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DOWNSTREAM OPTIONS IN THE OIL INDUSTRY FOR VIET NAM

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DOWNSTREAM OPTIONS IN THE OIL INDUSTRY FOR VIET NAM

INTRODUCTION

This paper will address the critical question for the economy of Viet Nam of the optimal use of its crude oil resources. At present, there is a considerable amount of oil exploration is going ahead with foreign partners. Among those involved are Enterprise Oil, BHP, Total, Shell Oil and Vietsovpetro. Currently, however, all the nation's oil exports (around 20,000 barrels/day) are being shipped in crude form and processed in Singapore by Shell Eastern. As output gathers pace (estimates indicate that up to 3 million tonnes per year may be available by the early 1990s) the question of whether, and to what degree, to add value prior to export will become increasingly important. Presently there is a small amount of refining capacity at the Saigonpetro refinery near Ho Chi Minh City (around 40,000 tonnes/year) and there are proposals, notably from Engineers India, an Indian state-owned company, to build a 3 million tonnes/year refinery in addition to a more modest 150,000 tonnes/year refinery planned for Tuy Ha.

There needs to be an overall view taken of the prospects for a new refined oil products exporter, such as Viet Nam, entering the Asian market given the planned refinery expansions envisaged elsewhere in the world and the likely course of demand, regional and worldwide, for refined products. While the immediate focus of the paper is Viet Nam in the Asian context, regard will also be taken to the prospects for processed oil exports for Asian countries more generally.

The paper is divided into six chapters. In the first chapter there is a short introduction to the economy of Viet Nam, discussing the context within which oil exploration has accelerated in the past two to three years, and assessing the type of economy in which future decisions about refining will have to be made. The second chapter provides an overview of the world oil demand outlook, with volume and price projections to the year 2000 assembled from a variety of sources. These serve as context for chapter 3, where there is an analysis of the regional oil outlook for the Asia-Pacific area. Viet Nam's own oil (and overall energy) outlook is assessed in chapter 4. This is important since refining capacity decisions must be made in the context of domestic as well as regional export demand potential. Chapter 5 reviews the world oil refining industry outlook, while chapter 6, in light of the Vietnamese demand and supply prospects reviewed in preceding chapters, assesses the attractiveness of the downstream policy options for Viet Nam over the last decade of the century. Managerial as well as strictly economic aspects of the capacity decision are presented, to recognize the fact that theoretically collect policies can have unattractive consequences if not managed and executed adequately. A summary of Viet Nam's best options completes the paper.

Chapter 1. The Vietnamese oil industry in context

THE VIETNAMESE ECONOMY

It hardly needs stating that after years of fighting the Viet Nam's economy is in great need of new industrial investment, new infrastructure and training initiatives. Among the current problems facing the economy are:

- high population growth, estimated at around 1 million per year on top of a base of around 65 millions;
- low levels of capacity utilization in virtually all light and heavy industrial sectors;
- severely constrained infrastructure, with only 10 per cent or so of the 100,000 km road network having a hard surface; 80 per cent of the 3,000 km of railway track being narrow gauge; and few dependable bridges;
- frequent electricity shortages and "brown-outs";
- very modest official development assistance inflows, estimated at around \$116 million in 1987 after \$147 million in 1986 (IBRD, 1989, p.202), equivalent to less than \$2 per capita;
- unemployment running at an estimated 20 per cent in early 1989.

However, there are also a number of encouraging aspects in the economy. As foreign investor and indigenous entrepreneurs have come to see the opportunities presented by the relaxation of limits on private economic activity, interest in expanding production has become apparent across many sectors. The following are examples of the new state of affairs:

- Considerable interest by foreign firms in investing in Viet Nam. Since the new foreign investment code was promulgated, some 50 licenses have been granted, involving capital commitments of around \$450 million. The bulk of these involve projects in the southern part of the country where the infrastructure is better.
- Expansion of food processing and fishing investment, again largely in the south.
- Expansion of raw materials processing activity, for instance in the garment-making, leather processing and latex sectors.
- Growing interest in tourism, with French, German, Japanese and Canadian firms envisaging hotel and resort developments.
- Progress towards setting up several export processing zones, with the first to be set up in Thu Tiem near Ho Chi Minh City.
- Strong growth of exports, of 22 per cent in 1988 over 1987, led by strong agricultural, forestry and fish product export growth. Rice exports have been particularly buoyant.

- Despite strong import growth - which is itself testimony to the growth of domestic economic activity - the visible trade deficit has stayed within reasonable limits, and in 1986 was estimated at \$310 million (hard currency trade flows only,) and in 1987 at \$237 million.
- Natural resource endowments which offer considerable potential once fully exploited. These include coal reserves (an estimated 2 billion tonnes); bauxite (7 billion tonnes); apatite, iron ore and chromite.

Among the most promising areas of the economy, however, is the oil industry. This has been referred to by a high-ranking Vietnamese official as "the spearhead industry of Viet Nam's national economy". The recent growth of output from the Bach Ho offshore field, reportedly from 1,000 b/d in 1986/87 to some 30,000 b/d in 1989, has boosted optimism considerably. Hopes that by 1990/91 output could be running at 60,000 b/d (equivalent to 3 million tonnes/year) and even 120,000 b/d by 1992 are being expressed. The agreement signed between Petro-Vietnam and Shell-Petrofina in late 1988, the first deal between Viet Nam and a non-Communist oil company since reunification in 1975, signalled a flurry of exploration and investment initiatives with foreign partners.

The liberalization of Viet Nam's foreign investment code allows for foreigners to own up to 99 per cent of a joint venture, allows for production - sharing and awards tax breaks to certain investments which meet criteria on labour-absorption, technology transfer and hard currency creation. This change in the legal infrastructure has had a considerable impact on foreign oil companies.

The background to the present state of the Vietnamese energy sector can be summarized briefly:

- 1970: Offshore exploration begun with law 011/70 allowing Exxon, Marathon, Mobil, Shell, Sunningdale and Union Texas to take concessions. Discoveries made in two fields, yielding some 2,000 b/d each.
- 1978: New concessions signed after 1970 agreements nullified. Agip, Bow Valley, Deminex and Elf based consortia join with Petro-Vietnam to drill in 12 wells. Results disappointing.
- 1980: Viet Nam and USSR sign agreement on oil and gas exploration.
- 1981: Vietsovpetro begins 1981-85 exploration plan.
- 1983: First offshore wells sunk by Vietsovpetro.
- 1984: Oil discoveries announced.
- 1986: New Five-Year Plan for 1986-90 entails 400 per cent increase in Soviet investment. Bach Ho field starts producing from two platforms, estimated at 1,000 b/d of crude and 1,000 cf/d of gas. Total output 282,000 b/year.
- 1987: Two tanker loads of crude sold to Japanese refiners; other cargoes shipped to Singapore. Total output 1.05 million b/year.
- 1988: Hydrocarbons India Ltd. sign 25-year production agreement. Several other foreign companies sign exploration agreements.

The current position of the country's exploration efforts can be summarized as follows:

Foreign exploration joint ventures or agreements

Company	Signed	Details
Hydrocarbons India Ltd	1988	Drilling, seismic surveys, training; \$5 million per year for 5 years
Shell Oil UK Petrofina	1988	25 year contract for 15,000 sq.km. in Hue Basin
ONGC (India)	1988	\$5 million/year in exploration
BP Development Ltd.	1989	25 year contract for offshore exploration, spending \$60 million in first 5 years, near Da Nang
Total	1988	Gulf of Tonkin 25 year exploration contract
Enterprise Oil UK (70 per cent) Cie Europeene des petroles (CEP) (30 per cent)	1989	Exploration of 9,000 sq.km. in South China Sea. Five year agreement, extendable for 20 years for production. Envisages spending \$600 million over 5 years.
Clyde Petroleum/Swedish Exploration Consortium	1989	12,000 sq. km blocks in Con Son Basin and Gulf of Tonkin
BHP (Australia)	1989	Spends \$16 million over 5 years of 25 year contract to explore 15,000 sq. km. near Da Nang.

A number of developments beyond "pure" oil and gas exploration are envisaged. The most significant of these is:

Foreign exploration joint ventures or agreements

Company	Signed	Details
Kuwaiti KOI, Transcomin (Spain)	1987	Up to \$2 billion of infrastructure projects, including an oil refinery, urea, sodium monoglutemate plants. Current status of agreement unclear.

To help put these figures in context, Tables 1.1 and 1.2 show Viet Nam's recent oil use levels. Petroleum product consumption is still very far below its level of the mid-1970s; while the volume of petroleum products imports has been growing fairly steadily over the past four to five years, to reach approximately 2.4 million tonnes in 1987. (Section 4 will assess the outlook for demand in some detail.)

Table 1.1 Viet Nam: Petroleum products consumption
('000 b/day)

Year	Volume
1973	120
1980	25
1985	29
1986	30
1987	30
1989	50 (forecast)

Source: PIW, 9 October 1989, p.2; Petroleum News, January-February 1989, p.43.

Table 1.2 Viet Nam: Petroleum products imports
(volume)

Year	Volume ('000 tonnes)
1983	1,800
1984	1,700
1985	2,000
1986	2,028
1987	2,413

Source: FEER, 27 April 1989, p.72, Vietnamese authorities.

Given this recent resurgence of exploration activity, and growing imports of petroleum products, where does Viet Nam stand regarding its refining capacity and intentions? As shown in Table 1.3, there are two main proposals to augment the current 40,000 tonnes/year refinery in operation at Cat Hai. One envisages an increment of 150,000 tonnes/year; the other 3 million tonnes/year.

The Cat Hai refinery, opened in December 1988, (also known by the name of operator, Saigon petro) is near Ho Chi Minh City. It was built by Serepco of France to process low-sulphur offshore oil of the type found in Viet Nam.

Prior to the refinery being opened, all Bach Ho crude was shipped by tankers to Singapore, for processing by Shell. Serepcó have a contract to run the refinery now that it is built.

Table 1.3. Refining capacity and proposals

Project	Capacity	Partners
United Saigon Processing Enterprises (Saigon petro) at Cat Hai (came on stream December 1988)	40,000 t/y	Built by Serepcó
Tuy Ha (proposed)	150,000 t/y	Vietsovpetro
Phu My (proposed)	3 mill t/y	Vietsovpetro
Thanh Tuy Ha (proposed) petro- chemicals complex		

Oil production in Viet Nam is estimated to have grown from around 1,000 b/d in 1986 to 35 to 40,000 b/d in 1989 (see Table 1.4). Vietnamese officials have been quoted as saying that they expect output to rise to 50,000 b/d in 1989 or 1990 (Petroleum News, Jan.-Feb. 1989, p.43).

Reserves are estimated at 20 million barrels, with offshore exploration expected to reveal up to 100 million barrels (see Table 1.5). Now that there is so much fresh exploration underway, there may well be further finds.

Other factors which are hard to evaluate, given the difficulty of assembling good data on Viet Nam, but which bear on the country's oil prospects, are as follows:

- the oil geology of offshore Viet Nam is said to be complex and the oil waxy and with high paraffin content;
- down-time on the rigs operating offshore has been high, so that exploration time tables are typically overrunning and budgets exceeded. (Petroleum News, Jan.-Feb. 1988, p.44).
- the major source of investment in the oil industry so far, the Soviet State petroleum enterprise, is apparently unwilling to continue its commitment indefinitely, and in particular does not wish to fund much more refinery expansion.

Other energy sources of importance in Viet Nam are coal and hydro. Coal is the dominant source of industrial and domestic energy. Coal output, about 80 per cent of which is from open-cast mines has, however, been disappointing, with output steady over the last few years at a level of around 6 million tonnes/year. 1987 output is estimated at 6.1 million tonnes. Exports have been falling in recent years, and the main foreign markets, the Soviet Union, Republic of Korea, Japan and Belgium, have been looking elsewhere for supplies of high quality coal.

Table 1.4. Estimates of Vietnamese oil production

Year	Volume	Comments
1986	1,000 b/d	Crude from Bach Ho field
1987	rising to 5,000 b/d	
1988	5,900 b/d	Petroleum Economist, June 1988, p.208
1989 (January)	13,500 b/d	Combined Bach Ho and Dragon
1989 (April)	15,000 b/d	combined Bach Ho and Dragon (PIW, 7 April 1989, p.10)
1989 (June)	35-40,000 b/d	(PIW, 7 Augsut 1989, p.10) from Bach Ho.

Table 1.5. Estimates of Viet Nam's oil reserves

Estimates	Comments
20 million barrels	Estimate as at April 1989. (PIW, 3 April 1989, p.10)
50-100 million barrels	Vietsovetro believes drilling will raise reserves to this level by an unspecified date.

There are hydro reserves as well. In January 1988 the first of four 100 MW turbine generators at the Tri An hydroelectric power plant, 80 km northeast of Ho Chi Minh City, began operation. By early 1989 it is hoped that the plant will produce 1.7 million kWh (Petroleum Economist, March 1988, p.97).

The Thu Duc hydro-electric power station was restored in early 1989, giving 16 MW capacity at once and an intended capacity of 345 million kWh for the national grid.

The foregoing overview of the reconstruction of Viet Nam's economy suggests that output could resume a strong upward trend during the next decade. Oil exploration is preceding more widely than ever before in the country's history, and promises to underwrite further growth of value added through enhanced refining operations. Subsequent chapters will assess Viet Nam's prospects as an oil refining location in the context of the world and the Asian energy outlook.

Chapter 2. Overview of the world oil demand outlook

This chapter provides the context within which Viet Nam's oil industry prospects may be considered. It begins with a review of the market economies' oil demand outlook, since these countries comprise the largest component of oil demand. Subsequent discussion bears on the regional outlook, then chapter 3 examines the Asia-Pacific region's oil and energy outlooks.

Demand projections for the developed and developing market economies are fairly tightly bunched over the period 1990 to 2000. As Table 2.1 shows, there is a fairly broad consensus regarding continuing growth in oil demand over the decade, with total oil demand by the year 2000 put in the range of 52.5 million b/d to 61.9 million b/d.

Table 2.1. Projections for total oil demand to 2000 for market economies
(million b/d)

Source	1990	2000
EIA International Energy Outlook (1989)	51.4	54.9
DOE Long Range Energy Projections	49.8	54.1
Ashland Oil (1988)	50.8	52.5
Conoco (1988)	51.3	59.8
DRI (Winter 1988/9)	51.0	57.4
EEC (Winter 1989)	53.0	59.9 - 61.9

Sources: EIA (1989, p.38); EEC (1989, p.47).

These forecasts lend weight to the overall view that oil demand will grow relatively steadily for the rest of the century. As the market economies' use of oil resumes its upward trends - albeit at a reduced coefficient from that seen prior to 1973 - and developing countries' use of oil continues to grow very rapidly, aggregate oil consumption is likely to be in the range of 5 to 20 per cent higher in 2000 than in 1988 or 1989. While the centrally planned economies' growth paths are relatively difficult to predict at present, it is likely that economic growth there will continue to be associated with a growing demand for oil. The developing economies' need for oil will continue to outstrip that of any other area, primarily since their rate of growth of output is likely to continue outpacing that of other regions. A summary of world oil demand is shown in Table 2.2, based on the latest International Energy Agency's projections. (These projections result in figures which are extremely close to those of the Energy Information Administration. See EIA (1989), p.20.) It indicates that demand in the developing countries may grow from 22 per cent of total demand in 1988 to 27 per cent in 2005, and that, in broad terms, OECD demand may fall from around three-fifths of the total to half the total by 2005. Table 2.3 shows the expected growth rates by type of country.

Table 2.2. World oil demand outlook by region
(million b/d)

	1988	1995	2005
OECD (IEA estimate)	36.8	38.8	41.1
Centrally planned economies	13.8	16.1	19.2
Developing countries	13.9	17.4	22.1
Total	63.3	72.3	82.4
OECD (EEC estimate)	36.9	39.8	40.6 ^{a/}

Sources: IEA, (1989, p.30), EEC (1989, p.47).

^{a/} mid-point of forecast range.

Table 2.3. Forecast oil demand growth to 1995

	Annual average growth (%)
Developing countries	3.3
CMEA	2.2
Developing market economies	0.8

Source: IEA (1989).

It is worth noting that figures for oil consumption such as these reflect a very marked decline in developed market economies' oil intensity, or oil: GNP ratio. In the USA the ratio has fallen no less than 30.3 per cent over the period 1970 to 1988, from a peak of 12,700 btu/\$1 GNP to a 1989 low of 8,400. While the rate of decline is decelerating it is important to observe that the ratio is still falling (OGJ, 31:7:89, p.60).

Table 2.4 provides another breakdown of oil demand, this time arranged by region. It is apparent from this table that Asia is the region which is expected to have the highest rate of growth of oil use. The Asian annual average growth-rate over the 1988-95 period is put at 138 per cent of the developing country average. The total oil demand forecast for developing countries by Conoco matches quite closely that foreseen by the EEC, which expects 15.0 million b/d in 1990 and 17.5 to 17.6 million b/d in 1995 (EEC, 1989, p.47).

Table 2.4. Developing countries' regional oil demand outlook to 1995
(million b/d)

	1988	1989	1990	1995	Annual average growth 1988/95 (%)
All developing countries	13.9	14.3	14.8	17.3	3.2
Africa	1.9	2.0	2.1	2.4	2.9
Latin America	4.8	5.0	5.1	5.8	2.6
Asia (excluding China)	4.1	4.3	4.5	5.6	4.4
Middle East	3.0	3.1	3.1	3.5	2.4

Source: Conoco (1989).

Demand projections are, obviously, a function of many variables and of many complex lags. Among the central determinants of demand, clearly, is price. Here too the oil price outlook is seen by many observers as a relatively uncontentious issue. Most analysts expect a gradual pick up from the very low real oil prices been in the mid- to late 1980s, with prices by the end of the century being in a range of \$22 to \$35 per barrel (in 1988 prices). This compares to a low-point of \$16 reached in 1986 and compares to a 1973 price of \$9 in 1988 prices.

As shown in Table 2.5, oil prices are expected to stay well below their 1979/80 peak in real terms, thus underwriting a continuous but gentle increase in usage.

Table 2.5. Crude oil price outlook

Source	1990	1995	2000
Energy Information Admin. (1987) (1988 \$)	\$15-\$18	\$16-\$22	\$22-\$35
IEA (1988) (1987 \$)	\$18	-	\$30
EEC (1989) (1987 \$)	\$15	\$18-\$20	\$20-\$26

Source: EIA (1987); IEA (1988); EEC (1989).

The sensitivity of oil demand to prior changes in prices has been the subject of extensive study. One of the more recent analyses is that of the IEA, which estimates that if oil prices in 1995 were \$30 rather than \$18, world oil demand would be around 5 per cent lower than otherwise (IEA, 1989, p.38). The precise size of the volume change would of course depend on how the \$12/barrel gap opened up, and whether it was sudden or gradual. But the order of magnitude difference is the important point, since it indicates that the outlook for producers is relatively robust across a wide range of possible oil prices. Of particular note is the IEA's finding that a \$12/barrel oil price differential in 1995 would only cause a 3.5 per cent change to the volume of developing countries' aggregate oil demand in that year.

Another important factor in determining the world oil price trajectory is the level of reserves. In this regard there has been some significant change in the world outlook since the mid-1980s. A number of oil companies and oil-exporting states have announced major upward revisions to their proved reserve figures, and this, coupled with the emergence of some powerful new exploration technologies, has produced a considerable change in companies' outlooks. Total world oil proved recoverable reserves have been revised from the 650 billion barrel level which obtained during the 1976 to 1986 period, to 890 billion barrels in 1988/89. (Cambridge Energy Research Associates, quoted in New York Times, 15 October 1989) Similarly, gas reserves have been revised upward, from an estimated 2,300 trillion cubic feet in 1976 to around 4,000 trillion cubic feet in 1988/89. Expressed in terms of years of oil supply, current reserves of oil now represent about 45 years' worth, up from the 30-35 year range that obtained in the ten years prior to 1987 or 1988. Coal reserves too have been written up, but by even more. The World Energy Conference has declared world proved recoverable reserves of bituminous coal in 1988 at 1.1 trillion tons, up by no less than 80 per cent from the 1985 estimate. (New York Times, 15 October 1989.) The main change there lay in a major upward revision in China's reserves, which now stand at 610,700 million metric tons, around four times the reserves estimated to exist in the USSR and Eastern Europe combined.

The Asia-Pacific region's reserves of crude oil are, as shown in Table 2.6, very varied by country, with nearly half of the total residing in one country--Indonesia. The region possessed in 1988 2 per cent of the world total of proved reserves with China's reserves representing a further 1.5 per cent.

The major technological change which suggests that there could be even greater recoverable energy reserves available are the new three dimensional seismic techniques. These should allow oil to be found less expensively than used to be the case, and should allow oil fields to be economically attractive at prices lower than used to be the threshold. (Financial Times, 16 October 1989.)

Overall, world oil demand is expected to continue rising at a trend rate of around 1.5 per cent per annum, which is clearly less than the expected rate of GDP growth. There may be 'shocks', or several oil price disturbances on the way, but most observers expect real prices to remain below the peak seen 1980.

Table 2.6. Asia-Pacific oil reserves, 1988
(million barrels)

Bangladesh	500
Brunei	1,420
Burma	58
China	14,000
India	4,250
Indonesia	8,400
Japan	57
Malaysia	2,900
Pakistan	96
Papua New Guinea	200
Philippines	16
Taiwan Province of China	5
Thailand	99

Total	33,354

Source: Energy Statistics Sourcebook
1988, Tulsa, OK, 1989; Petroleum
News, March 1989.

Chapter 3. The Asian regional oil outlook

The Asian region is expected to be that which exhibits the fastest rate of growth of demand of any. The basic reasons for this are the the continued growth of industrial output, population growth, and, as is the case across the world, expected slow real energy price rises (see Table 3.1).

Table 3.1. Regional macroeconomic indicators, 1973-1985

	Per capita GDP growth		Population growth	
	1973-80	1980-85	1980-87	1987-2000
Sub-Saharan Africa	0.5	-3.7	3.2	3.1
East Asia	4.6	6.4	1.5	1.5
South Asia	2.0	2.9	2.3	2.0
Europe Middle East, North Africa	2.4	0	2.1	2.0
Latin America, Caribbean	2.5	-2.2	2.2	1.8
High income countries	2.2	1.5	0.7	0.5

Source: IBRD (1989), pp.146, 215.

Table 3.2 shows recent demand by product in Asia, and reveals that while gasoline demand is the smallest of the three categories of product demand, it is the fastest growing. Continued expansion of automobile use in Asia will further underpin growth of demand for gasoline within oil demand. Non-communist world vehicle demand is expected to grow from 43.1 million units in 1988 to 47.2 million units in 1995; of this Asia-Pacific demand will grow from 8.2 million units (19 per cent) in 1988 to 9.8 million units (21 per cent) in 1995 (Ward's, 1988). Continued strong growth of demand in Japan (where vehicle demand grew by 12 per cent between 1987 and 1988 alone, reaching 6.72 million units) will be a major source of this growth.

One area in the Asia-Pacific oil outlook which is slightly anomalous is that fuel oil demand for electricity generation is expected to fall somewhat over the rest of the century, rather than rise. This is due to expectations of coal and natural gas penetration growing at the expense of fuel oil as an input. Estimates prepared in 1989 suggest that fuel oil use in the region could fall by as much as 12 per cent to 13 per cent over the 1990s in the electricity generation sector. Table 3.3 indicates how this substitution might evolve.

A significant result for current and prospective refiners in the region is that demand for the heavy products from the barrel - including resid and fuel oil - will, in this scenario, be falling while demand for the light end of the barrel - such as gasoline - will be growing disproportionately quickly. This will make the balancing problem facing refiners that much harder to deal with, and could also cause the price differential between heavy and light end-products to open up even more in favour of the latter.

Table 3.2. Asia-Pacific oil consumption by product: 1987
('000 b/d)

	Gasoline	Gas oil	Resid fuel oil
Bangladesh	1	12	6
Brunei	4	1	0
Burma	5	6	2
China	381	481	585
Hong Kong	4	30	18
India	67	374	142
Indonesia	84	171	53
Malaysia	51	65	48
North Korea	24	45	11
Pakistan	17	81	42
Philippines	28	50	67
Singapore	10	15	49
Republic of Korea	29	178	174
Sri Lanka	3	12	3
Taiwan Province of China	62	62	120
Thailand	45	110	40
Total ^{a/}	839	1,717	1,360
Change, 1986/87 (%)	9.3	8.0	3.5

Source: PIW, 9 October 1989, Special Supplement, p.2.

^{a/} includes other countries' sub-totals.

Table 3.3. Asia-Pacific utility fuel demand, 1987-2000

Country	Coal demand (million tons)		Gas demand (billion cu.ft.)		Fuel oil (million tons)	
	1987	2000	1987	2000	1987	2000
Japan	35.4	59.4	1,220	1,534	51.8	43.2
Republic of Korea	7.2	27.3	83	128	1.1	1.3
Taiwan Province of China	8.2	25.2	-	88	1.6	0.8
India	42.6	133.7	30	-	-	-
China	106.5	271.3	-	-	15.5	12.2
Others	36.4	87.8	346	1,265	14.5	16.5
Total	236.5	604.7	1,679	3,015	84.5	74.0

Source: Economist Intelligence Unit, quoted in Petroleum Intelligence Weekly, 21 August 1989, p.4.

Recent country-level data on energy use is assembled in Table 3.4. It shows that while there is a wide range across the countries in energy demand growth, there are many with extremely high rates of growth. Examples would be the Philippines and Thailand.

Table 3.4. Asian oil demand position summarized

Country	1987 total product demand ('000 b/d)	Recent oil demand growth rate (%)
Brunei	7	-1.4 (1986/87)
Burma	16	-17.5 (1986/87)
China	2,141	7.7 (1986/87)
Hong Kong	100	-2.4 (1986/87)
Indonesia	493	1.8 (1986/87)
India	968	5.5 (1986/87)
Japan	4,412	1.3 (1985/90 est.) - EIA
	--	8.0 (1987/88)
Malaysia	199	1.0 (1986/87)
Philippines	183	4.7 (1986, 1987)
		6.0 (1987/88)
		10.0 growth (1988/89)
Singapore	317	15.0 (1986, 1987)
Republic of Korea	638	7.0 (1986, 1987)
		20.0 (1988)
Taiwan Province of China	373	7.7 (1986/87)
Thailand	255	6.5 (1986/87)
		10.0 (1988 first half)
Viet Nam	30	+1.2 (1986/87)
Total	10,132	--

Source: PIW, (1989); EIA (1989); Petroleum Economist (1989); Far East Economic Review (1989).

Having examined the outlook for oil demand in the region, it is now appropriate to turn to a consideration of oil supply. Exploration is proceeding at a fairly active pace in Asia, despite the data in Table 3.5 which reveals a decline in the number of active rigs between 1986 and 1987. Reports from 1988 and 1989 indicate considerable exploration activity in China, Thailand, Indonesia and other countries. Table 3.6 attempts to bring together these reports and present a contemporary picture of the energy endowment and energy use evidence for each Asian country. The last column shows that the likely oil importing or exporting status of each country in 1995.

Table 3.5. Asia-Pacific exploration and rig activity

	Active rigs		Producing wells 1986
	1985	1987	
Bangladesh	5	5	-
Brunei	7	3	609
Burma	33	29	450
China	14	4	90
India	62	116	2,670
Indonesia	80	37	5,774
Japan	16	10	387
Republic of Korea	0	0	0
Malaysia	8	8	452
Pakistan	18	14	44
Philippines	2	2	-
Taiwan Province of China	7	4	-
Thailand	9	6	167
Total	261	238	11,570

Source: Energy Statistics Sourcebook 1988, Pennwell, Tulsa OK, 1988.

Bringing together the pictures of oil supply and oil demand allows one to contemplate what the net product flows in and out of Asia might look like. Despite the forecast growth of oil refining capacity it appears highly likely that there will be continuing net inflows of both crude and refined products to the region. Tables 3.7 and 3.8 show the patterns of oil inflow. One scenario of future regional inflows is set out in Table 3.9. This shows a growing need for net oil inflows over the forecast period. (Typically, gross flows will be considerably larger than net flows, since many crude types are traded between refiners to allow them jointly to balance their input-slates to meet the output mix they wish to achieve.) A more detailed view is constructed in Table 3.10, where the region's demand and indigenous supply of refined products is compared to expected net refined product availability from the OPEC member states. This suggests that the region's needs will almost certainly far outstrip aggregate OPEC supply capability. Expressing this gap in indexed form as in Table 3.11, shows a high and continuing excess demand for refined products over the period to 2000.

Before turning to consider Viet Nam's prospects explicitly, this section sums up the macroeconomic and worldwide energy environment in which Viet Nam will be selling oil and possibly more refined products. The overall outlook is likely to be propitious. This view is based on the following elements:

Table 3.6. Asia-Pacific countries' energy balances: overview

Country	Energy endowment				Energy use: comments	Likely oil position 1995
	oil	gas	coal	other		● heavy importer ◐ importer ○ exporter
Brunei	Large reserves				Very small amount of domestic use	○
Burma	Falling				Volatile but tending to fall as economy stagnates	◐
China	Large reserves	Large reserves	Huge reserves	Large hydro potential	Severe bottlenecks constrain oil being exploited. Rapid oil demand growth	○
Hong Kong	None	None	None	None	All coal and oil imported. Not energy intensive economy	●
India	Growing output				Consumption outstripping domestic oil supply	●
Indonesia	Large	Large	Large	Good hydro potential	Production and exports of oil falling. LPG long-term contracts continue to be fulfilled.	○
Japan	None	None	None	None	The dominant Asian energy user	●
Malaysia	Exploring	Exploring	Large but low quality	Hydro potential	May be net oil importer by 2005 LNG exports to continue	◐
Philippines	Modest		Output rising quickly		Strong growth of gasoline demand; total oil demand very volatile	◐

Table 3.6.(cont'd)

Country	Energy endowment				Energy use: comments	Likely oil position 1995
	oil	gas	coal	other		● heavy importer ◐ importer ○ exporter
Singapore	None	None	None		Will have gas by pipeline from Malaysia	● for refining and reexport
Republic of Korea	None	Growing LNG imports from Indonesia	Produces 50% of solid fuels used		Energy coefficient falling as output mix evolves	●
Taiwan province of China	Modest	Few	Few		Imports 90% of energy reserves, extremely fast demand growth though decelerating now	●
Thailand	Modest	Reserves being written down	Lignite reserves being found		Very rapid demand growth (e.g. up 15 % in 1988 over 1987)	◐ ○
Viet Nam	Growing exploring effort	Associated gas finds growing	Recoverable reserves shrinking		Offshore exploration prospects good. Demand growth in 10+ % per year range plausible.	●

Table 3.7. Net inflows of refined products to Asia-Pacific^{a/}
(1,000 b/d)

Year	Asia-Pacific oil demand	Asia-Pacific oil output	Net oil inflow to Asia-Pacific	Net inflows as % of world oil exports (%) ^{b/}
1980	10,735	4,885	5,850	18
1985	10,140	5,790	4,350	14
1990 forecast	11,508	5,910	5,598	17
1995 forecast	12,405	5,880	7,525	N/A
2000 forecast	14,442	5,480	8,962	N/A

Source: Oil and Gas Journal, 24 July 1989, p.22; BP (1989)

^{a/} Brunei, Burma, Bangladesh, Sri Lanka, New Zealand, Pakistan, Thailand, Malaysia, Philippines, Taiwan Province of China, Australia, Indonesia, Singapore, Republic of Korea, India, China, Japan.

^{b/} refined products and crude oil.

Table 3.8. Sources of oil inflows to Southeast Asia, 1988

Region or country of origin	Volume (m.t./year)
USA	4.5
Latin America	1.7
West Europe	0.6
Middle East	101.9
North Africa	6.3
West Africa	1.3
South Asia	0.1
Japan	0.7
Australia	3.6
USSR	14.1
China	7.4
Total	142.2

Source: BP (1989).

Table 3.9. Asia-Pacific oil balance forecasts
(million b/d)

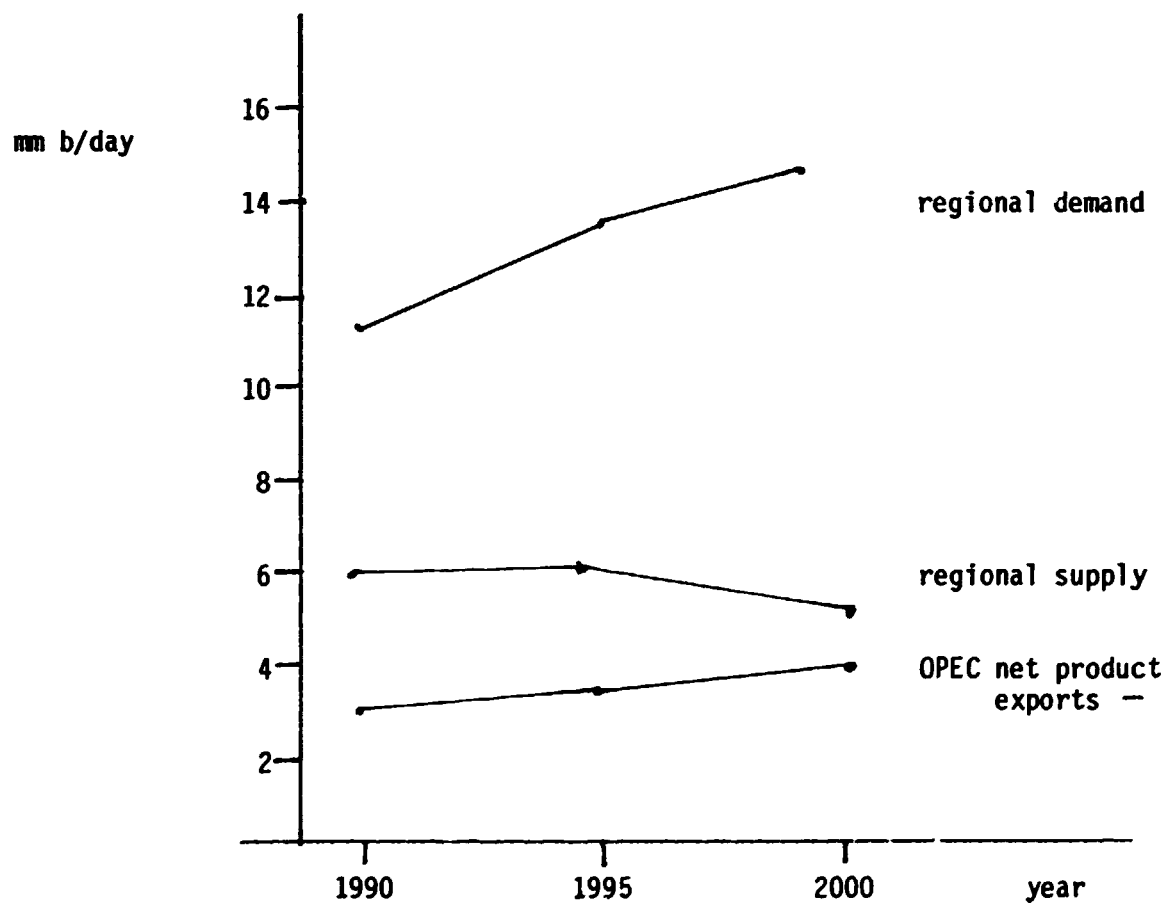
	1990	1995	2000
Regional demand	11.5	13.4	14.4
Regional supply	5.9	5.9	5.5
Net imports to region	5.6	7.5	8.9
Import dependence on Persian Gulf (%)	71	82	90

Source: Oil and Gas Journal, 24 July 1989, p.22.

- growth of industrial output in the Asian region is likely to remain considerably above the world average, putting continuous upward pressure on energy demand;
- the largest economy in the region, Japan, is a large energy importer and will remain so;
- a number of Asian oil producers, notably Indonesia and Malaysia, have written down their oil reserves in recent years, while Thailand's oil finds have not grown at the rate once expected, and the Philippines remains a small producer. At current exploitation rates only Brunei of the ASEAN group may have oil left after the year 2005;
- the ASEAN group's surplus of crude available for export has shrunk, bringing larger imports of both crude and refined products into the region.

Table 3.10

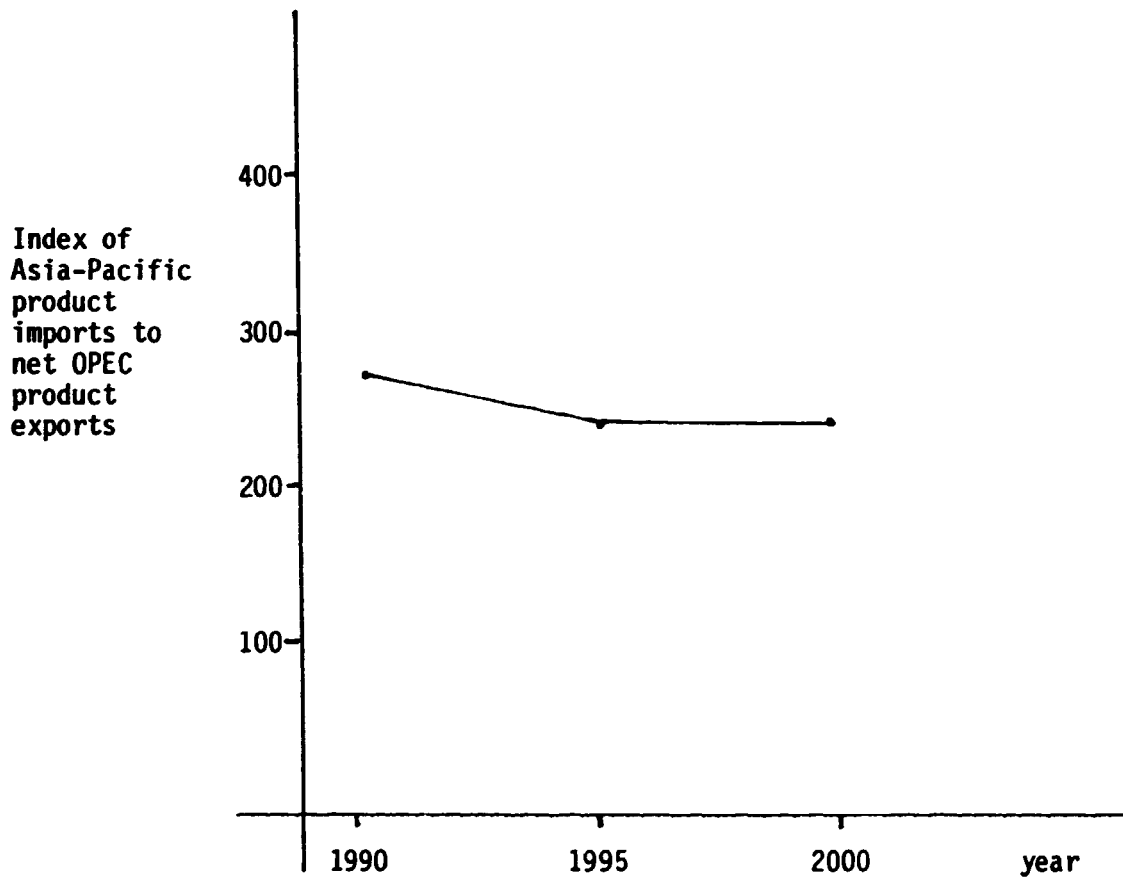
Asia-Pacific refined products demand balance



Sources: Oil & Gas Journal, 24:7:89; Al-Fathi (1989);
own projections for OPEC in 2000.

Table 3.11

Projected net refined products imports to Asia-Pacific,
1990-2000, indexed to net OPEC products exports



Source: calculated from Al-Fathi (1989); Oil & Gas Journal 24:7:89

CHAPTER 4: THE OIL DEMAND OUTLOOK IN VIETNAM

This chapter develops a set of forecasts of oil demand in Vietnam to the end of the century. It begins by reviewing the country's energy balance over the 1973 to 1987 period to see what role refined oil products have played in its total energy supply, then it looks at various ways in which domestic oil demand might grow.

Total energy use within Vietnam has been volatile since 1973, reflecting the disruptions which have occurred in the economy. Estimates by the IEA suggest that total energy demand in Vietnam reached some 7,656,000 tons of oil equivalent (toe) in 1973 then fell to 4,976,000 toe in 1983 but climbed slightly to 5,071,000 toe in 1987 (see Table 4.1). Within this total, coal output grew over time to take up the shortfalls which appeared as oil imports fell precipitously to about a quarter of their 1973 levels. Indeed, throughout the later part of this period, all the major energy sources other than oil grew, mitigating the consequences of having a collapse in oil imports. As table 4.2 shows, not only did electricity production increase, but thermal energy, hydroelectric power and vegetal fuels all grew in supply terms over the 1980 to 1987 period.

Table 4.3 shows petroleum product consumption over the period 1960 to 1975. It indicates a rapid growth of demand, then a rapid decline, especially in gasoline.

Table 4.1

Summary of energy balance, Vietnam, 1973-87, 000 toe

	1973					1983					1987				
	coal	oil	hydro	electr.	total	coal	oil	hydro	electr.	total	coal	oil	hydro	electr.	total
Indigenous production	1839	-	94	-	1933	3835	-	357	-	4192	3444	-	447	-	3891
Imports	1	5858	-	-	5858	10	1389	-	-	1399	10	1478	-	-	1488
Exports	-135	-	-	-	-135	-615	-	-	-	-615	-307	-	-	-	-307
<u>Total energy requirement</u>	1704	5858	94	-	7656	3229	1389	357	-	4976	3146	1478	447	-	5071
electricity generation*	-593	-	-94	202	-485	-798	-	-357	361	-794	-984	-	-447	456	-975
<u>Total final consumption</u>	1111	5858	-	158	7127	2431	1389	-	282	4102	2162	1478	-	353	3993
Total industry	1111	1152	-	-	2263	2431	456	-	-	2887	2162	470	-	-	2633
Total transport	-	4628	-	-	4628	-	733	-	-	733	-	786	-	-	786
Total other	-	68	-	158	226	-	152	-	282	434	-	174	-	353	527

* omits other minor adjustments totalling: 1973 : 44 th. toe
 1983 : 79 th. toe
 1987 : 103 th. toe

Table 4.2

Production of various energy sources in Vietnam, 1980-1987

Source	1980	1982	1984	1986	1987
Electricity production (gigawatt - hours)	3700	4680	4800	5200	5300
Thermal energy (gigawatt - hours)	2500	3140	3000	3200	3300
Hydro power (gigawatt - hours)	1200	1540	1800	2000	2000*
Vegetal fuels (000 tons oil equivalent)	4660	4864	5058	5269	5406

* Substantial enhancement of capacity from 1989.

SOURCE: IEA (1988), pp. 103, 105, 107, 113

Table 4.3

Long term petroleum production consumption trends in Vietnam
(000 b/day)

	1960	1965	1970	1975
Gasoline	1643	3680	17,329	7702
Jet fuel, kerosine	683	3122	12,021	5979
Fuel oils	2101	5495	20,798	9193
LPG	-	23	70	93
Total	4427	12,230	50,218	22,967

SOURCE: UN, World Energy Supplies, various issues

Note: Data prior to 1976 combines former North Vietnam and South Vietnam.

This presumably reflects demand related to the hostilities. A basis for contemplating Vietnam's normal oil products demand would therefore be the 1960-1965 period more than the 1970-1975 period.

Within the petroleum product demand mix, (see Table 4.4) the biggest change over the period 1971-73 to 1987 was the collapse of aviation fuels demand, reflecting the end of commercial aviation during the period. Motor gasoline demand within the total demand slate fell drastically too, but as a percentage of the total excluding aviation fuels fell less severely, from 26% on average over 1971 to 1973 to 19% in 1986 and 1987 on average. As the economy recovers in the years ahead, this mix of oil products demand will be a major factor in shaping refinery policy insofar as a refinery built to suit Vietnam's offshore oil will only be able to match certain output-mixes optimally. In general, turning heavy crudes into light products such as motor gasoline can be inefficient (for certain refinery configurations at least). Before considering the appropriate extent of domestic refining for Vietnam, which is done in Chapter 5, closer attention has to be given to the possible future path of refined oil products demand in Vietnam. It is to this that the discussion now turns.

A number of assumptions have to be made to allow forecasts of oil demand in Vietnam to be created.

Table 4.4

Oil product consumption in Vietnam, by product, 1980-87

	1971/73 average	1980	1981	1982	1983	1984	1985	1986	1987
NGL/LPG	10	5	5	5	5	5	5	5	6
Naphtha	0	0	0	0	0	0	0	0	0
Motor gasoline	930	250	250	250	250	260	270	280	280
Aviation fuels	2100	0	0	0	0	0	0	0	0
Kerosene	52	120	130	130	140	140	150	160	160
Gas diesel	1555	400	425	425	450	450	460	470	470
Residual fuels	1030	400	450	450	475	475	485	490	490
Other products	15	50	50	50	50	50	50	50	50
Refinery fuel	0	0	0	0	0	0	0	0	0
TOTAL	5693	1225	1310	1310	1370	1380	1420	1455	1456

Source: IEA (1988), p.43

Note: The 1971-73 annual average column was computed from IEA data to indicate consumption levels prior to the major changes in the economy experienced after the mid-1970s. They are used in chapters 4 and 5 for showing prior levels of demand which could be attained again.

This is an essential step, however, since an estimate of domestic oil needs will help shape the decisions which have to be made regarding refining capacity. Although there is an abundance of oil refining capacity in the region, many demand forecasts would, if realised, entail most of this capacity being used for Asian countries' own needs and thus not necessarily being available to Vietnam for processing and subsequent reimportation. The fact that the Vietnamese GDP is likely to remain relatively small in the regional context has the offsetting advantage of meaning that it would require only a small diversion of the region's refining capacity to satisfy the country's need for refined products.

Two different growth-paths for Vietnamese domestic oil consumption are developed here to provide an illustrative range of outlooks. Path I envisages oil demand growing at twice the pace of GDP growth (an unrealistically high elasticity over the long-term, but feasible in the short-term as existing capacity is brought back on stream). Over the 1986/87 to 1995 period it is assumed that GDP will grow at an annual average rate of 5%, so that oil demand is growing at a 10% annual rate. This implies total oil demand in 1995 of 64,300 b/day. Path II is based on a cross-sectional view of other developing economies' use of oil at comparable stages of development. It is based on Table 4.5, which uses UN data on various aspects of energy use to build up a plausible cross-sectional view of how Vietnam's energy use might evolve.

Table 4.5

Cross-sectional energy utilisation data, for selected countries

Country	GDP/capita \$ 1987		Annual average growth of energy consumption		Energy consumption per capita (kg oil equiv.)	
	1987	1965-87 growthrate	1965-80	1980-87	1965	1987
Vietnam	400-500 ^(a)	N/A	-2.6	1.6	106	88
Indonesia	450	4.5	8.4	3.9	91	216
Sri Lanka	400	3.0	2.2	3.9	106	160
Philippines	590	1.7	5.8	-1.4	160	241
Thailand	850	3.9	10.1	7.3	82	330

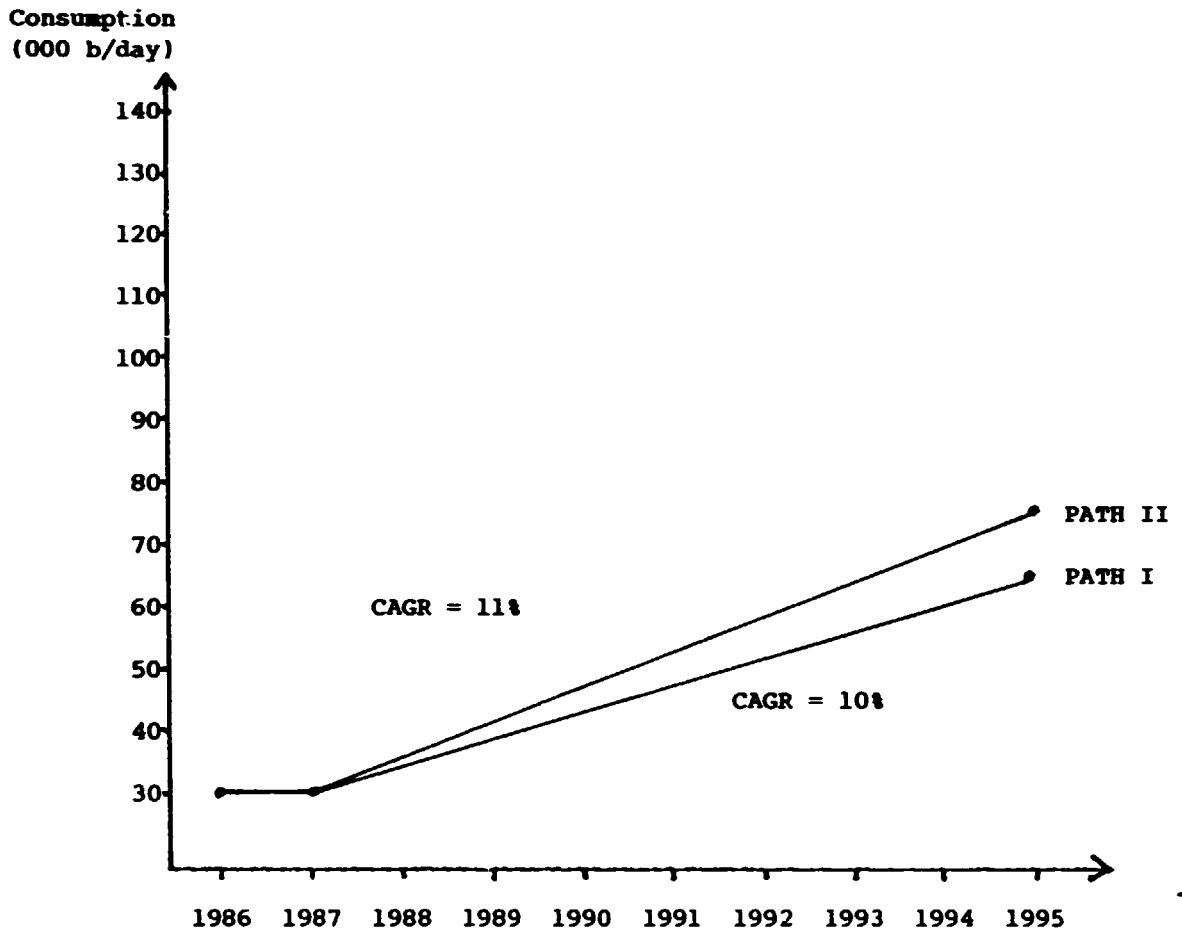
SOURCE: IBRD (1989), various tables

(a): source is own estimates

The countries shown in Table 4.5 are selected because they are broadly at levels of GDP/capita similar to the level likely soon to be attained by Vietnam. They are also countries with relatively similar levels of industry in GDP (in the range 27 to 33% for 1987) and urbanization levels (which are broadly correlated to some aspects of energy use) which are comparable to Vietnam's 21% (except for the Philippines). Each of this peer group of Asian countries in 1987 had a level of per capita energy consumption above that of Vietnam, but in 1965 there was some similarity across the group, except for Thailand, which then had an abnormally low figure. The peer group comparison would suggest that Vietnam could expect if its GDP growth over the 1987-1995 period were 5% compound, and if indeed its GDP/capita in 1987 was in the \$400-500 range, that its GDP/capita would be close to that of the Philippines in 1987. This would imply a per capita energy consumption of 240 kg oil equivalent, or about twice the 1987 level. Given an estimated rate of population growth over the forecast period of 2.4% per year, the 1995 population would be around 78 million. This level of population, each consuming twice the 1987 level of energy, implies a 142% increase in energy use for the country as a whole, or 72,600 b/day by 1995. To transform this energy use forecast to an oil use forecast, it is simply assumed here that oil in Vietnam in 1995 accounts for the same proportion of total energy use as it did in 1987. As shown in Table 4.6, path II is shown as lying slightly above path I. Together the two growth-paths bracket a demand

Table 4.6

Two growth-paths for Vietnamese oil consumption to 1995



*Petroleum News, Jan-Feb 1989, p.43, quoting Vietnamese officials

growth range of 10% to 19% and result in Vietnam's oil demand by 1995 broadly in the 60-70,000 b/day range.

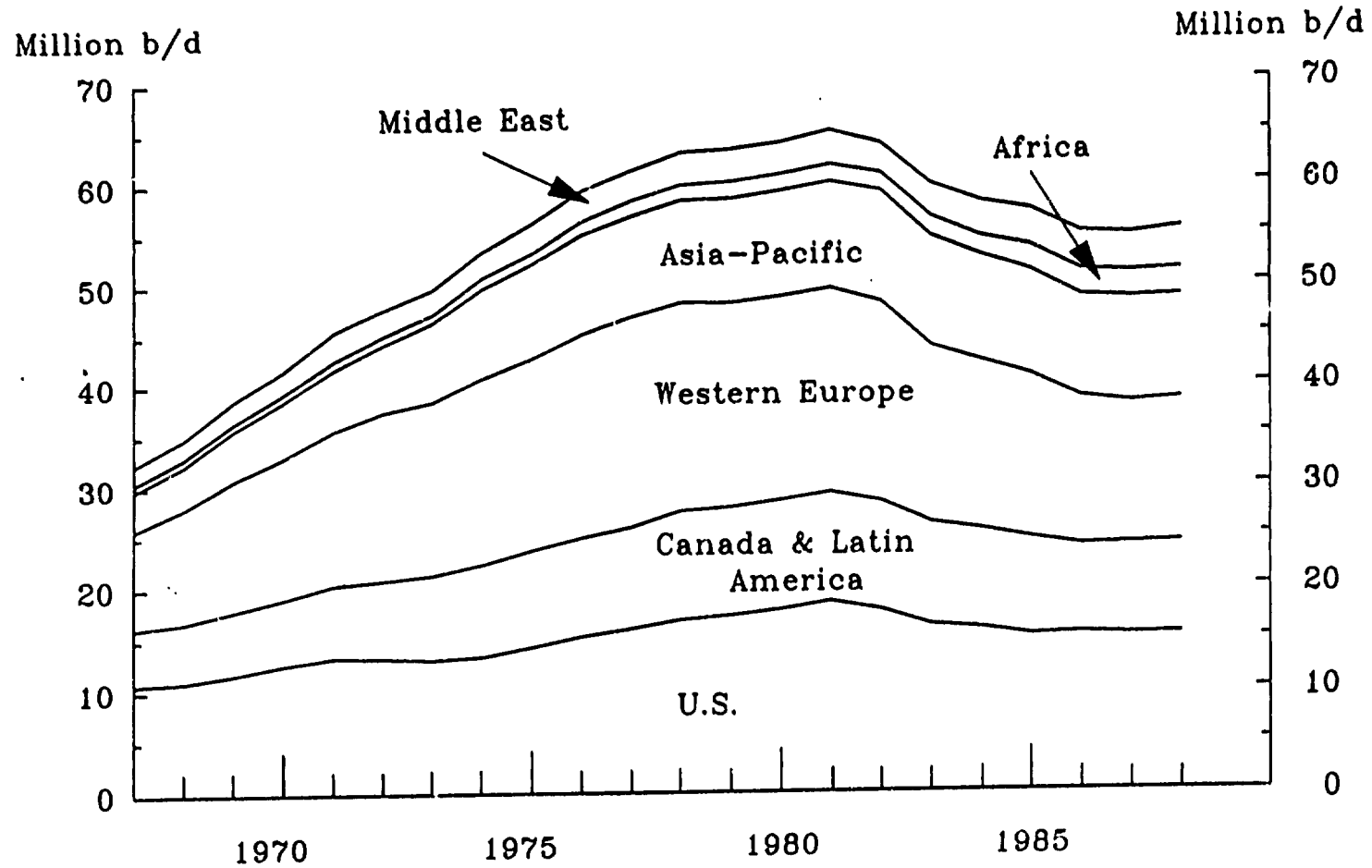
CHAPTER 5: THE WORLD REFINING INDUSTRY IN THE 1990S

This chapter discusses the likely evolution of the world oil refining industry in the 1990s before turning to Vietnam's refining situation in particular. The prospects of Vietnam are then discussed in the light of the outlook presented earlier in the chapter. The focus of Chapter 6 is then the policy framework within which the Vietnamese authorities must shape their downstream oil decisions. Several aspects of the management of downstream oil companies are discussed before a summary of the options facing Vietnam is presented.

The following factors are significant in considering the refining industry's prospects:

- * after a considerable amount of moth-balling in the early 1980s, reflecting slumping demand for oil products as real prices climbed, most of the world's refinery operators have begun again to add capacity (see Table 5.1).
- * In the Asian region, Indonesia and Singapore are adding capacity in large increments, with Singapore already established as one of the world's major refining centres.
- * Recent estimates of the Asia-Pacific region refining outlook indicate that an increasing amount of refined oil products will have to be imported, as discussed in Chapter 4, suggesting that there will be persistent excess demand for refined products in the region in the 1990s.

Non-Communist Refining Capacity At January 1



Source: OGJI

The current state of the Asian countries' refineries is set out in Table 5.2, which shows that Japan is by far the biggest refining location, followed by India, Singapore and ~~South~~ Republic of Korea. No other country possesses more than 7% of the region's total capacity. In Table 5.3 recent announcements about planned increments to the region's capacity are summarised. It is clear that Thailand and Singapore will be among the countries witnessing substantial capacity growth.

In view of the refined product balances developed in Chapter 3, and the domestic demand outlook laid out in Chapter 4, it seems very likely that, despite the region's growth of refining capacity indicated earlier in this chapter, there will be demand for any Vietnamese refined oil products available for export.

With up to 60% to 65% of the Asia-Pacific region's oil demand having to be satisfied by refiners outside the region during the second half of the 1990s, the only reason for Vietnam not being able to find markets for its refined products would be undercutting on price by large refiners in the Middle East. A refinery of the size envisaged in Vietnam might face a cost disadvantage, compared to optimally scaled refineries in the Middle East, but this in itself should not be a determining factor. (For a discussion of the relationship between refinery size and operating costs, see Nelson (1976).)

Table 5.2

Asia-Pacific refining capacity, 1988
(000 b/day)

Australia	637
India	1,059
Indonesia	714
Japan	4,566
South Korea	820
Malaysia	212
Pakistan	130
Philippines	286
Singapore	858
Sri Lanka	50
Taiwan, Province of China	192
Thailand	190
Other	68
	<hr/>
Total	72,933

SOURCES: Energy Statistics Sourcebook, 1988; Petroleum
Economist, April 1989, p.134.

Table 5.3

Asia-Pacific Region: selected refinery expansion plans

Country	Current demand for refined products (b/day)	Refinery expansion plans reported
Thailand	250,000 b/day, reaching 440,000 b/day by 1993	Current output around 194,000 b/day/ Expansion planned at: Thai Oil Co. Sri Racha: 65 to 100,000 b/d. Bangchuk, to 68,000 b/d. Esso Sri Racha, 55 to 110,000 b/d.
Singapore	317,000	Current output around 1m b/d. Shell: 4,000 t/d catalytic cracker Mobil: 23,000 b/d hydrocracker Esso: 50,000 b/d visbreaker SRC: 26,500 b/d cracker underway.
Philippines	183,000	National Oil Co. modernising Bataan refinery, due to be finished 1989.
Malaysia	199,000	Shell to refurbish refinery; Esso upgrading at Port Dixon; Petronas modernising Terengganu; Melaka refinery to go ahead. Up to 112,000 b/day expected.
China	2,141,000	Five refineries with total capacity of 80,000 b/day expected by 1991.
Taiwan, Province of China	373,000	Major upgrades, catalytic cracker renovations and new projects underway. New capacity of 156,000 b/day expected.
India	968,000	Six projects totalling 312,000 b/day proposed by 1992.
Indonesia	493,000	One 125,000 b/day Pertamina refinery for 1993 proposed.
Republic of Korea	638,000	Yukong Ltd. in Ulsan planning many upgrades

The other factor which could constrain Vietnam's prospects could be the suitability of its crude for transformation into the ideal slate of products. As noted earlier, demand is growing disproportionately fast for light products, making heavy crudes less desirable as input to refineries. Even in the OPEC member states' refineries, only the big Middle East export refineries are thought to be flexible enough to meet this evolving demand mix. Even then aggregate OPEC net exports of gasoline, the main light product, are expected to grow from 0.187 mn b/day in 1987 to 0.506 mn b/day by 1995, out of total product exports in 1995 of 3.64 mn b/day (Al-Fathi, 1989, p.97), indicating considerable opportunity for exporters of crude which can readily be transformed into light products.

It is, however, quite likely that the export issue will be moot, since, if Vietnam's economy pursues a reasonably stable growth-path during the 1990s, domestic demand for refined products will very probably outstrip the domestic refineries' capacity. If indeed this is the case, then the issue becomes one of the opportunity cost of building a large refinery, and allocating capital to that facility, rather than relying on importing refined products, or possibly reimporting domestic crude once it has been refined by a merchant refiner. The next chapter reviews these topics and the outlook for Vietnam.

CHAPTER 6: NEXT STEPS FOR VIETNAM IN REFINING

This chapter analyses the various policy options which the petroleum agencies in Vietnam will face, given the outlook for the country's crude and refined products as set out in the preceding five chapters. Although the preceding analysis suggests that there is very likely to be a ready market for refined products within the Asia-Pacific region (and indeed beyond) in the 1990s, this chapter will argue that an attractive demand outlook is a necessary but not sufficient condition for committing resources to refining. A poorly executed refining strategy can diminish value added in the economy even under the best demand outlook.

The refinery decision facing the authorities in Vietnam has so far been discussed as a straightforward capacity expansion one. In practice, however, as with any business decision, there are many more factors to consider.

The management aspects of the refining decisions facing Vietnam's petroleum agencies fall into the following headings:

- (a) managing the relationship with foreign oil companies.
- (b) developing indigenously the skills needed to commission then run and market the output of a significantly larger refining capability.
- (c) managing through all the exogenous shocks which inevitably occur in a cyclical industry subject to

worldwide political and economic upsets.

- (d) maximizing the local benefits from investment in what is inevitably a capital-, foreign exchange- and foreign expertise-intensive business.

The following pages discuss these aspects of the refining capacity decision.

(a) Managing the relationship with foreign oil companies

It is widely recognised now that foreign oil companies do have many skills to offer the developing countries as they build up their energy resources. Among the skills in which the companies have retained pre-eminence are seismic geology, understanding the exploration/production balance, tax organisation, product marketing, and others. Gaining access to these skills on attractive terms has, however, tended not to come easily to host country governments. In the case of China, a recent case-study showed the problems of "how best to structure the relationships with foreign companies so as to minimise the loss of sovereign control and maximise the benefits of their presence. China has yet to find this optimum ... These types of problem parallel those that other developing countries have faced when defining how their self-interest is best served by the presence of foreign oil companies." (Fridley and Christoffersen, 1987, p.261.) Although in Vietnam there has been a major policy shift regarding the way the foreign oil companies are perceived, in no country is the partnership

always straightforward. In Vietnam it will be necessary to review the costs and benefits facing the oil companies as they try continually to optimise their own interests across the Asia-Pacific region, with all the exploration and refining opportunities that present themselves there.

(b) Developing an indigenous skill-base

The skills needed to keep an integrated oil facility running, and achieve world-level margins from product sales, have taken the oil majors decades to build up. Looking across the oil producing countries' oil organisations, one senior Royal Dutch/Shell manager has forecast that because most of these organisations have failed to internalise enough of the skills, they will return to the oil majors with a different attitude in the 1990s. "They've wasted their stock of human know-how ... the national oil company gets caught up in political considerations ... [such that] as a class they are failures when stood next to their private counterparts." (Financial Times, 16 October 1989.) -

Ideally, the skill structure for a refinery complex of the kind being contemplated in Vietnam would be identified. Once this had been done, one could assess which skills would fall under the following headings:

- can be fully provided indigenously
- can be partly provided indigenously
- absent and must be imported, but skills transfer has a fair chance of working over time

- absent and must be imported, and skills transfer unlikely to be effective in the short term.

Taking a simple diagnostic of this kind would allow priorities for local training to be set, as well as allow an honest appraisal to be made of where foreigners could help build the skills of Vietnam's own labour-force.

(c) Managing through exogenous shocks

Contemplating the correct downstream capacity decision has undoubtedly become more difficult in recent years. As Broadman and Wilson (1987, p.268) have observed:

"In today's market, with crude and product prices highly variable and with increasing reliance on netback pricing schemes, the profit margin on most [refinery] investments have been reduced. As a result, devising an appropriate refinery strategy has become more challenging, ... [but] experiences abound which demonstrate that the more product there is, the greater the pressure to build or expand local refining capacity."

While domestic refining capacity is often seen in developing countries as a source of further tax revenue as well as value added, inefficiencies which reduce consumer welfare can arise. Thus, in general, "exposing the national refining market to import competition helps hold down consumer prices and reduces inefficiencies in national oil company management." (Broadman and Wilson, 1987, p.268.)

The indications in Vietnam are that the Petroleum General Corporation and the Ministry of Supply have been granted a monopoly of petroleum trade in Vietnam. The PGC will organise a retail distribution network, distribute and ration, where deemed necessary, refined products between sectors of the economy. (Petroleum Economist, Feb 1989, p.65.) There will therefore have to be considerable care taken to ensure that the marketing apparatus is kept efficient in an operations sense and effective in the sense that it allocates scarce supply in a transparent, predictable and rational manner.

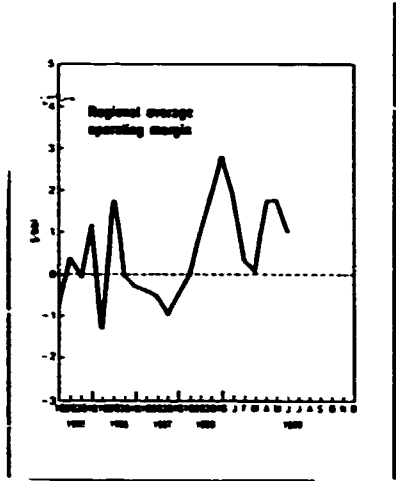
Moreover, a long-term view of the attractiveness of being an owner of refining capacity must recognise the volatility of returns to assets in that business, as well as the volatility of returns to refining vis a vis upstream involvement in oil. Recent experience in 1989 saw margins in downstream businesses (chemicals, refining and marketing) shrinking from previous levels as crude prices rose above levels of prior years. (Wall St. Journal, Oct 24 1989; Oct 21 1989.)

The Wright Killen time-series on US refining margins indicates the extreme volatility of returns to downstream assets. Between a recent low of around a \$1.30/barrel loss in early 1986 to a high of nearly \$3/barrel operating profit in late 1988, the return has been extremely variable. Even within a year the margin can swing by \$2/barrel or more.

Given that these figures exclude income tax, depreciation and finance charges (i.e. are gross rather than net margin) the real net returns to refiners will be even lower (see Table 6.1). (Wright Killen and Co., reported in Oil and Gas Journal, various issues.)

A factor which allows a small number of refiners to mitigate this problem is their ability to process crude very rapidly after receiving it, thus letting them respond quickly to changes in the spot prices for crude and refined products. (UNIDO, 1988, p.230) This can be seen as the processing equivalent of time-compression as a source of competitive advantage in manufacturing. Refiners who are physically distant from their markets, however, and who are not capable, technically or managerially, of this fast decision-making, will be at a disadvantage insofar as spot prices remain volatile.

It is, of course, also the case that at times refiners enjoy easier margins than do crude producers. When crude is abundant, many crude suppliers offer 'netback' pricing deals to refiners, thereby guaranteeing them a given margin, without risk. The price the refiner pays for crude is only decided once the products are sold in this type of arrangement. Margins under netback of \$1.50 - \$3/barrel were being reported in 1986. (Petroleum Economist, Sept 1986, p.321.)



(d) Maximising the local benefits

To achieve the best domestic use of resources, ideally one would estimate the value added to be derived from each stage of the processing chain from crude oil exploration down to the retail sales of gasoline and other finished products. There would then be an appraisal of the key success factors at work at each stage of processing, and a hard assessment made, for a country such as Vietnam, of how closely these factors could be met. In stages of processing where a frank appraisal showed that the chances of success were poor, it would be rational to import rather than commit scarce local resources to the process. Lack of data prevents this thorough an assessment being undertaken for Vietnam - although the indigenous agencies might well find that a useful exercise to conduct for themselves. A first effort is made in table 6.2, where the operating margins obtained by US refiners are compared to the margins estimated to have prevailed for a hypothetical \$8/barrel crude oil producer. It can be seen that the extra value added involved in refining has not consistently been rewarded, insofar as a simple comparison of margins is a guide.

Bearing in mind that the bulk of the costs of building, running and maintaining the facility need to be imported, thus implying an opportunity cost of foreign exchange, care obviously needs to be taken in devising the cost/benefit calculus. Above all, it needs to be clear that the

difference between the selling price of refined products and the selling price of crude oil is not all dollars due to the petroleum agency in Vietnam. There will be many costs to take into account and these will be relatively constant in the face of highly volatile refining margins.

It is important have rough, order of magnitude, estimates of the amount of capital which will be committed to downstream projects, since this capital obviously has many alternative uses in an economy like Vietnam. Data from refinery expansion plans announced elsewhere in the world (and, for the Asia-Pacific region, shown in Table 5.3) indicate a capital costs in the order of \$3,000-\$4,000/barrel/day. If the projected Tuy Ha refinery (of 150,000 t/year capacity) were built, this would indicate an investment of around \$550 mm. A recently proposed 120,000 b/day refinery in Thailand is estimated to have capital costs of \$4,300/barrel/day. Of course, the scale of the refinery and its complexity (specifically, the output-mix desired from it vis a vis the slate of crude inputs) dictate the precise costs. In the Thai case, built to take light crude input, there is a resid cat cracker, hydrotreater and reformer as well as the basic hydroskimmer, and all this adds to the cost. Naturally, these figures would be revised in the light of the precise engineering specifications needed in Vietnam.

The operating costs likely to be encountered may be expected to break down as shown in Table 6.3, where their likely import-intensity is also shown.

Table 6.1

Upstream and downstream margins compared

		Refining margins \$/barrel <u>a/</u> US Gulf coast	Refiner's cost of crude/b <u>b/</u>	Crude producer's inputed margin /barrel <u>c/</u>
1980		N/A	28.07	20.07
1985		N/A	26.75	18.75
1986		N/A	14.55	6.55
1987	Jan	-0.20	17.90	11.90
	July	-1.10	-	-
1988	Jan	0.10	14.71	6.71
	July	3.80	-	-
1989	Jan	1.80	16.85	8.85
	July	2.80	-	-

a/ 85% West Texas sour processed through high conversion refinery. Includes costs of utilities, catalysts, chemicals, labour, overhead, maintenance, insurance, local taxes, interest on working capital.

b/ US Gulf Coast

c/ Assumes \$8/barrel production costs.

SOURCES: Oil & Gas Journal, 31:7:84, p.60.
Petroleum Economist, various issues

Table 6.3

Estimates of likely operating costs

	US cents/barrel		Import intensity
	50,000 b/d	200,000 b/d	
Labour	17.4	10.7	high for skilled labour
Energy	25.9	25.9	available domestically
Maintenance materials	4.5	2.9	mostly imported
Chemicals, general	8.1	8.1	all imported
Tetra ethylene	6.4	6.4	imported
<u>Direct operating costs</u>	62.7	54.4	
Overhead	82.7	53.4	mainly imported staff, facilities
<u>Total operating cost</u>	145.4	107.8	

SOURCE: Nelson (1976); own estimates

Note: figures are dated.

This first questionmark over the appeal of refining has to be supplemented with a second, which is the set of four management issues described at the beginning of Chapter 6. When taken together and the potential opportunity cost of investing in refining in Vietnam is considered, the scale of the benefits begins to be questionable.

Having looked at the problems of managing in the oil refining industry, the discussion now turns to consider the policy options facing the petroleum agencies in Vietnam.

The options for Vietnam can practically be boiled down to four, as laid out in Table 6.4. There it is suggested that the fourth option, that of investigating various forms of partnership with overseas-based oil companies, may well offer the best combination of risk and reward. The reasons for this have as much to do with the management aspects of being in the oil refining industry as they do with the strict economics of the business.

To begin trying to maximise the benefit of any downstream involvement which is decided upon, a set of topics to monitor and evaluate, such as is laid out in Table 6.5, is suggested.

A different type of concern facing any new oil-exporting country's government is, of course, deciding on the appropriate macroeconomic policy framework.

Table 6.4

Summary of refining options for Vietnam

Policy option	Benefits	Drawbacks	Main prerequisites for success
1. Retain refining capacity at 1989 level	Avoid volatility of refining margins	Loss of domestic value added	Choice of partner as management contractor and own skills as oil products marketer
2. Expand capacity to reach self-sufficiency	Little or no need to import refined products in net volume terms	Opportunity cost of capital invested in refining will be considerable if construction delays and/or operational problems arise	As above, but even more critical
3. Expand capacity well beyond foreseeable domestic requirements	Potentially major source of value added to economy	Now open up project to all exogenous shocks in worldwide refining industry but at much lower volume and less certain crude supply than in Middle East	Thorough feasibility/competitive analysis needed to evaluate competition from Singapore and Middle East based refineries
4. Variety of "strategic partnerships" entailing joint ownership of refining with ultimate foreign purchaser(s)	Less operational risk than other options since less capital is committed and output is partly pre-sold	Must fit into global refining network envisaged by each oil major, thus less autonomy than in above options	Consistent management of relations with chosen partner(s) imperative. If managed correctly this option may offer best risk/reward combinations over time to a late entrant to the industry

Table 6.5

Immediate topics to monitor and evaluate

Topic	Rationale for monitoring and evaluation
Follow closely evolving global and regional energy balances	To identify and begin monitoring the critical sub-set of developments which have high impact on Vietnam's crude and refined oil prospects
Appraise suitable local oil partners	To identify which international oil companies are likely to have the best apparatus for helping develop and then market refined products produced in Vietnam. Also to gain assistance in the efficient running of the domestic sales and marketing infrastructure
Search for recent experiences in maximizing spin-off effects from oil refining in developing countries	Try to learn from lessons learned elsewhere in developing countries regarding optimal way to negotiate with oil companies to engender local spin-offs or benefits

Experience in many countries, including some OPEC member states, as well as Mexico, Norway and the UK, suggests that oil exports can have a significant and often perplexing impact on other sectors of the economy. A recent review has referred to the 'Dutch disease' (of exchange rate appreciation prompted by oil or gas exports) and its problems in developing countries, noting that if the exchange-rate rises quickly it hits agricultural producers worse than industrial producers since the latter's output is less than perfectly substitutable by imports. This, it is suggested, "may explain why the agricultural sector contracted in all oil exporting countries during the period 1974-82 while the industrial sector actually expanded in all but two of the countries." (Benjamin et al., 1989, p.90)

Summary and Conclusions

To sum up the forces likely to be at work in the international oil environment facing Vietnam in the next decade:

- * continued steady growth in demand worldwide for refined oil products
- * particularly strong demand growth in the Asia-Pacific region
- * somewhat stronger growth of demand for light products than heavy products in all regions
- * no further major change in world refining industry structure beyond continued debottlenecking to match the move to lighter product demand, and some continued

downstream push by a subset of OPEC members

- * continued cyclicity in refining margins as capacity growth proceeds irregularly and encounters swings in the business cycle at unpredictable intervals.

Together, these facts point to an environment which could be characterized as

- * a fairly assured sales outlook in the aggregate sense for a new, small-volume entrant like Vietnam
- * a somewhat less assured profit outlook for entrants in the same market region as well-established and sophisticated refining marketers
- * when seen from an import-substitution standpoint, refining offers some value-adding opportunity, but one whose appeal will probably be sporadic and always subject to erosion by operational difficulties reflecting the difficult if not hostile offshore operating milieu
- * very little indigenous management used to dealing with the vagaries of international refined products marketing. —

Taking these observations together, there would be considerable appeal in seeking to lay off some of these risks by allying with a partner who has experience in managing refining facilities and marketing the product. A number of such alliances have been forged in developing countries and appear to be feasible as a vehicle for the Vietnamese industry to move forward confidently and efficiently.

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