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**RECENT ENERGY TRENDS**

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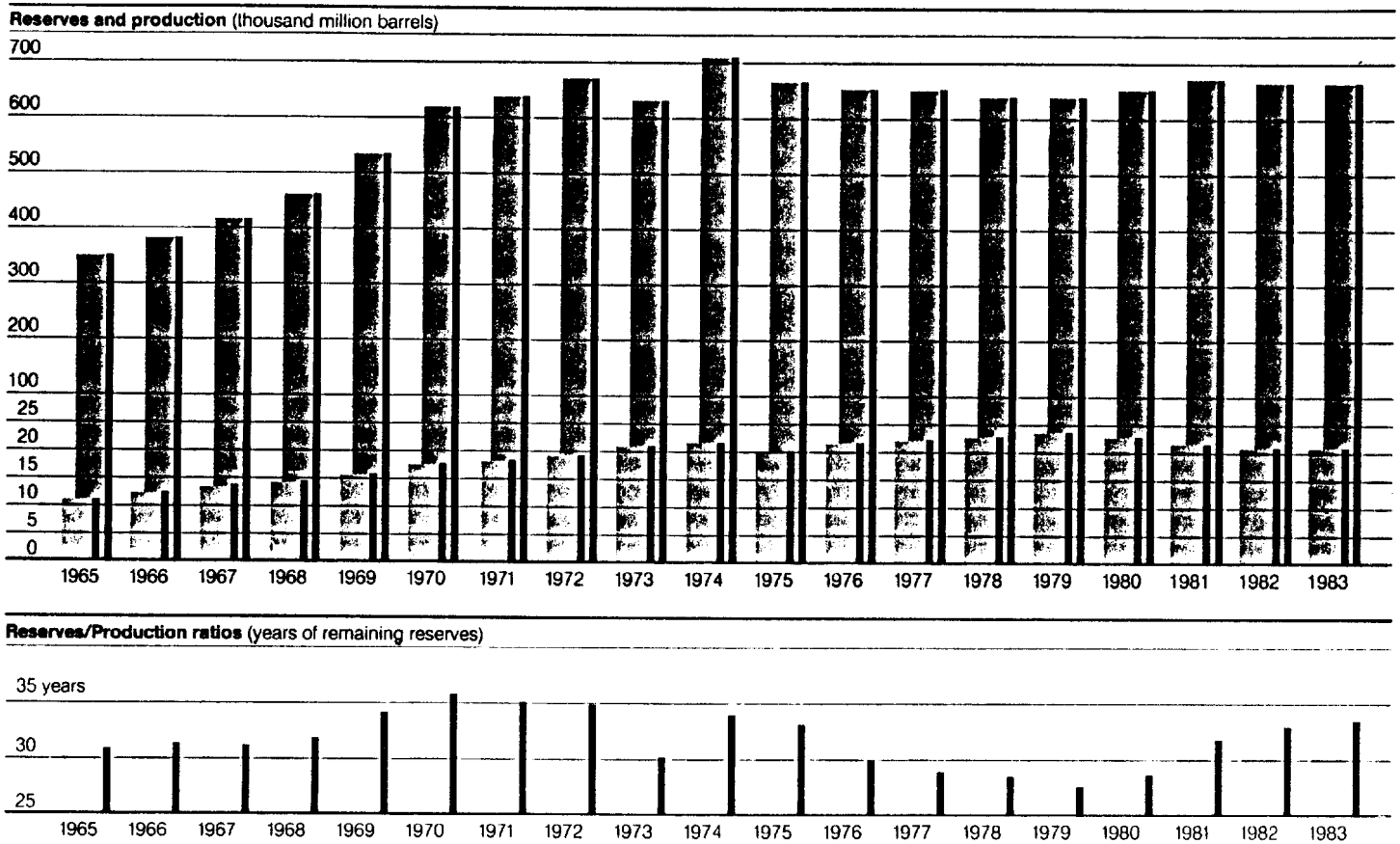
### 1. Introduction

The British Petroleum Company p.l.c. has recently issued the 1983 edition of the "BP Statistical Review of World Energy". The juxtaposition of eleven consecutive years of data, encompassing the two major OPEC price increases and the subsequent period of weaker prices, is highly thought provoking and provides a valuable perspective on today's energy market. This memorandum discusses what, in PIRINC's opinion, are the most interesting developments that are highlighted by an analysis of the BP statistics, and incorporates PIRINC's view on likely future developments into this historical analysis.

### 2. Oil Reserves and Production

The world reserves/production (R/P) ratio increased in 1983 for the fourth successive year, (Figure 1), further lessening the fears that built up in the late 1970's that oil resources were being depleted so rapidly that alternatives had to be urgently sought. The R/P ratio is now 33.4 years, only two years less than at its 1970 peak. Of course, much of the improvement is due to the 11% reduction in world oil consumption since 1979. However, the quintupling of the real price of oil between the end of 1973 and the beginning of 1980 also had a positive effect on reserves. Proved reserves at the end of 1983, at 678 billion barrels, were unchanged from end-1982 levels and were at the fourth highest level ever, being exceeded only in 1972, 1974 and 1981.

**FIGURE 1 OIL RESERVES, PRODUCTION AND R/P RATIOS**



Source: 1983 BP Statistical Review of World Energy.

Analyzing reserves solely on the basis of end-year volumes can provide a misleadingly optimistic view. Frequently only a proportion of a new discovery is booked initially. As development and production proceeds, a more complete and accurate picture of the reserves is built up, and the reserve estimate is increased accordingly. Of course, the upgrading of the reserve estimate can be particularly marked if oil prices increase substantially. If oil reserves are compiled on a discovery basis, i.e. all the reserves in a field or reservoir are placed

in the year in which that field or reservoir was discovered, a less sanguine view of the future trend in oil reserves emerges. The finding rate for new reserves of oil has been falling. Thus the stability in the end year reserves data was achieved primarily through upward revisions of known reserves; a process which cannot continue indefinitely, particularly with oil prices expected to fall in real terms.

Concurrent with the improvement in the R/P ratio, there has also been a sharp reduction in dependency on OPEC member countries for oil production (Table 1). Through the 60's and up until the quadrupling of oil prices at the beginning of 1974, OPEC's production level and its share of world production were growing. By 1973, 54% of the world's oil was supplied by OPEC, while less than 1/3 came from non-communist world areas outside of OPEC. For the remainder of the 1970's, OPEC was engaged in a holding action. Its production remained around 31 MMB/D, but its market share started to decline from its 1973 peak.

Radical changes in production patterns became apparent in the 1980's, as exploration and development projects instigated in response to the explosion in oil prices started to come on stream in a declining market. Forced by its cartel role to be the swing supplier, OPEC suffered a production decline of 40%, or 13 MMB/D, between 1979 and 1983, although total world production declined only 14%. In 1982, OPEC was superceded as the world's leading supplier of oil by the group of non-OPEC, free world producers. Aided by 45-50% increases in production in Western Europe, Latin

TABLE 1WORLD OIL PRODUCTIONSHARE BY AREA, 1965-1983 (%)

	<u>OPEC</u>	<u>CPE</u>	<u>REST</u>
1965	47	16	37
1970	50	17	33
1973	54	17	29
1976	52	21	27
1979	48	22	30
1980	44	24	32
1981	40	25	35
1982	35	26	39
1983	32	27	41

PRODUCTION, 1979-1983

(Millions B/D)

	<u>1979</u>	<u>1983</u>	<u>Growth (%)</u>
OPEC	31.5	18.3	-42
Non-OPEC			
N. America	11.9	11.7	- 1
Latin America	2.9	4.3	+50
W. Europe	2.4	3.5	+46
Africa	0.9	1.3	+46
Asia/Aust.	1.3	1.6	+21
Middle East	0.6	0.6	+ 5
CPE	<u>14.6</u>	<u>15.1</u>	<u>+ 5</u>
	65.8	56.4	-14

Note: CPE: Centrally Planned Economies - China, USSR, Albania, Bulgaria, Cuba, Czechoslovakia, East Germany, Hungary, Kampuchea, Laos, Mongolia, North Korea, Poland, Romania, Vietnam.

Source: 1983 BP Statistical Review of World Energy.

America and Africa, this group's market share had climbed to 41% by 1983, while OPEC's had fallen to less than a third.

The dramatic growth in the share of world production being supplied from the Centrally Planned Economies (CPE) has tended to be overlooked because most analysts focus on supply and demand in the Non Communist World (NCW) and incorporate just the net exports from the CPE's. Compared to the situation in 1965, the CPE's share of world production has increased by 2/3, while non-OPEC has grown only one-tenth and OPEC has declined by 2/3.

The revenue loss experienced by OPEC because of its production decline has been enormous. The member countries were substantially shielded from this loss initially because their official sales prices (OSP) were still rising. These peaked in 1981, and since then the producers' average OSP's have fallen by \$3.50 to \$9.00/Bbl, with the light crude producers cutting prices the most, and the heavy crude producers and Saudi Arabia cutting the least. In total, the organization's revenues from oil exports declined by \$119 billion, or nearly 44%, between 1980 and 1983 with \$94 billion of the decline occurring between 1981 and 1983 (Table 2). Saudi Arabia absorbed almost half of the 1980-83 revenue decline but, because its prices had lagged those of the other cartel members and were then realigned in late 1981, its share of the revenue decline rose to two-thirds over 1981-83. Every other member country, with the exception of Iran, whose exports in 1980/81 were severely curtailed by political and military events, also experienced sharp reductions in oil export

earnings. Since all the OPEC member countries are highly dependent on oil as a source of export income, and since their expectations for the 1980's would have been for revenue growth, this revenue loss has created serious strains in the economies of most of the countries.

TABLE 2

OPEC OIL EXPORT EARNINGS

	<u>1980</u>		<u>1981</u>		<u>1983</u>	
	<u>Exports</u> (MMB/D)	<u>Revenue</u> (\$ Bn.)	<u>Exports</u> (MMB/D)	<u>Revenue</u> (\$ Bn.)	<u>Exports</u> (MMB/D)	<u>Revenue</u> (\$ Bn.)
S.A.	9.3	96.8	9.1	106.8	4.2	44.1
Kuwait	1.5	16.9	1.0	12.7	0.9	9.1
U.A.E.	1.6	18.5	1.4	18.3	1.0	10.8
Iran	0.9	11.0	0.8	10.9	1.9	18.9
Iraq	2.4	27.2	0.7	9.2	0.8	8.5
Qatar	0.5	5.4	0.4	5.3	0.3	3.1
Algeria	0.8	10.6	0.7	9.8	0.5	6.0
Libya	1.7	22.2	0.4	14.7	1.0	10.8
Nigeria	1.9	24.4	0.7	17.5	1.0	11.2
Gabon	0.2	1.9	1.0	1.8	0.1	1.5
Venezuela	1.8	17.5	1.2	19.5	1.4	13.4
Ecuador	0.1	1.9	0.1	1.6	0.1	1.4
Indonesia	<u>1.2</u>	<u>13.4</u>	<u>1.2</u>	<u>15.0</u>	<u>0.9</u>	<u>10.1</u>
	23.9	267.7	19.4	243.1	14.1	149.0

Sources: PIW

International Crude Oil and Product Prices:

International Energy Statistical review: CIA

Notes:

1. Excludes NGL.

2. Product and crude sales for each country assumed to be at average crude OSP.

OPEC's loss of dominance of world oil production, its substantial surplus of production capability and the dramatic cuts in its revenue have all contributed to a weakening in the cartel's ability to sustain an artificially high crude oil price. If OPEC succeeds in maintaining its \$29/Bbl marker price through

this current period of market weakness, further tests of its collective control of prices will occur intermittently over the next several years.

The current reduction in OPEC dependency should not be assumed to be a permanent feature of the market. Oil reserves are distributed very unequally.

TABLE 3

PROVED OIL RESERVES, END 1983

(billion bbls)

	<u>Volume</u>	<u>Share (%)</u>	<u>R/P Ratio</u>
Middle East	369.7	54.5	85.1
OPEC	448.3	66.1	68.1
CPE	84.3	12.4	15.5
Rest World	145.1	21.5	17.5
Total	677.7	100.0	33.4

Source: 1983 BP Statistical Review of World Energy.

Over 75% of the world's proved reserves are located in the USSR and OPEC countries combined, with 55% in the Middle East alone. The differences in terms of quality reserves are even more pronounced, both because of the very early development of the U.S. as an oil province and because non-OPEC production (with the exception of Mexico) is being maximized while OPEC production capability is less than 2/3 utilized. Overall, 71% of the proved reserves have an R/P ratio which exceeds the 33.4 year average,



with 88% of these long life reserves located in OPEC countries. These statistics make a return to dependency on OPEC, and in particular on the Middle East, an eventual certainty, even if there were to be no growth in world oil demand. However, this shift back to Middle East oil will not occur until the next decade.

### 3. Oil Consumption

The free world economy was plunged into recession by both of the oil price shocks that occurred in the 1970's. By 1983 it was just entering the recovery phase of the second of these cycles. Oil consumption has been following a similar cyclical pattern. By the end of the first cycle, in 1979, non-communist world (NCW) consumption had recovered so strongly that it exceeded its previous 1973 peak. However, oil consumption was much harder hit during the second cycle. It fell for four consecutive years, and by 1983 it was at its lowest level for 12 years, 6.5 million B/D or 13% below its 1979 peak.

TABLE 4

<u>NCW OIL CONSUMPTION</u>					
(Millions B/D)					
	<u>1965</u>	<u>1973</u>	<u>1975</u>	<u>1979</u>	<u>1983</u>
OECD	22.4	40.0	36.9	41.1	33.4
Rest	<u>4.1</u>	<u>7.6</u>	<u>8.0</u>	<u>10.1</u>	<u>11.3</u>
Total NCW	26.5	47.6	44.9	51.2	44.7

Note: OECD includes Yugoslavia.

Source: 1983 BP Statistical Review of World Energy.

So far in 1984 oil consumption has been recovering strongly, aided by cold weather in the USA and Japan early in the year, and by the strong economic growth occurring in the USA and the Far East. For the year as a whole, PIRINC is projecting an increase in consumption of over 1 million B/D. However, this 2.4% rate of increase for 1984 should not be extrapolated as a long term trend. It is inflated by the weather impact, by the surge effect that economic recovery typically has on demand, and by the 6-month old coal strike in the U.K. PIRINC does not expect that oil consumption will come close to regaining its previous peak level during this cycle, or even the next one.

There are very clear differences evident between the consumption patterns in the OECD region and in the developing world (Table 4). From 1979 to 1983, consumption in the main industrial regions fell by almost 8 MMB/D, or one-fifth. In contrast, the developing countries, which had taken over the role as the primary source of growth even in the 1973-1979 period, increased their consumption by a further 1 MMB/D.

High oil prices and economic recession very rapidly had a large, negative impact on the level of oil consumption in the main industrial regions after 1979 (Table 5), but the initial rate of decline was not sustainable. By 1983, the signal that oil demand in the OECD area was levelling off and was likely to recover was fairly clear. Although the response time was slower, the problems of foreign debt, drastically lower oil income and recession also reduced the rate of growth of oil consumption in the developing areas, so that, by 1983, the patterns of demand

the developing areas, so that, by 1983, the patterns of demand growth in the two country groups were converging.

TABLE 5

CHANGES IN OIL CONSUMPTION, BY MAIN AREA

	(% p.a.)				
	<u>1979/73</u>	<u>1980/79</u>	<u>1981/80</u>	<u>1982/81</u>	<u>1983/82</u>
U.S.	1.1	-8.5	-6.1	-5.4	-0.7
W. Europe	-0.4	-7.1	-7.0	-4.5	-3.1
Japan	-0.3	-10.3	-5.8	-7.2	-1.0
OECD	0.3	-7.9	-6.3	-5.5	-2.1
Latin America	4.1	4.0	0.5	5.0	-2.5
Africa	4.9	9.1	5.6	4.7	1.1
Middle East	3.2	8.8	3.3	3.8	2.8
S.E. Asia	7.5	2.4	1.2	-1.8	0.8
S. Asia	3.1	7.2	7.4	5.1	1.8
All LDC's	4.1	+5.3	+2.3	+3.3	-0.1
Total NCW	1.1	-5.3	-4.4	-3.4	-1.6

Source: Derived from 1983 BP Statistical Review of World Energy.

The developing countries have frequently been singled out as the engine of growth for oil demand over the rest of the century. Their performance in 1983 might raise doubts on this issue. Certainly it would be unrealistic to expect the rapid growth of the 1973-1983 period to recur, considering the economic pressures that both OPEC and Latin America in particular are facing. Nevertheless, based on PIRINC's judgement that the market can now

expect a period of oil price stability, the developing countries have an opportunity for economic recovery. Consequently, oil growth should re-emerge.

Since they are at radically different stages in their economic development, and have different fuel substitution possibilities, the oil consumption patterns of the OECD and the third world are even less similar on a product basis.

TABLE 6

OIL CONSUMPTION: PRODUCT SHARES BY REGION 1973-1983

(% of total consumption)

	<u>OECD</u>		<u>Rest NCW</u>	
	<u>1973</u>	<u>1983</u>	<u>1973</u>	<u>1983</u>
Gasoline	27	32	18	18
Middle Dist.	27	31	29	34
Fuel Oil	30	19	39	34
Other	16	17	14	14

Source: Based on 1983 BP Statistical Review of World Energy.

Between 1973 and 1983, OECD oil consumption declined across the barrel, with over 3/4 of the decline concentrated in residual fuel oil. In contrast, third world oil consumption increased across the barrel, with almost half the increase in the middle distillates. Although the consequence was a lightening of the barrel in both cases, the product demand profiles are strikingly different.

#### 4. Oil Import Dependency

The ratio of oil consumption to production gives an estimate of the import dependency of an area: the higher the ratio, the greater the dependency.

TABLE 7

	<u>OIL SELF-SUFFICIENCY</u>		
	<u>1973</u>	<u>1979</u>	<u>1983</u>
U.S.	1.58	1.81	1.44
W. Europe	33.28	6.29	3.42
Japan	-----	totally dependent	-----
Middle East	0.06	0.07	0.15
CPE	0.93	0.89	0.88
Rest World	0.56	0.65	0.73

Source: Based on 1983 BP Statistical Review of World Energy.

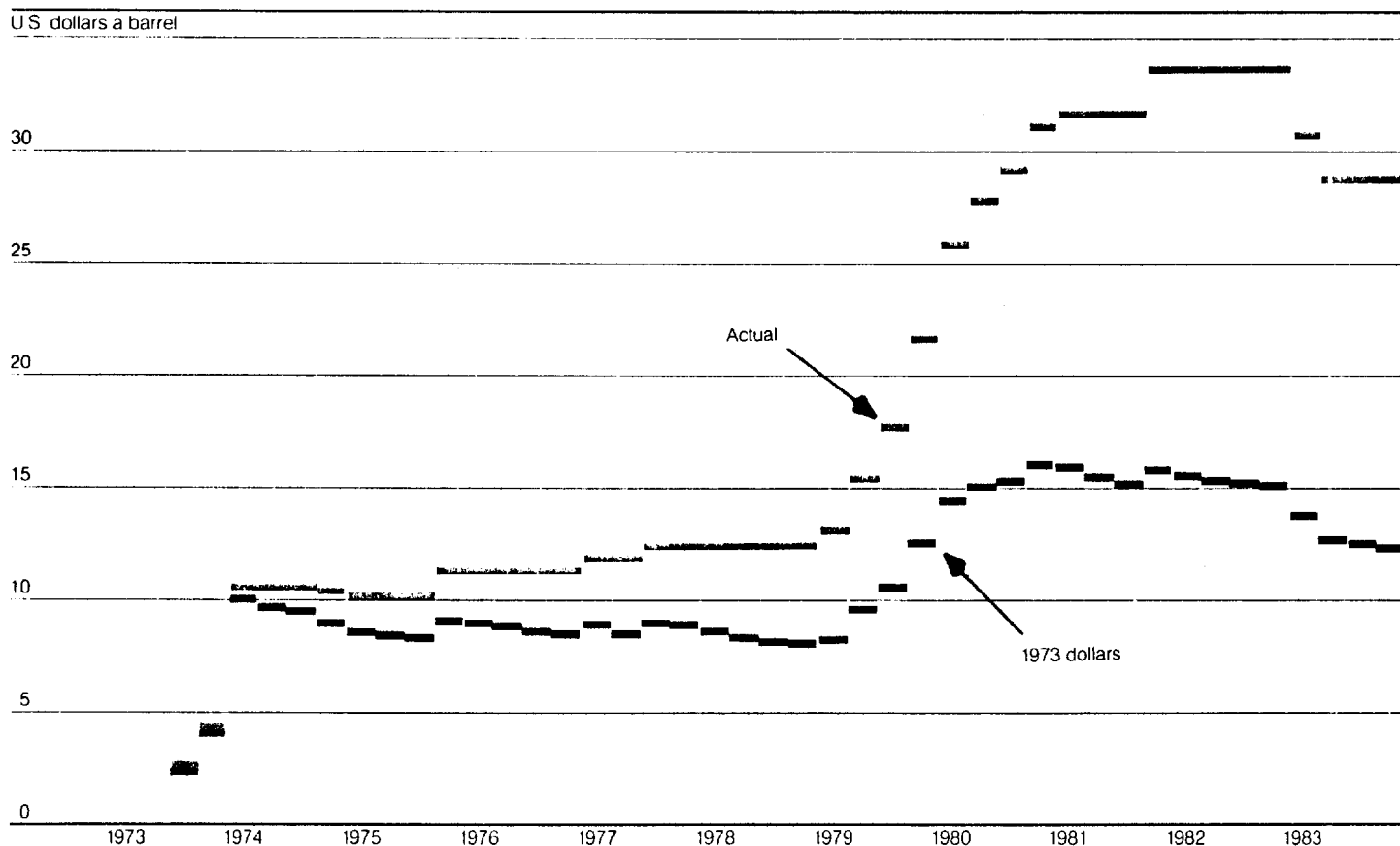
Europe enjoyed a dramatic improvement in its import dependency, mainly due to a surge in production in response to the two oil price shocks. There was also a small improvement in the U.S., although it arose solely from reductions in demand not increases in production. Perhaps the most surprising trend is the decreasing level of net oil exports in the Rest of the World. In this area, impressive production gains by several non-OPEC producers were outstripped by the curtailment of production by non-Middle East OPEC producers, such as Venezuela, and by the continuing growth in demand.

5. Price

As BP itself points out, by the end of 1983 the real price (in 1973 \$) had fallen back to its fourth quarter 1979 level. Thus,

FIGURE 2

ARABIAN LIGHT PRICES,  
(\$/Bbl)



Source: 1983 BP Statistical Review of Energy.

after adjusting for inflation, the price U.S. refiners were paying for foreign oil was the same at the end of 1983 as it had been four years earlier. However, the situation for other OECD refiners was not so favorable, because of the rapid appreciation

of the U.S. dollar over the period. In local currency terms, the real price of oil to Italian and British refiners rose by a quarter, to Japanese refiners by a third and to French and German refiners by a half between 1979 and 1983. In all these countries, the incentive to conserve oil is therefore still strongly present.

The majority of analysts believe that the fundamental excess of producing capacity within OPEC will make it extremely difficult for OPEC to raise prices significantly in the medium term. If OPEC is unable to increase its marker price at all then, by 1987 or 1988, the real price, in U.S. dollars, will be no higher than it was at the start of 1974.

## **6. Refinery Utilization**

The refinery capacity and throughput data for 1973-1983 indicate that utilization rates peaked in 1973 at 85%. Then capacity growth outstripped demand as refiners tried to position themselves to meet the high demand levels generally forecast for the 1980's. Consequently, utilization rates in the NCW were 10 points lower in 1979 than in 1973, despite throughputs reaching an all-time high. After the second price shock, refiners' inability or unwillingness to close capacity resulted in a continuing decline in utilization rates, to a low point of 67% in 1981 and 1982. Finally, in 1983, with a cumulative net reduction in capacity of 7 MMB/D, rates showed a marginal improvement, to almost 70%.

The decline in utilization rates has varied substantially between regions, (Table 8). Japan has been affected the most because of its excessively slow closure rate. Surprisingly, utilization rates in the Middle East have fallen as much as those in North America and Western Europe, despite the destruction of Abadan refinery early in the Iranian-Iraqi war, in 1981. Abadan had distillation capacity of 590,000 b/d, and, although third in terms of overall capacity, was known as "the largest refinery in the world".

TABLE 8

REFINERY UTILIZATION RATES BY AREA, 1973-1983

	(%)		
	<u>1973</u>	<u>1983</u>	<u>Change</u>
N. America	88	71	-17
Latin America	87	71	-16
W. Europe	81	66	-15
Middle East	86	71	-15
Africa	87	82	- 5
S.E. Asia	66	63	- 3
Japan	92	65	-27
Other Far East	87	81	- 6
CPE	89	81	- 8

Source: Derived from 1983 BP Statistical Review of World Energy.

If refiners are to enjoy a return to profitability, utilization rates have to recover to substantially higher levels. However, there is 1.5 MMB/D of additional capacity firmly



scheduled to come on stream between now and 1986 in OPEC countries alone (Table 9). This will barely be offset by the expansion in demand. Clearly, substantial refinery closures in the consuming areas are still required, but the progress that has been made so far in 1984 is disappointing. For example, 4

TABLE 9

ADDITIONS TO OPEC REFINERY CAPACITY, 1984-1986

<u>Country</u>	<u>Refinery</u>	<u>CDU Capacity (B/D)</u>	<u>Date</u>
Saudi Arabia	Yanbu (export)	250,000	1984
	Jubail	250,000	1985
Libya	Ras Lanuf	220,000	1985
UAE	Ajman	170,000	1986
Kuwait	Mena Abdullah	190,000	1986
Indonesia	Cilicap	160,000	1984
	Balikpapan	200,000	1984
	Dumai	<u>85,000</u>	1985
		1,525,000	

refineries, totalling 380 MB/D, have closed in Europe and only 6 refineries, totalling 190 MB/D, have closed in the U.S.

**7. World Oil Trade**

Although total international oil movements have slumped since 1979, inter-area trade in refined products has been expanding and could soon exceed its record 1973 level (Table 10). Over the period, product trade grew by 400 MB/D to 5.5 MMB/D, increasing its share of total oil movements from under 15% to

TABLE 10

OIL EXPORTS, BY MAIN AREA 1973-1983

(Millions B/D)

	<u>1973</u>	<u>1979</u>	<u>1980</u>	<u>1981</u>	<u>1982</u>	<u>1983</u>
<u>CRUDE</u>						
Middle East	18.79	19.46	16.42	14.00	10.95	9.54
Latin America	1.37	1.59	1.84	2.34	2.44	2.65
N. Africa	3.34	3.26	2.64	1.99	1.88	1.84
W. Africa	2.13	2.60	2.40	1.70	1.46	1.37
S.E. Asia	1.12	1.54	1.35	1.28	1.06	1.07
Soviet Bloc	0.67	1.00	1.12	1.22	1.23	1.43
Total World	28.46	30.23	26.54	23.45	20.10	18.84
<u>PRODUCT</u>						
Middle East	1.18	0.98	1.09	0.61	0.71	0.82
Latin America	2.47	2.06	2.04	2.04	1.69	1.42
N. Africa	0.08	0.16	0.18	0.18	0.27	0.34
W. Africa	0.02	0.05	0.08	0.04	0.04	0.06
S.E. Asia	0.28	0.37	0.36	0.38	0.42	0.33
Soviet Bloc	0.62	0.74	0.88	0.98	1.02	1.23
Total World	5.67	5.12	5.39	5.21	5.47	5.52
TOTAL OIL	34,030	35,350	31,935	28,655	25,565	24,355
% Product	16.7	14.5	16.9	18.2	21.4	22.7

Note: 1. Excludes intra-area movements eg within W. Europe.  
 2. May not add due to rounding.

Source: BP Statistical Review of World Energy 1973, 1979-1983.

almost 23%. In contrast, trade in crude dropped by 11.3 MMB/D to 18.8 MMB/D. The main loser from these trading shifts has been the Middle East, whose market share has dropped from almost 60% to close to 40%. The two main beneficiaries have been Latin America and the CPEs, with gains in both trade volume and market share. In Latin America, Mexico's mammoth increases in reserves and subsequent surge in crude exports more than offset the loss of product exports from Aruba and Curacao, as oil market economics undermined the viability of those two refineries. The Eastern Bloc was less selective, expanding both crude and product exports as it sought to generate the maximum amount of hard currency.

There are several factors that have contributed to the increasing emphasis on product trade, including the surge in oil production in the consuming areas, the development of export refineries in producing countries, and the policies of the E. Bloc. The start-up of the new export refineries in Saudi Arabia and Libya should ensure that the trend should continue, and that trade in products will soon account for more than 1/4 of all internationally traded oil volumes.

There is considerable concern in the industry about the ability of the market to absorb the increased product exports from OPEC. Table 10 implies that the market may be more accommodating than is frequently supposed. Soviet Bloc product exports between 1979 and 1983 increased by more than the total export volume expected from Saudi Arabia's new export refineries at Yanbu and Jubail.

## 8. World Tanker Fleet

The scrapping of tankers has occurred at about only half the rate at which the international oil trade has declined, despite the disproportionately large cuts in long-haul crude movements. The age of the fleet and the expected gradual recovery in PG exports at last offers a realistic possibility for a significant reduction in the tanker surplus.

TABLE 11

### TANKER FLEET, BY YEAR OF CONSTRUCTION

	(Million DWT)					
<u>Size (000DWT)</u>	<u>Pre 1965</u>	<u>1966-70</u>	<u>1971-75</u>	<u>1976-80</u>	<u>1981-83</u>	<u>Total</u>
10-65	17.4	5.4	10.1	11.1	11.7	55.7
65-125	3.4	13.8	13.7	12.4	5.1	48.4
125-205	-	3.0	12.4	12.5	0.9	28.8
205-285	-	4.5	79.7	19.8	0.4	104.4
Over 285	<u>-</u>	<u>0.7</u>	<u>18.1</u>	<u>25.9</u>	<u>1.2</u>	<u>45.9</u>
Total	20.8	27.4	134.0	81.7	19.3	283.2
% steam	47	34	67	58	3	55

Source: 1983 BP Statistical Review of World Energy.

More than two-thirds of the vessels over 125,000 DWT were built before 1976 and are typically high cost, steam turbine vessels consuming up to 70% more fuel than the new, diesel engined vessels. In addition, unless they are second hand they tend to

be fully depreciated and hence have no tax advantage. Therefore, a high scrapping rate is foreseen for these vessels over the next several years, particularly among those that have been in long term lay-up.

## 9. Natural Gas Production and Reserves

Natural gas has greater long-term potential as a source of energy than oil, and could well become as politicized. Proved reserves of natural gas would last over 61 years at the 1983 consumption level, which is almost twice oil's R/P ratio. But OPEC (32%) and the USSR (44%) again hold the bulk of the world's reserves, although their relative roles are reversed compared to oil.

Historically, the U.S. has been the dominant factor in world gas. In 1973, over half the gas produced and consumed in the world was in the U.S. However, the U.S. dominance has been eroding. In 1983, the U.S. ceded its position as the top producer to the USSR.

TABLE 12

### SHARES OF WORLD GAS PRODUCTION (%)

	<u>1973</u>	<u>1983</u>
U.S.	50	30
USSR	19	36
Canada	6	5
Holland	5	5
Other	20	24

Source: Based on 1983 BP Statistical Review of World Energy.

Since the U.S., including North Slope Alaska, has a reserve life of only 12.5 years, compared to 74 for the USSR and over 100 for OPEC, this trend must inevitably continue.

#### 10. Natural Gas Import Dependency

International trade in natural gas has expanded significantly over the last decade, but it remains much less important to energy consumers and producers, and to the maritime industry than trade in oil. The expansion in the gas trade has occurred because the growth of gas consumption in Japan, and to a lesser extent in Europe, has outstripped local production and forced these areas to increase their dependence on imports.

TABLE 13

	<u>NATURAL GAS SELF-SUFFICIENCY</u>		
	<u>1978</u>	<u>1979</u>	<u>1983</u>
U.S.	1.05	1.08	1.08
W. Europe	1.15	1.21	1.29
Japan	2.12	9.70	18.27
Middle East	0.77	0.63	1.01
CPE's	0.99	0.97	0.92
Rest of World	0.72	0.69	0.73

- Note: 1) Self sufficiency is the ratio of gas consumption to gas production.  
 2) In the BP Review, world production exceeds world consumption, primarily because of losses. For the purposes of this Table, production in each year was scaled so that world production equalled world consumption.

Source: Based on 1983 BP Statistical Review of World Energy.

However, the dependence of all three main industrial areas on gas imports is much less than their dependence on oil imports, and

essentially does not involve the Middle East (Table 7, Table 13). In fact, since Iran ceased supplies of gas to the USSR, and subsequently halved its production, the Middle East has struggled to achieve regional self-sufficiency in natural gas.

## 11. Nuclear

Nuclear power has unquestionably been the fastest growing primary fuel in the world, with its output having more than quadrupled since 1973. Nevertheless, it still meets less than 4% of the world's primary energy needs. The enthusiasm with which nuclear has been incorporated into countries' energy portfolios differs substantially. The five most dependent nations are all in Europe: Finland, Sweden, France, Switzerland and Belgium. Yet the U.S. in total consumes more nuclear power than the whole of Western Europe.

TABLE 14

### NUCLEAR DEPENDENCY, BY RANK, 1983

<u>Country</u>	<u>% Energy Met by Nuclear</u>	<u>Nuclear Energy Consumption</u> (MM Tons O.E.)
Finland	20.3	4.2
Sweden	17.7	7.0
France	15.1	27.4
Switzerland	14.3	3.8
Belgium	12.1	5.3
Japan	8.1	27.5
W. Germany	5.9	14.8
U.K.	5.5	10.7
Canada	5.5	11.5
USA	4.7	80.0

Source: Based on 1983 BP Statistical Review of World Energy.

Import dependency for uranium is obviously not directly comparable to import dependency for oil and gas. Uranium requires a much lower frequency of deliveries, even under normal circumstances, and it is relatively easy to store several years' supplies. Therefore short term supply interruptions are not a serious cause for concern. Nevertheless, countries that are dependent on nuclear energy and are highly reliant on imported uranium could face other pressures. Of the top ranked nuclear dependent countries, only France has substantial indigenous reserves of uranium. The bulk of the NCW reserves are in N. America and Africa, each of which have 40%.

## 12. Primary Energy

World energy consumption reached 6.93 billion metric tonnes oil equivalent in 1983, close to its 1979 peak and almost 1 billion tonnes more than in 1973. However, concurrent population growth resulted in world energy consumption per capita being the same in 1983 as it had been in 1973.

The industrial countries achieved significant gains in energy efficiency (defined as energy consumption per unit of GNP) over the ten year period. This improvement was offset by the developing countries' growing need for commercial energy supplies to fuel their transition towards industrial, urban societies. (Table 15.) Despite a 20% improvement in its energy efficiency over the ten year period, the U.S. remained the world's most prodigal user of energy. Even in 1983, its energy use per capita



was almost five times the world average, and more than double the rate in W. Europe and Japan.

TABLE 15

ENERGY EFFICIENCY

(Millions Tons O.E./1980 GDP \$ billions)

	<u>1973</u>	<u>1983</u>
Industrial countries	0.578	0.455
Developing countries	0.437	0.479

Sources: World Development Report 1984, The World Bank  
1983 BP Statistical Review of World Energy

Oil remained the leading source of energy but its market share contracted sharply, while the shares of all the other fuels expanded (Table 16). By 1983 oil had dropped 7 points, to a 40% share, losing ground in every region except E. Europe and China. If oil's share of the energy market had continued unchanged at its 1973 level, world oil demand in 1983 would have been 3.28 billion tonnes (70 MMB/D), 0.48 billion tonnes (9.8 MMB/D) more than it actually was.

Coal retained the number two spot, with a 2 point gain in its share. In contrast to oil, it increased its share in every region except E. Europe and China. Natural gas suffered a sharp loss of share in the U.S., in excess of that for oil. However, its dramatic growth in the USSR, and to a lesser extent in Japan and W. Europe, allowed it to expand its share of the world market by 1 point. The greatest consistency was shown by nuclear and

TABLE 16

**MARKET SHARE BY FUEL, BY MAIN MARKET 1973-1983**  
(Percent Distribution)

	USA	West Europe	Japan	OECD	Other	NCW	USSR	East Europe	China	World
<b>1973</b>										
Oil	45.1	60.4	77.4	53.4	60.8	54.5	37.3	22.1	14.8	47.3
Gas	31.0	10.5	1.5	20.3	12.2	19.1	22.7	10.5	1.8	18.0
Coal	18.5	20.4	15.4	18.6	19.2	18.7	36.0	65.4	80.7	28.2
Nuclear	1.2	1.3	0.7	1.2	0.1	1.1	0.3	0.2	-	0.8
Hydro	4.2	7.4	5.0	6.4	7.6	6.6	3.6	1.7	2.7	5.6
<b>1983</b>										
Oil	41.0	47.9	60.4	44.6	55.0	46.9	35.0	22.7	15.3	40.3
Gas	25.3	15.0	7.4	19.7	13.8	18.4	31.5	14.4	1.9	19.2
Coal	23.4	21.5	18.5	22.0	21.3	21.9	27.8	58.7	78.8	30.3
Nuclear	4.7	6.5	8.1	5.6	0.9	4.5	1.7	1.4	-	3.4
Hydro	5.6	9.1	5.7	8.1	9.2	8.4	4.0	2.8	4.0	6.8

Source: PIRA calculations, based on 1983 BP Statistical Review of World Energy.

hydroelectric power which expanded their market shares in every region. Nevertheless, in 1983 they still met only 10% of the world's energy needs.