PETROLEUM PRODUCTION AND THE NORWEGIAN ECONOMY — SOME RECENT ISSUES

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by

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1. Introduction

This paper has two parts. The first part will give a general overview of Norwegian petroleum production and its role in the national economy, to a considerable extent based on the recent white paper on oil policy (No 53-1979/80).

In the second part the following policy issues will be considered in more detail:

1. Depletion policy
2. Pricing policy
3. Concession policy
4. Taxation policy
5. Recent gas transportation plans.

The paper ends with a few concluding remarks.

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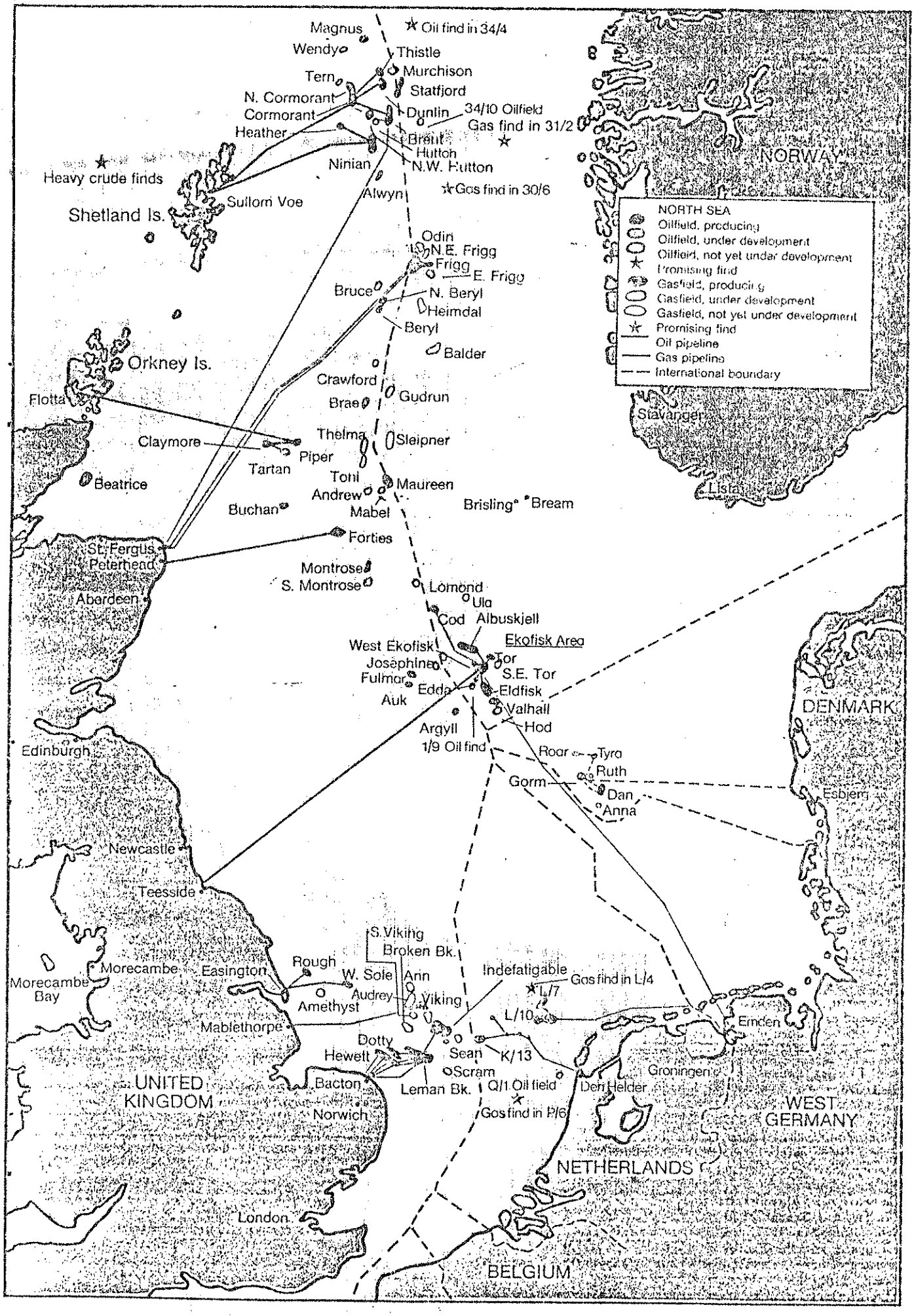
* Based on a lecture given to the Surrey Energy Economics Seminar, University of Surrey, Guildford, England, 8 May 1980. Mr Chris Rowland has kindly read through the original manuscript and suggested numerous improvements.



Source: Petroleum Economist April 1980

2. Petroleum production and the Norwegian economy

2.1 An historical survey

The first licencing round for exclusive production rights for oil on the Norwegian Continental Shelf took place in 1965, but it was not until 1969 that the first finds - the Ekofisk field followed by the Valhall field - were made. Before the Ekofisk discovery, a second licencing round was announced in 1968 with permits granted in 1969 and 1971. In this round the Frigg field was discovered in 1971. The third licencing round took place in 1973. With two big fields already discovered, the Government feared too much activity in the oil sector and restricted the number of blocks offered. As part of a new policy the Norwegian State Oil Company (Statoil) was given a 50% interest in all third round licences. At the same time the Statoil/Mobil group was given an exploitation permit for the blocks 33/9 and 33/12. Oil had been found in the adjacent blocks on the British side in the Brent field, and the Norwegian Government feared that production from Brent might deplete any reserves on the Norwegian side. In fact blocks 33/9 and 33/12 were subsequently found to contain the important Statfjord field. Drilling on the third round blocks has not yet revealed any commercially interesting finds, and to avoid a decline in offshore acticity as well as to gather more information about North Sea reserves, a fourth licencing round was announced in April 1978. Eight blocks were allocated in April 1979, some of which were considered very promising. It is still too early to say whether drilling results are up to expectations for all these blocks seen as a whole. However, oil has been detected in blocks 30/6, 31/2 and 34/4 (see map on page 2). Of particular interest is block 31/2 where the operator, Shell, has made a potentially significant gas find. If the find fulfills its promise, it could be very important for future activity on the Norwegian Shelf and in particular for the question of a co-ordinated transport solution for gas, to which we return in more detail later. Some of the permits granted in this round include a clause giving the authorities the right to delay the development of any discovery. In addition to the fourth round, the highly promising so-called "golden block" (block 34/10) was allocated to a group of three Norwegian firms, with Statoil as operator and Esso Exploration and Production Norway A/S as technical assistant. The intention was to give Norwegian companies experience in field development - previously Norwegian companies had gained experience in exploration drilling only. The fifth and most recent licencing round was

announced in June 1979. All blocks are north of the 62nd Parallel and drilling begins this summer. Difficulties are, however, likely to be encountered since the blocks are in traditional fishing areas with rough weather. Furthermore, the environmental opposition has been particularly fierce.

The table below shows the recoverable reserves of oil and gas found in each licencing round.

TABLE 1

	mill. t.o.e.
1st round	665
2nd round	465
3rd round	570 (incl Statfjord & 34/10
4th round	unavailable

Source: (2), p 93.

The production history of the Norwegian North Sea began with Ekofisk in 1971. Production from this field should reach its peak rate of about 40 million tonnes oil equivalents during 1980/81, then fall rapidly until 1988 and remain relatively constant thereafter.

Alternative ways of raising the recovery factor by water injection are currently under evaluation. If successful, recoverable reserves may increase considerably. The Frigg field is situated on the median line between the British and Norwegian sectors of the North Sea, and, according to an agreement between the two countries which may be revised, 60.82% of the reserves are Norwegian. Production from the Frigg field, containing non-associated gas only, started in September 1977 and plateau production of 16 billion Sm^3 for the whole field was reached in October 1979. The plateau is expected to last until 1989 with the field closing in 1994. Deliveries from this field account for about 30% of UK gas consumption. The Statfjord field is also partly British with 15.9% of the reserves in British territory. Production started in November 1979 from the A platform. Present production is about 3 million tonnes per year. Peak production of 12 million tonnes per year is expected within three to four years. Two more platforms will be installed in this field, and the B platform is scheduled to begin production in 1982. Two smaller fields - the Valhall/Hod complex and Murchison (16.25% Norwegian) - are under development and development plans for the Ula field were

announced in December 1979. Plans to develop the less attractive fields, Odin and North-East Frigg, have also been announced recently, after some uncertainty due to the proposed petroleum tax changes to which we shall return later. The history of aggregate oil and gas production is shown below in Table 2.

TABLE 2

	Oil mill. tonnes	Gas mill Sm^3	Mill t. oil equiv.
1971	0.3		0.3
1972	1.6		1.6
1973	1.6		1.6
1974	1.7		1.7
1975	9.3		9.3
1976	13.6		13.6
1977	13.4	2.6	16.0
1978	17.2	14.1	31.3
1979	18.2	21.9	40.1
Total	76.9	38.6	115.5

Source: (2), p 110.

Figure 1 illustrates the build up of actual and expected production from the various fields. Until Statfjord picks up in the second half of the 1980's, Ekofisk dominates the supply. Figure 2 shows the relative significance of oil and gas. Both figures are reproduced from the white paper (2), p 20. In Figure 3 total production of oil and gas is compared to domestic consumption. The figure shows that since 1975 Norway has been a net exporter of oil and gas. In 1979 production was about five times greater than the domestic consumption of about 7-8 million tonnes oil equivalent per year.

The importance of the petroleum sector for the Norwegian economy may be illustrated in several ways. Oil and gas production generates considerable income both to the licencees and to the Norwegian State. The gross value of production from the petroleum sector in current prices is shown in Table 3 for the years 1971-1979.

Figure 1. Production from Major Norwegian Oil Fields

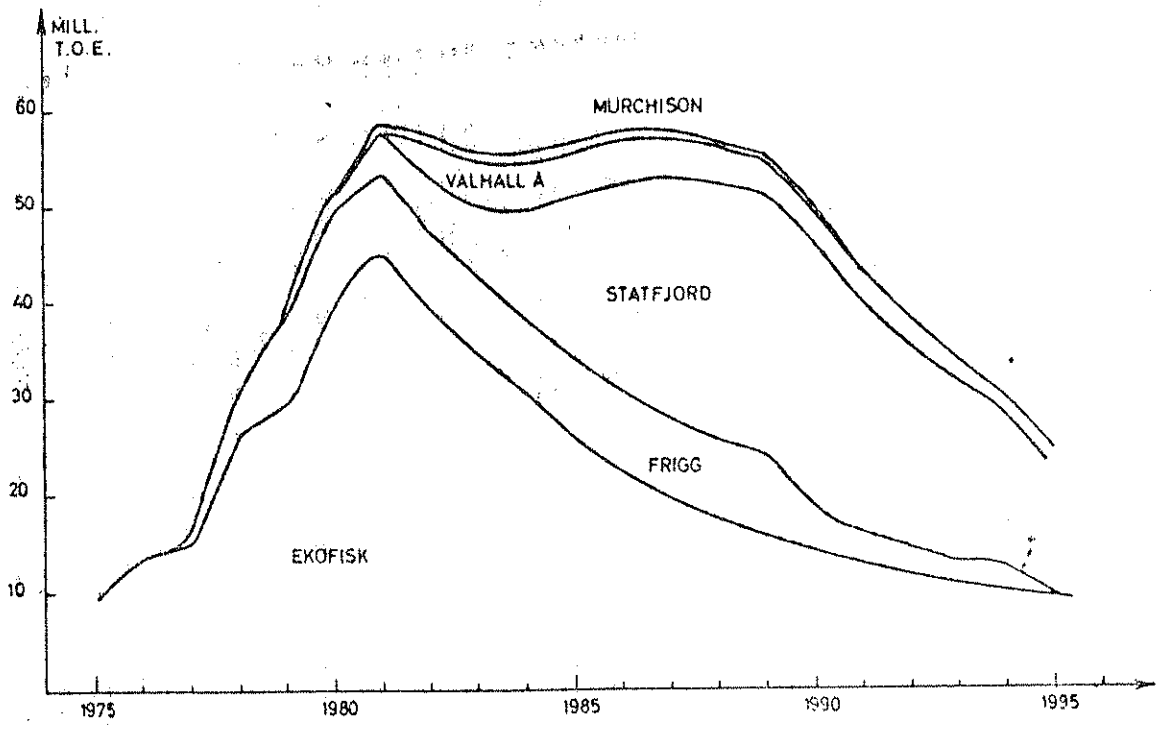


Figure 2. Norwegian Oil and Gas Production

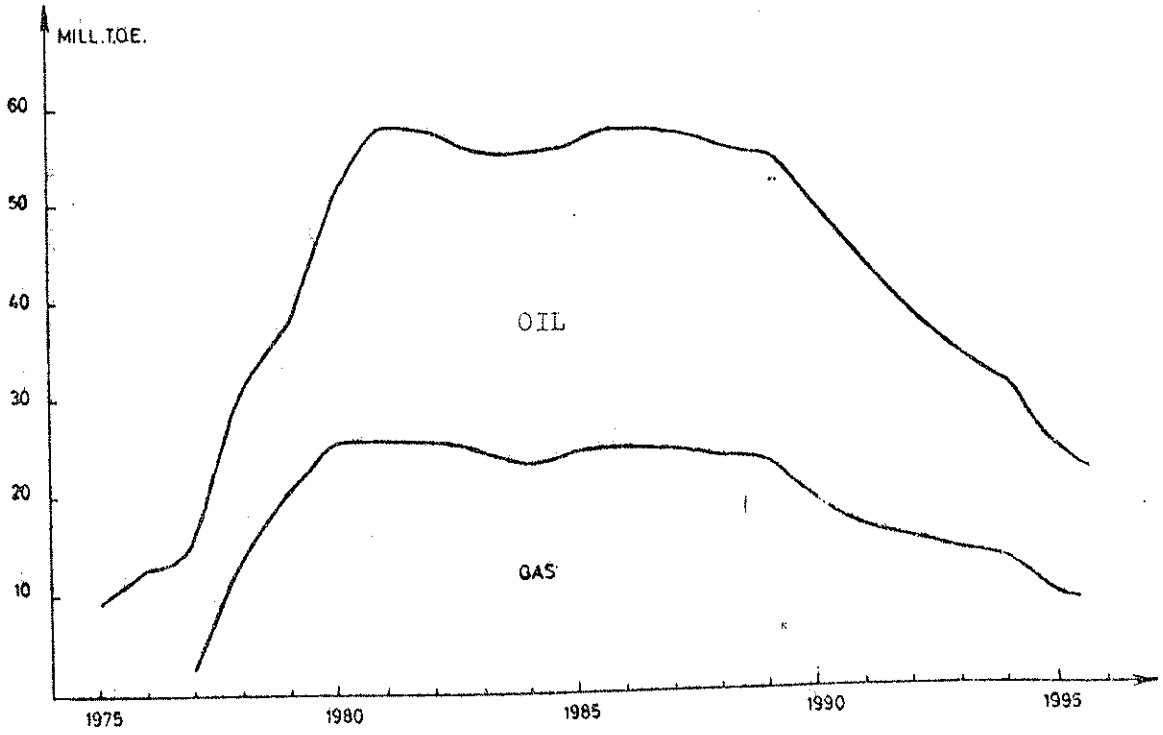


TABLE 3

	Value of Production million kroner	Petroleum sector value Added % of GDP	Oil Exports as % of Total Exports
1971	62	0	0
1972	266	0.2	0.5
1973	353	0.2	0.5
1974	856	0.5	0.8
1975	4,236	2.4	5.6
1976	7,342	3.8	10.0
1977	8,803	4.1	11.3
1978	15,280*	6.4*	16.9*
1979	23,700*	9.1*	22.5*

1 kroner ≏ £0.088 or $0.172

* provisional

Source: (2), p 116, 117, 118

The table shows that the gross value has increased sharply from 856 million kroner in 1974 to an estimated 23,700 million kroner in 1979. According to the National Budget for 1980, the forecast for this year is 34,000 million kroner. A better measure of the sector's economic importance is its value added - the gross value of production minus goods and services received from other sectors. The Gross National Product measures the value added for the whole Norwegian economy and the percentage contribution of the petroleum sector in Gross National Product in current prices is given in the second column.

According to the National Budget for 1980 this year's forecast is 13.3%. Exports from the petroleum sector have increased pari passu with offshore production. Table 3 also shows the value of these exports in current prices as a percentage of total exports. In the National Budget this percentage is expected to increase to about 28% in 1980.

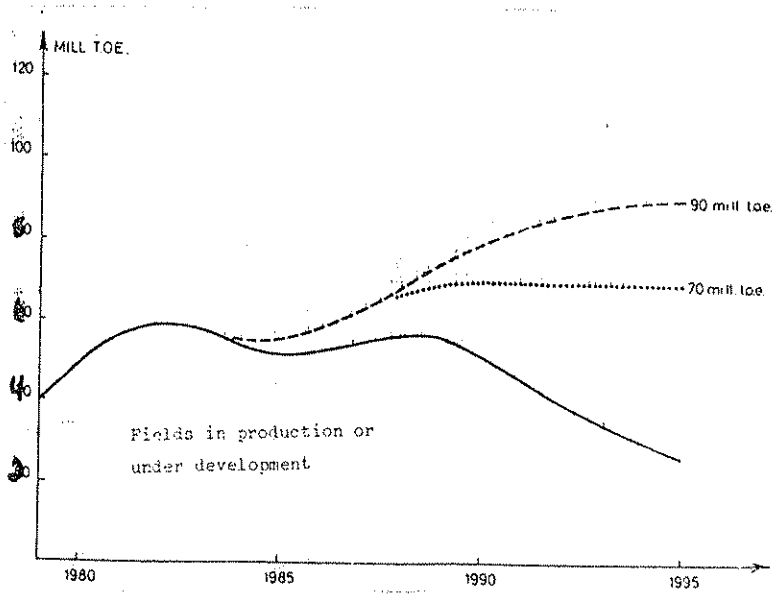
Total employment in petroleum related activities amounted to 36,000 persons in August 1979. This is about 2% of total employment in the country and 9% of total employment in industry. The absolute number is now about six times

as high as in 1973 when it was registered for the first time. Lastly, the petroleum sector accounted for 13% of total taxes received by the Norwegian State in 1979 (provisional figures) compared with only 1% in 1975. This evidence demonstrates how the petroleum sector established itself as a fundamental part of the Norwegian economy in the second half of the 1970's.

2.2 Some projections for the future

Uncertainty about levels of recoverable reserves makes forecasting future petroleum production rather difficult. Even figure 1 is now out-of-date since estimates of peak production and recoverable reserves from the Ekofisk field have recently been revised downwards from a range of 575-625,000 to 500-530,000 b/d by the operator, Phillips Petroleum. Total reserves in the area are now put at 3.2 billion barrels instead of 3.7 billion. With such uncertainty regarding fields already in production, it goes without saying that any sketch of future Norwegian petroleum production must be very speculative. In particular, estimates of future oil prices and reserves are highly uncertain. Despite these reservations we proceed with an economic analysis of possible futures for petroleum production in Norway.

Reserves already found together with expected remaining reserves south of the 62nd Parallel give a basis for alternative production paths in the future. Two alternative production profiles will be used in the subsequent analysis and are shown in Figure 3 below.

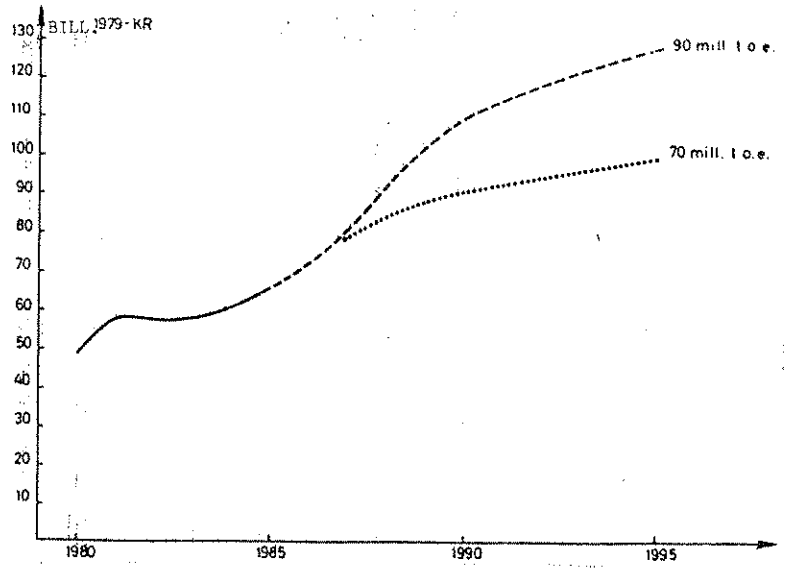


Source: (2), p 22.

This figure assumes that the first field, in addition to those already under development will come on-stream towards the middle of the 1980's. Production of 70 million t.o.e. might be produced by 1995. The alternative production profiles should not be regarded as prognoses or targets for production. Instead they should be regarded as boundaries for the likely range of production. Under certain circumstances production may increase faster and the levels may be reached sooner. Several factors determine the production build-up: notably the reserves found in the fourth round licences - in particular the find in block 31/2 - and the transport capacity. The gas reserves in this area may be rich enough to affect the increase in production although if insufficient gas transport is available, additional production might not materialise in this period. There is also a possibility of production higher than 90 million t.o.e. Reserves in blocks not yet allocated might be greater than expected and it may turn out that a production of 110 million t.o.e. might then be possible. However, up to the middle of the 1990's oil and gas production is more likely to be in the range 70 to 90 million t.o.e.

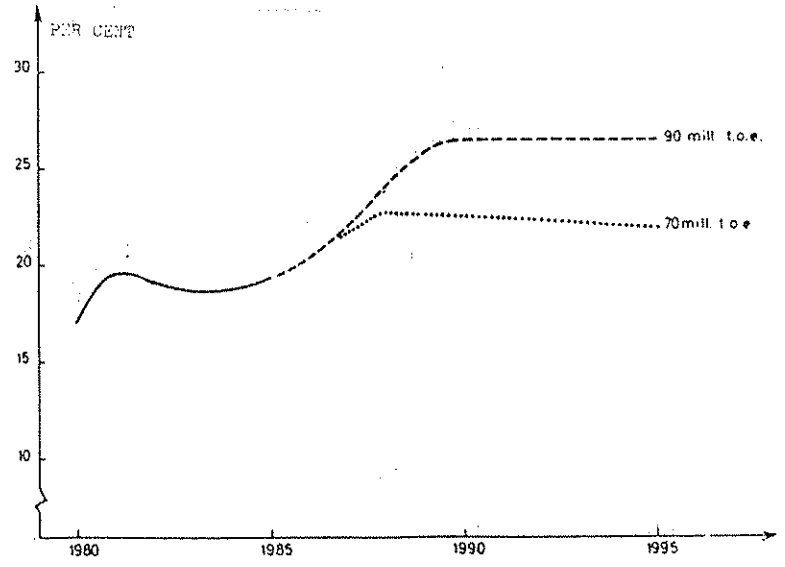
The gross production value of the alternative production paths is illustrated in figure 4. An oil price of $30 per barrel in 1980 with real price increases of 2.8 per cent per year are assumed. The rates of exchange between the different currencies are assumed invariant over the period and the values are given in 1979-Norwegian kroner. Experience has been that actual gross production has tended to be lower than expected, and future estimates have had to be adjusted downwards. The main reason has been delays in bringing fields into production, but it has also been necessary to downgrade expected output from fields already in production. In addition, oil prices up to 1979 showed a more moderate increase than expected while the dollar depreciated. For the immediate future the uncertainty regarding production volumes relates to fields already in production. This heavy dependence on one field, 75% of total production is expected to come from the Ekofisk field, makes the profile for the next few years rather uncertain. For example, the recent downward revision of production and reserves in the Ekofisk field affects the profiles shown in figure 7 and 8 as well as later figures in the paper. Figure 5 shows the expected percentage contribution to GNP from the petroleum sector. Here a growth in the non-oil economy of 3 per cent per year in real terms is assumed. Domestic inflation is assumed to equal the OECD average. If these assumptions are accurate, the petroleum sector could contribute some 20-25 per cent of GNP up to 1995.

Figure 4. Gross Value of Alternative Production Paths



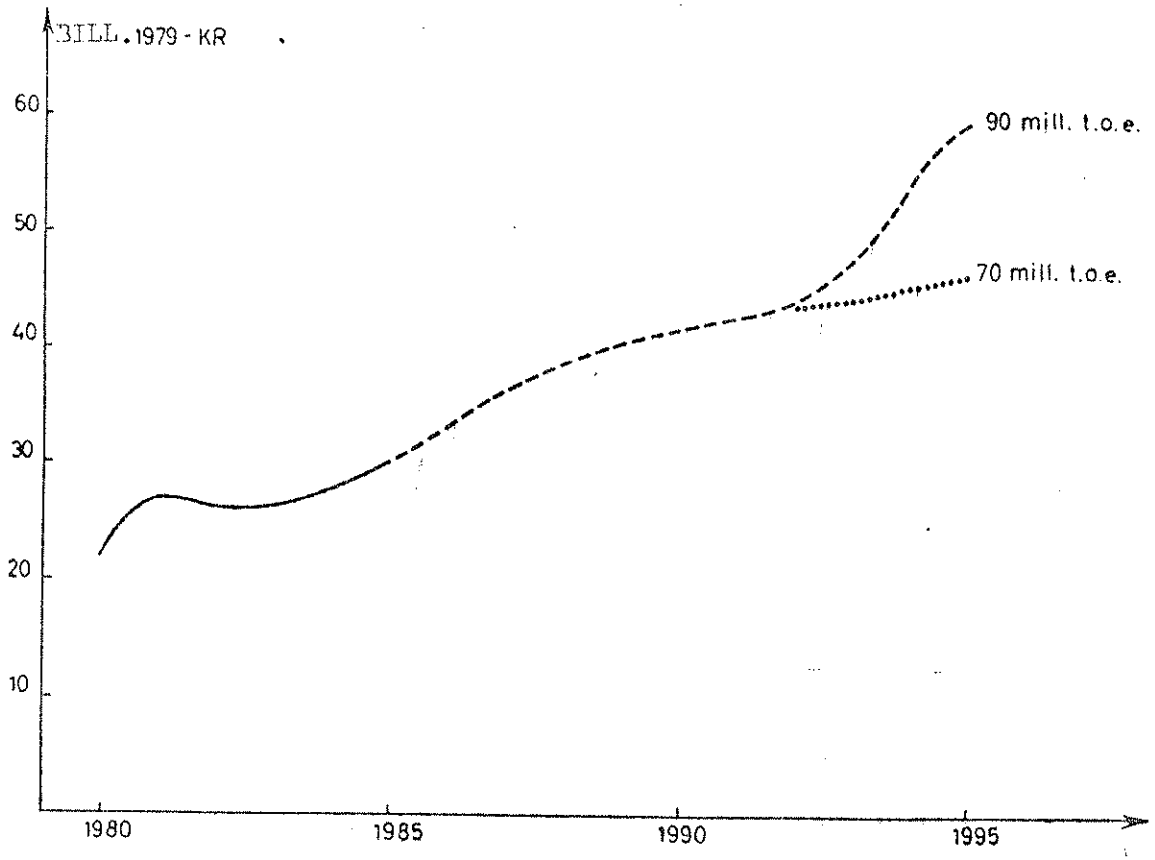
Source: (2), p 31.

Figure 5. Petroleum Sector Share in GNP



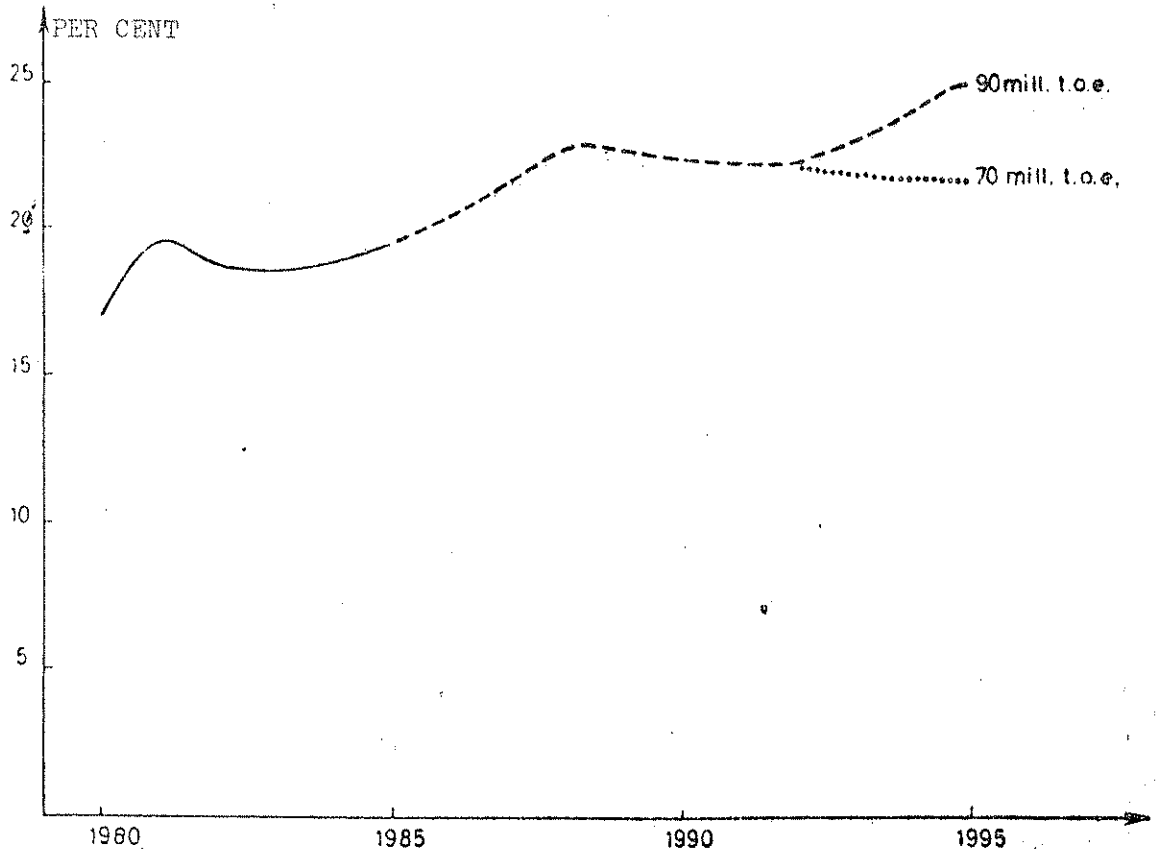
Source: (2), p 31.

Figure 6. Total Tax Receipts from Petroleum Sector



Source: (2), p. 32

Figure 7. Petroleum Sector Tax Share of Public Sector Income

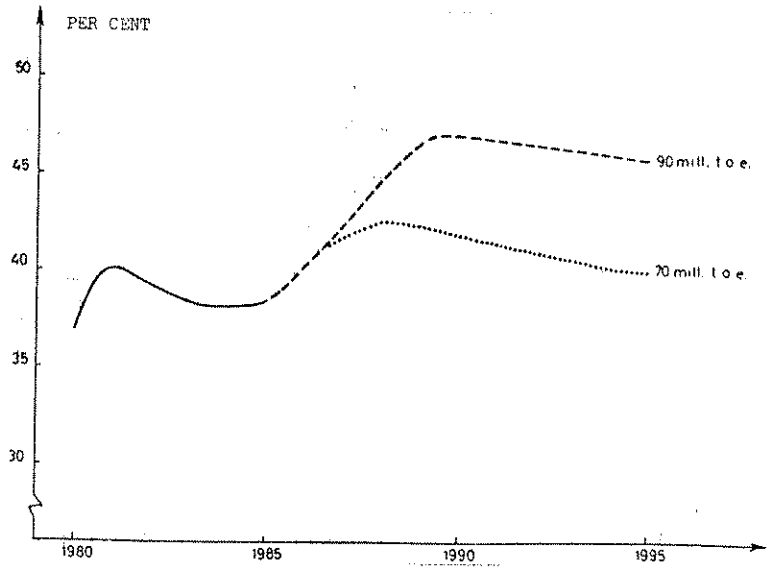


Source: (2), p. 33

Predicting total future taxes from the petroleum sector introduces new types of uncertainty regarding costs of investment and operation, new search activities and possible changes in the taxation system. In fact the system of petroleum taxes is currently being revised, and we return to a more detailed discussion of this topic later on. However, based on the tax rules in 1979, figure 6 gives an illustration of expected future total taxes from the petroleum sector in Norway, measured in 1979-kroner. These taxes as a percentage of total public sector income are shown in figure 7, indicating that 20-25 per cent of total future public sector income is likely to come from the petroleum sector. It is worth noticing that taxes will lag behind increases in the gross value of production as the tax system allows early depreciation once a field has come into production.

Finally, figure 8 shows for each production path the expected value of the oil and gas exports as a percentage of expected total exports value. The volume of other exports is assumed to increase at an average rate of 4 per cent per annum, while the rate of export inflation is assumed to equal the average OECD inflation rate, and real oil and gas prices are assumed to increase at a rate of 2.8 per cent per annum. It is also assumed that all oil and gas production is exported, which is roughly the case at present. As a consequence the value of exports equals the gross production value.

Figure 8. Oil and Gas Exports as Percentages of Total Exports



Source: (2), p 34.

Clearly the Norwegian economy is already, and will increasingly be, heavily dependent on the export of petroleum products.

In the revised National Budget for 1980, which was published in the first week of May 1980, this trend is more pronounced. The National Budget, published in September 1979, was based on a price of $27 per barrel. The revised budget assumes a $34 average price for 1980. Consequently, the value of oil and gas exports for 1980 has been revised upwards from 34 billion kroner to 45 billion kroner. For the first time in recent history, the current account is expected to show a surplus. Moreover the higher oil prices are likely to yield a considerable surplus of about 7 to 12 billion kroner which would be the highest surplus ever recorded.

The next section considers recent economic issues in Norwegian petroleum policy.

3. Some recent policy issues

3.1 Depletion policy

The 1979/80 white paper (2) contains no new depletion policy. The oil and gas production alternatives of 70 or 90 million t.o.e. per year date back to the first, very influential, white paper (1) on the role of the petroleum activity in the Norwegian society (No. 25 1973/74) in which these alternatives were presented as "illustrations of a moderate rate of extraction". A fast rate of extraction has been regarded as undesirable because the use of increased incomes domestically and the increased production due to the activity in the North Sea result in structural changes in the economy, which per se are assumed to have negative welfare effects (for example the strain to family life caused by higher labour mobility). Conversely, faster production build-up yields income which, when spent presumably results in welfare gains compared to later incomes. The extraction rates of 70 or 90 million t.o.e. are seen as the most reasonable candidates to maximise welfare taken as a whole. In any case, as to now production build-up has been far slower than expected and the question of which level to choose has not yet been really pressing.

More rapid growth in domestic incomes may cause undesirable structural changes due to the need for greater production from industries sheltered from foreign competition, such as most public sector activities and the service sectors.

The scope for increased labour productivity in these industries is rather limited. Instead greater production must come from increased employment in these sectors, and since Norway is close to full employment labour must move out of the export (or the import-competing) industries. The economic mechanism that motivates this reallocation will be a downward pressure on the profitability in these exposed industries caused by rising kroner values and/or increasing wages. Higher oil incomes imply a reallocation of labour (and other resources) away from exposed industries to sheltered industries and a reduction in industrial employment. Although this reallocation follows from general economic growth, faster oil production would speed up this process.

These considerations constitute less than a complete basis for a national depletion policy. Until the profitability and risks associated with alternative depletion profiles under various assumptions about oil prices, costs, rates of interest etcetera are identified no unambiguous choice of the best future depletion path can be made. Still, a moderate rate of extraction might turn out to be defensible also from a purely profitability point of view.

Failure to understand the inevitability of this development may account for some of the pressure for financial support from the State for those exposed industries feeling the profit squeeze most severely. Of course, some firms may be rescued by State support, but then at the cost of other firms. An attempt to save all threatened exposed firms is likely to put an upward pressure on wages so that the necessary reallocation may occur anyhow.

3.2 Pricing policy

It has been stated explicitly as official policy that the prices of North Sea petroleum products used by households and firms should equal world prices. While this principle is widely supported by economists and politicians, it has also been criticised.

Since Norway produces four to five times its level of domestic consumption the critics believe that Norwegian consumers should directly benefit by lower oil product prices. Saudi-Arabia and Kuwait keep gasoline prices to a fraction of world prices, so why should Norway follow a different policy? Firms using oil products could reduce their costs to become more competitive internationally and

expand.

The economic argument against this view is of course quite simple. For economic efficiency, the price of oil should equal its marginal social costs. The marginal social costs of a unit of North Sea oil is not equal to the cost of extracting a unit from the North Sea, but is equal to the potential revenue available in world markets, as valued by world oil prices. Hence the domestic price of oil should equal the world price of oil. A lower price means waste.

Pricing at world prices has been adhered to in practice, but not without exception. One exception has been the price of NGL used as inputs in the new petro-chemicals complex constructed in south-east Norway. The agreement between the Phillips group and the Norwegian State over transportation of petroleum from Ekofisk to Teesside in England included a clause defining the price and delivery conditions of NGL from Teesside to the Norwegian petrochemical industry. A similar agreement exists for NGL from other fields. Due to these conditions the price on this NGL is now considerably lower than the world price, and the Norwegian petrochemical industry is subsidised.

It could, however, be argued that due to the recent gas finds, Norway has a comparative advantage in petrochemicals production, and that the long run gains from establishing such an industry outweigh the short run losses from subsidising it in its infant stage. In any case a considerable expansion of petrochemical production is planned for Norway.

3.3 Concession policy

Drilling permits on the Norwegian Shelf are granted in a bargaining system between the oil companies and the State. In the most recent rounds the State has announced a preference for applicants who present plans for joint industrial ventures with Norwegian companies or for interesting research and development projects. In using drilling permits as an active part of industrial policy the aim is, i. a., to give Norwegian industrial companies access to advanced technology and new export markets, thereby increasing productivity and the growth potential in the Norwegian economy.

An argument against this policy is that the value of each applicant's proposals is not obvious and the highest bidder cannot be easily or unambiguously identified. Different industrial agreements may appeal to different Norwegian

interests (eg according to regions), and the applicants may be taking this into consideration to try to obtain a permit at a lower cost than would be possible if cash payment was the rule.

A more fundamental question is whether this bargaining system really provides the country with socially profitable industry. Admittedly it is the intention to attract the sort of project which is "interesting in itself for the foreign partner". But one might then ask why such projects would not be pursued except in connection with a drilling application. The danger is that the country undertakes projects which are unprofitable in themselves, since they are regarded by the oil companies as a cost item in a bigger project that shows an overall profit. If this is the case, scarce resources will be used to establish socially unprofitable industries, which will actually impede the growth potential of the economy. It would be more in line with the policy aims if a foreign company located an already planned and profitable project to Norway instead of somewhere else due to the Norwegian bargaining system. Still, from an economic point of view, it is difficult to escape the conclusion that cash payment would be preferable. The authorities would then be completely free to decide what sorts of industrial projects, if any, would be most beneficial to the economy, and there is no particular reason why the foreign industrial partners should be exactly those firms most suited to drill for oil in the North Sea.

One aspect of the concession policy which is likely to be more strictly adhered to by the government is the so-called "Norwegianisation" policy. "Norwegianisation" should, according to the government, occur in the use of goods and services and in the organisation of petroleum sector activity.

The concessions stipulate that Norwegian goods and services should be used whenever they are competitive with respect to quality, maintenance, availability and price. It is stressed that this does not constitute a preference for Norwegian firms or protection for the Norwegian onshore supply industry. The objective has been to give competitive Norwegian firms the opportunity to supply oil related goods and services, and to circumvent the traditionally established delivery patterns in the petroleum industry. In the organisation of the activity, the main contribution to "Norwegianisation" has been the establishment and expansion of the State's oil firm (Statoil). The concession policy has also secured important jobs for Norsk Hydro and Saga Petroleum in the North Sea. Future concession terms will, if possible, be modelled on the Statoil, Norsk Hydro

and Saga Petroleum agreement for the "golden block" 34/10, where the concession was granted to the Norwegian companies with foreign companies providing expertise on a contract basis. In such "entrepreneur-contracts" the Government envisages payment to the foreign company in oil or gas, but with the "fee" stipulated in financial terms instead of a fixed share of production. This, in particular, has been criticised by the international oil companies, who claim that they are likely to lose interest in exploration if they have such limited access to crude oil from any discoveries.

3.4 Taxation policy

Petroleum sector taxation in Norway comprises three main items: the standard company tax, a Special Tax on net earnings from petroleum extraction and pipeline transport and a royalty based on production. The company tax on profits is 51.9% and the Special Tax rate, which was introduced after the oil-price increases in 1973/74, is a present 25%. The royalty on oil production is on a scale from 8 to 16% of production, increasing with production. For other petroleum products there is a flat-rate royalty of 12.5%. Without going into the matter in detail, it can be said that since special allowances can be deducted before calculating taxable income, the effective average tax on earnings in the petroleum sector is considerably lower than the sum of the ordinary company tax rate and the Special Tax rate.

Following the dramatic increases in oil prices during 1979 and early 1980, the petroleum taxation system is now under review. If the proposals can be determined by the Storting during this term the new tax system will be effective from the first of January this year. The proposals have been discussed publicly and modified somewhat from their original form. The main original proposals were:

1. to increase the tax rate for Special Tax from 25% to 35%
2. to reduce the tax-credit period from 12 to 3 months after a three-year transition period
3. to stop the deduction of loan interest payments from Special Tax assessable income
4. to reduce the annual investment allowance in the Special Tax from 10% of total investment over 15 years to a shorter period of 10 years. The maximum allowance would be reduced to 150% to 100%.

In addition there were a number of other, less important, proposals.

This package was circulated for comments to the oil companies and other interested parties around the middle of February this year.

A major issue of the new tax proposals was whether they would affect the activity in the North Sea and in particular whether the recent plans to exploit some of the so-called "marginal fields" would be affected. These fields - Ula, North-East Frigg and Odin - became economically attractive after the price increases in 1979. The oil industry declared that plans for developing North-East Frigg and Odin would be postponed and development of the Ula field would be cancelled if the new tax rules were introduced. According to Mobil, the rate of return on Statfjord B would fall from 23 to 15.6% and the rate of return on Statfjord C would be as low as 13% or 14% in real prices - returns that might be insufficient for commercial development.

At the end of March modified proposals were presented. The right to deduct loan interest payments is not to be removed, and the average tax-credit period is to be reduced to six months instead of three months. The investment allowance period is not to be cut from 15 to 10 years, although only 6⅔% of total capital costs are to be deducted over this 15 year period. According to the Ministry of Finance, the modified tax proposals imply an average tax rate of 81.8% compared to a present rate of 69.2%. The original proposals imply a rate of 84.7% so that there is some reduction in the modified proposals. The new system will give Government tax revenue from the petroleum sector of 22.6 billion kroner in 1980, compared to a previous estimate of 11.6 billion kroner based on unchanged tax rules. For the period 1980-85 Government revenue from this sector is expected to be 281 billion kroner compared to 228 with the present system. These calculations use a price of $33 per barrel in 1980 with nominal price increases of 10% per year.

Perhaps as a result of the modifications made in the new tax proposals, an Oil and Energy Ministry spokesman has recently announced that the three marginal fields mentioned above are all going to be developed as originally planned. Some 2 billion cubic metres of gas should flow from Ula in the period 1983/4 to 1993/4, the 9 billion cubic metres in North-East Frigg might come onstream in 1984 and Odin's 22 billion cubic metres should come into production later in 1984.

3.5 Recent finds and possible gas transportation plans

Although the fourth-round discoveries have not yet been fully appraised, the

most significant find in this round is likely to be the Shell group's discovery on block 31/2. This find is believed to be at least as large as Frigg reserves of 160 billion Sm^3 and the White Paper suggests that the area surrounding and including block 31/2 might contain as much as 500-1500 billion Sm^3. Production from this area is not likely until the 1990's. This is due to local water depths of about 325 metres and a difficult geological structure. Also delineation drilling in the neighbouring blocks 31/3, 31/5 and 31/6 may take some time as the Government will probably allocate these blocks to the busy Norwegian trio of Statoil, Norsk Hydro and Saga Petroleum. Oil might also be produced from this field and would have to precede significant gas production since otherwise the oil will dissipate into the gas sands. Gas was also found on Statoil's block 30/6 and oil on Saga's block 34/4, although both finds have yet to be commercially proven. However, Statoil's block 34/10, the "golden block", will almost certainly be developed. The structure has been quite extensively appraised. Reserves here are thought to amount to one billion barrels of oil and gas. Production from this field might start in 1986/87, that is one year after the Statfjord C platform begins producing, according to present plans.

The results from drilling on the fourth round blocks, including 31/2 indicate that gas is going to constitute an increasingly greater share of the Norwegian reserves. Possible methods to transport this gas are currently under scrutiny at The Oil and Energy Ministry. The required extra transport capacity for gas from the Norwegian Shelf will depend upon:

a) the maximum level of annual production
b) the possible excess capacity in the existing Frigg and Ekofisk pipelines
c) when Statfjord gas production starts
d) the possible development of fields whose landing destinations have yet to be decided (eg the Sleipner field)
e) new gas finds(as above).

The price of gas will also be a decisive factor when deciding on what sort of transport system, if any, is going to be installed. Gas prices have risen substantially in recent times and gas is now fetching the same price per unit of calorific value as oil. Up to now prices of North Sea gas have been between 30 and 40 per cent lower than oil prices. In the middle of April 1980 the German firm Gelsenberg contracted to buy Ula gas at 11p per cubic metre of gas (The Guardian 21.4.80). This long-term gas contract is important to the oil companies operating in the North Sea and to Norway, since it is seen as the first of many contracts that price gas at oil equivalent prices. Plans for a gas gathering

pipe-line system in the Norwegian sector will be announced during next year, although for the moment possible routes and landfalls are undecided. A decision is required fairly soon, especially for Statfjord gas, since continued reinjection beyond the mid 1980's will be detrimental. The pipe-line from the gas-gathering system might come ashore at Emden in the Federal Replublic of Germany or at the Danish coast. The system would probably extend as far north as Statfjord although the possibility that Statfjord gas might be piped directly to the west coast of Norway has not been eliminated. A pipe-line across the Norwegian trench is now technically possible so that Statfjord gas might form the basis for petrochemical plants in Western Norway. In any case the State has an option for the NGL from Statfjord similar to its option for Frigg and just as Frigg NGL is used in Bamble, Statfjord NGL is planned to fuel a petrochemicals complex in Western Norway. If all gas from Statfjord is piped to Norway, the petrochemicals industry would be much bigger with investments including the pipe-line of 1-1.4 billion in constant 1980 values.

Another possibility is for export of Statfjord gas to Britain through existing or new British pipe-lines. However, if the new gas finds are as large as currently expected and if most of it is exported, a separate pipe-line for Statfjord gas might be uneconomic. Since a considerable quantity of Norwegian gas from the Frigg field already goes to Britain, it can be argued that diversification might be beneficial. A gas gathering pipe-line system in the Norwegian North Sea may have cost advantages since average costs fall rapidly as utilization increases. More important, however, will be the choice of landing destination for the gas. The gas may be sold to Britain or to buyers on the Continent. In Britain there is only one buyer, the British Gas Corporation, which in the past has forced low prices on suppliers, whereas on the Continent there are several buyers who must pay competitive prices. However, the price is not the only criterion - quantity, future needs, costs of the pipeline, specification of gas quality and possibility of Norwegian deliveries in the construction phase are also important factors. Another advantage of a gas gathering system, in contrast to a direct pipe-line from each field, is that it could act as a development catalyst for the marginal finds insufficiently attractive to justify individual development, (eg Sleipner, where the recoverable reserves are thought to be comparable to Frigg reserves). To go ahead with this £5 billion Norwegian gas gathering pipe-line system, long-run delivery contracts for a period of 15-20 years must be agreed, and negotiations with prospective buyers are now in progress. Political considerations may also affect the result. Landing of the Statfjord gas in Norway may be influenced by political arguments for petrochemical

developments in less industrial regions, and a preference for more Scandinavian co-operation in the energy and industrial field may also be important. However, a pipe-line system gathering gas from as far north as the Statfjord field picking up gas from other fields on its way south to a landfall on the Continent, possibly Emden, is at present the most likely plan. A link via the Danish Dan field, to secure deliveries to Denmark after Dan is exhausted is also possible since it could promote Scandinavian energy and industrial co-operation (which would also include Sweden) with other projects benefiting Norway.

4. Some concluding remarks

The enormous growth in the economic value of the output of petroleum in the second half of the 1970's has changed the Norwegian economy drastically. The beneficial effects on the balance of payments will give Norwegian Governments unprecedented freedom of maneouvering in economic policy for the rest of the century, at least. A discussion of how this opportunity should be exploited in the interest of "society as a whole" - including future depletion policy - has not yet really started. However, the Government has announced a major policy paper, either as a separate white paper or as part of the long term programme for the period 1982-1985, where the principles for the development of the petroleum sector in relation to the rest of the Norwegian society will be set out. Hopefully this paper will contain more economic analysis of policy options than the present white paper (2).

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