NOTES ON SOME PROJECTIONS OF ENERGY SUPPLY AND DEMAND

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CONTENTS

I. Introduction

1. A great many studies involving projections of global energy supply and demand have been made since the oil crisis of 1973-1974. These notes summarize the conclusions of three of the most comprehensive and authoritative long-term projection studies (those of the World Energy Conference (WEC) 1977, the Workshop on Alternative Energy Strategies (WAES) 1977, and the OECD Interfutures project, 1979) and comment briefly on several of the other ones.

2. Before doing so, however, it may be useful to point out that of the eighty or so studies undertaken since 1973, the projected increases in world demand for energy are significantly lower in the later studies than in those compiled earlier. This reduction is partly because of a lowering of expectations as to future rates of economic growth, and partly as a result of a reduction in the energy/GDP coefficient caused by greater conservation related to increased prices of energy, technological improvements and structural change. The projected rates of increase in the supply of energy have also tended to decline through time, mainly because of the greater emphasis being placed on production restraint by governments of the major oil-exporting countries.

3. The more recent preoccupations with supply have not been reflected in the WEC and WAES studies, the practical utility of whose conclusions might well be considered as having been vitiated by their assumptions of a continuation of earlier policies on oil production by governments of the major oil-exporting countries and on oil price rises to the end of the century and beyond (by the end of 1979 actual prices of oil were already above levels assumed for the end of the century in some of the projections). Despite its more recent publication, the Interfutures project suffers from similar limitations, particularly on oil price assumptions.

4. In fact none of the long-term projections of global energy supply and demand yet published takes full account of the recent sea-change in the oil supply and price situation. The US Central Intelligence Agency published a study in July 1979 which did take account of the changed Iranian situation, but its projections were only until 1982 and it focused on the oil supply prospects for OECD. Even the most recent OECD Economic Outlook, of December 1979 and covering the year 1980, was compiled before the extent of the most recent oil price rises was known. The National Institute of Economic and Social Research (NIESR) (London), in its November 1979 review, covered a longer period(1980-1985), but whilst it was able to take full account of the changed oil supply situation in terms of availabilities, it too was published before the oil price increases announced towards the end of 1979.

5. The major published studies also suffer from other limitations. WAES, for example,does not cover the centrally-planned economy countries (CPEs), while WEC assumes this group will remain self-sufficient. Yet evidence from the CIA and other sources suggests that the CPEs of Europe will become increasing net importers of oil during the 1980s as the great fields of Western Siberia become depleted. Interfutures does not attempt an an independent projection of global energy supplies.

6. The studies whose results are summarised below differ significantly in their assumptions as well as in their quantitative projections of energy supply and demand. However, there are some crucial conclusions which they share. The studies suggest that 'new' and unconventional sources of energy, such as solar energy and fast-breeder reactors, are unlikely to make a major commercial impact before the end of the century; as such, and assuming that the rate of exploitation of 'conventional' oil resources is not likely to increase substantially, the main possibilities of increasing energy supplies would be through greater production of coal and an expansion in that of 'conventional' nuclear energy. Even so, most projections suggest that energy supplies are likely to constitute a constraint on economic growth possibilities in the 1980s and perhaps to the end of the century. The realisation of even modest growth targets will therefore require considerable efforts at energy conservation and restriction. However, looking beyond the end of the century, given adequate investment in technology and resource development, there would seem to be no physical constraints to the expansion of energy production and thus to the possibilities for economic growth.

II. World Energy Conference

7. The WEC has seventy-six member countries from the developed, developing and centrally-planned economy countries. It collects and publishes data on the potential resources and means of production, transportation, transformation and utilisation of energy, as well as on the relationship between energy consumption and economic growth. Conferences on these matters have been held since 1924, the most recent being in Istanbul in September 1977; the next one is scheduled for Munich in September 1980.

8. One of the main arms of the WEC is the Conservation Commission, established in 1975 to evaluate, for the period 1985-2020, primary energy supply prospects and to determine possible courses of action toward overcoming potential shortfalls in availability, with particular attention to oil and gas. Three study groups were established by the Commission - on resources, conservation measures, and demand. The groups were assisted as necessary by studies commissioned to consultants. One of the major studies was that on "world energy demand to 2020" undertaken by the Energy Research Group from the Cavendish Laboratory of Cambridge University.(1)

9. The principal conclusions of the Conservation Commission,(2) which were accepted by the 1977 Istanbul Conference, are as follows :

i) during the period 1975-2020 world demand for energy, and thus economic growth, would have to adjust to whatever supplies of energy were available ;

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1. "World Energy Resources 1985-2020 : World Energy Demand to 2020" by I.J. Bloodworth et. al., IPC Science and Technology Press, 1978.

2. "World Energy : Looking ahead to 2020", edited by I. Berkovitch for the Conservation Commission of the World Energy Conference, IPC Science and Technology Press, 1978.

ii) the maximum potential global supplies of energy in the year 2020 were put at 1,000 exajoules (EJ) (1), implying an average annual rate of increase between 1975 and 2020 of 3 per cent (see Table 1) ;

iii) attaining such a rate, however, would entail major efforts in all energy resource fields, including the discovery and development of major oil and natural gas deposits (necessarily in increasingly difficult physical situations), the tripling of coal production, the doubling of nuclear power plant capacity every half-dozen years, and the use of solar energy on a scale and at a growth rate which is unprecendented ;

iv) these efforts would require greatly expanded investment, technology transfer, technical training and R & D in the requisite production, transportation and marketing facilities, together with the appropriate social and political conditions. In view of the long lead times in constructing energy facilities, concerted government action was needed without delay ;

v) resources of 'conventional' oil, together with projected discovery rates, are such that global production is expected to peak at about 220 EJ around 1990, fall to 175 EJ by 2005 and to 105 EJ by 2020. This means that by the year 2000, 'conventional' oil production would be sufficient to meet world demand only if the bulk of that demand were to be reserved for specific premium uses, such as transport and chemical feedstock, and use in heating and power generation were to be greatly limited ;

vi) supplies would, however, be augmented by 'non-conventional' oil, whose production potential could reach a level of 40-50 per cent of that of 'conventional' oil by 2020, given the requisite incentives ;

vii) resource availabilities are not as constraining a factor for natural gas as for oil, but they do mean that the global production potential is expected to peak in the year 2000, at over 140 EJ, and fall to some 115-125 EJ in 2020; by that year, 'non-conventional' sources could add a further 15 EJ to potential supplies ;

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1. One exajoule = 10^{18} joules. (A joule is the standard scientific unit for measuring energy; it is defined as the energy dissipated in one second by a current of one ampere flowing across a difference of one volt). One exajoule is approximately equivalent to 160 million barrels of oil (0.45 million barrels of oil per day) or 22.7 million tonnes of oil or 34.5 million tonnes of coal.

viii) resources of coal are abundant and, with advancing extraction technologies, recoverable reserves are sufficient for almost two centuries of supply at the most demanding rates, including those for conversion to synthetic oil and gas ;

ix) world production of coal is projected to increase by 2.7 per cent annually to 2020, in line with total output of energy. Provided economic conditions are favourable, output could increase at a faster rate ;

x) production of uranium for nuclear power generation will peak around 1990 at a level some four times its 1975 total unless new resources are identified and developed; but as under certain assumptions it is projected that requirements for uranium by 2020 would be around fifteen times those of 1975, it is likely that even if such discoveries were made, nuclear power generation would continue to be constrained unless considerable advances are also made in fuel utilisation technology and fast-breeder reactors are introduced on a large-scale from about 1990 ;

xi) the existing potential of hydraulic resources and the capacity of facilities under construction or planned indicates that the probable annual average amount of energy available from hydro-electricity facilities will more than double between 1975 and 2000 and quintuple between 1975 and 2020. This means that hydraulic resources would continue to account for around 5 per cent of total supplies of energy but would provide a diminishing proportion of that of electricity (23 per cent in 1975 and 16 per cent in 2020). By 2020 it is likely that some four-fifths of the world's hydraulic resources will have been harnessed, and development thereafter will be much slower ;

xii) given adequate technological progress, production of solar energy could increase from its current insignificant level to a range of some 25-75 EJ by the year 2020 (2.5-7.5 per cent of total supplies); it is probable that around four-fifths would consist of solar energy for heating and cooking ;

xiii) it is likely that geothermal resources will play an increasing role in world energy supplies and by 2020 could be providing around 40 EJ of energy (4 per cent of the total) ;

xiv) the resources base for the fusion fuel cycle is practically limitless, but the state of technology for converting the resources into energy is such that no reliable estimate can be made of when the process will become economic except to state that by 2020, on optimistic assessments, it may just be reaching the demonstration stage ;

xv) on the demand side the Commission considered that an average annual increase of 3 per cent in the potential supplies of energy, to 1,000 EJ in 2020, could be consistent with economic growth from 1975 to 2020 maintaining its 1960-1975 pace, of around 4.2 per cent per annum in OECD, 3.3 per cent in the CPEs and 5.7 per cent in the developing countries (LDCs) (see Table 2) ;

xvi) this conclusion , however, was dependent on three assumptions; viz. that during the period (a) the income elasticity of demand for energy declined from 0.8 to 0.4 in OECD and from 1.3 to 0.9 in LDCs, (b) the price elasticity of demand for energy was -0.4 in OECD and -0.3 in the LDCs, and (c) the CPEs remained self-sufficient in energy ;

xvii) reducing the income elasticity coefficients in this manner, partly as a result of a response to energy price increases and partly as economies matured, would mean the saving of almost half of the energy that otherwise would have been used by the year 2020. Three-tenths of this saving would be effected through technological improvements and one-sixth through structural changes ;

xviii) a successful global energy strategy would need the following elements

- maximum production of non-renewable 'conventional' energy resources (coal, oil, gas and fissile materials) ;
- significant development of 'non-conventional' oil and gas resources ;
- timely development of renewable energy resources (hydro, solar (including biomass), geothermal and fusion) ;
- enhanced conservation through the more efficient utilisation of energy ;
- increasingly extensive substitution of coal and nuclear energy resources for oil and (later) gas ; and

- suitable arrangements between energy supply industries and governments to provide adequate capital for the large-scale and costly capital investment programmes required ; and

xix) the timing of such a strategy is crucial, and decisions to implement programmes of expanded energy production and of enhanced conservation of demand must be made promptly : a delay of ten years (to the latter part of the 1980s) would precipitate a global energy deficit and consequent crisis before the year 2000.

III. Workshop on Alternative Energy Strategies

10. The WAES consisted of a group of over seventy-five leaders of commerce, industry, government and academia who for two and a half years from October 1974 studied energy supply and demand, and assembled a set of 'global'(1) and national integrations for the period 1977-2000.(2) The participants in the Workshop, together with their associates, were assisted in their task by a secretariat from the Massachusetts Institute of Technology.

11. WAES adopted a 'scenario' approach to their model building, specifying the assumptions made for key variables such as 'world'(1) economic growth, 'world'(1) oil/energy price, national policies toward energy, oil discoveries and production limits, principal replacement fuels for oil, etc. The scenarios chosen were not forecasts but simply plausible versions of possible futures, leading to different estimates of maximum potential supplies of and desired demand for primary energy. The period under examination was divided into two parts : 1977-1985, in which the contribution of each primary energy source was already largely determined by existing infrastructures; and 1985-2000, when alternative energy supply systems and conservation measures could make major contributions.

12. The major conclusions of the study are as follows :

i) the supply of oil will fail to meet increasing demand before the year 2000, most probably between 1985 and 1995, even if energy prices rise 50 per cent above their 1975 levels in real terms ;

ii) demand for energy will continue to grow even if governments adopt vigorous conservation policies. This growth must be satisfied increasingly by energy resources other than oil, which will be reserved progressively for uses which only it can satisfy (e.g. chemical feedstocks) ;

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1. The WAES concept of 'global' and 'world' was the 'World Outside Communist Areas' (WOCA).

2. "Energy : Global prospects 1985-2000", Report of Workshop on Alternative Energy Strategies directed by Carroll L. Wilson of M.I.T., McGraw-Hill 1977; and three Technical Reports, M.I.T. Press, 1977.

iii) continued growth of energy demand requires that energy resources be developed immediately with the utmost vigour. The alternatives take 5-15 years to develop and the need for replacement fuels will increase rapidly in the last decade of this century ;

iv) electricity from nuclear reactors can make an important contribution to global energy supply but has yet to be accepted on a large-scale. Fusion power is not expected to be significant before 2000 ;

v) coal has the potential to make a substantial contribution to global energy supply : reserves are abundant, but taking advantage of them requires an active development programme by both producers and consumers ;

vi) natural gas reserves are large enough to meet projected demand, provided incentives are sufficient to encourage the development of extensive and costly inter-continental gas transportation systems ;

vii) although the resource bases of other fossil fuels, such as oil sands, heavy oil and oil shales, are very large, they are likely to supply only small amounts of energy before 2000 ;

viii) renewable resources of energy, other than hydro-electric power, are unlikely to contribute significantly to energy supplies this century, although they could be of importance in particular areas; they are likely to become increasingly important in the next century ;

ix) energy efficiency improvements, beyond the substantial energy conservation assumptions built into the WAES analysis, can further reduce energy demand and narrow the prospective energy gap ; and

x) the critical interdependence of nations in the energy field requires an unprecendented degree of international collaboration, notably the will to mobilise finance, labour and R & D with a common purpose never before attained in peace-time; moreover, this collaboration is required now.

The range of projections of energy supply and demand, as determined by WAES, is set out in Table 3.

IV. Interfutures

13. The OECD Interfutures project,(1) which ran from 1976 to 1978, was undertaken in order "to provide OECD member governments with an assessment of alternative patterns of longer-term world economic development in order to clarify their implications for the strategic policy choices open to them in the management of their own economies, in relationships among them, and in their relationships with developing countries."(2)

14. The project analysed prospects, constraints and issues in the longer-term perspective, with particular attention to such subjects as the physical limits to growth, the interaction between growth, structural adaptation and value changes, and the relationships between the policies and progress of developed and developing countries. It adopted a 'scenario' approach, adopting four basic scenarios differentiated according to level of economic growth and type of economic management. Among the issues on which the project concentrated was the extent of the problems which will be faced during the transition from an energy system dominated by oil to one in which other fuels will have to play a growing part, and how these problems might best be overcome.

15. The first consideration in this process was an examination of the physical limits to growth. The report concluded that "energy resources should be sufficient to meet in the long-term, and on a regular supply basis, world consumption levels which will be ten to fifteen times higher than that of 1975, at costs which over the period are not more than twice or three times as high as production costs in 1978."(3) Drawing heavily on estimates of the WEC, the report considered that resources of oil, natural gas, coal, uranium and thorium, in aggregate could not provide a long-term solution to energy demand but that, eventually, renewable sources of energy, particularly nuclear energy, would provide such a solution.

16. The problem would be in overcoming the period of transition which would be of the order of half a century at least and be marked by great uncertainties. This is the period during which oil production will peak and then decline but before the new forms of renewable energy are available on a large-scale. Because of the size and complexity, and therefore cost, of energy systems, the pattern of supply of and demand for the different fuels can change only slowly. It is the decisions taken before 1985 which will be of crucial importance for the development of the energy situation during the first quarter of the next century. The only decisions which can have any major influence on the energy situation before 2000 are those to (i) implement energy saving policies, (ii) expand nuclear energy plants, and (iii) increase coal production.

17. Superimposed on these global considerations are problems resulting from the uneven distribution of resources, particularly of oil, and the resultant geopolitical tensions. Problems of this nature seem likely to be of growing significance during the transition period.

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1. Interfutures : "Facing the future - mastering the probable and managing the unpredictable", OECD, 1979.
2. Ibid, page iii.
3. Ibid, page 26.

18. An assessment of energy supply potential is only meaningful when related to prospective energy demand, on which the Interfutures project made the following assumptions : that the ratio of energy consumption to GNP would decline (in the case of the OECD countries from 0.8 in 1975 to 0.6 in 2000 for scenarios A, B2 and B3, and to 0.6 in 1985 and 0.5 in 2000 for scenario B1; in the case of the developing countries from 1.4 in 1975 to 1.0 in 2000 for all scenarios); and that the long-term price elasticity of demand for energy is far from negligible, a significant reduction in energy consumption in OECD being possible with only a small relative decline in national income.

19. Application of the various scenario assumptions resulted in a wide range of projected increases in energy consumption between 1975 and 2000. Details are given in Table 4.

20. The authors of Interfutures commented on the results obtained in the following terms :

Scenario A : Sociopolitical rather than physical limits might prevent realisation of this scenario owing to the need for great investment in oil exploration and development and in coal production, as well as the environmental problems holding back the development of nuclear energy and the need to adopt simultaneous policies on conservation and on developing alternatives to oil.

Scenario B1 : Energy supply problems remain, as almost all the projected 15 per cent reduction in demand compared with that in Scenario A is assumed to come from a halting of development of nuclear energy production. Market pressures on fossil fuels are therefore unchanged, and despite strict conservation measures, an energy crisis due to the depletion of oil resources remains a possibility.

Scenario B2 : Less opposition to nuclear energy allows retention of higher coefficients of energy demand to GNP.

Scenario C : OPEC supply policy leads to a doubling of the 'real' price of oil between 1978 and 2000 and to a favouring of the 'South'. Total demand is put at a level 28 per cent below that in Scenario A, the bulk of the decline occurring in OECD whilst that in the developing countries is only moderately lower (16 per cent).

Scenario D : Protectionism leads to a realignment of energy trade flows. Total demand is put at about the same level as in Scenario B1 but that in OECD is rather higher and in other countries (in aggregate) rather lower.

21. The main conclusions of the report - as regards energy - are as follows :

i) the development of nuclear energy is essential during the transition to the post-oil era; there is no longer time to organise a type of development which consumes little energy and is socially harmonious ;

ii) the development by OECD of a common coal policy will considerably reduce the risk of an energy crisis. Coal will have to play a major role in energy supply from 1985 ;

iii) energy conservation policies can have significant effects but need to be formulated in a long-term perspective and applied consistently and vigorously ;

iv) because of the length of the transition period, vigorous measures should be taken promptly to develop new forms of energy or new sources of the same fuels ;

v) enhanced cooperation should take place among the oil-importing countries on the implementation of the above policies ;

vi) OECD should also seek better cooperation with OPEC in order to encourage that group to adopt a more positive attitude toward undertaking the necessary amount of research and investment to maintain an exportable surplus of oil, which would benefit developed and developing countries alike ; and

vii) OECD should provide technical and financial assistance to developing countries (either directly or through international organisations) in order to help them to exploit their fossil fuel resources and to obtain nuclear energy when their level of energy consumption or situation so warrants; it should in addition cooperate with them on the production of new sources of energy, particularly biomass; consideration should also be given to how to guarantee these countries a certain supply of oil (or the means to obtain that supply) in case of shortage.

V. Other studies

1. Organisation for Economic Cooperation and Development

22. In 1977 the OECD published a study on the "World Energy Outlook". This was a revision and extension of its earlier study on "Energy Prospects to 1985" and contained a reassessment of energy prospects for the world to 1985 and of the OECD region to 1990 and beyond. The study was undertaken on a scenario basis, with the object of assessing what quantities of energy should be needed to fulfil given rates of economic growth for particular groups of countries, from which the necessary levels of global energy production could be calculated. It assumed that oil supplies for export from OPEC would match the potential demand for OPEC oil, although recognising that in practice not all OPEC members would necessarily always produce to capacity.

23. The study concluded that a continuation of present policies governing energy supply expansion and conservation would produce by 1985 a close and uncertain balance between importing countries' demand for oil imports and exporting countries' prospective oil production. The uncertainties of the latter led the authors of the study to propose an immediate further examination of the measures necessary to increase OECD output of oil and to conserve its consumption in order to hold down net imports. They estimated that prompt action through "accelerated policy measures" could save up to 30 per cent of OECD countries' net oil-imports by 1985. The main statistical components of the supply - demand position through to 1985 are given in Table 5.

2. National Institute of Economic and Social Research

24. The NIESR Economic Review of November 1979 included a short-term forecast for 1980 of the effect of the oil price rises on GDP within OECD, and a medium-term forecast through 1985 which assessed the increase in the supply of oil necessary to maintain economic growth of 3 per cent per annum in the industrialised countries and an annual rise of 6 per cent in the oil demand of the non-OPEC developing countries. It assumed that the oil targets agreed at the 1979 Tokyo Summit Conference would not be met in all cases, that the Comecon countries would cease to be net exporters of oil by 1985, that all the 'easy' energy conservation measures had been taken, and that there were few possibilities for the substitution of other fuels for oil until nuclear energy production began to increase rapidly.

25. Application of these and other assumptions led the NIESR to calculate that fulfilment of the above objectives would require an increase in OPEC oil-exports of 2 per cent per annum from 1979 to 1985. Whilst it was considered that the OPEC members were fully capable of such an increase the problem was to assess their willingness to do so. Another difficulty was to assess the movement in oil prices relative to those of other products (e.g. an index of the average unit value of manufactured exports).

26. NIESR concluded that it was not possible to determine with any assurance whether economic growth outside the CPEs would be constrained in the medium-term by energy supplies; but whilst it appeared that a 3 per cent growth rate in OECD was possible, any return to higher rates would become energy-constrained unless vigorous and successful new conservation measures were taken. The projections of the demand for and supply of oil, on which these conclusions were based, are given in Table 6.

3. United States Central Intelligence Agency

27. The CIA study of July 1979 on the "World oil market in the years ahead" focused on the oil supply prospects to 1982 for OECD countries (excluding Australia and New Zealand). It concluded that under the assumptions made, energy demand in OECD would exceed available supplies at all rates of economic growth above 2 per cent per annum if OPEC were to produce at what the CIA judged to be the oil producers' 'preferred levels'. Even if OPEC were to produce at projected maximum capacities, the CIA concluded that energy demand would exceed supplies by 1982-1983 if the OECD economic growth rate exceeded 3 per cent per annum. The solution was swift government action to enhance energy conservation measures and thus reduce the energy/GDP ratio by 2 - 2.5 per cent annually.

Table 1

Potential world production of primary energy, 1972-2020

exajoules (per cent)

	1972	1985	2000	2020
Oil	115 (43)	216 (44)	195 (28)	106 (11)
Gas	46 (17)	77 (16)	143 (21)	125 (12)
'Unconventional' oil and gas	- (-)	- (-)	4 (-)	40 (4)
Coal	66 (25)	115 (24)	170 (25)	259 (26)
Nuclear	2 (1)	23 (5)	88 (13)	314 (31)
Hydro	14 (5)	24 (5)	34 (5)	56 (6)
Solar, geothermal, wood, biomass	26[a] (9)	33 (6)	56 (8)	100 (10)
Total	269 (100)	488 (100)	690 (100)	1,000 (100)

a Consists almost entirely of 'non-commercial' energy - wood fuel, dung, vegetable waste, etc.

Source: WEC Conservation Commission, 1977.

Table 2

Potential world demand for 'commercial' energy, 1972-2020

exajoules (per cent)

	OECD	LDCs	CPEs	World
1972	150 (62)	27 (11)	66 (27)	243 (100)
1980	178 (57)	46 (15)	86 (28)	310 (100)
1990	212 (51)	86 (20)	120 (29)	418 (100)
2000	242 (43)	152 (27)	167 (30)	561 (100)
2010	262 (35)	253 (34)	233 (31)	784 (100)
2020	278 (28)	397 (40)	325 (32)	1,000 (100)

Source: WEC Conservation Commission, 1977.

Table 3

Range of potential energy supply, demand and balance, 1972-2000

(million barrels per day, oil or oil equivalent)

	OECD[a]	Non-OPEC LDCs	OPEC	World[b]
1972				
Supply	40	5	27	74
Demand	58	6	2	69
Balance	-18	-1	+25	+5
1985				
Supply	55-69	12-15	42-46	112-127
Demand	78-104	15-18	4-5	102-138
Balance	-11 to -48	-3	+37 to +41	-15 to +10
2000				
Supply	73-93	20-32	51-61	154-191
Demand	115-143	27-38	8-14	160-207
Balance	-42 to -50	-6 to -7	+43 to +48	-6 to -15

a Excluding Australia and New Zealand.

b Outside Communist areas; includes bunkers.

Source : 1972 - UN World Energy Supplies
1985,2000 - WAES, Third Technical Report, 1977.

Table 4

Demand for energy in 1975 and 2000

(million tonnes of oil or oil equivalent)

	World	Developed	Developing	Centrally Planned
1975	5,606	3,481	440	1,685
2000				
Scenario				
A (high growth)	14,622	7,022	2,736	4,861
B1 (moderate growth)	12,449	..	..	..
B2 (structural difficulties)	13,180	6,021	2,388	4,771
C (north-south rift)	12,002	4,847	2,291	4,864
D (protectionism)	12,434	5,668	2,223	4,543

Source : OECD, Interfutures.

Table 5

Projected energy production, requirements and net trade, 1974-1985

(million tonnes of oil or oil equivalent)

	1974	1980	1985 [a]	1985 [b]
Production				
OECD	2,260	2,708	3,295	3,579
Other developed	51	59	81	81
Developing (ex OPEC)	334	604	837	837
OPEC	1,595	1,820	2,263	1,727
Total above	4,240	5,191	6,476	6,224
CPEs (Europe)	..	..	..	..
CPEs (Asia)	..	..	..	..
Total world	..	..	..	..
Requirements				
OECD [c]	3,466	4,204	5,094	4,886
Other developed [c]	83	99	122	122
Developing (ex OPEC) [d]	424	563	749	749
OPEC [e]	122	230	371	371
Total above	4,095	5,096	6,336	6,128
CPEs (Europe)	1,367	1,766	2,251	2,251
CPEs (Asia)	285	..	..	..
Total world	5,747	..	..	..
Net trade				
Net imports				
OECD	1,313	1,608	1,923	1,295
Other developed	38	49	51	51
Developing (ex OPEC)	114	-15	-59	-59
Total	1,465	1,642	1,915	1,387
Net exports				
OPEC	1,449	1,559	1,857	1,326
CPEs (Europe) [f]	40	35	-20	-20
CPEs (Asia) [f]	0	25	60	60
Total	1,489	1,619	1,897	1,366
Trade balance	+24	-23	-18	-21

Notes to Table 5.

a Assumed continuation of present policies toward conservation and production in OECD; oil price of $11.51 per barrel (1975 dollars) for Saudi reference type.

b Assumed modification of present policies leading to enhanced conservation and expanded production in OECD : oil price of $11.51 per barrel (1975 dollars) for Saudi reference type.

c Assumed annual average economic growth of 4.3 per cent, 1974-1980; and 4.1 per cent, 1980-1985.

d Assumed annual average economic growth of 4.5 per cent, 1974-1976; 5.6 per cent, 1977-1980; and 8.0 per cent, 1981-1985.

e Assumed annual average economic growth of 8.9 per cent, 1974-1976; 6.2 per cent, 1977-1980; and 8.0 per cent, 1981-1985.

f Oil only.

Source : OECD World Energy Outlook, 1977.

Table 6

World demand for and supply of oil, 1973-1985
(million tonnes)

	1973	1978	1979 e	1985 f
Net Imports				
OECD	1,295	1,298	1,292	1,460
CPEs (Europe)	-50	-75	-60	0
CPEs (Asia)	0	-15	-20	-20
LDCs (ex OPEC)	190	190	167	120
Total	1,435	1,400	1,380	1,560
OPEC				
production	1,525	1,480	1,480	1,810
consumption	90	125	125	250
Net exports	1,435	1,400 a	1,380 a	1,560

a Adjusted for stock changes.
e Estimate.
f Forecast.

Source : Based on NIESR, Economic Review, November 1979.