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REPORT ON THE OUTLOOK FOR OIL SUPPLY AND DEMAND

(Note by the Secretariat)

The General Working Group considered at its meeting on 25th January 1967 a report [DIE/E/PE/66.180 : Confidential] from the High Level Group on supply and demand prospects to 1970/75.

The General Working Group endorsed generally the report, and instructed the Chairman to forward it to the Special Committee for Oil, amended to take account of points raised in the General Working Group.

A revised version of the study by the High Level Group is attached accordingly, for consideration by the special Committee at its meeting on 27th and 28th April 1967.

THE OUTLOOK FOR OIL SUPPLY AND DEMAND

The small High Level Group was appointed [DIE/E/PE/64.103 (final)] to promote consultation on the problems arising from the growing requirements of OECD Europe for oil. For this purpose it was to assess in general terms the likely trends to 1970/75, their implications, including the consequences of hypothetical interruptions, and the measures available to Governments to deal with those implications.

2. The Group treated the central subject of its task, the reliability of Europe's oil supplies, by three main stages :
Will oil supplies be physically adequate to meet demand ?
Apart from physical adequacy, what other considerations may affect the reliability and continuity of oil supplies ?
In the light of the above, is there a need for measures of insurance ; and if so what form could these take ?
This report follows this arrangement, with an initial background section giving the Group's estimates of trends in the normal pattern of supply and demand to 1970/1975

I. TRENDS IN THE NORMAL PATTERN OF SUPPLY AND DEMAND TO 1970/1975

3. The Group was recommended by the General Working Group, for the purpose of promoting consultation on problems to assess in general terms the likely trend over the period 1965 to 1970/75. Group concluded that it was desirable first to assess the situation in the shorter term ahead, as a basis for any subsequent longer term view ; and that a period of up to about five years ahead was near enough to be susceptible of a fairly reasoned assessment. Such a time scale would avoid the risk of basing policies either on longer term forecasts too uncertain for definite policy decisions now, or simply on the current position, which will change before policies can have any effect. The possible pattern in 1970 was therefore considered in some depth. Possible developments in the period 1970-1975 were necessarily considered in more general terms, the essential purpose being to examine whether developments thought possible in that period necessitated any qualification of views formed primarily on consideration of the estimated situation in 1970.

4. The estimates accordingly adopted as the background to the study are set out in Annex I. Further analysis of OECD Europe's sources of imports in 1965 and estimated 1970 is in Table I below.

TABLE I

O.E.C.D. Europe gross imports by source

m. metric tons a year
crude oil equivalent

	1965		1970	
	Amount	% of total	Amount	% of total
North America	3	1	3	1
Other W. Hemisphere	45	12	29	5
Other E. Hemisphere West of Suez	96	25,5	193	35
Middle East and Levant	204	54	283	51
Other E. Hemisphere East of Suez	2	0,5	3	1
Communist bloc	26	7	39	7
Total gross imports (*)	376	100	550	100

(*) These figures differ marginally from those in Annex I because they include an element for stock changes, etc.

5. The significance of these trends to 1970/1975 is discussed under Sections II and III below.

II. PHYSICAL ADEQUACY OF SUPPLIES

Oil Reserves and Production Capacity

6. The subject of oil reserves is treated in depth in Annex II to the paper. The Group is satisfied that there is no reason to suppose that sufficient additional reserves cannot be found to ensure a satisfactory reserves/consumption ratio to be maintained for so far ahead as it is now necessary or realistic to consider. (Annex II in fact considers for this purpose the period to 1980.) This conclusion implies also that the oil to be supplied from the reserves can be supplied at costs, so far as the physical factors are concerned, comparable with those now obtaining. It is true that in some respects average costs may increase (e.g. offshore exploration is usually more expensive than onshore, which most previous exploration has been). And it is true that the expected costs of producing some of the ultimate reserves available in the form of tarsands and shales are higher than those of producing the oil now meeting the needs of OECD Europe and of the E. Hemisphere generally. But production from the latter is not in fact required in the time scale considered in Annex II because of any expected shortage of conventional reserves, and it is likely, as a general rule, to be developed only insofar as it is competitive in costs with conventional production in the W. Hemisphere – and this is already

considered practicable. And such higher cost elements, e.g. in exploration, as may arise in the supply of oil from conventional resources are likely still to be offset by increased economies in other respects e.g. in transport.

7. The issue of more concern therefore, in the opinion of the Group, is not the physical extent of, or the cost of producing, reserves now, and yet to be, proved ; but whether exploration and development work can continue at an adequate rate to maintain the increasing production and supply capacity required.

8. Given that the oil in the ground exists from which to meet an assumed demand, it is in a sense axiomatic that the work of proving, developing and exploiting reserves will continue. The capital investment needed will, however, be increasingly great in total (though not necessarily so per annual ton of oil requirement), and it is prudent to consider on the one hand whether circumstances might arise when the capital continually needed may not be available or the incentive to invest it inadequate ; and, on the other, what conditions would most facilitate the investment required.

9. A number of studies are available of possible future capital requirements and of the ways in which they might be met. The question has, however, often been asked, particularly at times of pressure on prices and hence of reduced profits, whether investment can continue at the levels necessary to find, develop and deliver into markets the growing amounts of oil required. It is fair to say that in fact investment has continued apace, in periods both of poor and of good profitability for the industry ; indeed it is arguable that over-investment may still be taking place in certain sectors. Where earnings have been inadequate to finance oil demands for investment, the additional loan capital has been forthcoming. There seems no reason to suppose that the present structure of the industry and its response to market conditions will give grounds for concern that the capital needed to maintain reserves and production capacity cannot continue to be found. It must at the same time be noted that it is in the interests neither of the Governments of importing countries nor of exporting countries that margins should be squeezed to the point at which the continuous investment needed to maintain future supplies might be endangered.

Transport facilities

10. No reason is seen to expect transport costs to rise ; indeed further economies should still be possible e.g. from the continued increase in the proportion of free world trade done in the larger and more economic tankers. Nor is there reason to expect a lack of the investment necessary to maintain sufficient capacity to keep freight rates in reasonable relation to costs.

III. RELIABILITY OF SUPPLY

11. The question whether, assuming that the physical factors affecting the supply and cost of oil seem likely to remain satisfactory overall, there are other considerations which might affect the continuity and reliability of supply, is considered in two aspects :

The possibility of actual interruptions of production or transport, and the effect of hypothetical interruptions ;

The possibility of unfavourable terms of supply.

The considerations affecting one aspect may of course affect also the other, but it is helpful to examine each in turn.

Possible interruption of production or transport

12. Interruptions might in theory occur by reason :
(a) definite act of policy by one or more producing and transit countries ;
(b) internal unrest and perhaps local conflicts ;
(c) plant and equipment failures or labour restraints.

13. The Group is not competent to assess the risk of oil supplies being interrupted as an incidental result of international political actions arising primarily from other considerations or affecting, exporting countries. So far as oil as such is concerned, however, certain general considerations of particular relevance can be stated :

(a) The relative importance of transit countries has changed, with the increase in sources west of Suez, and in the proportion of large tankers able to use the Cape route on an economically viable basis. Whereas in 1956 nearly 75 per cent of the total imports (103 of 138m. tons) to OECD Europe came via Suez and the East Mediterranean pipelines ; the proportion in 1970 is expected to be only 50 per cent (280 of 550m. tons). This proportion seems unlikely to rise, given the transport cost advantage of oil west of Suez, and the continued economic advantage of very large tankers moving oil to Europe via the Cape. These considerations, in as much as they lessen the effect of any deliberate interruption by a transit country, ipso facto lessen any incentive to seek to attain objectives by such interruption, and make it less likely ;

(b) The number of exporting countries has increased and is still increasing. Because a loss of supplies from any one is less likely to cause embarrassment to importing countries (or even to the main producing companies, most of which now have sources of production spread over more countries than they had even a few years ago) the risk of restrictive action is correspondingly reduced ;

(c) All exporting countries are increasingly committed to development expenditure, and to Government services generally, for which they need a continuing flow of oil revenue. The more developed the economies of these countries become and the higher the standard of living of the population, the less readily can their Governments contemplate any prolonged stoppage of the main source of revenue. This consideration alone does not of course ensure that supplies will not be interrupted ; no country, whether importing or exporting, developed or undeveloped always bases its policies and actions solely on prima facie rational economic considerations. But such considerations are generally a stabilizing factor ;

14. For these reasons, which are further discussed in paragraph 18 below on terms of supply, the risk of a deliberated and major interruption of supply has most probably diminished. It must however be recognized that if such an interruption were to occur, and to lead to a reduction in deliveries to OECD Europe (and only a major and prolonged interruption would in fact, as it noted in paragraph 15 below, be likely to have that result) the damage to the economies of importing countries would be greater than would have been caused by a similar proportionate shortfall of oil supplies in the past. Whereas in 1956 oil imports met only 23 per cent of OECD Europe's total energy requirements, they met 45 per cent in 1965 and may be meeting about 57 per cent in 1970 ; and much of the increased use of oil is of course in industry. Any shortfall in oil imports is therefore likely to have an increasingly serious serious effect.

15. Although the Group's assessment of the risk of physical interruption of supply is on balance reassuring, such a risk clearly cannot be ruled out. An interruption might occur for reasons not directly related to oil, e.g. (b) or (c) of paragraph 12 and not in any case as an act of policy by the exporting country concerned. A study was accordingly made of the effect on availability in 1970 of various hypothetical interruptions. The main conclusions of the study, which is described in Annex II to this paper are :

(a) The effect of an interruption of transit routes (Suez and E. Mediterranean pipelines) would be only a small stock rundown in OECD Europe in the first quarter ;

(b) Similarly, an interruption of transit routes and of one-fifth of the M. East exports (i.e. roughly any one major source in 1970) would also be only a small stock rundown in the first quarter ;

(c) With transit routes and two-fifths of M. East exports, or roughly two major sources, out in 1970, the effect would still be only a stock rundown, extending in this case into the second quarter also ; but thereafter normal supplies could be maintained ;

(d) It is not until transit routes and three major M. East sources are assumed to be interrupted that any persistent shortfall appears beyond the first six months ; and as is noted in Annex III, some of the assumptions taken in respect of emergency supplies are prudently conservative, and it is by no means certain that a continuing deficit need occur even in this case ;

(e) The effect of interruption of N. African exports should be only a relatively small stock rundown in the first quarter.

Comparing these conclusions (in respect of 1970) with those drawn from the last previous similar OECD review (in respect of 1965) (DIE/E/PE/62.30) broadly the same picture results from similar hypothetical interruptions. Thus in terms of stock rundown (assuming no restriction of demand in importing countries) the interruption of the transit routes and of 75 per cent of M. East export would in the earlier study have rundown stocks by 70 days in nine months ; in the present study interruption of the transit routes and of 60 per cent of M. East exports would rundown stocks by 57 days, or if 80 per cent M. East exports were assumed to

be interrupted by 79 days. (It must be emphasized that these examples are merely illustrative hypotheses, and an interruption of supplies from M. East sources is quoted only for comparative purposes with the previous study ; in fact a range of hypothetical interruptions in several areas was examined. These are conclusions in respect of supplies of oil. It must of course be recognized that if a major interruption of supplies were to occur some of the alternative supplies might be of higher cost, and tanker freights also might rise.

16. Recognising that some risk of interruption will exist, and having assessed the effect of various hypothetical interruption, the group considered whether it is possible to compare the risks for one producing country or transit route with another. At any one time, there may clearly be good reason to think one source more prone to interruption than another. But the position has to be considered not simply as it is, but as it may develop. Any judgment of possible future political developments in the main producing areas must remain a matter for individual Members Governments of the OECD. The Group concluded, however, that some obvious facts and certain basic considerations could usefully be noted :

(a) The most secure sources of supply clearly are and will remain those within the OECD itself ;

(b) Supplies from the Soviet bloc have to be considered as a special case ;

(c) Other supplies come almost entirely from developing countries. There can be no certainty now about the relative freedom from risk of interruption of these at any future time. A decision to favour imports from one source rather than from another, based on a current appreciation, could prove mistaken. Because risks of interruption exist ; and because there is no way of knowing where they may fall, the only self-evidently prudent policies (short of concentrating, at enhanced cost, on internal OECD supplies) are those consistent with encouraging the availability of supplies from several sources, thus spreading the risk.

<u>Unfavourable terms of supply</u>

17. The risk of actual interruptions of supply cannot, as has been noted, be ruled out. But there are grounds for thinking that if there is any risk to energy importing countries it is rather that the terms of supply might become increasingly unfavorable, and that it is to meet this contingency that policies should be framed. The Group, having concluded that there was no reason to suppose, so far as the physical factors are concerned, that the cost of oil supplied would necessarily rise in the period under review, considered other possible reasons for unfavourable changes in the terms of supply under four headings :

    Concerting of policies to this end by the Governments of exporting countries ;

    Pressure on transport costs by transit countries ;

Entry of the Governments exporting countries into the oil business, upstream (exploration and production) and downstream, (transport, refining and distribution) etc. ;

Changes in the terms of exploration and production concessions.

Concerting of policies by the Governments of exporting countries

18. At present the only single source of energy which is capable in the near future of meeting in full the growing energy demands of OECD Europe is the oil produced in developing countries. It is possible therefore that those countries could, if they formed a complete exporting monopoly, and chose to act as such, exact a higher return to themselves. A corresponding rise in price in all importing countries would not necessarily follow, if only because there would in some cases still remain alternative sources of supply which would check such a development. But if a substantial increase in costs to consumers should result from an increased return to producing countries, secured by them by the undue exercise of monopoly power, it would clearly be a cause of concern. There are, however, several reasons why an attempt to exploit the present situation to a position of deadlock is unlikely :

(a) The interest of the Governments of exporting countries vary, both generally and on oil. Some, for example, may at any one time be more anxious to enlarge their revenues by definite increases in exports, than by adopting extreme measures in the hope (but not the certainty) of securing a higher return per ton exported, perhaps at the expense of volume. This may, in particular, be expected to be true of new producers. Several new countries have appeared in the past ten years as host countries with significant production ; there is no reason to suppose that others will not appear in the future. Although the Governments of new producing countries will not necessarily continue indefinitely to seek higher export growth but may, as there see a share established in world trade for their exports, also turn their attention more to increasing the return per ton (as, for example, has happened in the case of Libya), it remains true that any new producer is for a time at least likely to be most concerned with increasing the volume of exports. This in itself makes the risk of a monopoly exporting bloc, acting in the way sometimes feared, less than may at first appear. And the interests of established major producing countries are of course also not necessarily identical on this point, but may vary, among other reasons, according to the extent and expected costs of production of proved reserves ;

(b) Moreover, even if it were to be assumed that concessionary Governments were ready to co-operate sufficiently to succeed in enforcing monopoly terms, they know that to do so unduly would inevitably lead importing countries to decide to reduce their dependence upon oil even though the alternatives to it might cost more. Such substitution could not be achieved on any large scale in the immediate short term. Maintaining OECD Europe coal production, for example, in the near future at higher levels than are now expected would seem unlikely to make any significant difference in this context. But over a period, and at a cost, alternatives could be found over a sufficient part of the total field of energy requirements, to make aggressive action

damaging, on anything but a short term view, to the interests of producing countries themselves. The potential of nuclear energy for basic industrial power is in the long term virtually unlimited, and alternative petroleum products could in due course be produced from known hydrocarbon deposits of tarsands, of shales and of commercially exploitable coal within the OECD, notably in the Western Hemisphere. The capital requirements to develop these energy sources, and the delivered costs of the liquid fuel referred to, would be greater than those of oil from developing countries ; but they do already set limits even to the theoretically possible upward pressure on future process. Moreover it is not of course necessary for the whole or even a large part of the demand met from a given source to be susceptible of replacement by another, for pressure on prices to be eased. Should ever effective monopoly power begin to be applied unduly to oil exports from present sources outside OECD, a relatively marginal substitution by other fuels and hence reduction of the possible market for that oil could limit the overall net return to exporting countries, and suggest the advantage of more moderate policies. A rise in oil costs resulting from action by producing countries which consuming countries regarded as excessive, would risk the Governments of consumer countries adopting policies which might limit imports permanently. The Governments of producing countries are unlikely to be unaware of this risk ;

(c) The consideration in (b) above is that the existence in the long term of alternatives even if higher cost, to present sources of energy imports affects the present attitudes of the Governments of exporting countries. To this must be added that in many fields marginal substitution of considerable significance is indeed already feasible and taking place, at energy prices competitive with those for imported oil. Nuclear energy (the rate of development of which is largely at the discretion of OECD Governments) and indigenous natural gas are being developed at a growing rate, and there are reserves of coal within the OECD areas (United States) available for planned development at competitive costs if desired. None of these sources of energy is available as an immediate replacement in the event of an actual interruption of oil supplies ; but their growing availability, actual or potential, is relevant to the extent to which upwards pressure can be brought on the costs and prices of other forms of energy including oil. Imported natural gas, although generally available only from oil exporting countries, can also help to have a steadying effect on prices, at least in the next decade or so when it will be striving to find a place in world energy markets.

19. There is therefore good reasons to conclude that the prima facie risk of a monopoly oil exporting bloc emerging and exercising undue pressure is not so great as to be a major factor in energy planning, provided that, as is implicit in the above analysis :

(a) Exploration and development continues over a wide range of countries ;

(b) The possibilities of substitution are not unnecessarily limited by restrictive, fixed supply arrangements, but a reasonable degree of flexibility and ability to adapt to changed circumstances is available

Other aspects of policy are considered more specifically under the Section "Measures of Insurance" below.

Transport costs

20. The technical prospects for containing or reducing costs are good. The risks of excessive tolls by transit countries are countered by the growing sources of oil west of Suez and the economics of very large tankers. The risks of flag discrimination in the oil trade are small and insignificant in the growing volume of trade.

Entry of the Governments of exporting countries into the oil business

21. The royalty oil to which concessionary Governments are entitled has almost always in the past been disposed of by the producing companies, and not sold by the Governments. Some increased trading by the Governments of exporting countries is, however, to be expected in the future, particularly as more oil become available to their national oil companies from new "partnership" concessions, and if only for reasons of prestige and because direct disposal of oil lends itself to the kind of barter deal found attractive by developing countries.

Such trade is likely to have to be made at competitive prices, and in this respect does not in itself increase the risk of unfavourable terms of supply to importers. There is also some reason to suppose that much of such direct trade as develops is likely to be by way of a net increase in exports of hydrocarbons to particular markets not fully developed via the existing channels of trade (cf. the Iranian agreement to supply natural gas to the USSR in return for assistance with a steel plant).

Terms of concessions

22. The extent to which particularly favourable terms to the host Government may appear in new concession agreement is set largely by the relative supply and demand for new territory. Thus although there have been ample proved reserves available in recent years to meet foreseeable demand, the competition for concessions by companies short of their own crude, by the so-called new internationals, and by companies given special encouragement to explore, has enabled concessionary Governments to secure changes in the terms of new concessions. There seems little reason to expect the competition for new concessions to decrease, and concessionary Governments may therefore continue to be able to demand stiff terms for new concessions, especially those in favourable territory. It does not, however, follow that the terms of existing concessions will have to change to match those obtained for special territory from marginal bidders. While the possibility of changes in the terms of existing concessions cannot be ruled out, (and the terms in respect of the tax payable to concessionary Governments have of course changed in recent years) the Group concluded that the risk of major changes, such as might significantly effect the prospects for oil supply, is small ; similar considerations obtain in this field as are considered in paragraph 18 above on terms of supply generally.

Summary of III. Reliability of supply

23. The Group's discussions, summarized above, led it to draw the following conclusions :

    a. Some risk of interruption of supplies from exporting countries, possibly for reasons not directly related to oil, can never be excluded ;

    b. The risk of deliberate and prolonged withholding of a major part of supplies by exporting countries on policy grounds related to oil has most probably diminished ;

    c. If for any reason a major interruption of supplies were to occur, and a significant shortfall in deliveries to OECD Europe resulted, such a shortfall would be likely to be more damaging to European economies than a comparable shortfall in the past, because of the greater proportion of essential energy needs now met by oil ;

    d. The relative risks of interruptions for whatever reason from specific developing countries in the future cannot reasonably be assessed ;

    e. The risk (given certain provisos – para. 19) of prices being forced, because of the action of concessionary Governments, to a point necessitating reduced dependence upon oil, are not alarming ;

    f. There will none the less continue to be pressure by concessionary Governments to change the terms of trade ; and they are likely gradually to take a growing part in the oil trade themselves.

IV. POSSIBLE MEASURES OF INSURANCE

24. Insurance would be against two risks – actual interruptions of supply ; and imposition of unfavourable terms of supply. Measures against one risk are likely of course to help against the other, but it is helpful to discuss them separately in the first place.

Insurance against interruptions

(…)

25. (…)

26. (…)

Insurance against unfavourable terms of supply

27. Basically unfavourable terms of supply can be imposed on importing countries only il suppliers and/or concessionary Governments can exercise a monopoly. The fact that the price of oil is at present acceptable to consumers, notwithstanding the efforts of concessionary Governments to increase their take, and the need of the oil industry to earn sufficient return to finance the increasing investment required, reflects certain features of the present trade in oil :

(a) In general, there is an absence of tied supply arrangements of a kind which would expose the importing party to unilateral action.

(b) Supplies are drawn from a large and increasing number of countries.

(c) They are marketed, similarly, by a large number of competing companies.

(d) In addition, there have been more specific reasons in recent years in the form of inter alia of pressure on prices generally from communist bloc oil exports, and from Libyan oil at, until recently, preferential tax rates.

28. There seems advantage in the basic insurance (short of special and costly measures) against unfavourable terms resting on a system of supply so organized as :

(a) to maintain a flexible and genuinely competitive structure, without so depressing the market as to reduce returns to the point where the further investment needed to maintain the necessary flexibility might not be forthcoming ; and
(b) to minimize any risks of friction between producing and consuming countries (which could be to their mutual disadvantage) by leaving so far as possible the prima facie differing interests of these countries to be bridged by conventional trading.

29. Although downward pressure on prices and hence on returns has in recent years been particularly strong, partly because of the special factors referred to at para 27(d) above, such a structure has and does basically obtain, and is a large part of the reason for reasonable confidence on the security of oil supplies. There are, however, clearly several ways in which security against unfavourable terms of supply could, theoretically at least, be further improved :

(a) Exploration for and development of the hydrocarbon resources in the O.E.C.D.

(b) Maintenance of reserve production capacity within the O.E.C.D. itself.

(c) Encouragement of further diversification of production capacity outside O.E.C.D. territories.

(d) Maintenance of stocks at such a level that any threat of cessation of supply would more obviously be ineffective.

30. <u>OECD resources.</u> It is axiomatic that no obstacle should be put in the way economically justifiable exploration for and development of oil and gas within the O.E.C.D. The attractions to the oil industry itself, however, of finding and developing such resources, where reasonable prospects are thought to exist, are clear and there seems little case for further special, positive action ; it is more a question of not actually creating disincentives.

31. A similar conclusion is arrived at in respect of the idea that development of the known hydrocarbon resources of shale and tarsand within the O.E.C.D. area would afford complete security against changes in the terms of present oil supply. They could not of course, on present estimates, provide oil for OECD Europe at costs competitive with present prices ; and the capital cost of developing them would be much higher than those of finding and developing conventional sources of oil. It is in OECD Europe's ultimate interest that the oil industry should be able to develop economic methods of exploiting these resources, but, particularly in view of the considerable amount of research and development in hand (see Annex II), it does not appear that there is a case at present for further special action so far as OECD Europe is concerned. It will be desirable, however, to review this assessment from time to time in the light of further developments. Should present estimated cost of oil from shale or tarsands be reduced, or should the cost of oil from conventional sources move more favourably than there at present seems reason to expect, the attraction to OECD Europe of more rapid development of these alternative sources would clearly increase.

32. Reserve production capacity in the OECD. The present standby capacity in N. America is an important factor in the security of the rest of the OECD's oil supplies and of the terms of supply. This is not to say that without this capacity there would be necessarily be an unacceptable risk to supplies ; other considerations discussed above would still carry weight. But the ability to increase production from within the OECD is clearly of special significance should a risk appear of interruption of normal supplies. It must be assumed that, as the rest of the OECD area's requirements rise faster than the standby capacity in North America is likely to increase, the relative value in any crisis of the reserve capacity in North America will continue to grow less. It is possible that if and as this happens, other stabilizing factors will appear more strongly, to balance the overall position. At present, however, no single factor of similar direct importance, in the foreseeable future, to this N. American reserve capacity can be seen. It is therefore clearly desirable to review from time the pattern of world oil supply/demand, and the effect of hypothetical interruptions of supply, taking into account the latest estimates of N. American standby capacity ; and to consider whether, as that and other factors change, any modification of policies now judged reasonable may be called for.

33. Measures to encourage further diversification of production capacity outside OECD territories. (…)

34. Stocks. (…)

Precautionary planning for action to be taken in the event of an interruption of supplies

35. Existing OECD Council recommendations, set out in DIE/E/PE/66.62, cover two fields. The first is that of the internal arrangements of each Member country ; here the recommendations are, in short, to the effect that Member Governments should :

(a) have plans prepared in advance to enable them to restrict consumption ;

(b) have in existence committees representing the oil industry at national level.

It appears from DIE/E/PE/66.116 that national planning to meet these two recommendations is, as a general rule, adequate. Although therefore the position shown in DIE/E/PE/66.116 remains to be considered by the Special Committee, the Group for its part has no special point to raise in this field.

36. The second field is that of international arrangements. Here the existing Council decisions are, in short, to the effect that :

(a) if an emergency should arise, an international industry advisory body should be set up, to advise the Special Committee's recommendations on the apportionment of available supplies ;
(b) initially available supplies should be shared on a basis related largely to normal inland consumption, but with 10 per cent reserved for ad hoc allocation in the light of conditions at the time ; special regard would be paid to serious economic difficulties due to lack of oil, to climatic difficulties and unseasonal factors (e.g. from strikes or in respect of other sources of energy). This arrangement would be an interim arrangement to serve as a starting point in an emergency, and could be reconsidered, if necessary, should an emergency occur ;
(c) should OECD Europe be threatened with an oil shortage, the Chairman of the Special Committee for Oil should, in consultation with the Secretary-General, convene a meeting of the Special Committee for Oil which might suggest, inter alia, that the OECD Council should put into operation an emergency organization and procedure [that is, in effect, the measures referred to in (a) and (b) above].

37. The Group noted these arrangements as having an important bearing on the ability of Member Governments and of the oil industry to move rapidly to minimize the effects of any interruption of supplies which might occur. The Group has not itself examined whether any modification of these arrangements might be desirable, but suggests that the Committee may wish to consider arranging for them to be reviewed.

SUMMARY AND CONCLUSIONS

38. The Group's main conclusions may be summarized as follows :

(a) no physical reason is seen to fear shortage of oil or any significant rise in costs for the period under review ;

(b) there has been an increasing diversification in OECD Europe's sources of supply, resulting inter alia in a reduction of the proportion drawn from the M. East. Forecasts for more than a few years ahead are hazardous, but no reason is seen to expect this trend to be reversed ;

(c) while interruptions of supply cannot be ruled out, it would require a major interruption (of at least 68 per cent of present M. East exports and of transit routes, and lasting beyond six months) to lead to any continuing reduction of supplies to Europe ; it is

unlikely that such a major interruption would be deliberately provoked, and any risk of that happening has most probably diminished ;

(d) if, however, a shortage of supplies should ever occur, it would do no harm to the economies of OECD Europe than any similar proportionate shortage would have done in the past ;

(e) overall, therefore, there is at present no case for changing the agreed OECD stockpiling objectives ;

(f) no further specific measures of general insurance are recommended by the Group, but some matters particularly deserve to be reviewed from time to time (see below).

39. The Group recommends :

(a) that the existing OECD European stockpiling objectives should stand [CES/62.30 (1st Revision)]

(b) that consideration should be given to reviewing the present OECD precautionary planning, in the international field, for action to be taken in the event of an interruption of supplies ;

(c) that the prospects for oil supply and demand should be further reviewed from time to time.
In such future reviews matters to be kept in mind would be :

(i) That they should be designed to relate, in the light of the Japanese position in the oil trade, to Japan as well as to OECD Europe

(ii) The implication of any change in the relationship between North American reserve production capacity and OECD Europe's and Japan's demand

(iii) The comparative economics of alternative energy sources, including in particular W. Hemisphere tarsands and shales.

ANNEX I

NORMAL OIL SUPPLY AND DEMAND IN THE NON-COMMUNIST WORLD 1965, 1970(*) AND 1975(*)

NORMAL OIL SUPPLY AND DEMAND IN THE NON-COMMUNIST WORLD 1965, 1970 AND 1975						
m. metric tons a year						
crude oil equivalent	1965		1970		1975	
	Demand	Supply	Demand	Supply	Demand	Supply
United States	555	435	660	530	800	610
Other North America	80	65	100	75	120	120
Other Western Hemisphere	80	220	100	255	130	280
Western Hem.	715	720	860	860	1050	1010
OECD Europe	375	25	550	20	770	30
Other E. Hem. - West of Suez	25	110	40	215	50	360
Middle East and Levant	35	415	45	580	60	800
Other E. Hem. - East of Suez	170	30	260	50	370	70
Eastern Hem.	605	580	895	865	1250	1260
Net imports from Communist Bloc		45		70		80
Stock Changes, Transit Losses and Additional Military Offtakes	25		40		50	
TOTAL NON-COMMUNIST WORLD	1345	1345	1795	1795	2350	2350

NOTE. (*) The estimates for 1970 and for 1975 are of course tentative. In particular that for 1975 can be no more than an indication of a possible picture of supply and demand, which may prove in the event to be substantially different.

ANNEX II
WORLD OIL RESERVES

1. The figures published for proved reserves do not in any sense represent a geological assessment of the limit of oil reserves ; they are the result of such exploration activities as the oil companies consider useful. They indicate only the current potential which is considered to be available for expanding production, representing the reserves which are understood to have been located and which would be recoverable by known methods at present level of costs. For purely economic reasons it would be unnecessary to undertake the expense of establishing reserves at anything like the present years' cover of production. However, in the United States exploration is encouraged by defence considerations, and outside the United States the conditions under which concessions are held and operated often stimulate rapid and extensive exploration. For many years the total world proved oil reserves have increased steadily, more new oil has been added to reserves than has been produced.

2. In the North American region, which currently produces from indigenous resources about four-fifths of its requirements, proved reserves of liquid petroleum are some 6 billion tons or 13 times the present production rate. This ratio of reserves to production of approximately 13:1 has remained almost constant for the past 45 years despite continually increasing production.

3. Proved reserves in OECD in Europe and Japan are very small in relation to those of the rest of the world. In Europe they are about 400 m. tons and in Japan they are up to now quite insignificant. The possibility of discoveries being made cannot be discounted, and in view of their obvious value exploration will continue, and the reserves already being exploited will be further developed. The total amount of indigenous oil available in these two areas is, however, not very significant in relation to requirements.

4. Outside the OECD countries and the communist countries the greater part of proved reserves lies in the Middle East, with some 29 billion(*) tons. The next most important region is Central and South America, with about 3.5 billion tons. Exploration efforts in Africa have resulted in dramatic increases in production, from 2m. tons in 1955 to 90m. tons in 1965, and the reserves already proved are put at 3 billion tons. Another 1.5 billion tons of proved reserves are in the Far East countries especially Indonesia and Malaysia. The total of the reserves proved for the area of the free world outside the OECD represents about 46 years production at present rates.
   (*) 1,000 million

5. The proved reserves in the Soviet Bloc and China were estimated at the end of 1964 to be about 4.8 billion tons of which 4.4 billion were in the USSR. This represented some 20 years production at the current rate.

6. On the basis of these estimates, world proved reserves are nearly 50 billion tons, or over 30 years supply at present rates of production (10). These estimates take no

account of improvements in method of recovery which will almost certainly take place. At present the estimated average recovery is about 30 per cent of the oil originally in place and this could certainly rise substantially ; some authorities suggest up to perhaps 50 per cent (2). Such an improvement would considerably lengthen the theoretical life of reserves at present production levels without any more oil being discovered. Moreover deposits of very heavy oil now known to exist but not at present considered to constitute reserves could be brought into exploitation.

7. Estimates of ultimate reserves are of course far from precise. Even for the United States where exploration has been more intensive than in any other area of comparable size in the world, it is considered that there is scope for more than six times the amount of exploratory drilling in the geologically favourable rocks than has been done so far, assuming that for adequate exploration at least one well every two square miles is needed (7). Survey of the available information on the location of the world's sedimentary basins and areas, and on the results of exploration so far carried out, making conservative allowance for the diminishing returns to be expected from further drilling in known producing areas, etc., have indicated figures for total ultimate producible reserves seven or ten times the current proved reserves (1, 3, 7). A very recent estimate for the potential reserves in the world's offshore areas alone is 100 billion tons, or over twice the total current proved reserves (6).

8. In addition to the known and estimated reserves of oil there are very large potential reserves in the form of oil shale and tarsands. The world possible potential reserves of the higher grade organic-rich shales have been put as high as 2,400 billion tons (8). Estimates of oil known to be in place as shale oil, on a world-wide basis, are 250-320 billion tons, most being in the United States (4, 9), where economic exploitation may well be possible within the next decade, and various methods of shale oil production are under active consideration, including the use of nuclear explosion to produce shattered zones for insitu retorting (11, 12). Oil in place in the evaluated portion of Canadian tarsands deposits which are expected to be exploited commercially at competitive prices in the near future (the first scheme is designed to produce 2 million tons a year within the next few years) is put at 112 billion tons, from which about 42 billion tons of up-graded synthetic crude oil could be recovered. This latter figure alone approaches present world crude oil reserves (5). The possibility of constructing a pipeline to the Pacific coast to handle crude from Athabasca sands is being considered (13). Thus the present, conservative, estimates of known reserves in tarsands and shale represent about six times the proved crude oil reserves of the world ; and the total possible potential reserves could be up to 50 times the proved crude oil reserves. The time when shale or tarsands will contribute substantially to world supplies will be determined by the economics of production ; as is noted above, some economic production is already within sight in the Western Hemisphere.

9. To put the question into perspective Table I shows the current (end 1965) and estimated positions for 1980 for the world, the free world and free world in the Eastern Hemisphere. It will be seen, e.g., that to maintain reserves at present recovery rates in the free world for 15 years consumption in 1980 would require the discovery of

additional reserves of 30.6 x 10^9 tons, or about two-thirds of the current proved reserves (of which rather over two-thirds would have been consumed by 1980). An increase in the average recovery from 30 per cent to 50 per cent would, however, extend the existing reserves sufficiently to cover 15 years consumption without any new discoveries at all.

10. The current estimates of ultimate availability are set out in Table II. It will be seen that that the potential availability of crude oil from conventional reserves alone (i.e. not including oil from shale or tarsands) is put at 350 to 500 billion tons. This may be compared with the figures of 18 (or 34) billion tons in the final column of Table I, for the additional reserves which must be found by 1980 to have 25 years' free world (or total world) production respectively in reserves at that date; assuming the improvement in recovery factor shown. Clearly, these estimates cannot be regarded as anything more than approximate assessments, but there is no reason to suppose that there will be an abrupt change in the tempo of development, and it seems clear that there is ample opportunity for the development of oil reserves to cope with any forese[e]able increase in world demand within this century. As Hendricks (7) says in relation to the United States resources "Total resources in the ground and the amounts that ultimately will be discovered and produced are important, but for economic and political considerations in the next few decades the current capacity are of greater importance."

TABLE I

Production and reserves - 1965 - 1980 10**9 Tons

	Current production rate	Proved reserves	Estimated 1980 Production	Cumulative Production 1966-1980	remaining 1965 proved reserves	Additional reserves required at 1980 Production Rate		Remaining 1965 proved Reserves at 50% recovery	Additional reserves required at 1980 Production Rate	
						15 yrs	25 yrs		15 yrs	25 yrs
	(1)	(2)	(3)	(4)	(5)	(6)		(7)	(8)	
Total world	1,55	47,9	3,5	37	10,9	41,6	76,6	42,5	-	34,1
Free World	1,28	43,4	2,9	30,5	12,9	30,6	59,6	41,5	-	18,1
Free Eastern Hemisphere	0,57	33,8	1,7	16,1	17,7	7,8	24,8	40	-	-

NOTE Col. (7) This calculation assumes a 50% recovery factor 1965-1980 production rather than the estimated normal average of 30%. It does not allow for any additional oil which might possibly be drawn in the future from reserves exploited, as the lesser recovery factor, before 1965.

TABLE II

Estimate of Ultimate Availability of oil 10**9 Tons

Conventional reserves not yet proven	350 - 500
Shale oil	250 - 2400
Tar sands	40

(1)Report of a symposium by the Exploitation and Production Group of the Institute of Petroleum in 1961 (Inst. Petr. Review. 1961 15)
(2)World Power Conference of Energy Resources, 1962.
(3)King Hubbert "Energy Resources". Washington 1962 (Report of the Committee on U.S. Natural Resources of the National Academy of Science).
(4)F.J. Jaffe, Oil and Gas International, 1964 4,(2). 37.
(5)OECD Special Committee for Oil "Oil today (1964)".

(6)L.G. Weeks Bull. Amer. Ass. Petrol. Geol. 1965, 49 1680-93.
(7)T.A. Hendricks “Resources of Oil, Gas and Natural-Gas Liquids in the United States and the World”. U.S. Geological Survey Circular 522 (1965).
(8)D.C. Duncan and V.E. Swanson
“Organic-Rich Shale of the United States and World Land Areas.” U.S. Geological Survey Circular 523 (1965).
(9)Resources and Transport Division of U.N. Department of Economic and Social Affairs, “Progress and Prospects in the Utilisation of Oil Shale”. Table 4 (September 1965)
(10)British Petroleum Company Limited Statistical Review of the World Oil Industry 1965 (based on data from American Petroleum Institute, Canadian Petroleum Association Oil and Gas Journal).
(11)U.S. Delegation’s Note of 21st April, 1966, “Oil Shale in the United States”.
(12)Colorado School of Mines, Third Annual Oil Shale Symposium, April 1966.
(13)Platt’s Oilgram News Service,19September 1966.

ANNEX III
EFFECT OF INTERRUPTION OF SUPPLY

A study was made of the effect of various hypothetical interruptions of supply, given as background the figures for normal supply and demand in Annex I. It was assumed that emergency supplies from sources not interrupted would be as follows :

	m. metric tons a year crude oil equivalent		
Western Hemisphere	1st quarter	2nd quarter	3rd quarter
United States	25	75	100
Canada	2	4	5
Venezuela	6	19	25
Total	33	98	130
Retained to replace re-routed exports from E. Hemisphere	43	43	43
Balance available for export to E. Hemisphere	-	55	87

Eastern Hemisphere

1. (…)

2. The results of the study are summarized in Table I attached. The study included also hypothetical interruptions of transit routes only (defined as Suez Canal and E. Mediterranean pipelines), and of supplies from N. Africa. None of these hypotheses lead to any significant shortage and they are, for the sake of simplicity, omitted from the table, which shows only the calculated effect of varying levels of hypothetical interruptions from the M. East. The study was made primarily with reference to supplies to OECD Europe, but where continuing shortages appear the calculations spread them more widely, as explained in the foot-note to the table.

3. The study is concerned primarily with the physical availability of oil and of transport facilities. In a major interruption of supplies some increase in the price of oil delivered to Europe must of course be allowed for.