources in Europe's energy supplies and the rapid expansion of domestic oil production will have an even greater impact on Europe's oil import requirements if its overall energy consumption growth rate is slowed down. The OECD Oil Committee predicts that Europe's energy consumption will grow at an average annual rate of 5.4 per cent between 1970 and 1980, essentially at the same rate as in the 1960's. (Table 2, Entry 6). The Committee derived this projection by applying the GNP growth rate of 4.8 per cent per annum that had been projected by OECD back in 1970 (also an extrapolation of the 1960's trend) and by assuming a continuing increase in energy use per unit of GNP.^{12/}

11/ Petroleum Press Service, February 1973, p. 68.

12/ OECD "Oil-The Present Situation and Future Prospects" op. cit, p. 23.

In view of the far-reaching changes in the international petroleum-energy situation and a dramatic reversal of the long-run historical trend of declining relative energy costs, the assumptions underlying the Oil Committee's projection of Europe's energy consumption are probably no longer valid. Steeply rising energy costs as well as the growing uncertainty over future energy imports can be expected to result in a decline in the energy consumption per unit of GNP, and may even lead to a slow down in GNP growth. It may be quite symptomatic that over the past four and a half years, U.K. energy demand has increased more slowly than the GNP. For every one per cent increase in GNP there was an average increase of only 0.6 per cent in the use of energy. Energy consumption in Britain did not increase at all during the first half of 1973.^{13/}

If the above mentioned optimistic expectations concerning domestic production of oil and coal are fully realized, even a half percentage point decline in Europe's projected energy consumption growth rate would reduce its oil import needs in 1980 to about 5.2 billion barrels a year, some 35 per cent less than the amount projected by the OECD Oil Committee. (Table 2, Entry 2). In that case, Europe's oil imports would be growing through the end of this decade at an average annual rate of less than 1 per cent. In comparison, U.S. oil imports have been only recently projected to grow at an average annual rate of close to 9 per cent, reaching about 3 billion barrels a year by 1980.^{14/} Despite a much smaller initial base of U.S. oil imports (1.7 billion barrels in 1972 compared to 5.1 billion barrels in Europe's case), the annual increment to U.S. oil imports in the second half of the 1970's in that case would on the average, be almost 4 times larger than in the case of Europe.

Japan's Response to the Energy Crisis

Among the major industrial nations, Japan is by far the most dependent on oil imports for its energy needs and thus is facing the most difficult problem as a result of recent radical changes in the international petroleum situation. Japan's overall energy consumption more than tripled in the last decade, growing at an average annual rate of over 12 per cent, double the rate of growth in the United States. Unlike the United States and Europe, Japan, however, did not reduce coal consumption, which increased in absolute terms some 30 per cent between 1960 and 1970. Even so, the share of coal in her total energy consumption dropped from 55 per cent in 1960 to 23 per cent in 1970, with almost 60 per cent of the coal consumed now being imported. The greater part of the

^{13/} Journal of Commerce, August 23, 1973.

^{14/} An average of the projections by the U.S. Department of the Interior and by National Petroleum Council.

Table 3. Japan's Petroleum Production, Imports, Exports and Consumption
(Millions of Barrels a Year)

	Annual Average				Annual Average 1971-72
	1961-63	1964-66	1967-69	1970	
1. <u>Indigenous Production</u>	5.2	5.0	5.5	5.6	5.6
Percentage change/year	+17.0	-	-	-	-
2. <u>Imports</u>	355.2	629.8	1033.9	1450.6	1693.0
Percentage change/year	+24.5	+17.8	+18.8	+19.8	+ 9.0
Crude petroleum	312.0	557.7	936.3	1300.9	1424.2
Percentage change/year	+24.0	+18.6	+18.8	+17.3	+ 9.5
Petroleum products	43.2	72.1	97.6	149.7	129.3
Percentage change/year	+23.0	+10.4	+18.4	+32.7	-13.6
3. <u>Exports</u>	23.0	53.1	57.6	47.9	1279.1
4. <u>Domestic Consumption</u>	292.3	507.7	837.6	1178.1	1321.5
Percentage change/year	+23.9	+17.8	+20.0	+18.2	+ 6.8
5. <u>Total Energy Consumption</u>	+11.3	+11.1	+13.4	+11.7	+ 5.9
Percentage change/year					

- Sources: 1. The Japanese National Committee of the World Petroleum Congresses
"The Petroleum Industry in Japan", Tokyo, 1971;
2. Government of Japan, Minerals, Oil and Coal Mining Bureau
"Japanese Fiscal Year 1973-1977: Oil Supply-Demand Plan" March 14, 1973;
3. Japan Tariff Association, Japan Exports and Imports, Commodity by Country, 1972/12;
4. Data for total energy consumption from OECD "Oil-The Present Situation and Future Prospects" p. 46., Paris 1973.

increase in the overall energy consumption was made up by petroleum, whose share in Japan's energy market jumped from 36 per cent in 1960 to 72 per cent in 1970.^{15/}

Indigenous oil production in Japan has stagnated at the marginal level of a mere 5.5 million barrels a year, meeting less than one per cent of the total oil demand during the 1960's and less than half of one per cent during the past three years. Oil imports thus had to meet the entire increase in oil demand for energy needs, as well as a ten-fold increase in oil consumption for non-energy purposes. Petroleum imports were growing at an extraordinary rate of 20 per cent a year during the 1960's. This was twice as fast as Japan's aggregate imports. Petroleum imports almost tripled in volume in the first half of the decade, and more than doubled again in the second half. (Table 3, Entry 1). In comparison, Western Europe's oil imports were growing at 12.5 per cent a year in the last decade, and U.S. oil imports at only 6.5 per cent.

The proportion of energy in Japan's total imports increased from about 12 per cent in 1955 to more than 24 per cent in 1971. Imports of primary energy sources, largely petroleum, comprised 43 per cent of Japan's total energy requirements in 1960, but rose to 85 per cent by 1970, indicating an extreme vulnerability of Japanese economy to any major change in the international energy-petroleum situation. Western Europe and particularly the United States are less vulnerable in this respect, depending on imports for 60 and 15 per cent of their respective energy needs.

Unlike the United States or Western Europe, Japan has only very limited potential for expansion of domestic oil production, or for development of alternative sources of energy. Potential for expansion of hydro-power, which in 1970 contributed about 3 per cent of total energy requirements, has been all but exhausted. Natural gas contributed only 1.4 per cent of total energy consumed in 1970, and its share is expected to reach 2.25 per cent of the total by 1980. Nuclear power at the same time contributed in 1970 less than one half of one per cent, but according to the OECD Oil Committee, should account for at least 6 per cent of total energy consumption by 1980.^{16/} Clearly, petroleum imports would still have to meet the bulk of the projected future energy requirements. (Table 4).

^{15/} OECD "Oil-The Present Situation and Future Prospects" op. cit., p. 46.

^{16/} Ibid.

At the time of deepening international petroleum crisis, the only avenue open to Japan for reducing her extreme dependence on oil imports is an all-out effort to conserve energy and to reduce drastically energy consumption growth rate. Industry accounts for more than 60 per cent of total energy consumption. It is logical therefore that the Japanese should focus this effort on the energy-related industries, those that use primary energy sources as their raw material and those that employ energy-intensive technology. Indeed, the rapid growth of energy consumption during the past decade was largely due to the emphasis in Japan's industrialization on such energy-related industries as petrochemicals, primary metal-processing, heavy machine-building. By curbing further capacity expansion in such industries and reducing capacity utilization in enterprises that are particularly energy-intensive, the Japanese now hope to reduce sharply the growth rates of energy-consumption and oil imports.

Virtually all energy-intensive industries, particularly petrochemicals and primary metal-processing, are also highly pollutant. Their concentration in the very limited land area of Japan has resulted in a widespread environmental destruction and in intolerable levels of pollution. Consumption of energy per square mile of populated land and the level of industrial pollution in Japan are the highest of all industrial nations. It has been estimated that if Japan had an industrial structure similar to that of the United States or Western Europe, its current level of pollution would be 20 to 40 per cent lower.^{17/} In the past few years, pollution and environmental destruction have become an explosive political issue, with public pressure mounting for an immediate curb on further capacity utilization in the most pollutant industries.

A major restructuring of Japanese industry is thus viewed as the most promising, if not the only available way to solve both the energy and the pollution crises. Pressure for such a restructuring has gained momentum since early 1973. In February 1973, the Japanese cabinet approved a new five-year plan for 1973-1977, which represented a significant revision of the plan that had been adopted only a year before. The new plan envisions a major slow down in the rates of growth of chemical and metal-

^{17/} Government of Japan, the Environment Agency "The Environmental White Paper" quoted in the Oriental Economist (Tokyo), August 1973, p. 10.

Table 4. Projections of Japan's Petroleum Production, Imports and Consumption
(Millions of Barrels a Year)

	Actual		Projection A '73					
	<u>1967-70</u>	<u>1971-72</u>	<u>1973</u>	<u>1974</u>	<u>1975</u>	<u>1976</u>	<u>1977</u>	<u>1973-77</u>
<u>Domestic Production</u>		5.6	5.7	5.7	5.7	6.3	9.4	
<u>Average Change (%/Yr)</u>			1.8		+10.5	+49.2	+10.9	
<u>Imports</u>		1693	1903	2022	2141	2290	2424	
<u>Av. Change (%/Yr)</u>	+18.1	+8.1	+12.4	+6.3	+5.8	+6.9	+5.7	+7.5
<u>Consumption</u>		1321	1439	1714	1841	1972	2091	
<u>Av. Change (%/Yr)</u>	+19.1	+5.9	+6.8	+19.2	+7.4	+7.1	+6.1	+9.6
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		Projection B '72		Projection C '72		Projection D '71		
		<u>1976</u>	<u>1973-76</u>	<u>1980</u>	<u>1973-80</u>	<u>1975</u>	<u>1973-75</u>	
<u>Domestic Production</u>				16.8	+14.7%	5.7	+0.7%	
<u>Imports</u>				3387.2	+9.1%	2296.7	+10.7%	
<u>Consumption</u>		2064.6	+11.8%	3404.0	+12.6%	2149.2	+17.6%	

Sources: 1. Actual: same as in Table 9;

2. Projection A: Government of Japan, Minerals, Oil and Coal Mining Bureau "Japanese Fiscal Year 1973-77: Oil Supply-Demand Plan" March 14, 1973;

3. Projection B: Government of Japan, Minerals, Oil and Coal Mining Bureau "Japanese Fiscal Year 1972-76: Oil Supply-Demand Plan" 1972;

4. Projection C: OECD Oil Committee "Oil-Present Situation and Future Prospects" p. 46 (based on data provided by the Japanese delegation (1972?));

5. Projection D: The Japan National Committee of the World Petroleum Congresses "The Petroleum Industry in Japan" Tokyo, 1971 (quoting Japanese Government data).

processing industries, and a reduction of their contribution to GNP (which increased from 11.5 per cent of the total in 1960 to 15.6 per cent in 1972) to 15.1 per cent by 1977.^{18/} Only the machine-building industry as a whole is expected to increase its share on GNP, according to the plan, which also foresees a substantial decline in the rates of economic growth, business plant and equipment investments, and exports.

Reform of Industrial Structure

A month later, the Study Group for Industrial Planning, an influential private organization representing broad business interests, came out with a concrete plan of the reform of Japan's industrial structure.^{19/} The plan quickly received wide publicity, general public acceptance, and a virtual governmental endorsement. It calls for a decisive break with the past industrial policies that emphasized quantitative aspects of growth and development of heavy and petrochemical industries.

In essence, the plan envisions an immediate suspension of further capacity expansion in such energy-intensive and polluting industries as petroleum-refining, petrochemicals, iron and steel, non-ferrous metals, pulp and paper, and trimming utilization of their already existing capacities to Japan's own domestic needs. It also calls for phasing out within next 8 years of all primary stages of material processing in these industries, leaving in Japan only higher, more sophisticated stages of material processing that are less energy-consuming and polluting. Capacities for primary processing will be set up by Japanese firms, with Government assistance, in the less-developed countries for export to Japan of various intermediate products, such as pig iron, steel ingots, refined petroleum products, fertilizers, and others.

Heavy industries that are highly material-intensive and therefore are also responsible for inordinate energy consumption and pollution, would also be phased out, leaving in Japan only those operations that require highly skilled labor and high-technology. The plan specifically mentions the automotive industry, calling for an early termination of car-manufacturing in Japan, with the exception of some high precision components.

^{18/} Government of Japan "Basic Economic and Social Plan, Fiscal 1973-1977" in the Bank of Tokyo Semiannual Report, October 1972-March 1973, June 1973, p. 35.

^{19/} The Study Group for Industrial Planning "Reform of Japan's Industrial Structure" in Keidanren Review, No. 26, Spring 1973, published by the Japan Federation of Economic Organizations.

Existing capacities in heavy-industry would be gradually transferred to the less-developed countries, while Japan's industrial structure would be increasingly shifted towards a greater proportion of high-technology, precision manufacturing, sophisticated material processing, and research and development types of industries.

In line with the proposed reform of the industrial structure, the plan also advocates an early adoption of measures that would reduce consumption of electric power by industries, including the abolition of special power rates for some key industries. Future expansion of generating capacities in Japan will be determined primarily by the availability of assured fuel supplies, rather than by the anticipated demand as was done in the past. Expansion of transportation in Japan will also be greatly scaled down, especially interregional shipment of bulky cargoes, and private car ownership.

In recent years, structural changes similar to those outlined above have been already taking place in Japan's industry. So far, stimulus has come mainly from the growing labor shortages and costs, and more recently from the pollution-control legislation and public pressure. The energy crisis, the sharp rise in oil-import costs and growing unpredictability of future oil supplies, has added a powerful new impetus to this process, further accelerating its tempo and widening its scope. It thus has become imperative that the restructuring process be carried out in an orderly manner, on an organized, planned basis, in order to prevent economic disruptions, reduce costs and preserve basic competitiveness of Japanese exports.

With their tradition of close cooperation and trust between industry and the government, and proven ability to institute rapid policy changes, the Japanese seem to be well prepared for such a bold economic experiment. They enjoy a distinct advantage in this respect over other industrialized nations. The need for far-reaching structural changes is apparently growing in Europe, and to lesser extent even in the United States. Yet it is doubtful that they will be able to respond to such a need as rapidly and in as orderly a fashion as the Japanese. Pressure for protection of domestic extractive industries and other special interests may be a serious hindrance both in Europe and especially in the United States.

Radical change of world petroleum prospects and accelerating structural changes in Japan's economy in the past few years have already resulted in a major scaling down of official government projections of future oil demand and imports. Thus, in 1971 Japan's domestic oil consumption was projected to reach 2150 million barrels a year by 1975. (Table 4, Projection D). This target implies an annual average growth rate of oil demand of 17.6 per cent between 1972 and 1975, which is not far below the 19.1 per cent rate registered in the second half of 1960's.

A year later, in 1972, the same reporting agency scaled down the projection to 11.8 per cent (Table 4, Projection B), and most recently, in March 1973 this projection was further reduced to an annual average rate of 9.6 per cent for the period of 1973-77. (Table 4, Projection A).

Significantly, this latest projection forecasts an even sharper drop in the growth rate of oil demand after 1974, to 7.4 per cent in 1975, 7.1 per cent in 1976, and 6.1 per cent in 1977. The annual average growth rate of oil imports has likewise been scaled down in successive projections, from 10.7 per cent to 9.1 per cent, and finally to 7.5 per cent. The latest projection expects the rate to drop as low as 5.7 per cent by 1977, (Table 4, Projection A), a truly extraordinary decline from the annual average growth rate of 18.1 per cent during 1967-70.

March 1973 projections do not yet reflect the potential impact upon oil demand and imports of the proposed structural changes. Once underway, the reform of the industrial structure should further reduce the projected rates of growth of oil consumption and imports. After all, this is one of its principal objectives.

Still additional reduction of these rates may come about if Japan's overall economic growth slows down more than is currently expected. The latest official projection foresees a GNP growth rate of about 9 per cent through the end of this decade, a significant decline from the average annual rate of more than 12 per cent in the second half of 1960's.^{20/} The element of an easy success in Japan's economic growth is all but gone, and from now on the rates of growth can be expected to drop off sharply, Harvard professor, Henry Rosovsky has noted.^{21/} There is a fundamental difference between economic growth associated with closing a technological gap and economic growth depending on extension of domestic and foreign technological frontiers. Efforts to reduce industrial pollution and country's vulnerability to the vagaries of the international petroleum market, as well as the rising public sentiment against further economic expansion, may also help to depress economic growth rates, and with them the rates of growth of oil consumption and imports.

Recent projections of Japan's future energy consumption were based on the assumption that any major reduction in energy demand by the industrial sector would be largely offset by a sharp increase in the energy demand by the household-service sector. Until recently, it had been taken virtually for granted that as Japan enters the mass-consumption age, it would generally follow the traditional Western patterns.

^{20/} "Basic Economic and Social Plan, Fiscal 1973-77" op. cit. p. 22.

^{21/} Henry Rosovsky "Japan's Economic Future" in Challenge, July-August 1973.

And these, as is well known, emphasize demand for energy-intensive, "big-ticket" items such as cars and individual houses, and various energy-consuming services.

These assumptions, however, may no longer be valid. Western patterns, after all, have evolved under the impact of declining energy costs and abundant energy supplies. Faced with sharply rising energy costs and unpredictable supplies, the Japanese are likely to evolve quite different patterns of energy consumption in their household-service sector. Energy consumption by this sector most probably will increase at a much slower rate than was expected. Indeed, it is of considerable advantage to Japan that it has been able to postpone for so long the advent of the mass-consumption age. With the household-service sector accounting for only 20 per cent of Japan's total energy consumption, the country is better equipped to deal with the dual energy-pollution crisis. In comparison, the share of this sector in total energy consumption is between 30 and 40 per cent in other industrialized nations. It is easier, both logistically and politically, to seek reduction of energy consumption in the industrial sector, than in the household-service sector.

Australia, New Zealand and South Africa

Oil-import needs of Australia, New Zealand and South Africa, three other developed, oil-importing countries in the non-communist world, are only a fraction of those of the United States, Western Europe and Japan. Australia, the largest oil-consumer among the three, furthermore, is rapidly moving towards a virtual self-sufficiency in energy and petroleum. When oil production commenced in 1964, the output was able to meet only 2 per cent of the domestic demand. By 1973, output increased more than 57-fold, meeting almost 60 per cent of demand and reducing Australia's import needs in half between 1969 and 1972. (Table 5).

Largely because of the rapid expansion of the energy-intensive processing industries, particularly primary metals, Australia's energy consumption has grown at an average rate of 5.6 per cent a year in the last decade, and is expected to grow at 6.0 to 7.0 per cent a year during the 1970's. Oil demand, however, is expected to grow more slowly. The country is richly endowed with coal, which accounts for some 40 per cent of her total energy consumption, and with natural gas, whose production is expanding even faster than that of oil. Australia is thus expected to reduce her reliance on oil for energy consumption and become almost totally self-sufficient in energy and oil by the end of 1970's.

Table 5. Australia, New Zealand, South Africa: Petroleum Production, Net Imports and Consumption in (10^6 Bbl./Yr.) and Average Annual Rate of Change in (per cent)

	<u>Million Barrels a Year</u>					<u>Average Annual Change (%)</u>		
	<u>1960</u>	<u>1965</u>	<u>1969</u>	<u>1970</u>	<u>1971</u>	<u>1961-65</u>	<u>1966-70</u>	<u>1970-71</u>
<u>Australia</u>								
Production	0	2.6	15.8	65.1	112.9	+9.1	+92.0	+167.0
Net Imports	80.9	125.2	163.1	122.3	84.5	+9.1	-.5	-39.0
Consumption	80.9	127.8	178.9	187.4	197.4	+9.5	+8.0	+5.0
<u>New Zealand</u>								
Production	0	0	0	.5	.8			
Net Imports	13.4	21.5	26.1	27.2	25.3	+9.9	+4.8	-1.4
Consumption	13.4	21.5	26.1	27.7	26.1	+9.9	+5.2	0
<u>South Africa</u>								
Net Imports	29.4	46.5	66.5	71.0	83.4	+9.6	+8.8	+12.0
Consumption	29.4	46.5	66.5	71.0	83.4	+9.6	+8.8	+12.0

Sources: U.S. Department of the Interior, Bureau of Mines,
"International Petroleum Annual" 1970 and 1971.

Indigenous oil production commenced in New Zealand only in 1971 on a very modest scale meeting only 3 per cent of her domestic oil demand in 1971. The country, however, has great potential in hydropower and geothermal power, that are already being exploited on a large scale. The recent discovery of a giant natural gas field off-shore adding on to the other resources has put New Zealand well on the way to a basic self-sufficiency in energy. Oil demand and imports, after growing at almost 10 per cent a year in the first half of 1960's, markedly slowed down in the second half. Both oil demand and imports declined in absolute terms in 1971, and are expected to continue declining in the years to come. (Table 3)..

In contrast, South Africa has no known oil or natural gas reserves and except for small oil production from coal, is almost totally dependent on imports for its petroleum consumption. With rapidly expanding economy, especially various energy-intensive processing industries, the country's oil demand and imports are growing at a high rate. (Table 3). South Africa, however, has rich coal and uranium deposits, and their expanded exploitation may offer an opportunity to reduce her dependence on oil imports.

A Turning Point in the World Petroleum Situation

Oil consumption in the non-communist world more than doubled in 1960's, while the combined oil imports of the energy-deficit countries more than tripled, mainly on account of the unprecedented expansion of oil consumption and imports by Western Europe and Japan. Yet, despite the spectacular increase in demand, the international petroleum situation remained remarkably stable throughout the decade. This was reflected in the easy supply conditions, and virtually stable prices under the conditions of a strong buyer's market.

One of the basic reasons for this stability was an even faster rate of discoveries and development of new oil deposits in the Middle East and North Africa in the late 1950's and in the 1960's. Another important reason was the fact that the largest oil-consuming country in the world, the United States, remained basically self-sufficient in energy and petroleum, and seemed to be capable of retaining this self-sufficiency almost indefinitely. The world petroleum market in the 1960's, moreover, was compartmentalized into two major trade zones: the Western Hemisphere, mainly Venezuela and Canada, providing the bulk of U.S. oil imports, and the Eastern Hemisphere, mainly the Middle East and North Africa, supplying almost exclusively Western Europe and Japan. About 85 per cent of European and Japanese oil imports still come from the Middle East and North Africa. The separation between the two zones was widened by the sharp increase in freight costs following the closure of the Suez Canal in 1967.

Even as late as 1970-1971, the prevailing view in Europe and Japan foresaw no end to the well-acquainted, easy conditions in the international petroleum situation. Few people overseas, or for that matter even in this country, paid much heed to some early warnings of a possible change in the U.S. energy-petroleum situation that could upset the world oil market. It was generally assumed that oil imports of both Europe and Japan would soon level off, after the process of oil substitution for coal was completed, thus assuring continuation of the easy conditions in the market. High hopes, furthermore, were still pinned on the early advent of the large-scale use of nuclear power and on the development of off-shore oil production, especially in the North Sea. Thus, despite their high dependence on oil imports, Europe and Japan appeared quite confident that their future oil-import needs, whatever they are, would be adequately and reliably met by supplies from the traditional sources in the Middle East and Africa. Their confidence was to be shattered soon.

The key factor in the radical turnabout in the international oil situation in the three years following 1970 was a sudden change in the energy-petroleum position of the United States. With sharp increase in domestic oil demand, U.S. oil imports doubled in volume between 1970-1973, and for the first time the United States emerged as a major competitor for the oil resources of the Middle East and Africa, setting off a violent chain reaction throughout the world oil market. There was a rapid and perceptible tightening of the supply conditions in the market, and fears became widespread that the known world oil reserves were not adequate to meet the projected oil demand of the industrialized countries. Almost overnight, the buyer's market was transformed into a seller's market, bringing to life a powerful cartel of petroleum-exporting countries (OPEC) and opening the way to unrestrained price increases. Between November 1970 and November 1973, export price (on f.o.b. basis) of typical Persian Gulf crude increased three-fold.

The rapid increase in U.S. oil imports from more distant sources has also placed a heavy strain on the available tanker fleet, sending tanker freight rates sharply upward. The United States' attempt to cover the shortfall in her own oil refining capacity with imports of oil products from Europe and Japan, both of which had a limited excess capacity at that time, resulted in tightening supply conditions in their domestic markets and price increases. To protect their own consumers, some European governments felt obliged to restrict or ban petroleum product exports even prior to the outbreak of the latest war in the Middle East.

The dramatic rise of oil-import costs, and even more, the shattered confidence in the reliability of oil supplies, have radically altered future oil consumption and import perspectives of Europe and Japan. The upheaval in the world oil market was undoubtedly an important factor in the sharp decline in the growth rates of their oil demand and imports in 1971-1973. The growth rate of Europe's oil demand and imports dropped from an average of 11 per cent a year during 1965-1970 to less than 6 per cent in 1971-1972, while the drop was even more precipitous in the case of Japan: from 20 per cent to 6 per cent for domestic oil demand, and from 19 per cent down to 8 per cent for oil imports. (Tables 2 and 3). All previous projections of their future oil demand and imports were also significantly scaled down even prior to the latest Middle East conflict, and in the light of the most recent oil supply disruptions, even the latest projections will have to be further revised downward.

With the turn for the worse in the international petroleum situation in the wake of the Middle Eastern conflict, the Europeans can be expected to step up the search and development efforts in the North Sea and halt and possibly reverse the decline of coal production. Both Europe and Japan are now most likely to make an all-out effort to speed up the expansion of nuclear power generation. The Japanese in particular can be expected now to double their efforts to conserve energy and to carry out the planned reform of their industrial structure in order to curtail further expansion of oil demand and to reduce their dangerous dependence upon oil imports. Even if the oil supplies in the world market were to be soon restored to their "normal" level and promises of their future increase were again issued, it is doubtful that this would detract the major oil-consuming nations from the new course designed to reduce their dependence on oil imports.

One of the possible consequences of the world energy-petroleum crisis could be a major relocation of energy-intensive industrial capacities from developed to less developed countries. If such relocation indeed takes place on a significant scale, the oil demand and imports of a number of less-developed countries will probably continue to grow as fast as in the recent past, and in some cases possibly even faster. An acceleration of LDC oil imports may thus partially offset the expected slow-down in oil imports of the industrialized countries. Nevertheless, the growth rate of the combined oil imports by all energy-deficit countries and regions outside the United States will most probably be much lower from now on than in the past.

The sharp acceleration of the growth rate of U.S. oil demand and imports in 1971-1973, at the time of a major slow-down in the growth rate of oil imports of other industrial nations, has made the United States a determining factor in the world oil market, on the demand side. Future developments in this market will be to a large extent determined by the success of U.S. efforts to check the unrestrained expansion of its oil demand and imports. An effective Arab embargo on oil exports to this country will add a powerful impetus to the efforts to bring on stream additional oil and gas resources, develop alternative sources of energy, and change the existing wasteful patterns of energy-petroleum consumption. These efforts, once they acquire momentum, can be expected to continue, irrespective of whether the embargo is lifted soon or not. An early restoration of a basic self-sufficiency in energy most probably will become from now on one of the national priorities.

Western Europe, Japan and the other oil-importing countries of the world will be the immediate beneficiaries of the costly U.S. efforts to reduce its dependence on oil imports. Early U.S. success in the development of alternative sources of energy would be of particular help in restoring a degree of stability to the international petroleum market. Not only would this have a highly beneficial effect on balance of payments position of major oil-importers, but it would allow them to save capital by reducing somewhat costly subsidies to their coal industries and oil stockpiles. It is clearly in the interests of all major oil-importers to cooperate closely in the development of alternative sources of energy and in working out adjustments in the trade and monetary arrangements to facilitate the necessary structural changes in their economies.

In the light of the dramatic increase in U.S. oil consumption and imports in 1972 and 1973, (oil imports increased at an average rate of 24.5 per cent a year between 1971-73) previous projections of future U.S. oil-import needs at first appeared to be very much on the low side, including even the "most pessimistic" projection by the National Petroleum Council of 3.5 billion barrels of oil imports by 1975 and 6.0 billion barrels by 1980.^{27/} Now, however, there is little doubt that U.S. oil imports will grow at a much slower rate in the future than the rates only recently projected or experienced in the past three years.

27/ National Petroleum Council, "U.S. Energy Outlook" December 1972.

Table 6. Possible Petroleum-Import Needs of Energy-Deficit Countries and Regions
(Billions of Barrels a Year)

	1972	1973 ^e	Average	Projections		Av. (%) Change/Year	
			% Change 1971-73	1975	1980	1974-75	1976-80
United States	1.7	2.3	+ 24.5	2.6	3.0	+ 6.3	+ 2.9
Western Europe	5.1	5.3	+ 7.6	5.8	6.4	+ 5.0	+ 2.0
Japan	1.7	1.9	+ 12.0	2.1	2.4	+ 5.0	+ 3.0
LDCs ^{1/}	1.1	1.2	+ 7.0	1.4	2.1	+ 7.0	+ 9.0
Other ^{2/}	.2	.2	+ 2.6	.2	.4	-	+14.9
TOTAL	9.8	10.9	+ 9.5	12.1	14.3	+ 5.4	+ 3.4

e= Estimates.

1/ Only net oil importers.

2/ Australia, New Zealand and S. Africa for 1972-75, and also Eastern Europe for 1980.

Sources: Same as in Tables 2-5; U.S. Department of Interior; The British Petroleum Company, Ltd., "B.P. Statistical Review of the World Oil Industry, 1972".

In the light of the most recent radical changes in the U.S. energy-petroleum situation and policies, even the "most optimistic" projections by the National Petroleum Council of 2.6 billion barrels of oil imports by 1975, and by Dr. Walter Levy of 3.0 billion barrels by 1980^{28/} appear quite realistic. These highly optimistic projections were based on the assumption of an early implementation of radical energy conservation and development measures, precisely those that are now being adopted.

Thus, the most recent projections by the OECD Oil Committee of 1980 oil imports of 6.8 billion barrels for Western Europe, 3.4 billion barrels for Japan and 3.5 billion barrels for the United States,^{29/} a total of 13.7 billion barrels, now appear to be on the high side. The same is even more true of the recent White House forecast of their^{30/} combined oil-import needs of 15.2 to 18.6 billion barrels by 1980.

In view of the current trends in the energy-petroleum situation and the existing potential for the development of various indigenous energy resources and for energy conservation in the oil-important countries and regions of the world, and given the new thrust of their energy policies, the figures in Table 6 can be now suggested as a possible approximation of their future oil-import needs. These estimates may also be closer than previous projections to the potentially realizable oil-import demand, i.e. the demand matched by oil supplies that might be actually available in the world market in the future.

28/ Walter J. Levy "An Atlantic-Japanese Energy Policy," address at the Europe-America Conference in Amsterdam, Holland, March 27, 1973.

29/ OECD Oil Committee "Oil-the Present Situation and Future Prospects," Paris 1973.

30/ The White House "The President's Energy Message", April 18, 1973.