

DEPARTMENT OF ENERGY

# Development of the oil and gas resources of the United Kingdom

# 1982





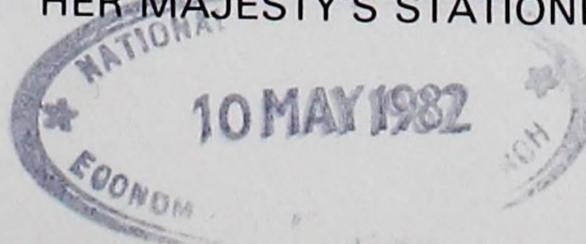
DEPARTMENT OF ENERGY

# Development of the oil and gas resources of the United Kingdom 1982

A Report to Parliament by the Secretary of State for Energy  
April 1982



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resources of the United Kingdom 1982

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Throughout the text one thousand million ( $10^9$ ) is referred to as one billion and one million million ( $10^{12}$ ) as one trillion

Useful conversion factors:

- 1 tonne is approximately 7.5 barrels
- 1 cubic metre = 35.31 cubic feet

Front cover design is based on a British Petroleum Co Ltd photograph of production platform FA (Graythorp 1) in BP's Forties oil field in the North Sea.

# Summary

This report describes the development of the oil and gas resources of the United Kingdom in 1981. It includes the Department of Energy's latest estimates of oil and gas reserves on the United Kingdom Continental Shelf (UKCS).

## **Oil production**

North Sea oil production exceeded for the first time the amount of oil used in the UK. Total production increased from 80.5 million tonnes in 1980 to 89.4 million tonnes in 1981. At the end of the year there were 18 offshore oil fields in production, including three — Tartan, Buchan and Beatrice — which came onstream during the year.

Forecasts of oil production for the years 1982 to 1985 are given in Appendix 16.

## **Gas production**

Production of natural gas from the UKCS was 37.4 billion cubic metres in 1981.

Approval has been given by the Secretary of State for Energy for the development of the Morecambe gas field. This scheme, together with the Rough gas storage project for which development approval is expected in spring 1982, aims to provide a seasonal flow of gas to help the British Gas Corporation (BGC) to meet peak winter demand from 1983/84.

## **Oil and Gas (Enterprise) Bill**

The Bill was published on 17 December 1981. It provides for the disposal of the British National Oil Corporation's oil-producing business

to the private sector. It will also permit the disposal of assets held by BGC, and the Government intends to use these powers in the first instance to privatise BGC's interests in North Sea oil fields. The Bill also proposes to introduce competition in the supply of gas by removing BGC's purchasing privileges and restricting the Corporation's monopoly in the supply of gas by pipe. Important safety provisions are also included.

## **Licensing**

The Seventh Round of licensing was completed. Interest in exploration on land was maintained by the award of 31 exploration licences and 15 production licences.

## **Exploration**

Exploration activity offshore reached its highest level since 1977. A total of 73 exploration and appraisal wells were drilled in 1981, compared to 54 in 1980. 12 discoveries were announced in the year, the highest number since 1976.

## **Economic benefits**

Revenue from the sale of oil produced from the UKCS rose to £12.3 billion in 1981, compared to £8.9 billion in 1980. Revenue from the sale of gas reached £0.8 billion, compared to £0.6 billion in 1980.

Government income from taxes and royalties in the financial year 1981/82 amounted to about £6.4 billion.

## **Investment**

Gross capital investment in the oil and gas exploration and production

industry as a whole was estimated at £2.8 billion in 1981, representing about 20 per cent of total UK industrial investment.

### Offshore safety

There was an increase in the number of fatal accidents, serious injuries and dangerous occurrences reported to the Department of Energy in 1981.

# Part I: Reserves, exploration and development

## Oil reserves

In 1981 there were a number of encouraging drilling results in the Central North Sea which have yet to be evaluated. However, there were also some disappointing results affecting estimates of reserves in more speculative areas, particularly the South Western Approaches. Estimates of reserves in existing discoveries were little changed. On balance the original quantity of recoverable reserves on the UKCS is now estimated to be some 50 million tonnes below that of the 1981 Brown Book\*. Within this overall reserve range, which is comparable with previous years' estimates, the presentation of ranges for different categories of reserves has been changed.

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\*Development of the oil and gas resources of the United Kingdom 1981. HMSO price £4.50

Table 1(a) shows remaining recoverable proven, probable and possible reserves in present discoveries. As in previous years, the totals for each category have been derived by summing individual estimates for each field; the results are rounded to the nearest 25 million tonnes. The most likely estimate of remaining recoverable reserves in present discoveries is the sum of proven and probable reserves, around 1625 million tonnes. This figure is some 75 million tonnes lower than last year, the difference being essentially an allowance for production in 1981.

Table 1(b) gives estimates of the range of the originally recoverable oil reserves on the UKCS. The probability that all existing discoveries together will eventually produce less than the sum of their currently estimated

*Table 1(a) Remaining recoverable oil reserves in present discoveries on the UKCS as at 31 December 1981*

	(million tonnes)				
	Proven*	Probable*	Proven and Probable	Possible*	Maximum Possible
Fields in production or under development	975	250	1225	225	1450
Other significant discoveries not yet fully appraised	75	325	400	450	850
Total remaining reserves in present discoveries	1050	575	1625	675	2300

- \* The terms "proven", "probable" and "possible" are given the internationally accepted meanings in this context:
- (i) Proven — those reserves which on the available evidence are virtually certain to be technically and economically producible.
  - (ii) Probable — those reserves which are estimated to have better than a 50 per cent chance of being technically and economically producible.
  - (iii) Possible — those reserves which at present are estimated to have a significant but less than 50 per cent chance of being technically and economically producible.

Table 1(b) Range of originally recoverable oil reserves on the UKCS

(million tonnes)

<i>Initial reserves in present discoveries</i>		
Cumulative production to end 1981	354	
Remaining reserves in present discoveries <sup>1</sup>	1475-1775	
Total (rounded)		1825-2125
<i>Potential undiscovered reserves</i>		
Reserves in future discoveries under licences up to and including the Seventh Round <sup>1</sup>	175-1125	
Reserves in future discoveries on the remainder of the UKCS (unlicensed) <sup>1 2</sup>	100-1050	
Total		275-2175
<i>Total recoverable reserves</i> (discovered and undiscovered)		2100-4300

<sup>1</sup>See text for derivation.

<sup>2</sup>About half of these reserves may be in water depths of more than 1000 feet.

proven reserves is very much smaller than that of any one field producing less than its proven reserves. If, for example, the chances of one field producing less than its proven reserves are roughly one in ten, the chances of two unrelated fields doing so together are roughly one in a hundred. On similar arguments, it is very unlikely that all fields will exceed their possible total. Accordingly the range of remaining reserves in present discoveries of 1050 - 2300 million tonnes in Table 1(a) has been narrowed to a range of 1475 - 1775 million tonnes in Table 1(b) to match the statistical probabilities associated with the overall estimated reserve range of 2100 - 4300 million tonnes. Correspondingly the ranges of the estimates of recoverable reserves in future discoveries in Table 1(b) have been widened; these broader ranges give a better indication of the geological uncertainties related to undiscovered reserves compared to those involved in the evaluation of existing discoveries.

The increase in the estimates of undiscovered reserves in currently licensed territory is due partly to the

transfer of some prospects from the unlicensed category following the issue of Seventh Round licences in 1981 and partly to the improved prospects in the Central North Sea.

#### Gas reserves

The presentation of Table 2 has been revised to bring it into agreement with that used for Table 1. The estimates of ranges are now statistically consistent with those for oil reserves. In addition, gas reserves have been listed under their principal hydrocarbon source (dry gas fields, gas condensate fields and in association with oil), since each source presents different problems for the production of gas. The most likely estimate of remaining recoverable reserves in present discoveries for these three sources is the sum of proven and probable reserves, about 1000 billion cubic metres (Table 2(a)). Of this total, dry gas fields remain the major source of gas supply; the known fields are estimated to contain some 600 billion cubic metres of remaining recoverable reserves. Condensate fields and associated gas fields each contribute about 200 billion cubic metres.

Table 2(a) Remaining recoverable gas reserves on the UKCS as at 31 December 1981

All figures in billion cubic metres (figures in trillion cubic feet in brackets)

	Proven*	Probable*	Proven and Probable	Possible*	Maximum Possible
<i>Gas from dry gas fields</i>					
(1) Fields in production or under development					
(a) Southern Basin	287(10.1)	40(1.4)	327(11.5)	11(.4)	338(11.9)
(b) Other areas †	175(6.2)	28(1.0)	203(7.2)	34(1.2)	237(8.4)
Total	462(16.3)	68(2.4)	530(18.7)	45(1.6)	575(20.3)
(2) Other significant discoveries not yet fully appraised					
(a) Southern Basin	54(1.9)	37(1.3)	91(3.2)	48(1.7)	139(4.9)
(b) Other areas	—	—	—	—	—
Total	516(18.2)	105(3.7)	621(21.9)	93(3.3)	714(25.2)
<i>Gas from gas condensate fields ††</i>					
(1) Fields in production or under development	—	—	—	—	—
(2) Other significant discoveries not yet fully appraised	23(.8)	193(6.8)	216(7.6)	263(9.3)	479(16.9)
Total	23(.8)	193(6.8)	216(7.6)	263(9.3)	479(16.9)
<i>Associated gas from oil fields ††</i>					
(1) Fields in production or under development					
(a) Currently delivering gas to shore	3(.1)	—	3(.1)	3(.1)	6(.2)
(b) Expected to be connected	116(4.1)	11(.4)	127(4.5)	8(.3)	135(4.8)
Total	119(4.2)	11(.4)	130(4.6)	11(.4)	141(5.0)
(2) Other significant discoveries not yet fully appraised	6(.2)	34(1.2)	40(1.4)	31(1.1)	71(2.5)
Total	125(4.4)	45(1.6)	170(6.0)	42(1.5)	212(7.5)
Total remaining recoverable reserves	664(23.4)	343(12.1)	1007(35.5)	398(14.1)	1405(49.6)

\* The terms "proven", "probable" and "possible" have the meanings defined in Table 1(a).

† UK Frigg, Morecambe

†† All in Northern North Sea

Table 2(b) gives estimates of the range of potential gas reserves on the UKCS. For discovered reserves, application of the approach used for oil reserves results in considerable narrowing of the range compared to last year.

Little exploration for gas was undertaken in 1981 and no new finds

were made. However, study of the Southern North Sea has indicated that it is extremely unlikely that no new gas fields will be discovered in this area. Consequently, the minimum expectation for future finds in the area has been raised from zero to 60 billion cubic metres. The range associated with future discoveries in the Southern North Sea (on a basis

Table 2(b) Range of originally recoverable gas reserves on the UKCS

All figures in billion cubic metres (figures in trillion cubic feet in brackets)

*Initial reserves in present discoveries*

(1) Cumulative production to end 1981*		418(14.8)
(2) Remaining reserves in present discoveries		
(a) Dry gas fields	580(20.5) — 660(23.3)	
(b) Gas condensate fields	140( 5.0) — 325(11.5)	
(c) Gas associated with oil	160( 5.6) — 190( 6.7)	
	<hr/>	
Total		880(31.1) — 1175(41.5)
		<hr/>
Total initial reserves in present discoveries (rounded)		1300(46 ) — 1600(56 )
		<hr/>

*Potential undiscovered reserves*

(a) Dry gas fields	60(2.1) — 600(20.3)	
(b) Gas condensate fields	unassessable (see text)	
(c) Gas associated with oil	5(0.2) — 60( 2.1)	
	<hr/>	
Total		65( 2.3) — 660(22.4)

*Total recoverable reserves* (discovered and undiscovered) (rounded)

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1350(48 ) — 2250(79 )

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\* Includes flared gas.

comparable with that used for the known fields) is put at 60–600 billion cubic metres. It is not possible to make any estimate of the likelihood of the discovery of further gas reserves in gas condensate fields since prospects of this nature are normally considered to contain oil until proved otherwise. A small allowance has been made for associated gas production from oil fields yet to be discovered in the Northern North Sea.

In total it is estimated that the remaining recoverable gas reserves (after allowing for production of 420 billion cubic metres) lie in the range 950–1850 billion cubic metres.

**Licensing**

*Offshore*

The Seventh Round of licensing was completed with the announcement on 1 October 1981 of a further 11 awards for blocks specifically listed by the Secretary of State. The blocks were: one in the South Western Approaches; two in the English Channel; and eight North of the

Shetlands. These awards brought the total for the Round as a whole to 90, the number envisaged when the Round was launched. All awards were taken up. Further information about the Round was included in the 1980 and 1981 editions of the Brown Book.

Details of each of the seven rounds of production licensing are shown in Appendix 2.

*Onshore*

31 exploration licences and 15 production licences were awarded during 1981. Most covered territory within established areas of interest in South and South West England, the West Midlands, Yorkshire and Humberside and the Midland Valley of Scotland.

**Exploration drilling**

*Offshore*

Exploration activity in 1981 showed a significant increase compared to previous years and reached its highest level since 1977. During

1981 47 exploration wells and 26 appraisal wells were commenced. Corresponding figures for 1980 were 32 and 22 respectively. Much of the increased activity was accounted for by the drilling of Fifth and Sixth Round well commitments in the Moray Firth and Central North Sea but drilling on blocks licensed in Rounds One to Four also made a significant contribution. Appendix 3 gives details of the number of exploration wells and appraisal wells drilled by geographical area in the years 1972-1981.

Twelve discoveries were announced in 1981, the highest number since 1976; eight of these were made in the Central area of the North Sea. All significant discoveries of hydrocarbons on the UKCS are listed at Appendix 4.

The level of activity in each sector of the UKCS was as follows:

— Northern North Sea

This area is a mature exploration province and most of the wells drilled (seven exploration and two appraisal) tested structures adjacent to known oil accumulations.

Two discoveries were made along the edge of the East Shetland Platform in blocks awarded in the Seventh Round. Both require further mapping and appraisal drilling to assess their potential.

— Moray Firth

Fifteen exploration and two appraisal wells were drilled in 1981. Since 12 licences were awarded in the Seventh Round (eight in the Inner and four in the Outer Moray Firth), the high level of interest shown in the area should be maintained in 1982. Further drilling will be encouraged by a discovery made late in the year in block 13/29. This is the first discovery in the Inner Moray Firth since 1976 when the Beatrice field was found in block 11/30.

— Central North Sea

Exploration drilling was at a very high level in 1981; 21 exploration and 10 appraisal wells were drilled giving rise to eight announced discoveries. Since only two of the blocks covered by licences awarded in the Seventh Round were previously unlicensed, the increase in activity can be attributed to a renewal of interest, particularly in the deeper prospects where higher formation pressures have presented new drilling problems.

— Southern North Sea

One appraisal well was drilled, thus confirming a gas discovery in block 41/24a.

— South Western Approaches and Channel

Following the award of 14 licences in the Seventh Round, there has been an increase in seismic activity to identify drillable structures. Only one exploration well was drilled during 1981, by Phillips Petroleum in block 73/7.

— Irish Sea and Celtic Sea

No exploration took place in 1981. A plan for a three well exploration programme in the Irish Sea has been received.

— West of Shetland

There was a drop in activity during 1981 with only two exploration wells being drilled, compared to the four exploration and two appraisal wells completed in 1980. 11 licences were awarded during the year as part of the Seventh Round.

— North of 62°N

In the Seventh Round, eight licences were awarded covering previously unlicensed blocks but no drilling took place in 1981.

## — Rockall Trough

No exploration activity took place in this unlicensed area during 1981. The great water depths and inhospitable north-east Atlantic weather make drilling very difficult over much of the area. However, deep-water drilling technology continues to make advances, and exploration of the area can be expected in the future.

The relative success of drilling in various areas of the UKCS can be shown by comparing the number of discoveries made with the number of exploration wells drilled in the area. The historical "success ratio" indicated gives a guide to current success, although it does not take account of the whole basin (which may extend outside British waters) or of the exploration target to which the well was drilled. The ratios for each of the major areas of the UKCS are given in Table 3. The location of the areas is shown in the map at Appendix 1.

The overall success ratio over the last 17 years has been 1 in 4 which is significantly above the world average. However, comparison of the total number of exploration wells drilled to the end of 1981 (689) with the number of discoveries which have led

to fields in production, fields under development and fields under appraisal, together with the discoveries currently showing commercial potential, in total about 60 discoveries, indicates that the likelihood of finding a commercial field is about 1 in 12. Estimates by year, by round of licensing or by company can be misleading.

### *Onshore*

Exploration activity reached a higher level than in previous years. 13 exploration wells were drilled with an additional four wells still drilling at the end of the year. Encouraging results were encountered in two BP wells which are currently being tested and evaluated. Five shallow wells were drilled under a single exploration licence in Dunfermline, Fife.

In December a blow-out occurred at Hatfield Moor in Yorkshire when an exploration well at shallow depth encountered gas which caught fire. The well was successfully controlled after 18 days.

### **Development drilling**

#### *Offshore*

134 development wells were started in 1981, including 92 in the area east

*Table 3 Success ratios for the major areas of the UKCS as at 31 December 1981*

Area	Exploration wells	Discovery wells	Ratio
East Shetland Basin	162	59	better than 1 in 3
East Shetland Platform	1	0	Nil
Moray Firth Basin	127	19	better than 1 in 7
Central North Sea Basin	123	41	1 in 3
Central Plateau	32	1	1 in 32
Mid North Sea High	16	0	Nil
Southern North Sea Basin	168	46	better than 1 in 4
East English Channel Basin	2	0	Nil
West English Channel Basin	2	0	Nil
South West Approaches Basin	2	0	Nil
Celtic Sea Basin	6	0	Nil
Cardigan Bay Basin	4	0	Nil
Irish Sea Basin	9	2	1 in 4.5
West Shetland Basin	35	2	1 in 17.5
<b>Total</b>	<b>689</b>	<b>170</b>	<b>1 in 4</b>

of Shetland and four in the Southern Basin. The increase in development drilling by mobile units was sustained, with six units engaged in development at the end of the year. About 20 per cent of all development wells were drilled by mobile drilling units, compared with 15 per cent in 1980.

Appendix 3 gives details by geographical area for the years 1972-1981 of the number of development wells drilled and the mobile rig and fixed platform activity on the UKCS.

#### *Onshore*

Seven development wells were drilled on the Wytch Farm field during the year. In the same licence area, the structures at Stoborough and Bushey Farm were also drilled. The Wareham structure was not drilled during 1981.

Details of the number of exploration and appraisal/development wells drilled and the rig activity for the years 1972-1981 are given in Appendix 3.

#### **Development and production programme approvals**

Under the terms of petroleum production licences, development work and the production of petroleum may be carried out only with the consent of the Secretary of State for Energy or under a development or production programme approved by him.

At the end of 1981 all producing oil fields (with the exception of Auk, Argyll, Beatrice, Buchan, Tartan and Wytch Farm), and all producing gas fields, were operating under temporary consents given normally for three or six months at a time.

Of the fields which came onstream during the year, Buchan is operating under a long term consent and Beatrice and Tartan are operating under "staged" approvals designed to

give operators a firm base for investment decisions while retaining Government control for the longer term.

Revised development programmes have been received for Auk, Argyll, Beatrice, Brent, South Cormorant and Heather.

## Part II: Production and downstream activities

### Oil production

1981 witnessed a significant threshold of achievement. North Sea oil production in the year exceeded for the first time the amount of oil used in the UK. 1.8 million barrels of oil per day flowed on average from the 18 offshore oil fields in production.

In the course of 1981 three new offshore oil fields, Tartan, Buchan and Beatrice came onstream. Total oil production increased from 80.5 million tonnes in 1980 to 89.4 million tonnes in 1981. This includes 0.4 million tonnes of gas condensate (a mixture of pentane and higher hydrocarbons) extracted mainly from the output of the Frigg and Southern Basin gas fields, 1.2 million tonnes of heavier natural gases from oil fields and 0.2 million tonnes of crude oil from fields in Dorset and the East Midlands. Production from individual oil fields is given in Appendix 8.

Two offshore fields, Fulmar and North Cormorant, came onstream during February 1982.

Forecasts of petroleum production were given by the Secretary of State for Energy in reply to a Parliamentary Question on 4 March 1982. The reply is reproduced in Appendix 16.

### Oil disposal

Total disposals of UK North Sea oil in 1981 amounted to 89.5 million tonnes. 37.8 million tonnes were delivered to UK refineries, constituting over half of the total deliveries of oil to UK refineries.

Although 33.0 million tonnes of foreign crudes were imported during the year, these imports were more than offset by exports of 51.0 million tonnes of North Sea crude, thus placing the UK for the first time in the position of a net exporter. The North Sea crude oil was exported almost entirely to the markets of our partners in the European Community and the International Energy Agency. The remainder went to traditional markets in Finland and the Caribbean. Figures for exports of crude oil by country are given in Table 4.

*Table 4 Exports of UKCS crude oil in 1981*

Destination <sup>(1)</sup>	million tonnes (rounded)
Bahamas	1.5
Belgium	0.4
Canada	1.2
Denmark	2.6
Federal Republic of Germany	12.7
Finland	0.3
France	3.2
Italy	0.4
Netherlands	7.2
Netherlands West Indies	0.8
Norway	1.5
Portugal	0.2
Spain	0.4
Sweden	2.6
Switzerland	0.1
USA	15.5
Virgin Islands	0.4
Total exports	51.0

(1) Some of the exports to the Caribbean area may have been for transshipment to the USA; exports to the Netherlands include oil for transshipment or in transit to other destinations (eg Belgium and the Federal Republic of Germany).

### British National Oil Corporation (BNOC)

The Oil and Gas (Enterprise) Bill was

published on 17 December 1981. It will provide for the disposal of BNO's oil-producing business to the private sector. Subject to the Bill's passage through Parliament, this will be achieved by the Corporation transferring its oil-producing assets into a subsidiary, named Britoil. 51 per cent of Britoil's shares will then be offered for sale to the public as soon as market conditions allow. The Government hopes that this will be possible before the end of 1982. The Corporation will remain in existence, wholly State owned, principally to trade in oil to which it has access through participation agreements.

### **Gas supplies**

In 1981 production of natural gas from the whole of the UKCS amounted to 37.4 billion cubic metres (1.32 trillion cubic feet). Production from individual fields is set out in Appendix 9.

Total supplies to BGC were slightly lower in 1981 than in 1980. UKCS production accounted for 75 per cent of the 1981 total against 78 per cent in 1980. The increased import share arose from reduced production from certain Southern Basin fields, offset by increased output from the UK/Norwegian Frigg field (60.82 per cent of production from this field is deemed to come from Norway under the UK/Norway intergovernmental agreement of 1976).

### **Associated gas**

Almost all the gas hitherto supplied to BGC came from gas fields containing insignificant quantities of oil, and was predominantly methane. Gas found in association with oil is likely to contain, in addition to methane, substantial quantities of natural gas liquids (NGL). These consist of ethane, liquefied petroleum gases (LPG — propane and butane) and condensate. Associated gas from Brent, the first major source of such gas to be developed on the UKCS, will flow to St Fergus in Scotland through

the Shell/Esso Far North Liquid and Associated Gas (FLAG) system. The system is expected to begin operation in spring 1982. However, for many other fields, the volume of associated gas produced is too small to allow individual gas pipelines to shore to be economic, and other methods of carrying the gas ashore have to be considered.

In some cases it is possible to use existing pipelines serving larger fields. A start was made in 1978 when gas from the Piper field began to flow into the Frigg pipeline system. Gas from the Tartan field, which came into production at the beginning of 1981, will also be brought ashore in the Frigg pipeline system once technical problems have been resolved. Further north, Shell/Esso's Western Leg pipeline is linked into the FLAG system, providing a route ashore for gas from the Ninian, NW Hutton and North and South Cormorant fields.

### **Projects for further gas supplies**

Development approval for the Morecambe project has been granted to BGC. The Morecambe field will provide a seasonal flow of gas; it will produce at maximum rates throughout periods of peak demand but will normally be shut-in or produce at minimum rates throughout the summer months. The issue of a storage licence for the Rough project by the Crown Estate Commissioners and the granting of development approval are both expected in spring 1982. The Rough reservoir capacity will be developed to store gas produced from other fields during periods of low demand; this gas will then be made available during the months of high demand. Together, the Morecambe and Rough projects will play an important part in helping BGC to meet peak winter demand from 1983/84.

BGC has continued its discussions with producers of Southern Basin gas fields to explore ways of achieving

extra production, or of restoring declining production. As a result of previous negotiations, there has been further development of the Leman Bank, Indefatigable and West Sole fields.

Work has commenced on constructing the Northern Leg pipeline which will feed into the FLAG System. This spur pipeline will provide the means for gas and NGL from the Magnus, Murchison, and Thistle fields to be brought ashore.

Arrangements have been made for piping Odin and North East Frigg gas to St Fergus via the Frigg pipeline system. Gas flow is expected to begin in 1984.

### **Gas Gathering Pipeline**

The integrated pipeline project was planned on the basis that it would be a private sector utility, mainly owned and financed by the private sector, with 30 per cent participation by BGC.

On 11 September 1981, the then Secretary of State for Energy announced that the Government had completed its examination of the scheme and that after many months of negotiation the private sector had not come forward with proposals to invest in the scheme at the necessary levels. As it was clear to the Government that the vast bulk of North Sea gas reserves could and would be brought ashore by alternative schemes, it was therefore decided that companies should, in the future as in the past, make their own arrangements for bringing the gas ashore. The Government is confident that, following the pattern which has been successfully adopted for the discovery and exploitation of North Sea oil, the producer companies will ensure that Britain's North Sea gas reserves are brought onshore efficiently in accordance with the nation's needs.

Following the Government's decision, the oil companies have started to consider their own plans, both individually and in concert. It is expected that these will result in a number of smaller gas gathering schemes, built as and when required to serve appropriate sectors of the North Sea.

### **Flaring**

Under the terms of petroleum production licences, gas may be flared only with the consent of the Secretary of State for Energy. Consents for flaring at new developments, at levels above the minimum necessary to ensure safe operation, are given only where there is no technically or economically feasible alternative means of gas disposal. During 1981, equipment for the re-injection of gas was being commissioned at a number of fields. In order to control and monitor flaring at such fields, consents have normally been given for limited periods.

The average rate of flaring during 1981 was 11.54 million cubic metres per day; this was a slight reduction over 1980 levels even though oil production increased by over 11 per cent. This improvement was achieved in spite of the following factors: the lack of feasible economic alternative means of gas disposal at Buchan and Beatrice, which came onstream during the year; the high flare on Tartan because the export of gas at planned levels was not possible pending the installation of additional processing equipment following the discovery of hydrogen sulphide (a corrosive gas) in the reservoir; and increased flaring on Brent during the commissioning of the fourth platform. The average rates of oil production and gas flaring at producing oil fields for the years 1975 to 1981 are illustrated in the chart at Appendix 10.

The commissioning of gas handling and LPG recovery facilities at Sullom

Voe during 1982 will allow the offshore operators of fields supplying the Brent and Ninian pipeline systems to pipe ashore NGL in live crude and consequently reduce flaring offshore. The terminal will process live crude from Brent, North and South Cormorant, Dunlin, Thistle, Murchison, Ninian and Heather and, when they come onstream, also from Magnus, NW Hutton and Hutton. Plans for the disposal of surplus gas are under discussion.

Further information on flaring at each field is given in Appendix 11.

### **British Gas Corporation (BGC)**

At present the law prohibits anyone other than BGC from supplying offshore natural gas by pipe for non-industrial purposes, while anyone proposing to supply such gas for industrial fuel purposes is required first to offer the gas to BGC. In order to introduce competition in the supply of gas, the Oil and Gas (Enterprise) Bill proposes to remove BGC's first offer purchasing privileges and to restrict the Corporation's monopoly in the supply of gas by pipe. The broad effect of the proposals will be to create three categories of consumer. At the top end, consumers taking over two million therms a year will be free to buy gas from the supplier of their choice. At the bottom end, BGC will continue to be the sole supplier of gas to premises taking less than 25,000 therms a year, unless such premises are more than 25 yards from a BGC gas main (or BGC does not object to another supplier); thus BGC's monopoly will in future match its obligation to supply gas on request.

Between these two categories, consumers may purchase gas from a supplier other than BGC but only with the consent of the Secretary of State. During the Second Reading debate of the Bill on 19 January 1982, the Secretary of State for Energy said that he would envisage granting such

consent in all cases where he was satisfied that the safety arrangements proposed were adequate. The Government believes that the freeing of the market for gas will provide encouragement, which has recently been lacking, for licensees to explore for and develop gas fields on the UKCS.

Provisions are also made in the Bill to enable suppliers to have access to BGC's onshore pipeline system. The initial course of action for a private supplier wishing to use one of BGC's pipelines will be to negotiate with the Corporation, but, should such negotiations fail, there is provision for the Secretary of State to determine whether the pipeline should be used and on what terms.

The Oil and Gas (Enterprise) Bill will also permit the disposal of assets held by BGC, and the Government intends to use these powers in the first instance to privatise BGC's interests in North Sea oil fields. The Corporation has already been directed to dispose of its interest in the licence relating to the onshore Wytch Farm field under existing legislation.

### **Production and disposal of natural gas liquids**

The term NGL is used to cover the associated gas liquids and gas condensate which come ashore in a gas pipeline but are excluded from the natural gas taken by BGC, and the heavier gases (ethane and LPG) separated from crude oil at oil terminals. NGL currently available includes small amounts of gas condensate from the Southern Basin gas fields. Heavy gases from the Forties and Piper fields are separated at Kinneil and Flotta. Total production of NGL in 1981 was 1.6 million tonnes. The completion of commissioning of the gas separation and the LPG recovery and separation facilities at the Sullom Voe oil terminal in 1982 will add up to 2 million tonnes of NGL per annum to UK availability, but the largest intake

of NGL from the North Sea is likely to be from the FLAG pipeline landfall at St Fergus. Authorisation is expected to be given in spring 1982 for the construction of an NGL pipeline from St Fergus to Mossmorran in Fife where the gases will be separated at Shell's fractionator; ethane from the fractionator is destined for use in the ethylene cracker being built by Esso Chemicals, also at Mossmorran.

### **Pipelines**

Three major offshore pipelines were constructed in 1981: the 30 inch diameter oil pipeline from the Brae field to the Forties 'Charlie' platform; the 24 inch diameter oil pipeline from the Magnus field to the Ninian Central platform; and the 24 inch diameter gas pipeline from the West Sole field to the Easington shore terminal.

The 16 inch oil pipeline from the Beatrice platform to a terminal and tanker loading facility at Nigg was commissioned during 1981. Details of the major North Sea pipelines are given in Appendix 13.

### **Terminals**

There are five oil terminals, at: Sullom Voe in Shetland; Flotta in Orkney; Teesside (which receives oil from the Norwegian Ekofisk field); Hound Point on the Firth of Forth (which receives Forties oil via Cruden Bay); and Nigg Bay. There are also five gas terminals: three at Bacton, Easington and Theddlethorpe, which receive gas from the Southern Basin fields; and two at St Fergus to serve the Frigg pipeline system and the FLAG system. A sixth terminal is under construction at Barrow for gas from the Morecambe field.

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# Part III: Operational aspects

## **Offshore employment**

A survey of the workforce employed offshore was conducted by the offshore operators in July 1981, on behalf of the Inland Revenue. The returns indicate a total offshore workforce of about 21,000, of which 85 per cent are British nationals. The survey covered not only those manning offshore installations, but also construction workers and the personnel of mobile drilling rigs, service vessels, support barges and survey teams.

## **Training**

The Burgoyne Committee's Report on Offshore Safety identified the need for more consistent safety training and recommended that an inspector be appointed with specific responsibility for such matters. The inspector so appointed sought advice from the TUC and employers' and training organisations. As a result recommendations about training needs and methods have been submitted to the Oil Industry Advisory Committee of the Health and Safety Commission (HSC).

Offshore companies provide the majority of training required for their employees. However, external specialist training continues to play an important role. In 1981 the range and quality of external training improved substantially.

Following a review of all industrial training boards, the Government announced on 15 December 1981 that the offshore responsibilities of the Petroleum Industry Training Board (PITB) are to remain.

The PITB organised courses in specialist aspects of electrical safety and offshore management during the year. The Instrument Technicians Scheme at Leith Nautical College received its third intake, bringing the total number undergoing training to 43. At the Offshore Fire Training Centre, 3,000 personnel attended courses, an increase of over 10 per cent compared with 1980. A new course on offshore gas hazards was introduced. The offshore industry responded to the Manpower Services Commission's programme for Youth Opportunities by providing some 150 Work Experience places in basic clerical and engineering skills.

The Drilling and Production Technology Training Centre (DPTTC) continued to be well supported by companies, with over 2,000 personnel attending courses. Following the introduction of the Offshore Installations (Well Control) Regulations 1980, the DPTTC introduced courses in well control techniques for drillers and drilling supervisors. The scope for practical training was improved by the addition of a further dry well in co-operation with Dresser Europe SA.

The two main offshore training associations, the Scottish Offshore Training Association (SCOTA) and the Petroleum Training Association North Sea (PETANS), continued to train personnel in a wide range of topics. During the year SCOTA opened a new training centre at Aberdeen. PETANS mounted some 200 courses, including a number on offshore survival training in

conjunction with the Department of Maritime Studies at Lowestoft. Following a large increase in demand for such training, £70,000 is to be spent on the construction of a new tank for survival training.

### **Offshore safety**

The Department of Energy continued to enforce its current safety legislation on and around offshore installations. In discharging these responsibilities, the Inspectorate served four improvement notices and drew eight cases to the attention of the Procurator Fiscal. The Inspectorate is empowered to enforce the Health and Safety at Work etc Act 1974 offshore, as agents of the HSC.

The Diving Operations at Work Regulations 1981 came into effect on 1 July 1981. They require that all divers working on the UKCS must hold a certificate of competence. Certificates are issued by the Health and Safety Executive (HSE) to applicants who have successfully undertaken the relevant courses at Government approved diving schools or alternatively can produce documentary evidence of specific training in other countries or of experience which satisfies, for certain grades, the Department of Energy's Chief Diving Inspector or, for others, the HSE.

The Oil and Gas (Enterprise) Bill contains proposals to extend the power to make regulations under the Mineral Workings (Offshore Installations) Act 1971 to gas storage and accommodation installations on the UKCS and also to installations in the foreign sector of cross-boundary fields. The proposals on accommodation installations make it clear that the 1971 Act and safety regime apply to installations like the Alexander L Kielland which capsized in the Norwegian sector of the North Sea in March 1980.

The main recommendation of the Burgoyne Committee's Report on

Offshore Safety was that the Secretary of State for Energy should assume full Ministerial responsibility for all offshore safety matters (except the safety of ships and seafarers engaged in offshore work which would remain principally with the Secretary of State for Trade). This has been implemented. Policy is initiated by the Department of Energy but the HSC advises the Secretary of State on all aspects of offshore safety. The Department's Petroleum Engineering Division was strengthened by the transfer from the HSE of four inspectors, experienced in occupational health and safety.

The Oil Industry Advisory Committee met twice during the year. Proposals for the improvement of braking systems on draw-works (the winching machinery for lowering the drilling equipment) were agreed with the industry at the end of the year. Practical implementation will be the subject of further discussions.

### **Offshore accidents and dangerous occurrences**

During 1981, six deaths were reported to the Department of Energy under the Offshore Installations (Inspectors and Casualties) Regulations 1973, together with 59 serious injuries and 135 dangerous occurrences. A breakdown of these statistics is given in Appendix 15.

In addition, 14 people were killed in two separate helicopter accidents, one person was lost overboard from a ship carrying out a sea-bed survey, one death occurred during anchor handling operations and there was one fatality on a mobile installation under tow.

The reduction in the number of fatalities noted in 1980 was not maintained during 1981. This, together with the rise in serious injuries, particularly those occurring during drilling and maintenance operations, is a cause for concern.

Three of the six fatal accidents occurred during drilling operations on mobile installations, one occurred on a supply boat, one from a stand-by vessel and one during maintenance operations. For the second consecutive year there were no fatal accidents during diving operations. The increase in dangerous occurrences was not associated with any particular activity. More zealous reporting could possibly account for some of the reported increase.

Experience in 1981 underlines the importance of safety during maintenance and drilling operations. These two groups accounted for by far the largest number of incidents (99) in 1981, a sharp rise over the figure of 74 in 1980. However, the rise in incidents associated with drilling operations must be seen against the increased drilling activity in 1981.

In view of a number of incidents which have occurred during the loading and unloading of supply boats, the Department has commissioned research into the safety of this activity.

#### **Offshore emergency planning**

The Department's Offshore Emergencies Handbook was updated as necessary during 1981. The Handbook describes the main lines of communication to be used and action to be taken by Government, industry and other organisations in the event of an emergency involving an offshore installation, such as fire, collision or structural failure.

The Department's NOROX series of exercises, which began in 1975, is intended to test lines of communication and co-ordination of response in various offshore emergencies, between the offshore operator and organisations such as the police, HM Coastguard and the armed forces. A further exercise in the series is due to be held in spring 1982.

#### **Protection of installations**

Regular surveillance and patrolling of offshore oil and gas installations and pipelines continued to be carried out by Island Class offshore patrol vessels and Nimrod maritime patrol aircraft. Other defence resources would be available for deployment in an emergency.

Contingency plans for the protection of installations against terrorist attack were tested in a variety of exercises during the year.

During 1981, a further twelve, 500 metre, safety zones, which no unauthorised vessel is allowed to enter, were established around permanent installations: the Fulmar Single Anchor Leg Mooring buoy; the Beatrice and North Cormorant production platforms; and nine subsea wellheads in the Beryl, Ninian, Buchan and Argyll fields. There are now 98 safety zones protecting permanent oil and gas installations on the UKCS. In addition, temporary safety zones were established to protect mobile drilling rigs while on location for drilling purposes.

The Oil and Gas (Enterprise) Bill contains proposals to rationalise the application of criminal law and police powers in relation to installations in UK territorial waters and on the UKCS and to extend criminal law and police powers to installations located in foreign sectors of cross-boundary fields. The Bill would also enable the Secretary of State to establish safety zones around installations which are in the course of construction or dismantlement on station and to extend safety zones into foreign sectors of the continental shelf.

#### **Environmental aspects**

Individual operators are responsible for dealing with oil spills at offshore installations or shore terminals and each is required to have plans for such eventualities. Operators engaged in developing oil and gas resources in

areas close to shore are required to make special contingency arrangements to ensure an efficient and prompt response to any pollution incident. The Government, in consultation with the industry, has drawn up a list of essential elements which it will expect to be included in the arrangements. The Government's role in such pollution incidents is likely to consist primarily of monitoring the operators' activities and offering advice and assistance as necessary.

A total of 71 spills from offshore installations were reported to the Department of Energy in 1981. The total amount of oil involved was approximately 104 tonnes.

The non-statutory notification scheme for chemicals used offshore enabled operators to take more account of environmental factors when selecting chemicals for particular applications, as well as helping Government specialists to advise where necessary on the options for disposal.

The Secretary of State for Energy has the power to exempt operators from certain parts of the Prevention of Oil Pollution Act 1971, as amended, so as to allow them to discharge, into the sea, treated water which contains small amounts of oil. Exemptions specify that the oil content of any discharge must not exceed an average of 40-50 parts per million. A total of some 525 tonnes of oil was permitted to be discharged in this way from 24 platforms during 1981.

In October 1981 the Royal Commission on Environmental Pollution presented its Eighth Report, on Oil Pollution of the Sea. Recommendations were made on the prevention of pollution from offshore oil activities. The Government's response is under consideration.

# Part IV: The economic and industrial impact of UKCS oil and gas

## The economic impact of UKCS oil and gas

In 1981 UKCS oil and gas production accounted for 4 per cent of UK Gross National Product (GNP). This is calculated from the figures shown in Table 5 which also gives 1980 figures for comparison.

January 1983 it is proposed that the rate of Petroleum Revenue Tax (PRT) should be increased from 70 to 75 per cent and a system of advance payments of PRT (APRT) should also be introduced. APRT will be computed (like SPD) at a rate of 20 per cent on the value of oil and gas produced,

Table 5 *Income from UKCS oil and gas production in 1980 and 1981*

	1980	1981 (provisional)
Value of sales and services rendered	9.6	13.2
less goods and services bought outside the sector*	0.9	1.3
Value added by the sector	8.7	11.9
less interest, profits and dividends due abroad	2.2	2.1
GNP at market prices arising within the sector	6.5	9.8

(\* defined as operating plus exploration costs minus employment incomes).

In 1981 the sales proceeds of oil produced on the UKCS are estimated to have amounted to £12.3 billion and those of natural gas to £0.8 billion. The resources needed in the production of oil and gas are substantial but a growing proportion of the value added on the UKCS will accrue to the Government as receipts of royalties and taxes rise. Total taxation and royalty receipts attributable to the UKCS are estimated to be £6.4 billion in 1981/82. This figure compares with the 1981/82 estimated total VAT yield of £12.3 billion and income tax yield of £28.5 billion.

In his 1982 Budget statement the Chancellor of the Exchequer proposed that the Supplementary Petroleum Duty (SPD) introduced by the 1981 Finance Act to run until end June 1982 should continue in operation until 31 December 1982 and should then lapse. With effect from 1

less an allowance equal to the value of the first 500,000 tonnes of production per field per six month period, but will be set off in full against ordinary PRT liabilities. Where (for example in the early years of production) no ordinary PRT liability has yet arisen, or where APRT due exceeds the amount of ordinary PRT due, any APRT not set off immediately will be set against future PRT liabilities. Where exceptionally APRT cannot be set off in this way, it will be repaid at the end of field life. The effect of these Budget measures will be a modest reduction in the tax yield.

The value of the Government's receipts from taxes and royalties for the financial years 1977/78 to 1981/82 is shown in Table 6. Receipts of PRT are expected to have fallen slightly between 1980/81 and 1981/82 because of the introduction

Table 6 Taxes and royalties attributable to UKCS oil and gas

£ million

Financial Year	Royalties	SPD	PRT	Corporation Tax (1)	Total
1977/78	228	—	—	10	238
1978/79	289	—	183	90	562
1979/80	628	—	1435	266	2329
1980/81	991	—	2420	480	3891
1981/82 (provisional)	1350	2050	2380	650	6430

(1) The Corporation Tax shown is the estimated proportion of the tax payable which can be attributed to UKCS oil and gas, but before setting off any Advance Corporation Tax (ACT). It is estimated that in 1978/79 £40 million of Corporation Tax was satisfied by setting off ACT; the corresponding amounts in 1979/80, 1980/81 and 1981/82 were £100 million, £240 million and £220 million respectively.

of SPD which, as mentioned above, is deducted from the profit on which PRT is charged.

Under the terms of petroleum production licences the Secretary of State may take royalties in kind rather than cash. In 1981 royalty was taken in kind from most UKCS producing oil fields; BNOG acts as the Secretary of State's agent in handling the oil, which amounted to some 10.6 million tonnes in 1981.

#### Costs and investment

Estimates of exploration, development and operating costs incurred by operators and other production licensees engaged in the exploitation of the oil and gas resources of the UKCS during the period 1976 to 1981 are given in Appendix 14.

Total expenditure on exploration in 1981 amounted to £558 million which represents an increase of £179 million over the 1980 level. This reflects the higher level of drilling activity in 1981.

The expenditure on the construction and installation of platforms and associated equipment and on related pipelines and onshore terminals amounted in 1981 to £2,466 million for the development of oil fields and £274 million for the development of gas fields compared with £2,172 million and £217 million for oil and gas fields respectively in 1980.

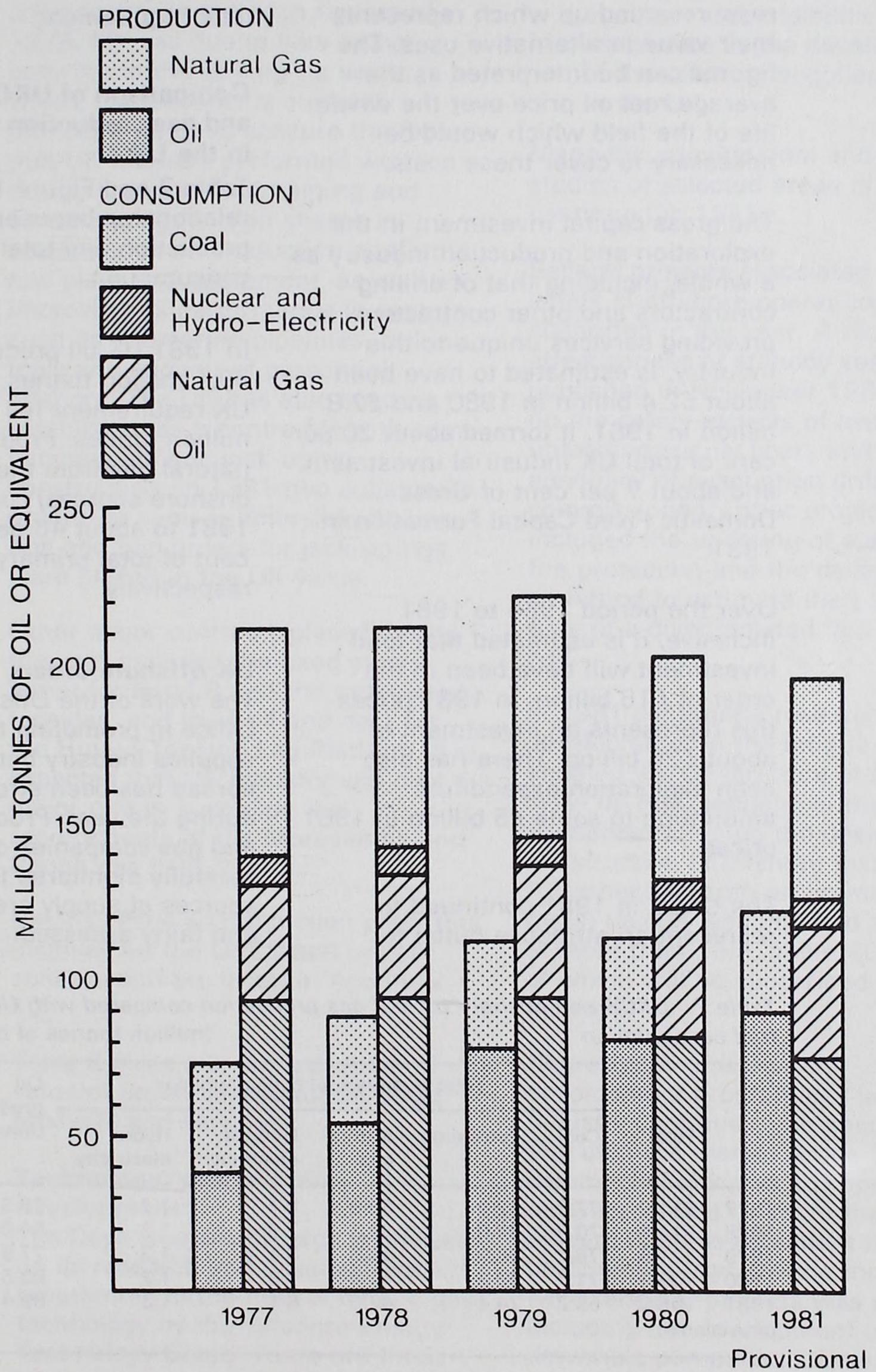
With the development of associated gas it is increasingly difficult to maintain a meaningful distinction between oil and gas field expenditure since where gas is produced in association with oil many costs are of a joint nature.

Operating costs of oil and gas fields in 1981 amounted to £858 million and £124 million respectively. The increase of £273 million in oil field expenditure compared to 1980 is attributable, for the most part, to the fields that came onstream late in 1980 or in 1981, increased oil production and the manning of additional facilities.

The costs of producing oil from the offshore fields vary widely from one field to another. They depend critically on the characteristics of individual fields such as the size of their reserves, estimates of which may be subject to change, although the average cost is less affected by such changes than the costs of individual fields. The average cost of fields which started production before the end of 1981 is put at \$12 per barrel in 1981 prices. For fields under development at that date the average cost is forecast to be \$13 per barrel. These figures include exploration, development and operating costs over the expected life of the field, but exclude payments to the Government of royalties and taxes on oil production and abortive exploration costs not attributable to individual

Figure 1

### UKCS and onshore oil and gas production compared with UK total primary fuel consumption



(figures are given in Table 7)

fields. The importance of both the capital funds employed in offshore developments and the time lag between capital expenditure and production is taken into account by assuming a real rate of return on the resources tied up which represents their value in alternative uses. The figures can be interpreted as the average real oil price over the whole life of the field which would be necessary to cover these costs.

The gross capital investment in the exploration and production industry as a whole, including that of drilling contractors and other contractors providing services unique to this industry, is estimated to have been about £2.4 billion in 1980 and £2.8 billion in 1981. It formed about 20 per cent of total UK industrial investment and about 7 per cent of Gross Domestic Fixed Capital Formation in 1981.

Over the period 1965 to 1981 inclusive, it is estimated that total investment will have been in the order of £16 billion. In 1981 prices this represents an investment of about £26 billion. There has also been exploration expenditure amounting to some £5 billion in 1981 prices.

The UKCS in 1981 continued to represent an attractive outlet for

investment funds. The two main sources of finance remained the companies' own resources and loans by UK-based banks, with total identifiable lending by the latter providing around one quarter of the total requirement.

### Comparison of UKCS and onshore oil and gas production with consumption in the UK

Table 7 and Figure 1 show the relationship between oil and gas production and total primary fuel consumption.

In 1981 UK oil production was 89.4 million tonnes, while the total UK requirement fell to about 74 million tonnes. Production of oil and natural gas from the UKCS (and onshore sources) corresponded in 1981 to about 46 per cent and 16 per cent of total primary fuel consumption respectively.

### UK offshore orders

The work of the Offshore Supplies Office in promoting the UK offshore supplies industry both at home and abroad has been strongly maintained during the year. Procurement by oil and gas companies on the UKCS is carefully monitored to ensure that UK sources of supply are fully considered and fairly assessed.

Table 7 UKCS and onshore oil and gas production compared with UK total primary fuel consumption (million tonnes of oil or oil equivalent)

	Total	Total primary fuel consumption <sup>(1)</sup>					Oil production <sup>(2)</sup>	Natural gas production <sup>(3)</sup>
		Coal	Petroleum	Natural gas	Nuclear electricity	Hydro electricity		
1977	211.6	72.2	92.9	36.9	8.4	1.2	38.3	35.3
1978	211.9	70.5	94.0	38.3	7.9	1.2	54.0	33.9
1979	221.6	76.2	94.0	42.0	8.1	1.3	77.9	34.2
1980	202.3	71.7	80.8	41.4	7.8	1.2	80.5	32.0
1981 (provisional)	195.0	69.2	74.4	42.0	8.1	1.3	89.4	32.1

<sup>(1)</sup>Includes oil and gas for non-energy and marine bunkers.

<sup>(2)</sup>Crude petroleum together with condensate and petroleum gases extracted at terminal separation plants.

<sup>(3)</sup>Includes land and colliery methane and associated gas (notionally methane) produced and used mainly on Northern Basin oil production platforms and excludes gas flared or reinjected.

The total value of orders reported by operators for 1981 was £2.9 billion. Of this, £1.9 billion (67 per cent) was placed in the UK.

The slightly lower overall UK share compared with the high figures of 1979/80 was due to very heavy ordering in the drilling rig sector where the UK fleet is currently limited. It tends to obscure the fact that UK industry performed well during the year, maintaining and consolidating its high shares in sectors such as production platforms and plant and equipment, as well as improving its performance in sectors such as submarine pipelines, drilling tools and support of personnel offshore. The UK has also become established as a centre for both semi-submersible and jack-up rig construction. In 1981 two substantial orders for semi-submersible drilling rigs and two orders for jack-up rigs were placed in the UK yards.

Other major contracts placed during the year included the fixed steel jacket for Beryl B and the associated topsides, and the hull and deck for the Hutton Tension Leg Platform. It is expected that UK industry will play a major role in supplying the requirements of the Morecambe and Rough gas field projects.

Details of the oil production platforms installed on the UKCS and under construction are given in Appendix 12.

Table 8 gives a broad indication of the value of orders placed for different products and services.

### **Technology, research and development**

The Department of Energy is advised on its research and development programme in the field of oil and gas technology by the Offshore Energy Technology Board. There are three main areas of work:

- the acquisition and analysis of geological, geophysical and

reservoir engineering data to assess potential hydrocarbon reserves;

- the determination of the safety standards to be laid down by the Department in pursuance of its statutory responsibilities;
- assistance in the development of the offshore supplies industry in the UK.

Magnetic, gravitational and seismic studies of selected areas of the UKCS continued in 1981.

Several projects associated with the safety of offshore operations were supported in the year. A report on the effectiveness of standby vessels was published in November 1981. Studies on the safety aspects of loading and unloading supply boats and on the adequacy of evacuation drills were commissioned. Other projects included the updating of standards for fire protection and the development of a method to estimate the survival time of a diver isolated in a diving bell.

In 1981 continuing research and development on the fatigue of metals enabled the Department of Energy to draw up new sections of the Guidance Notes on the design and construction of offshore installations. A further research programme on metal fatigue was initiated at a cost of more than £3m, about 80 per cent of which will be subscribed by industry.

Shared cost research and development programmes with industry continue to be encouraged. The offshore market is one of high commercial risk and it is appropriate for Government to share the cost of research and development of the basic technology. During the year a wide range of projects was supported, including the development of new downhole pumps to maintain oil flow from reservoirs, fire detection systems and non-destructive testing techniques for structural inspection.

*Table 8 An analysis of orders\* placed in the UK for goods and services for developments offshore during 1981*

Sector	Value of orders placed £ million		
	Total	UK share	UK%**
Exploration			
A Surveying	32	15	47 (65)
B Exploration and appraisal drilling	520	160	31 (31)
Sub-total	552	175	32 (34)
Development			
C Production platforms	638	494	77 (77)
D Installation operations	162	107	66 (54)
E Plant & equipment	252	196	78 (76)
F Submarine pipelines	157	88	56 (40)
G Development drilling	208	148	71 (57)
H Terminals	166	162	98 (99)
Sub-total	1,583	1,195	75 (78)
Production			
I Maintenance	68	60	88 (86)
Sub-total	68	60	88 (86)
General services (excluded wherever possible from A-I above)			
J Transport	222	162	73 (61)
K Diving and underwater services	105	85	81 (54)
L Drilling tools and equipment	246	170	69 (58)
M Support of personnel offshore	69	35	51 (39)
N Miscellaneous	66	61	92 (98)
Sub-total	708	513	72 (61)
Grand total	2,911	1,943	67 (71)

\*The figures represent orders over £100,000 in value for all sectors except I Maintenance where they represent orders over £50,000 in value.

\*\*The 1980 percentages are in brackets.

The above analysis is based on data collated from returns supplied by each operator under a voluntary arrangement agreed with the UK Offshore Operators Association (UKOOA).

The UK share represents the value of the contracts and main sub-contracts placed with companies which, through employment, manufacturing or sub-contracting, make a substantial contribution to the UK economy. The main purpose of the returns is to monitor the orders flowing from UKCS activity and the share of orders gained within the UK. They are designed to fit in, as far as possible, with the normal recording procedures of the offshore operating companies and do not deal in detail with what is imported and what is home produced.

The value of orders and expenditure data are not directly comparable for several reasons: the expenditure resulting from an order is often spread over a number of years, varying as it progresses due to inflation and other causes; and the allocation of orders between categories is difficult because sub-contracts often flow from the main order.

The programme of work begun in 1979 to examine the development of remotely-controlled underwater vehicles (RCVs) has continued. The work is carried out with the help of the underwater engineering companies, the aerospace and defence industries and the oil industry. During the year, the RCV programme was extended to cover

other aspects of underwater engineering including research related to oil production equipment placed on the seabed.

A considerable number of reports on projects already started have been published. Whenever possible, a short summary of these reports is included in the bi-monthly Departmental

publication "Offshore Research Focus", copies of which are available from the Construction Industry Research and Information Association (CIRIA), 6 Storey's Gate, London SW1P 3AU. A technical report on non-commercial projects can be obtained from the British Library, Boston Spa, Wetherby, West Yorkshire LS23 7BQ.

## Part V: Field by field review

### **Offshore oil fields in production**

Appendix 6 gives basic information about the 18 fields in production at the end of 1981.

#### *ARGYLL (Hamilton block 30/24)*

Six wells were producing during 1981. A new infill development well, which was completed late in 1981, will shortly begin production. A second infill development well was started at the end of the year.

Two exploration wells which were drilled in a Jurassic reservoir to the west of the field provided encouraging results. Approval was given for an extended production test on one of the wells. Severe weather at the end of 1981 caused the Transworld 58 production platform to break loose from its location; it was subsequently returned to its station after inspection and repair in the Firth of Forth.

Oil is loaded into tankers offshore.

#### *AUK (Shell block Part 30/16)*

Two wells were sidetracked in 1981, bringing the total number of wells drilled to 15. A maximum of nine wells were on production during the year. The reservoir pressure continues to be maintained by a strong natural water drive.

Oil is loaded into tankers offshore.

#### *BEATRICE (BNOC block 11/30a)*

Production from the field began in September 1981, coinciding with the commissioning of the pipeline and of the oil handling facilities at the Nigg Bay terminal. An additional fixed production platform will be installed

to provide satellite production facilities by late 1983.

Three wells were drilled by a jack-up rig during the year. On the main 'A' platform five wells were started, and one well was deepened to allow the location to be used for water injection.

Oil is transported by pipeline to Nigg Bay.

#### *BERYL A (Mobil block 9/13a)*

Three oil production wells and one water injection well were drilled during 1981, thus essentially completing the development of the main Upper Beryl reservoir. The evaluation of the Triassic reservoir and the development of the Lower Beryl reserves continued. At the end of the year there were 22 oil production wells and six injection wells for either gas or water. An additional well was converted as a stand-by gas injector.

Oil from storage in the concrete gravity platform is loaded through a loading tower into tankers offshore. Construction of a second tower, to be linked by pipeline to the Beryl A platform, began in 1981. Produced gas has continued to be re-injected into the reservoir.

#### *BRENT (Shell block 211/29a)*

Development drilling continued on the four platforms. 14 wells were started during the year, bringing the total number on the platforms to 66. Following studies during the year, Shell plans to introduce a miscible-gas-flood recovery system in the

lower (Statfjord) reservoir; drilling of gas re-injection wells for this purpose has begun.

Production from the Brent 'Charlie' platform started in June 1981. All four platforms are now onstream.

Oil is transported by pipeline to Sullom Voe via South Cormorant. Gas will be piped to St Fergus through the FLAG system when it commences operation in spring 1982.

*BUCHAN (BP block 21/1a extending into Texaco block 20/5a)*

The field came onstream in May 1981. Steady production was maintained from five wells, except during the severe weather at the end of the year.

Texaco drilled one well to confirm the extension of the field westwards into Block 20/5a.

Oil is loaded into tankers offshore.

*CLAYMORE (Occidental block 14/19a)*

Development of the main Jurassic sandstone reservoir, and the North Claymore Lower Cretaceous sands, continued during 1981. One of the three wells drilled from the main platform was designed to investigate the deeper reservoirs on the horst-block between the two main areas.

Following the withdrawal of plans to install a floating production facility (Claymore B) in the northern area of the field, a template was installed through which subsea water injection wells will be drilled, thus freeing platform slots for production wells. The first of the injectors was completed in 1981, and water injection commenced through flowlines laid from the main platform.

The side-tracking of a well to the southwest of Claymore confirmed the presence of oil in an area previously believed to be water-bearing. The new field, named Scapa, was recently

granted separate status. Possible development of the area has been discussed with the Department of Energy.

Oil is transported by pipeline to Flotta.

*SOUTH CORMORANT (Shell block 211/26a extending into Shell block 211/21a)*

Water injection was established through two wells early in 1981. Another well, originally drilled as a producer, was sidetracked to provide a third water injection location, although completion has been delayed by drilling problems.

Production was shut down between May and October to allow engineering work to be carried out on the Brent pipeline pumping station which is located on the South Cormorant platform.

Preparations are well advanced for the installation in 1982 of an Underwater Manifold Centre (UMC) which will connect subsea wells in the Central Cormorant area to the South Cormorant platform. The single satellite well designed to test equipment for the UMC was brought onstream at the beginning of 1981.

Oil is transported by pipeline to Sullom Voe. Small quantities of gas will be transported to St Fergus via the FLAG system.

*DUNLIN (Shell block 211/23a extending into Conoco block 211/24a)*

Five wells were completed during 1981, bringing the total number of platform wells to 20.

Water breakthrough remained a problem in the field. Water cut continued to increase in 1981, corresponding with a slow decline in the rate of oil production during the year.

Oil is transported by pipeline to Sullom Voe via South Cormorant.

*FORTIES (BP block 21/10 extending into Shell block 22/6a)*

Eight wells were drilled in 1981: two from platform A; three from platform C; and three from semi-submersible rigs in block 22/6a.

Production was maintained from 52 wells; a further 12 wells were used for water injection. Workovers were undertaken on some of the water injection wells to clear accumulated sand. One well was fitted with a downhole pump for trial purposes but indications are that production can be supported by water injection in conjunction with recompletion of wells without the need for the large scale use of such pumps.

The evaluation of options for the development of the extension of the field into block 22/6a is expected to be completed in 1982. A fifth production facility may be needed to develop reserves in this block.

Oil is transported by pipeline to Cruden Bay.

*HEATHER (Unocal block 2/5)*

Seven development wells, of which four were producers, were drilled from the platform in 1981. Production was maintained from 19 wells, with a further seven being used for water injection, and one for NGL injection.

During 1981, an exploration well showed the existence of a separate oil pool adjacent to the Heather field. The well was put on an extended production test to allow further evaluation.

Production rates continued to rise during 1981, owing mainly to the increased effectiveness of pressure maintenance by water injection. However, the assessment of reserves was reduced partly because reservoir characteristics were poorer than expected.

Oil is transported by pipeline to Sullom Voe via the Ninian Central

platform. The process of livening the crude oil piped to Sullom Voe has commenced.

*MONTROSE (Amoco block Part 22/17 extending into Amoco block Part 22/18)*

In 1981 no drilling took place from the platform or on the extension of the field to the south.

At the end of the year there were 16 producing wells, of which two were shut-in pending workovers, and four injection wells, of which one was suspended pending a workover.

Workovers were carried out to install downhole pumps in wells with high water cuts and to replace pumps which failed owing to sand influx after production shutdowns.

Oil is loaded into tankers offshore.

*MURCHISON (Conoco block 211/19a extending into Norwegian block 33/9 Mobil/Statoil)*

Ten wells were drilled from the platform during 1981: three for production; one for gas injection; and six for water injection. Production was maintained from six wells.

Gas injection commenced in August 1981 and will continue until gas can be transported to St Fergus via the Northern Leg pipeline and the FLAG system.

Oil is transported by pipeline to Sullom Voe via Dunlin and South Cormorant.

*NINIAN (Chevron block 3/3 extending into BP block 3/8a)*

36 wells were drilled in 1981 (16 on the Central platform, 13 on the Southern platform and seven on the Northern platform), bringing the total number of platform wells to 81.

The problems experienced with the gas compression equipment on the

Central and Southern platforms were largely resolved thus allowing NGL to be re-injected into the reservoir at acceptable rates during 1981. However, both the Central and Southern platforms are now exporting live crude oil to Sullom Voe.

Oil is transported by pipeline to Sullom Voe. Surplus gas will be transported to St Fergus via the FLAG system.

*PIPER (Occidental block 15/17a)*  
Five development wells were drilled in 1981, including the first production well drilled in the southern oil pool. This was the longest deviated well so far drilled on the UKCS, with a measured depth of 18,184 feet from the drilling floor.

Optimisation of production through well workovers continued during the year. Oil zones were plugged when they produced excessive water and new intervals were perforated in the clean oil layers.

Oil is transported by pipeline to Flotta. Associated gas is delivered through the Frigg pipeline system to St Fergus.

*STATFJORD (Conoco blocks 211/24a, b and c, extending into 211/25a and b, also extending into Norwegian blocks 33/9 and 33/12 Mobil/Statoil)*  
Six development wells were drilled during the year: three completed as producing wells; two for gas injection; and one for water injection.

Production increased steadily during 1981. The B platform, which was towed out in August, is scheduled to begin production at the end of 1982. Construction of the C platform, which is scheduled for start-up in 1986, is under way.

Oil is loaded into tankers offshore. Gas is being re-injected into the reservoir until transportation is available.

*TARTAN (Texaco blocks 15/16a and 14/20a)*

Production from the field began in January 1981. The discovery of unexpectedly high concentrations of hydrogen sulphide in the reservoir has made it necessary to flare produced gases. Equipment resistant to hydrogen sulphide is being installed in the field.

Five production wells were drilled in 1981, three from the platform and two from subsea installations. First water injection commenced at the end of the year. One platform well was temporarily converted to NGL re-injection to minimise loss of NGL in the flare.

Oil is transported by pipeline to Flotta via Claymore. Transport of gas to St Fergus via Piper and the Frigg pipeline system is planned to commence by late 1982 when gas-sweetening equipment on the Tartan platform should become operational.

*THISTLE (BNO block 211/18a extending into Conoco block 211/19a)*  
Nine wells were drilled during 1981, all as oil producers. Production was maintained from 20 wells with a further 12 wells being used for injection of both gas and water.

During the year an attempt was made to reduce water cut from the high permeability zone by the injection of polymer. This was initially successful but water breakthrough recurred. Production wells are now being completed in the sands below the high permeability zone in order to recover as much oil as possible.

Oil is transported by pipeline to Sullom Voe via South Cormorant. Gas is being re-injected into the reservoir until it can be transported to St Fergus via the Northern Leg pipeline and the FLAG system.

**Onshore oil fields in production**

*WYTCH FARM (BGC/BP, Dorset)*  
Seven wells were drilled during 1981,

four on the easterly Goathorn site, and three on the western side of the field. Of these, three were planned as Bridport sands producers, and two as Sherwood sands producers. One well is a water injector to support the Bridport sands reservoir and a further two wells may be converted to water injection at the end of their useful production life.

In 1981 over 140,000 tonnes of oil was produced from Wytch Farm, mainly from the Bridport sands reservoir. Oil is transported by pipeline to a rail terminal at Furzebrook. Nearly all the gas produced is fed into the local BGC grid.

In October 1981 the Secretary of State for Energy issued a Direction under Section 7(2) of the Gas Act 1972 requiring BGC to dispose of its 50 per cent interest in the licence relating to the Wytch Farm field. The Government's decision is in line with the general policy embodied in its plans for the future of BNOC and BGC's other oil interests, as incorporated in the Oil and Gas (Enterprise) Bill. Under the terms of the Direction, detailed arrangements for the disposal are a matter for BGC.

#### **OTHER LAND FIELDS**

In 1981 total production from the other land fields in the East Midlands and at Kimmeridge in Dorset was nearly 90,000 tonnes.

**Offshore oil fields under development**  
Appendix 5 provides basic information on the eight fields under development at the end of 1981.

#### ***BERYL B (Mobil block 9/13a)***

Two wells were drilled from the template during 1981. Further wells will be drilled in 1982 and first oil is expected from the main development in 1984.

Production is continuing from a test well, via a single-well sub-sea

completion, tied into the existing Beryl A facilities.

Oil will be loaded into tankers offshore using the Beryl A facilities.

#### ***BRAE (Marathon block 16/7a)***

No drilling took place in the area in 1981.

The field is scheduled to come onstream in mid 1983. Oil and NGL will be transported by pipeline to Cruden Bay via the Forties pipeline.

#### ***NORTH CORMORANT (Shell block Part 211/21a)***

The project was on schedule in 1981, with the installation of the platform in April and the spudding of the first well in December. Oil production began in February 1982.

Oil is transported by pipeline to Sullom Voe via South Cormorant. Modest quantities of gas will become available in 1983 for transport to St Fergus via the FLAG system.

#### ***FULMAR (Shell block Part 30/16 extending into Amoco block 30/11b)***

First oil was produced in February 1982. The crude oil is loaded into tankers offshore and gas will be re-injected into the reservoir until a disposal route is available.

#### ***HUTTON (Conoco block 211/28a and Amoco block 211/27)***

The template was installed in June 1981. Drilling of the first development well began in July. Between nine and 13 wells will be drilled prior to tow-out of the Tension Leg Platform planned for autumn 1983. First oil is expected at the beginning of 1984.

Oil will be transported to Sullom Voe via NW Hutton and South Cormorant.

#### ***NW HUTTON (Amoco block 211/27)***

Four wells were drilled during 1981 to complete the pre-drilling of seven development wells through a template. The platform was installed

in September 1981. First production is expected in early 1983. Oil will be transported by pipeline to Sullom Voe via South Cormorant and gas will be transported to St Fergus via the FLAG system.

*MAGNUS (BP blocks 211/12a and 211/7a)*

Two sub-sea wells in the south of the field were completed during 1981. They will be used as producers for a short time before conversion to water injection.

First production is expected in 1983. Oil will be transported by pipeline to Sullom Voe via the Ninian Central platform. Gas will be transported to St Fergus via the Northern Leg pipeline and the FLAG system.

*MAUREEN (Phillips block 16/29a)*

Development of the field by template drilling continued in 1981. The eleventh template well was started at the end of the year. An attempt to drill a water injection well to investigate the northern area was abandoned after a series of drilling problems.

**Offshore oil fields under appraisal**

*ALWYN NORTH (Total block 3/9a extending into Texaco block 3/4a)*

Texaco drilled a successful well which confirmed the extension of the field into block 3/4a.

Detailed development plans are being discussed with the Department of Energy.

*ANDREW (BP block 16/28 extending into Phillips block 16/27a)*

BP re-entered its suspended well late in 1981 and plans to investigate the deep horizons. At the end of 1981 two exploration wells were being drilled on features adjacent to Andrew on both sides of the field. Development proposals for the field, and possibly for the other prospects in the area, have not yet been submitted to the Department of Energy.

*CLYDE (BNOC block 30/17b)*

During 1981 an exploration well was drilled on a nearby structure to the west to delineate the potential of the area.

Outline development proposals have been presented to the Department of Energy. Following the Government's decision in 1980 to delay the development of the field by two years, first oil production is projected for 1987.

*TERN (Shell block 210/25)*

No wells were drilled in 1981. Initial discussions were held with the Department of Energy about the development of the field, although a formal plan has yet to be submitted.

*TONI — THELMA — TIFFANY (T block) (Phillips block 16/17)*

In 1981 a further two successful appraisal wells were completed in the Thelma and south-east Thelma areas. However, the area is complex and as yet no development plan has been proposed.

*14/20 (Texaco)*

One further appraisal well in the 14/20-5 area was successful in proving the extension of the oil accumulation in the area. A preliminary development proposal was submitted to the Department of Energy during the year.

**Offshore gas fields in production**

Details of the seven offshore gas fields in production are given in Appendix 7. Significant developments have occurred on three of the fields:

*LEMEN BANK (Shell block 49/26 extending into Amoco block 49/27, Arpet block 49/28 and Mobil blocks 53/1a and 2)*

Shell drilled three infill wells this year to increase deliverability of gas. Amoco are considering the installation of four small platforms on the field in their acreage. A further

platform is being installed in the Shell sector of the field to improve deliverability and recovery of reserves.

*ROUGH (BGC block 47/8b extending into BGC block 47/3d)*

Development approval for the Rough gas storage project is expected in spring 1982. Gas from other fields will be injected into the reservoir for storage during the summer and then made available to meet high demands during the winter. The existing Rough facilities will continue to be available to meet gas demand until 1984, when the storage scheme is planned to become operational.

*WEST SOLE (BP block 48/6)*

Deliverability is to be improved by the installation of extra compression facilities and the construction of an additional pipeline to the Easington terminal. The scheme is scheduled for completion in 1983.

**Offshore gas and gas condensate fields under development or appraisal**

*NORTH BRAE (Marathon block 16/7a)*

A further two appraisal wells were drilled in 1981, and one started in 1980 was completed. The area is now more clearly defined. Possible plans for the development of this condensate field have been discussed with the Department of Energy.

Gas liquids from the field would be transported by pipeline to Cruden Bay via South Brae and Forties. Gas would initially be re-injected into the reservoir to improve the recovery of gas liquids.

*MORECAMBE (BGC blocks 110/2a, 110/3, 110/8)*

The development plan for the field has recently been approved. It involves the emplacement of six drilling platforms with separate production and accommodation platforms. Slant drilling techniques will need to be employed because of the shallow reservoir depth. The field

will initially be developed to produce gas at maximum rates in periods of peak demand. BGC estimates ultimate reserves to be in excess of 140 billion cubic metres.

Gas will be transported by pipeline to a terminal at Barrow.

Other possible oil and gas field developments are set out in Table 9.

Table 9 Other possible oil and gas field developments (oil except where indicated)

Block and discovery well number (field name)	Licence number	Operator	Remarks
3/2-1	P.204	Conoco	No drilling took place in 1981. Early development is unlikely.
3/7-1 3/8a-3	P.203 P.199	Chevron } BP }	The area was delineated by the drilling of a further two wells in 1981. More drilling is scheduled for 1982.
3/14-1	P.090	Total	A successful exploration well on an adjacent structure increased the potential for development.
3/28a-2	P.234	Chevron	Methods of extracting the heavy oil from the reservoir are under consideration.
9/8-1 Condensate (Bruce)	P.209	Hamilton	No drilling took place in 1981, but an appraisal well was successfully tested on a separate structure in Block 9/9b. Licensees of the blocks are investigating the possibility of a joint development.
9/12-1 9/13-4	P.254 P.139	Union } Mobil }	A 3-D seismic survey was carried out in 1981.
9/19-2 } 9/19-5A } Oil and Gas	P.103	Conoco	Drilling of a further appraisal well on this complex structure began at the end of 1981.
14/19-9 (Scapa)	P.250	Occidental	Further appraisal of this feature to the south west of Claymore is planned in 1982.
15/23-1Z } 15/23-4 }	P.237	Texaco	No drilling took place in 1981.
15/30-1 } 16/26-2 } Condensate	P.103 P.213	Conoco } Gulf }	Further appraisal drilling on 15/30 is scheduled for 1982. A successful appraisal well on the 16/26 part of the accumulation was drilled in 1981.
16/7-2 (West Brae)	P.108	Marathon	An appraisal well confirmed the discovery and established the existence of deeper reserves.
16/21-1, 2 (Balmoral)	P.201	British Sun	Another successful appraisal well was drilled in 1981. BNOC is drilling a further well on the structure in 16/21b.
23/21-1 Condensate (Lomond)	P.101	Amoco	No drilling took place in 1981.
41/24a-1	P.034	Total	A successful appraisal well was drilled in 1981.
47/14a-1 Gas (Amethyst)	P.005	BNOC	Following re-interpretation of seismic information, a further appraisal well may be drilled in 1982.
49/22-2 Gas	P.025	Conoco	An appraisal well is planned in 1982 for this structure, known as 'S-Ax'.
206/8-1 (Clair)	P.165	BP	BP will carry out extended tests on this heavy oil discovery in 1982.
211/16-2 (Eider)	P.296	Shell	No drilling took place in 1981.
211/18-12	P.236	BNOC	Further appraisal of the area and evaluation of adjacent accumulations is necessary before a development plan can be formulated.
211/18-13	P.236	BNOC	Drilling of an appraisal well to evaluate the area further began at the end of 1981.

# Appendix 1

## Location of sedimentary basins in and around the UK



## Appendix 2 Licensing

Offshore production and exploration licences are issued under the Petroleum (Production) Act 1934, as extended offshore by the Continental Shelf Act 1964. To date there have been seven rounds of production licensing in 1964, 1965, 1970, 1971/1972, 1976/1977, 1978/1979 and 1980/1981. Details of each round are given below.

Round	Area under offer	No of blocks on offer	No of applications	No of companies in consortia	No of blocks applied for	Licences		
						No of blocks	No awarded	No of companies
First (1964)	North Sea	960	31	61	394	348	53	51
Second (1965)	North Sea Irish Sea English Channel	1102	21	54	127	127	37	44
Third (1970)	North Sea Irish Sea Orkney/Shetland Basin	157	34	54	117	106	37	61
Fourth (1971/1972)	North Sea Irish Sea Celtic Sea Orkney/Shetland Basin	421 for discretionary award; 15 for tender bid	92 31	228 73	271 15	282	118	213
Fifth (1976/1977)	North Sea Irish Sea Celtic Sea Orkney/Shetland Basin English Channel/ South Western Approaches West of Scotland	71	53	133	51			
Sixth (1978/1979)	North Sea West Shetland Basin Cardigan Bay/ Bristol Channel South Western Approaches	46	55	94	46	42	26	59
Seventh (1980/1981)	North Sea West Shetland Basin Orkney/Shetland Basin English Channel South Western Approaches	Specified area of Northern North Sea; 80 elsewhere	125	204	97	90	90	157

# Appendix 3

## Drilling activity

(A) Exploration drilling; exploration wells started in each geographical area

	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981
East of England	8	7	4	2	3	5	—	—	—	1
East of Scotland	16	18	25	49	25	23	20	22	19	36
East of Shetland	8	16	26	23	25	24	11	4	7	7
West of England/ Wales	—	1	4	2	4	4	3	—	—	—
West of Shetland	1	—	8	3	1	11	1	3	6	2
Channel and SW Approaches	—	—	—	—	—	—	2	4	—	1
<b>Total all areas</b>	<b>33</b>	<b>42</b>	<b>67</b>	<b>79</b>	<b>58</b>	<b>67</b>	<b>37</b>	<b>33</b>	<b>32</b>	<b>47</b>

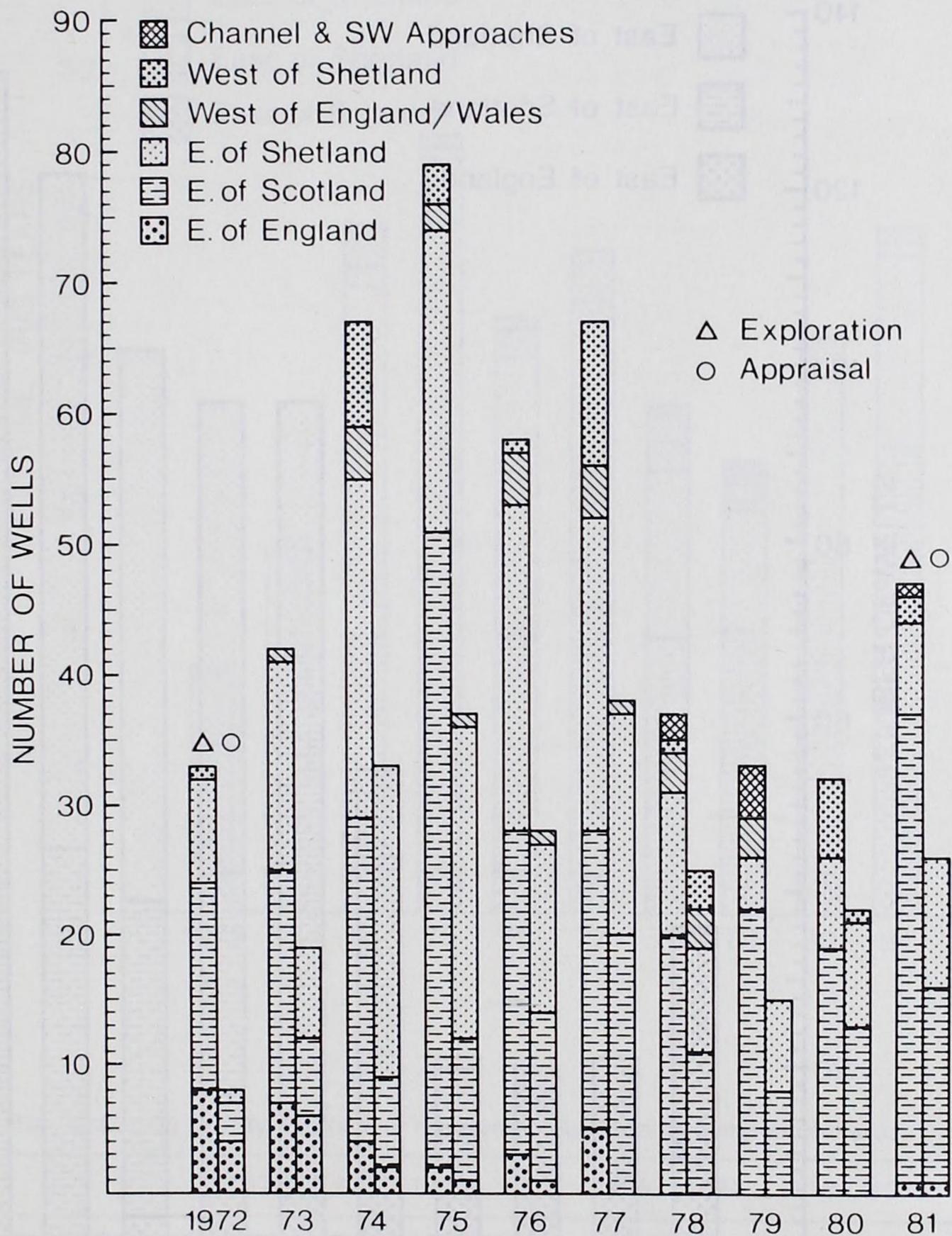
(B) Appraisal drilling; appraisal wells started in each geographical area

	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981
East of England	4	6	2	1	1	—	—	—	—	1
East of Scotland	3	6	7	11	13	20	11	8	13	15
East of Shetland	1	7	24	24	13	17	8	7	8	10
West of England/ Wales	—	—	—	1	1	1	3	—	—	—
West of Shetland	—	—	—	—	—	—	3	—	1	—
<b>Total all areas</b>	<b>8</b>	<b>19</b>	<b>33</b>	<b>37</b>	<b>28</b>	<b>38</b>	<b>25</b>	<b>15</b>	<b>22</b>	<b>26</b>

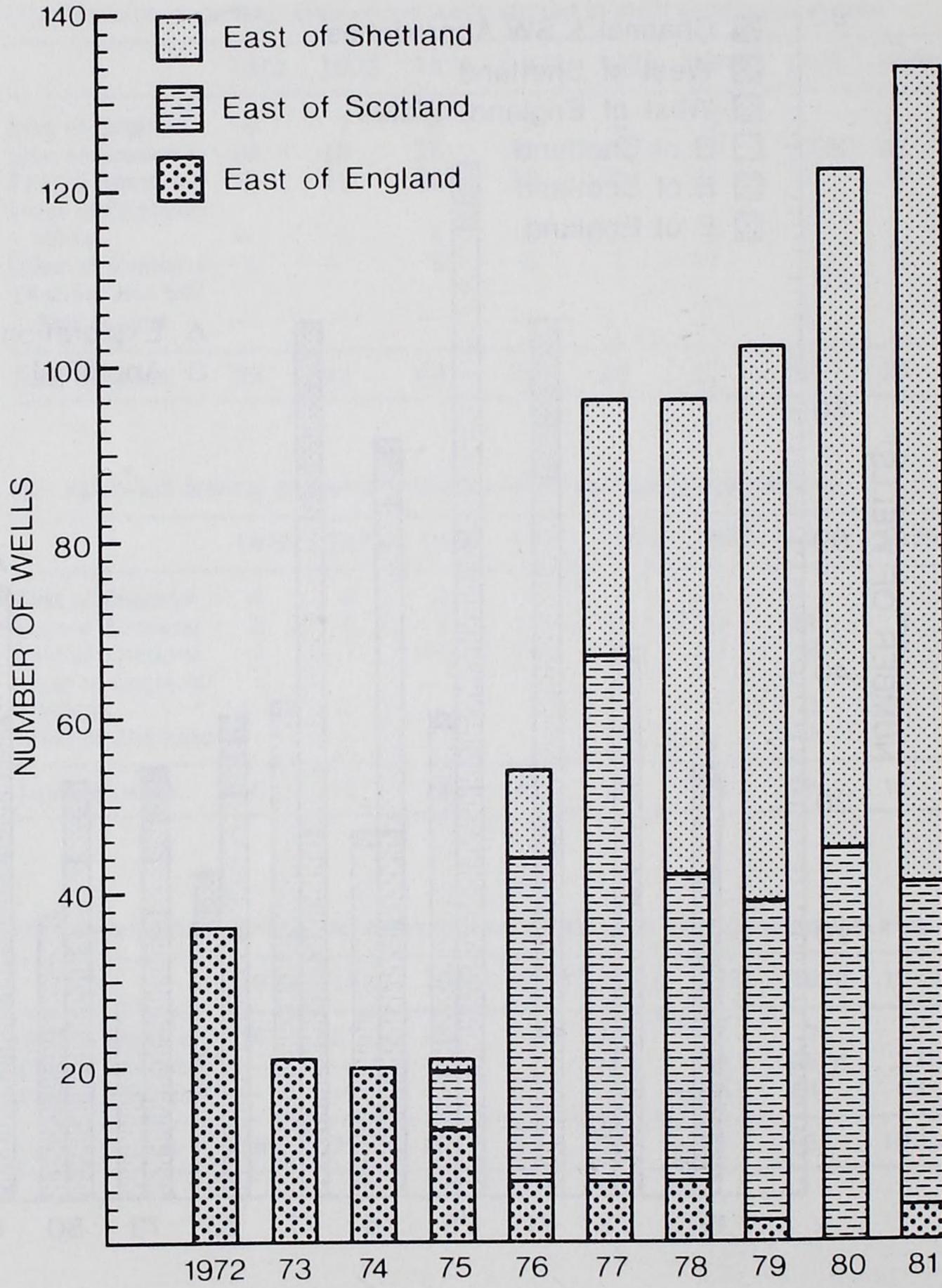
(C) Development drilling; development wells started in each geographical area

	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981
East of England	36	21	20	13	7	7	7	2	—	4
East of Scotland	—	—	—	7	37	60	35	37	45	38
East of Shetland	—	—	—	1	10	29	54	63	77	92
<b>Total all areas</b>	<b>36</b>	<b>21</b>	<b>20</b>	<b>21</b>	<b>54</b>	<b>96</b>	<b>96</b>	<b>102</b>	<b>122</b>	<b>134</b>

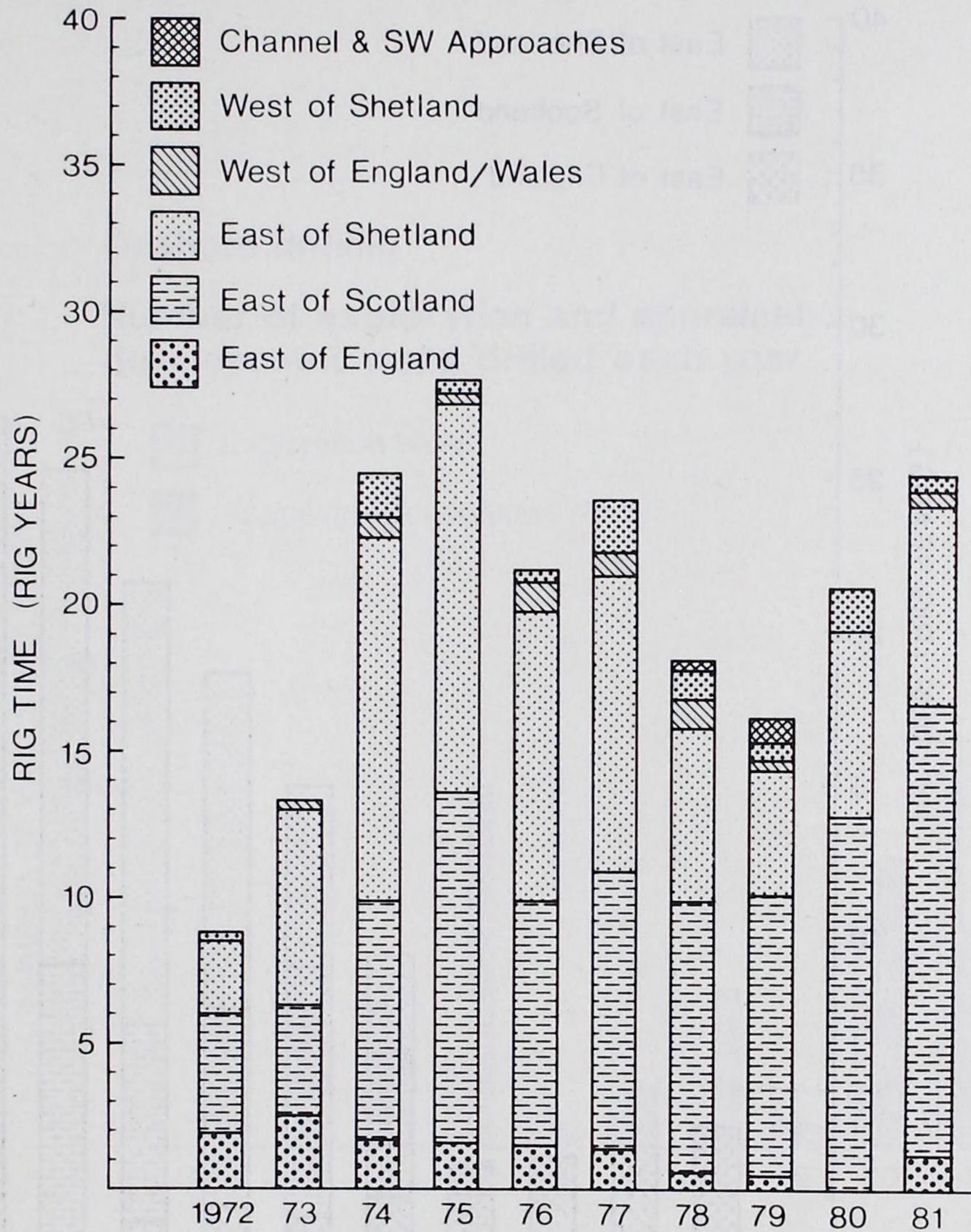
## Offshore exploration/appraisal wells drilled each year – 1972-1981



### Offshore development wells drilled each year – 1972-1981



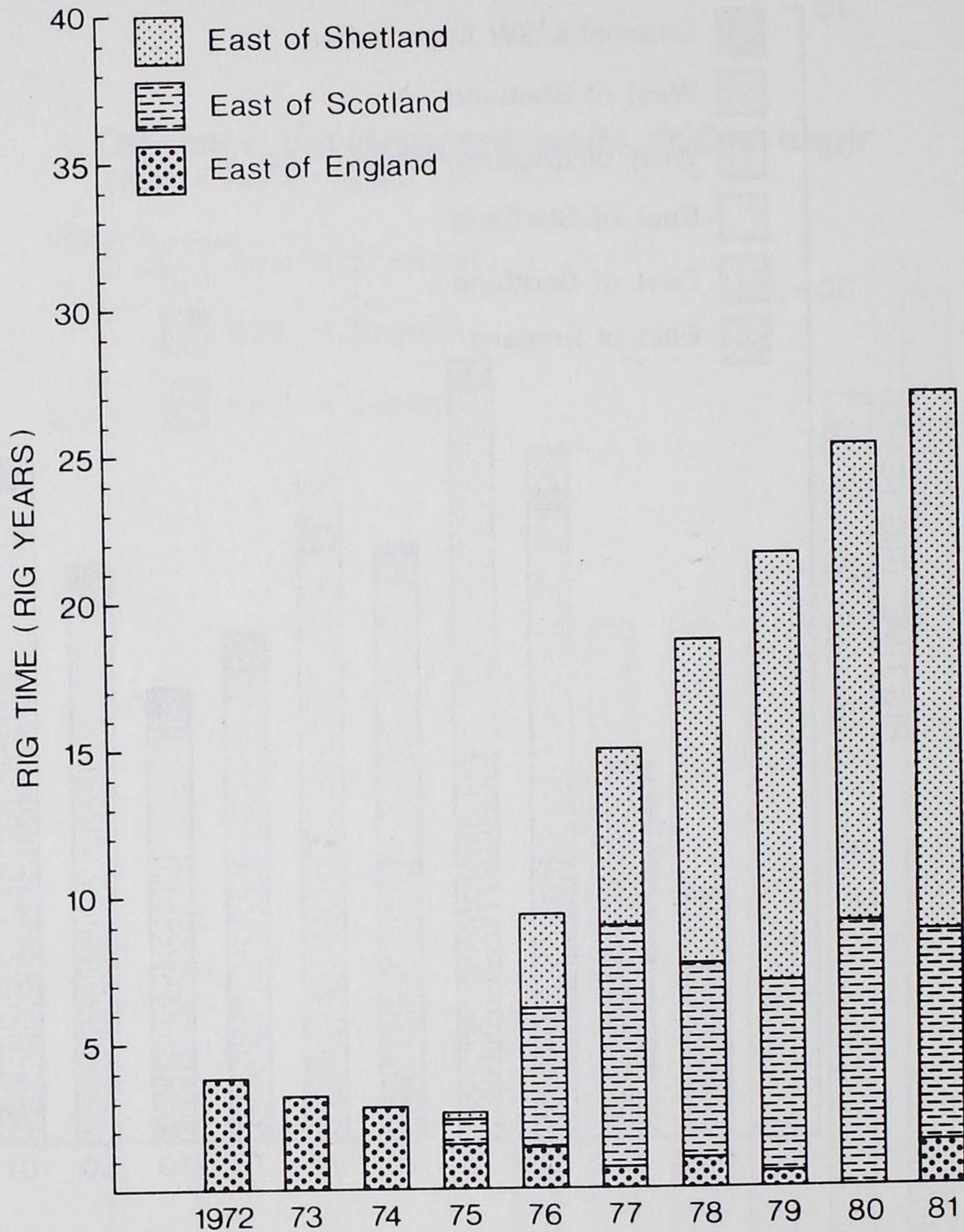
## Mobile rig activity Rig time spent in UK Continental Shelf



(D) Mobile rig activity; rig time (in rig years) breakdown by geographical areas

	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981
East of England	1.9	2.5	1.7	1.6	1.5	1.4	0.6	0.5	—	1.2
East of Scotland	4.1	3.8	8.2	12.0	8.4	9.5	9.3	9.6	12.8	16.3
East of Shetland	2.7	6.9	12.4	13.6	9.9	10.1	5.9	4.5	6.3	6.5
West of England/ Wales	—	0.1	0.7	0.2	1.0	0.8	1.1	0.2	—	0.2
West of Shetland	0.1	—	1.5	0.3	0.4	1.8	1.1	0.4	1.5	0.4
Channel and SW Approaches	—	—	—	—	—	—	0.1	0.9	—	—
<b>Total all areas</b>	<b>8.8</b>	<b>13.3</b>	<b>24.5</b>	<b>27.7</b>	<b>21.2</b>	<b>23.6</b>	<b>18.1</b>	<b>16.1</b>	<b>20.6</b>	<b>24.6</b>

## Fixed platform activity Rig time spent in UK Continental Shelf



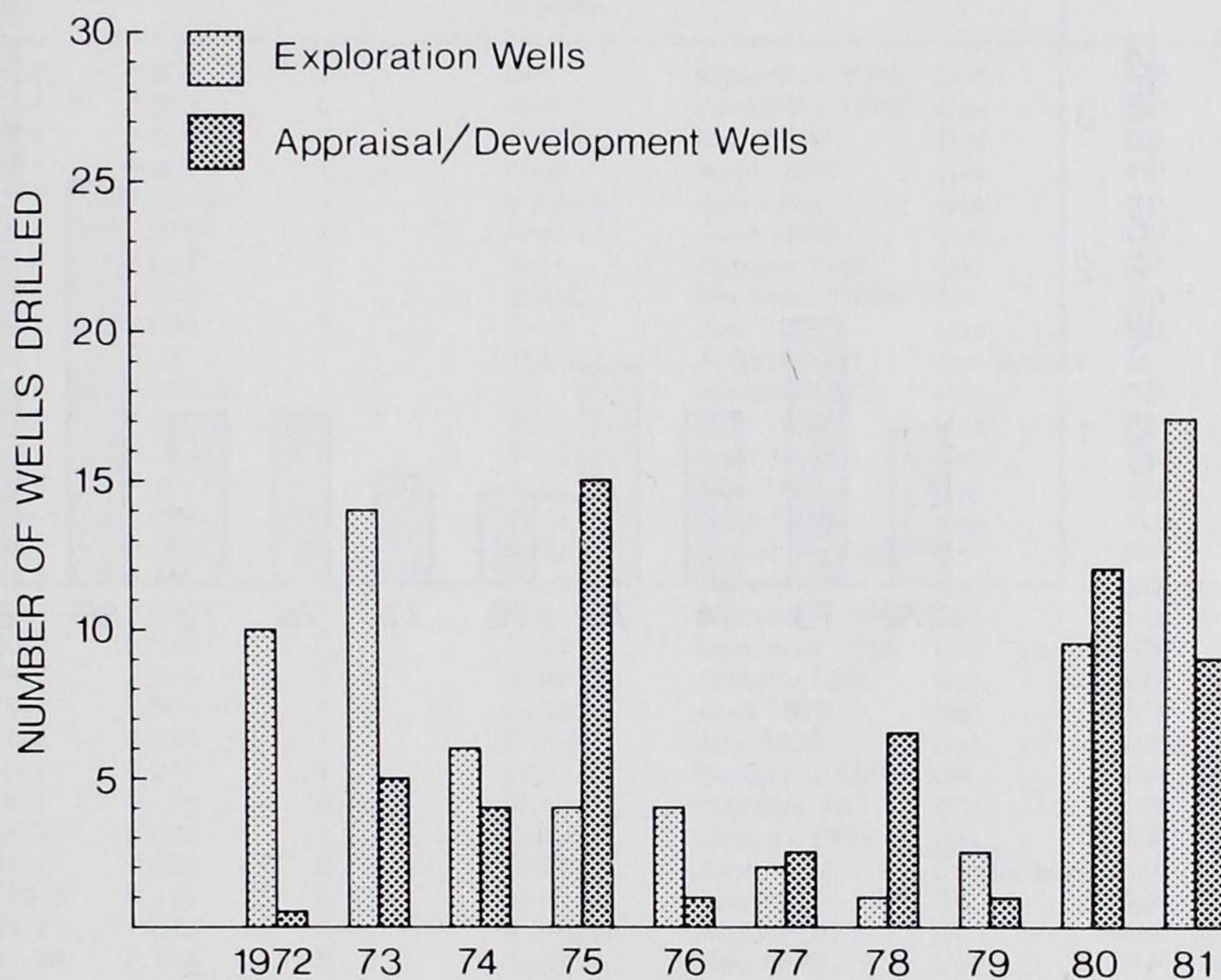
(E) Fixed platform activity; rig time (in rig years) breakdown by geographical areas

	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981
East of England*	3.8	3.2	2.8	1.5	1.4	0.7	1.0	0.5	—	1.4
East of Scotland	—	—	—	0.9	4.7	8.2	6.6	6.5	9.0	7.4
East of Shetland	—	—	—	0.2	3.2	6.0	11.0	14.5	16.2	18.2
<b>Total all areas</b>	<b>3.8</b>	<b>3.2</b>	<b>2.8</b>	<b>2.6</b>	<b>9.3</b>	<b>14.9</b>	<b>18.6</b>	<b>21.5</b>	<b>25.2</b>	<b>27.0</b>

\* Most of this activity was associated with the development of the Southern Basin gas fields.

## Onshore drilling

### Number of exploration and appraisal/ development wells drilled each year



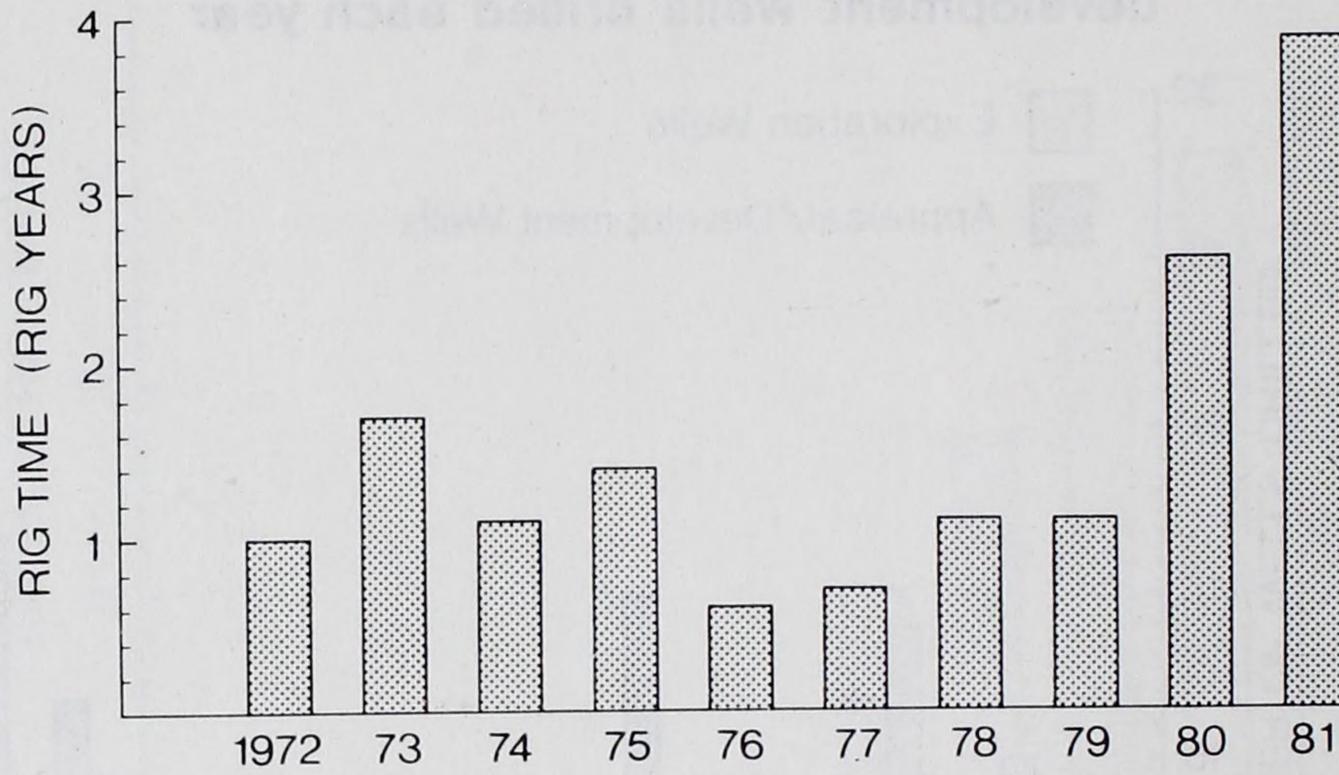
(F) Onshore drilling; number of wells drilled

	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981
Exploration wells	10	14	6	4	4	2	1	2½	9½	17
Appraisal/ Development wells	½	5	4	15	1	2½	6½	1	12	10

NOTE: Where a well was started in one year and completed in the next it has been shown as a half in each year.

## Onshore drilling

### Rig activity



(G) Onshore drilling; rig activity in rig years

	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981
Activity (rig years)	1.0	1.7	1.1	1.4	0.6	0.7	1.1	1.1	2.6	3.9

# Appendix 4

## Significant\* hydrocarbon discoveries

Announced by the end of 1981. In Department of Energy number order.

Field (1) name	Block and well number	Licence number	Licence round	Operator at the end of 1981	Date discovered	Type	Category (2)	Area (3)
WEST SOLE	48/06-1	P.001	1	BP	December 1965	Gas	FIP	SNSB
VIKING	49/17-1	P.033	1	Conoco	December 1965	Gas	FIP	SNSB
Ann	49/06-1	P.028	1	Phillips	May 1966	Gas	SD	SNSB
LEMEN BANK	49/26-1	P.007	1	Shell	April 1966	Gas	FIP	SNSB
	42/23-1	P.004 (4)	1	Burmah	July 1966	Gas	SD	SNSB
INDEFATIGABLE	49/18-1	P.016	1	Amoco	June 1966	Gas	FIP	SNSB
HEWETT	48/29-1	P.037	1	Arco	October 1966	Gas	FIP	SNSB
	48/22-1 (5)	P.005	1	BNOC	November 1966	Oil	SD	SNSB
Scram	53/04-1	P.039	1	Arco	July 1967	Gas	SD	SNSB
	48/21-1	P.047	1	Placid	August 1967	Condensate	SD	SNSB
	44/23-1	P.003 (4)	1	BP	January 1968	Gas	SD	SNSB
ROUGH	47/08-1	P.030 (6)	1	BGC	May 1968	Gas	FIP	SNSB
Sean	49/25-1	P.054	2	Shell	April 1969	Gas	FUA	SNSB
	49/28-3	P.037	1	Arco	May 1969	Gas	SD	SNSB
	41/24a-1	P.034	1	Total	June 1969	Gas	FUA	SNSB
MONTROSE	22/18-1	P.020	1	Amoco	December 1969	Oil	FIP	CNSB
	43/20-1	P.002	1	Hamilton	June 1969	Gas	SD	SNSB
	41/25a-1(5)	P.039	1	Total	September 1969	Gas	SD	SNSB
	41/20-2	P.039	1	Total	November 1969	Gas	SD	SNSB
	43/08-1	P.048	1	Hamilton	January 1970	Gas	SD	SNSB
	47/13-1	P.050	1	Conoco	April 1970	Gas	SD	SNSB
Broken Bank	49/21-2	P.039	1	Conoco	July 1970	Gas	OPD	SNSB
FORTIES	21/10-1	P.246	1	BP	November 1970	Oil	FIP	CNSB
AUK	30/16-1	P.116	3	Shell	February 1971	Oil	FIP	CNSB
	49/16-3	P.033	1	Conoco	January 1971	Gas	FIP	SNSB
	30/02-1	P.098	3	BNOC	June 1971	Condensate	SD	CNSB
BRENT	211/29-1	P.117	3	Shell	July 1971	Oil	FIP	ESB
ARGYLL	30/24-2	P.073	2	Hamilton	August 1971	Oil	FIP	CNSB
FRIGG	10/01-1A	P.118	3	Total	May 1972	Gas	FIP	ESB
Lomond	23/21-1	P.101	3	Amoco	May 1972	Condensate	OPD	CNSB
'S-Ax'	49/22-2	P.025	1	Conoco	May 1972	Gas	SD	SNSB
BERYL A	9/13-1	P.139	4	Mobil	September 1972	Oil	FIP	ESB
	30/13-2	P.079	2	Phillips	September 1972	Oil	SD	CNSB
SOUTH	211/26-1	P.232	4	Shell	September 1972	Oil	FIP	ESB
CORMORANT								
	211/18-1	P.236	4	BNOC	September 1972	Oil	SD	ESB
Amethyst	47/14a-1	P.005	1	BNOC	October 1972	Gas	SD	SNSB
PIPER	15/17-1A	P.220	4	Occidental	January 1973	Oil	FIP	MFB
MAUREEN	16/29-1	P.110	3	Phillips	February 1973	Oil	FUD	CNSB
	47/15-2	P.133	4	Amoco	March 1973	Gas	SD	SNSB
DUNLIN	211/23-1	P.232	4	Shell	July 1973	Oil	FIP	ESB
THISTLE	211/18-2	P.236	4	BNOC	July 1973	Oil	FIP	ESB
HUTTON	211/28-1A	P.204	4	Conoco	December 1973	Oil	FUD	ESB
Alwyn	3/14a-1	P.090	2	Total	November 1973	Oil	FUA	ESB
HEATHER	2/05-1	P.242	4	Union	December 1973	Oil	FIP	ESB
NINIAN	3/03-1	P.202	4	Chevron	April 1974	Oil	FIP	ESB
'N.W. Dunlin'	211/23-3	P.296	4	Shell	February 1974	Oil	SD	ESB
	15/17-7	P.220	4	Occidental	January 1974	Oil	SD	MFB
Bruce	9/08-1	P.209	4	Hamilton	July 1974	Condensate	OPD	ESB
MAGNUS	211/12-1	P.193	4	BP	July 1974	Oil	FUD	ESB
CLAYMORE	14/19-2	P.249	4	Occidental	June 1974	Oil	FIP	MFB
Andrew	16/28-1	P.092	3	BP	June 1974	Oil & Cond.	FUA	CNSB
	15/23-1Z	P.324	4	Texaco	October 1974	Oil	SD	MFB

Field (1) name	Block and well number	Licence number	Licence round	Operator at the end of 1981	Date discovered	Type	Category (2)	Area (3)
BUCHAN	21/01-1	P.241	4	BP	August 1974	Oil	FUD	MFB
	211/13-1	P.296	4	Shell	November 1974	Condensate	SD	ESB
NORTH CORMORANT	211/21-2	P.232	4	Shell	August 1974	Oil	FUD	ESB
	9/13-4	P.139	4	Mobil	August 1974	Oil & Cond.	OPD	ESB
'N of Thistle'	211/18-6	P.236	4	BNOC	August 1974	Oil	FUA	ESB
MORECAMBE	110/02-1	P.153	4	Hydrocarbons GB	September 1974	Gas	FUD	ISB
TARTAN	15/16-1	P.237	1	Texaco	January 1975	Oil	FIP	MFB
Brae N	16/07-1	P.108	3	Marathon	May 1975	Condensate	FUA	ESB
	2/05-6	P.242	4	Union	December 1974	Oil	SD	ESB
Mable	16/29-4	P.110	3	Phillips	February 1975	Oil	SD	CNSB
STATFJORD	211/24-4	P.104	3	Conoco	February 1975	Oil	FIP	ESB
N.W. HUTTON	211/27-3	P.184	4	Amoco	April 1975	Oil	FUD	ESB
	3/04-4	P.119	3	Texaco	March 1975	Oil	SD	ESB
	14/20-1	P.294	4	Texaco	February 1975	Oil	FUA	MFB
Crawford	9/28-2	P.209	4	Hamilton	April 1975	Oil	SD	ESB
BERYL B (North)	9/13-7	P.139	4	Mobil	May 1975	Oil	FUD	ESB
	210/25-1	P.296	4	Shell	May 1975	Oil	FUA	ESB
Tern	21/02-1	P.244	4	Zapex	June 1975	Oil	SD	CNSB
	3/02-1	P.204	4	Conoco	June 1975	Oil	SD	ESB
	211/13-2	P.296	4	Shell	July 1975	Oil	SD	ESB
	211/26-4	P.296	4	Shell	August 1975	Oil	SD	ESB
	15/30-1	P.103	3	Conoco	September 1975	Condensate	SD	MFB
	3/04-6	P.119	3	Texaco	August 1975	Oil	SD	ESB
Balmoral Scapa	16/21-1	P.201	4	British Sun	August 1975	Oil	SD	CNSB
	14/19-9	P.250	4	Occidental	July 1975	Oil	SD	MFB
	211/13-3	P.296	4	Shell	December 1975	Oil	SD	ESB
Alwyn N	3/09a-1	P.090	2	Total	October 1975	Oil	FUA	ESB
	211/18-9	P.236	4	BNOC	September 1975	Oil	SD	ESB
MURCHISON	211/19-2	P.104	3	Conoco	September 1975	Oil	FIP	ESB
'West Brae'	16/07-2	P.108	3	Marathon	August 1975	Oil	SD	ESB
FULMAR	30/16-6	P.256	3	Shell	December 1975	Oil	FUD	CNSB
	15/13-2	P.198	4	BP	October 1975	Oil	SD	MFB
	15/21-3	P.218	4	Monsanto	October 1975	Oil	SD	MFB
	21/02-2	P.244	4	Zapex	December 1975	Condensate	SD	CNSB
	23/27-3	P.114	3	Ranger	March 1976	Oil	SD	CNSB
	23/26a-1	P.057	2	BP	April 1976	Oil	SD	CNSB
Audrey	49/11a-1	P.028	1	Phillips	March 1976	Gas	SD	SNSB
	15/27-1	P.226	4	Phillips	April 1976	Oil	SD	MFB
	9/19-2	P.103	3	Conoco	May 1976	Oil & Cond.	SD	ESB
N.W. HUTTON	211/27-6	P.184	4	Amoco	May 1976	Oil	FUD	ESB
	3/07-1	P.203	4	Chevron	June 1976	Oil	SD	ESB
	14/20-5	P.324	4	Texaco	April 1976	Oil	SD	MFB
	14/20-6A	P.324	4	Texaco	June 1976	Oil	SD	MFB
	49/29-2	P.105	3	Mobil	June 1976	Gas	SD	SNSB
Eider	211/16-2	P.296	4	Shell	May 1976	Oil	SD	ESB
Toni-Thelma	16/17-1	P.225	4	Phillips	July 1976	Oil	FUA	CNSB
	211/18-12	P.236	4	BNOC	July 1976	Oil	SD	ESB
BEATRICE	11/30-1	P.187	4	BNOC	September 1976	Oil	FIP	MFB
	3/07-2	P.203	4	Chevron	November 1976	Oil	SD	ESB
	211/18-13	P.236	4	BNOC	January 1977	Oil	SD	ESB
	211/19-6	P.104	3	Conoco	January 1977	Oil	SD	ESB
	3/29-2	P.198	4	BP	August 1977	Gas	SD	ESB
	16/22-2	P.240	4	Total	May 1977	Oil	SD	CNSB
	15/23-4	P.324	4	Texaco	August 1977	Oil	SD	MFB
BRAE	16/07a-8	P.108	3	Marathon	July 1977	Oil	FUD	ESB
	3/14a-4	P.090	2	Total	August 1977	Condensate	SD	ESB
Clair	206/08-1A	P.165	4	BP	July 1977	Oil	SD	WSB
	16/26-2	P.213	4	Gulf	October 1977	Condensate	SD	CNSB
	210/15-2	P.226	4	Phillips	October 1977	Oil	SD	ESB
Clyde	30/17b-2	P.266	5	BNOC	June 1978	Oil	FUA	CNSB
	14/18-1	P.263	5	Occidental	May 1978	Oil	SD	MFB
	2/10a-4	P.234	4	Chevron	May 1978	Oil	SD	ESB
	3/28a-2	P.234	4	Chevron	September 1978	Oil	OPD	ESB
	9/18a-3A	P.103	3	Conoco	March 1979	Oil	SD	ESB
	30/17b-5	P.266	5	BNOC	May 1979	Oil	SD	CNSB
Tiffany	16/17-8A	P.225	4	Phillips	July 1979	Oil	FUA	CNSB
	9/19-5A	P.103	3	Conoco	July 1979	Gas	SD	ESB
	16/28-4	P.092	3	BP	October 1979	Oil	SD	CNSB

Field (1) name	Block and well number	Licence number	Licence round	Operator at the end of 1981	Date discovered	Type	Category (2)	Area(3)
N.E. Brae	21/25-1	P.013	1	Shell	September 1979	Oil & Gas	SD	CNSB
	2/05-10	P.242	4	Union	September 1979	Oil	SD	ESB
	21/25-2	P.013	1	Shell	December 1979	Oil	SD	CNSB
	16/03a-1	P.108	3	Marathon	April 1980	Condensate	FUA	ESB
	16/21a-2	P.201	4	British Sun	March 1980	Oil	SD	CNSB
	30/12b-2	P.185	4	Amoco	February 1981	Oil	SD	CNSB
	21/19-1A	P.238	4	Shell	April 1981	Oil	SD	CNSB
	30/24-15	P.073	2	Hamilton	January 1981	Oil	SD	CNSB
	3/14a-7	P.090	2	Total	August 1981	Oil	SD	ESB
	30/07a-1	P.032	1	Phillips	May 1981	Oil	SD	CNSB
	20/02-1	P.317	6	BNOC	April 1981	Oil	SD	CNSB
	29/05a-1	P.188	4	Arco	September 1981	Oil	SD	CNSB
	3/04-8	P.119	3	Texaco	October 1981	Oil	SD	ESB
	21/15a-2	P.120	3	Conoco	August 1981	Oil	SD	CNSB
	2/15-1	P.327	7	Chevron	October 1981	Oil	SD	ESB
	30/24-17	P.073	2	Hamilton	December 1981	Oil	SD	CNSB
	13/29-1	P.307	6	Ultramar	December 1981	Oil	SD	MFB

\* The description "significant" generally refers to the flow rates achieved in well tests and does not necessarily indicate the potential commerciality of the discovery.

(1) Fields in production or under development are shown in capital letters.

(2) FIP, Fields in Production; FUD, Fields under Development; FUA, Fields under Appraisal; OPD, Other Possible Development; SD, Significant Discovery.

(3) ESB, East Shetland Basin; WSB, West Shetland Basin; MFB, Moray Firth Basin; CNSB, Central North Sea Basin; SNSB, Southern North Sea Basin; ISB, Irish Sea Basin. The location of the major basins of the UKCS is shown in the map at Appendix 1.

(4) Licence relinquished.

(5) Block relinquished.

(6) P.030 now applies to Block 47/08a operated by Amoco. The Rough field operated by BGC is Block 47/08b, licence P.323.

# Appendix 5

## Offshore oil fields under development

The table gives basic information on the eight fields under development at the end of 1981.

Field name (Block numbers and licence number)	Licensees/Company interest in block (%) at the end of 1981	Extension into other UK Blocks		Date of discovery	Date of production start-up	Operator's estimate of first year of peak production	Operator's estimated peak production (million tonnes per year)	Operator's estimate of recoverable reserves originally present in the field (million tonnes) <sup>1</sup>
		Block number + licence number	Licensees/Company interest in block (%) at the end of 1981					
Beryl B (9/13a) P.139	Mobil/50 Amerada/20 Texas Eastern/20 BGC/10 *BNOC/Nil			May 1975	1984	1985	4.1	39.9
Brae (16/7a) P.108	Marathon Oil North Sea (GB) Ltd/38 Bow Valley Exploration (UK) Ltd/14 BNOC/20 BCRIC Exploration (UK) Ltd/6.3 LL & E (UK) Inc/6.3 BCRIC Oil (UK) Ltd/1.4 Sovereign Oil and Gas Ltd/4 Kerr McGee Oil (UK) Ltd/8 Saga Petroleum (UK) Ltd/2			April 1975	1983	1983	5.3 <sup>3</sup>	40 <sup>3</sup>
North Cormorant (Part 211/21a) P.258	Shell/50 Esso/50 *BNOC/Nil			July 1974	1982	1986	7.3	56.0 <sup>2</sup>
Fulmar (Part 30/16) P.256	Shell/50 Esso/50 *BNOC/Nil	30/11b P.185	Amoco/25.77 BGC/25.77 Amerada/18.08 Texas Eastern/10.38 Mobil/20	Nov 1975	1982	1985	7.6	59.0 <sup>2</sup>
Hutton (211/28a) P.204	Conoco/33 $\frac{1}{3}$ Gulf/33 $\frac{1}{3}$ BNOC/33 $\frac{1}{3}$	211/27 P.184	Amoco/25.77 BGC/25.77 Mobil/20 Amerada/18.08 Texas Eastern/10.38	Nov 1973	1984	1984	4.7	35
N.W. Hutton (211/27) P.184	Amoco/25.77 BGC/25.77 Amerada/18.08 Texas Eastern/10.38 Mobil/20			April 1975	1983	1984	5.1	37.5
Magnus (211/12a) P.193	BP Petroleum Development Ltd/100 *BNOC/Nil			June 1974	1983	1984	5.8	75
Maureen (16/29a) P.110	Phillips Petroleum Co UK Ltd/33.78 Fina Exploration/28.96 AGIP (UK) Ltd/17.26 Century Power & Light Ltd/9 Ultramar Exploration Ltd/6 The British Electric Traction Co Ltd/5 *BNOC/Nil			Feb 1973	1983	1984	4	21

<sup>1</sup> The reserves figures quoted may not be precisely comparable with each other or with official figures quoted in this report since differences exist in the procedures and assumptions adopted by different companies and by the Department of Energy.

<sup>2</sup> Total discounted reserves, that is, proven plus suitable discounted figures for probable and possible reserves.

<sup>3</sup> Oil and NGL. These figures refer only to the Southern portion of the Brae field, the only part for which development approval has been given at present.

\* BNOC is a co-licensee through its participation agreement.

# Appendix 6

## Offshore oil fields in production

The table gives basic information on the 18 fields in production at the end of 1981.

Field name (Block numbers and licence number)	Licensees/Company interest in block (%) at the end of 1981	Extension into other UK blocks		Date of discovery	Date of production start-up	Operator's estimate of first year of peak production	Operator's estimated peak production (million tonnes per year)	Operator's estimate of recoverable reserves originally present in the field (million tonnes) <sup>1</sup>
		Block number + licence number	Licensees/Company interest in block (%) at the end of 1981					
Argyll (30/24) P.073	Hamilton Oil Great Britain PLC/28.8 Hamilton Brothers Petroleum (UK) Ltd/7.2 RTZ Oil and Gas Ltd/25 Blackfriars Oil Co Ltd/12.5 Trans-European Co Ltd/2.5 Texaco North Sea UK Ltd (Texaco)/24 *BNOC/Nil			Oct 1971	June 1975	1977	1.1	6.5
Auk (Part 30/16) P.116	Shell UK Ltd (Shell)/50 Esso Petroleum Company Ltd (Esso)/50 *BNOC/Nil			Feb 1971	Feb 1976	1977	2.3	8.4 <sup>2</sup>
Beatrice (11/30a) P.187	BNOC/28 Deminex UK Oil and Gas Ltd/22 Kerr McGee Oil (UK) Ltd/25 BP Petroleum Development Ltd/15 Hunt Oil (UK) Ltd/10			Sept 1976	Sept 1981	1984	2.4	15.5
Beryl A (9/13a) P.139	Mobil Producing North Sea Ltd (Mobil)/50 Amerada Exploration Ltd (Amerada)/20 Texas Eastern UK Ltd (Texas Eastern)/20 BGC/10 *BNOC/Nil			Sept 1972	June 1976	1980	5	66
Brent (211/29a) P.117	Shell/50 Esso/50 *BNOC/Nil			July 1971	Nov 1976	1984	20.7	225.7 <sup>23</sup>
Buchan (21/1a) P.241	BP Petroleum Development Ltd/27.1 Transworld Petroleum (UK) Ltd/14 CCP North Sea Ass. Ltd/6.35 Gas & Oil Acreage Ltd/5 City Petroleum Co/14 Can Del Petroleum (UK) Ltd/14 St Joe Petroleum (UK) Ltd/14 Charterhall Oil Ltd/4.56 Lochiel Exploration/1 *BNOC/Nil	20/5a P.294	Texaco/100 *BNOC/Nil	June 1974	May 1981	1982	2.4	6.7
Claymore (14/19a) P.249	Occidental Petroleum (Caledonia) Ltd/36.5 Getty Oil (Britain) Ltd/23.5 Union Texas Petroleum Ltd/20 Thomson North Sea Ltd/20 *BNOC Nil			May 1974	Nov 1977	1982	4.7	54

Field name (Block numbers and licence number)	Licensees/Company interest in block (%) at the end of 1981	Extension into other UK blocks		Date of discovery	Date of production start-up	Operator's estimate of first year of peak production	Operator's estimated peak production (million tonnes per year)	Operator's estimate of recoverable reserves originally present in the field (million tonnes) <sup>1</sup>
		Block number + licence number	Licensees/Company interest in block (%) at the end of 1981					
South Cormorant (211/26a) P.232	Shell/50 Esso/50 *BNOC/Nil	211/21a P.232	Shell/50 Esso/50 *BNOC/Nil	Sept 1972	Dec 1979	1984	2.0	25.2 <sup>2</sup>
Dunlin (211/23a) P.232	Shell/50 Esso/50 *BNOC/Nil	211/24a P.104	Conoco Ltd (Conoco)/33 $\frac{1}{3}$ Gulf Oil (Great Britain)Ltd (Gulf)/16 $\frac{2}{3}$ Gulf (UK) Offshore Investments Ltd/16 $\frac{2}{3}$ BNOC/33 $\frac{1}{3}$	July 1973	Aug 1978	1979	5.7	40.0 <sup>2</sup>
Forties (21/10) P.246	BP Oil Development Ltd/100 *BNOC/Nil	22/6a P.084	Shell/50 Esso/50 *BNOC/Nil	Oct 1970	Sept 1975	1980	24.6	261
Heather (2/5) P.242	Unocal Exploration and Production Co (UK) Ltd/31.25 Getty Oil Exploration (UK) Ltd/31.25 Tenneco Great Britain Ltd/31.25 DNO (Heather Oilfield) Ltd/6.25 *BNOC/Nil			Dec 1973	Oct 1978	1982	1.6	8-12
Montrose (Part 22/17) P.019	Amoco UK Petroleum Ltd (Amoco)/30.77 BGC/30.77 Amerada/23.08 Texas Eastern/15.38 *BNOC/Nil	Part 22/18 P.020	Amoco/30.77 BGC/30.77 Amerada/23.08 Texas Eastern/15.38 *BNOC/Nil	Sept 1969	June 1976	1979	1.4	12.1
Murchison (UK) (211/19a) P.104	Conoco Ltd/33 $\frac{1}{3}$ Gulf/16 $\frac{2}{3}$ Gulf (UK) Offshore Investments Ltd/16 $\frac{2}{3}$ BNOC/33 $\frac{1}{3}$			Sept 1975	Sept 1980	1982	5.0 <sup>4</sup>	42 <sup>4</sup>
Ninian (3/3) P.202	Chevron Petroleum Co Ltd/24 ICI Petroleum Ltd/26 Murphy Petroleum Ltd/10 Ocean Exploration Ltd/10 BNOC/30	3/8a P.199	BP Petroleum Development Ltd/50 Ranger Oil (UK) Ltd/20 Lasmo North Sea Ltd/30 *BNOC/Nil	Jan 1974	Dec 1978	1982	15.2	143 <sup>3</sup>
Piper (15/17a) P.220	Occidental Petroleum (UK) Ltd/36.5 Getty Oil (Britain) Ltd/23.5 Union Texas Petroleum Ltd/20 Thomson North Sea Ltd/20 *BNOC/Nil			Jan 1973	Dec 1976	1979	12.5	93
UK Statfjord (211/24 a & b) P.104 (211/24c) P.293	Conoco/33 $\frac{1}{3}$ Gulf/16 $\frac{2}{3}$ Gulf (UK) Offshore Investments Ltd/16 $\frac{2}{3}$ BNOC/33 $\frac{1}{3}$	211/25a P.104 211/25b P.293	Conoco/33 $\frac{1}{3}$ Gulf/16 $\frac{2}{3}$ Gulf (UK) Offshore Investments Ltd/16 $\frac{2}{3}$ BNOC/33 $\frac{1}{3}$	Apl 1974	Nov 1979	1988	27	412
Tartan (15/16a and 14/20a) P.237	Texaco/100 *BNOC/Nil			Dec 1974	Jan 1981	1982	4	27

Extension into other UK blocks

Field name (Block numbers and licence number)	Licensees/Company interest in block (%) at the end of 1981	Block number + licence number	Licensees/Company interest in block (%) at the end of 1981	Date of discovery	Date of production start-up	Operator's estimate of first year of peak production	Operator's estimated peak production (million tonnes per year)	Operator's estimate of recoverable reserves originally present in the field (million tonnes) <sup>1</sup>
Thistle <sup>5</sup> (211/18a) P.236	BNOC/15.6 Burmah Oil Exploration Ltd/8.4 Deminex UK Oil and Gas Ltd/42.5 Santa Fe (UK) Ltd/16.875 Tricentrol Thistle Development Ltd/10 Charterhouse Petroleum Development Ltd/1 Charterhouse Oil and Gas Ltd/1.4 Ultramar North Sea Ltd/1.4 BNOC (Alpha) Ltd/2.8	211/19a P.104	Conoco/33 $\frac{1}{3}$ Gulf/16 $\frac{2}{3}$ Gulf (UK) Offshore Investments Ltd/16 $\frac{2}{3}$ BNOC/33 $\frac{1}{3}$	July 1973	Feb 1978	1981	6.8	60

<sup>1</sup> The reserves figures quoted may not be precisely comparable with each other or with the official figures in this report since differences exist in the procedures and assumptions adopted by different companies and by the Department of Energy.

<sup>2</sup> Total discounted reserves, that is, proven plus suitable discounted figures for probable and possible reserves.

<sup>3</sup> Stabilised crude excluding NGL.

<sup>4</sup> Total production and reserves of field including Norwegian sector.

<sup>5</sup> The interests shown refer to the Thistle field area of block 211/18a only.

\* BNOC is a co-licensee through its participation agreements.

# Appendix 7

## Gas fields in production

The table gives basic information on the seven fields in production at the end of 1981.

Field name (block number and licence number)	Licensees/Company interest in block at the end of 1981 (%)	Extension into other UK blocks		Date of discovery	Date of production start up
		Block number and licence number	Licensees/Company interest in block at the end of 1981 (%)		
West Sole (48/6) P.001	BP Petroleum Development Ltd/100			Oct 1965	March 1967
Leman Bank (49/26) P.007	Shell UK Ltd (Shell)/50 Esso Petroleum Co Ltd (Esso)/50	49/27 P.016	Amoco UK Petroleum Ltd (Amoco)/30.77 BGC/30.77 Amerada Exploration Ltd (Amerada)/23.08 Texas Eastern (UK) Ltd (Texas Eastern)/15.38	April 1966	Aug 1968
		49/28 P.037	Arpet Petroleum Ltd (Arpet) 33 $\frac{1}{3}$ British Sun Oil Co Ltd/23 $\frac{1}{3}$ Union Rheinische (UK) Ltd/10 Superior Oil (UK) Ltd/20 Canadian Superior Oil (UK) Ltd/3 $\frac{1}{3}$ Sinclair (UK) Oil Ltd/10		
		53/2 P.025 53/1a P.025	Mobil Producing North Sea Ltd/100		
Indefatigable (49/18) P.016	Amoco/30.77 BGC/30.77 Amerada/23.08 Texas Eastern/15.38	49/23 P.016	Amoco/30.77 BGC/30.77 Amerada/23.08 Texas Eastern/15.38	June 1966	Oct 1971
		49/19 P.008	Shell/50 Esso/50		
		49/24 P.007	Shell/50 Esso/50		
Hewett* (48/29) P.037	Arpet/33 $\frac{1}{3}$ British Sun Oil Co Ltd/23 $\frac{1}{3}$ Union Rheinische (UK) Ltd/10 Superior Oil (UK) Ltd/20 Canadian Superior Oil (UK) Ltd/3 $\frac{1}{3}$ Sinclair (UK) Oil Co Ltd/10	48/30 P.028	Phillips Petroleum Co UK Ltd/35 Fina Exploration Ltd/30 AGIP (UK) Ltd/15 Century Power & Light Ltd/7.22 Plascom Ltd/4.26 Halkyn District United Mines Ltd/4.26 Oil Exploration Ltd/4.26	Oct 1966	July 1969
		52/5a P.028	Phillips group as above		

Extension into other UK blocks

Field name (block number and licence number)	Licensees/Company interest in block at the end of 1981 (%)	Block number and licence number	Licensees/Company interest in block at the end of 1981 (%)	Date of discovery	Date of production start up
		52/4a P.112	Phillips/19 AGIP (UK) Ltd/8.1 Fina/16.3 Century Power & Light Ltd/3.9 Halkyn District United Mines Ltd/2.3 Oil Exploration Ltd/2.3 Plascom Ltd/2.3 Arpet/15.3 British Sun Oil Co Ltd/10.7 North Sea Exploitation and Research Co Ltd/4.6 Superior Oil (UK) Ltd/9.1 Canadian Superior Oil (UK) Ltd/1.5 Sinclair (UK) Oil Co Ltd/4.6		
		48/28a P.037	Arpet Group as for Block 48/29		
Viking (49/17) P.033	Conoco Ltd (Conoco)/50 BNOC/50	49/12a P.033	Conoco/50 BNOC/50	May 1968	July 1972
		49/16 P.033	Conoco/50 BNOC/50		
Rough (47/8b) P.323	BGC/100	47/3d P.323	BGC/100	May 1968	Oct 1975
Frigg (UK) (10/1) P.118	Total Oil Marine Ltd/33 $\frac{1}{3}$ Aquitaine UK Ltd/22 $\frac{2}{9}$ Elf UK Ltd/44 $\frac{4}{9}$	9/10a P.090	Total/33 $\frac{1}{3}$ Aquitaine/22 $\frac{2}{9}$ Elf/44 $\frac{4}{9}$	May 1972	Sept 1977
		9/5a P.194	BP Petroleum Development Ltd/100		

\* The Hewett field includes accumulations formerly known as Dotty and Deborah.

# Appendix 8

## Oil production

(million tonnes)

Field	1975	1976	1977	1978	1979	1980	1981	Cumulative total from 1975
Argyll	0.5	1.1	0.8	0.7	0.8	0.8	0.5	5.2
Auk		1.2	2.3	1.3	0.8	0.6	0.6	6.8
Beatrice							0.2	0.2
Beryl A		0.4	3.0	2.6	4.7	5.4	4.7	20.8
Brent		0.1	1.3	3.8	8.8	6.8	11.1	31.9
Buchan							0.9	0.9
Claymore			0.3	3.0	4.0	4.4	4.5	16.2
South Cormorant					0.04	1.1	0.7	1.9
Dunlin				0.7	5.7	5.2	4.7	16.3
Forties	0.6	8.6	20.1	24.5	24.5	24.6	22.8	125.7
Heather				0.1	0.8	0.7	1.2	2.8
Montrose		0.1	0.8	1.2	1.3	1.2	1.1	5.7
Murchison (UK)						0.4	3.1	3.5
Ninian				0.04	7.7	11.4	14.3	33.5
Piper		0.1	8.6	12.2	13.2	10.4	9.8	54.3
Statfjord (UK)					0.04	0.5	1.2	1.8
Tartan							0.7	0.7
Thistle				2.6	3.9	5.3	5.5	17.3
<b>Total offshore crude</b>	<b>1.1</b>	<b>11.5</b>	<b>37.3</b>	<b>52.8</b>	<b>76.5</b>	<b>78.7</b>	<b>87.6</b>	<b>345.5</b>
Condensate	0.3	0.4	0.5	0.4	0.4	0.4	0.4	2.8
Heavier natural gases		0.1	0.4	0.6	0.8	1.1	1.2	4.2
Onshore crude	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.9
<b>Total production</b>	<b>1.6</b>	<b>12.1</b>	<b>38.3</b>	<b>54.0</b>	<b>77.9</b>	<b>80.5</b>	<b>89.4</b>	<b>353.8</b>

<sup>1</sup> Production is defined as the quantity of oil extracted from the field (liftings) minus the quantities of gas reinjected or flared offshore.

<sup>2</sup> Platform and terminal use is included.

<sup>3</sup> Crude oil includes condensate and residual dissolved gases present in the disposals of stabilised crude by the industry.

<sup>4</sup> Heavier natural gases are ethane, propane and butane produced in the treatment of liquid or gaseous hydrocarbons at pipeline terminals.

<sup>5</sup> Condensate, which is a mixture of pentane and higher hydrocarbons, arises mainly from the treatment of gas produced from the Frigg and Southern Basin fields.

<sup>6</sup> All figures given above are rounded to the nearest 100,000 tonnes (except for the Ninian field in 1978, and the South Cormorant and Statfjord UK fields in 1979). This rounding has created some discrepancies between individual annual field figures and the totals of both UKCS production and of cumulative production for each field.

# Appendix 9

## Gas production

(million cubic metres)

	Total to end 1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	Cumulative total to end 1981
West Sole Field	6,368	2,277	1,895	1,829	1,826	2,012	1,947	1,533	1,365	1,445	1,455	23,952
Leman Bank Field	24,511	13,132	13,096	15,609	15,015	15,367	15,581	14,719	13,831	9,482	13,207	163,550
Hewett Area	5,887	5,152	5,712	7,057	7,644	8,113	7,852	6,392	6,288	6,568	5,048	71,713
Indefatigable Field	164	4,507	4,557	5,545	6,249	6,355	6,779	6,450	6,006	6,878	5,613	59,103
Viking Area		1,394	3,594	4,765	5,512	6,046	6,330	5,238	4,397	4,689	3,307	45,272
Rough Field					10	512	1,063	931	1,005	467	99	4,087
Frigg Field <sup>1</sup>							614	2,907	5,345	6,374	7,057	22,297
Piper Field <sup>2</sup>								4	536	521	520	1,581
Other <sup>3</sup>						10	138	326	455	866	1,083	2,878
<b>Total</b>	<b>36,930</b>	<b>26,462</b>	<b>28,854</b>	<b>34,805</b>	<b>36,256</b>	<b>38,415</b>	<b>40,304</b>	<b>38,500</b>	<b>39,228</b>	<b>37,290</b>	<b>37,389</b>	<b>394,433</b>

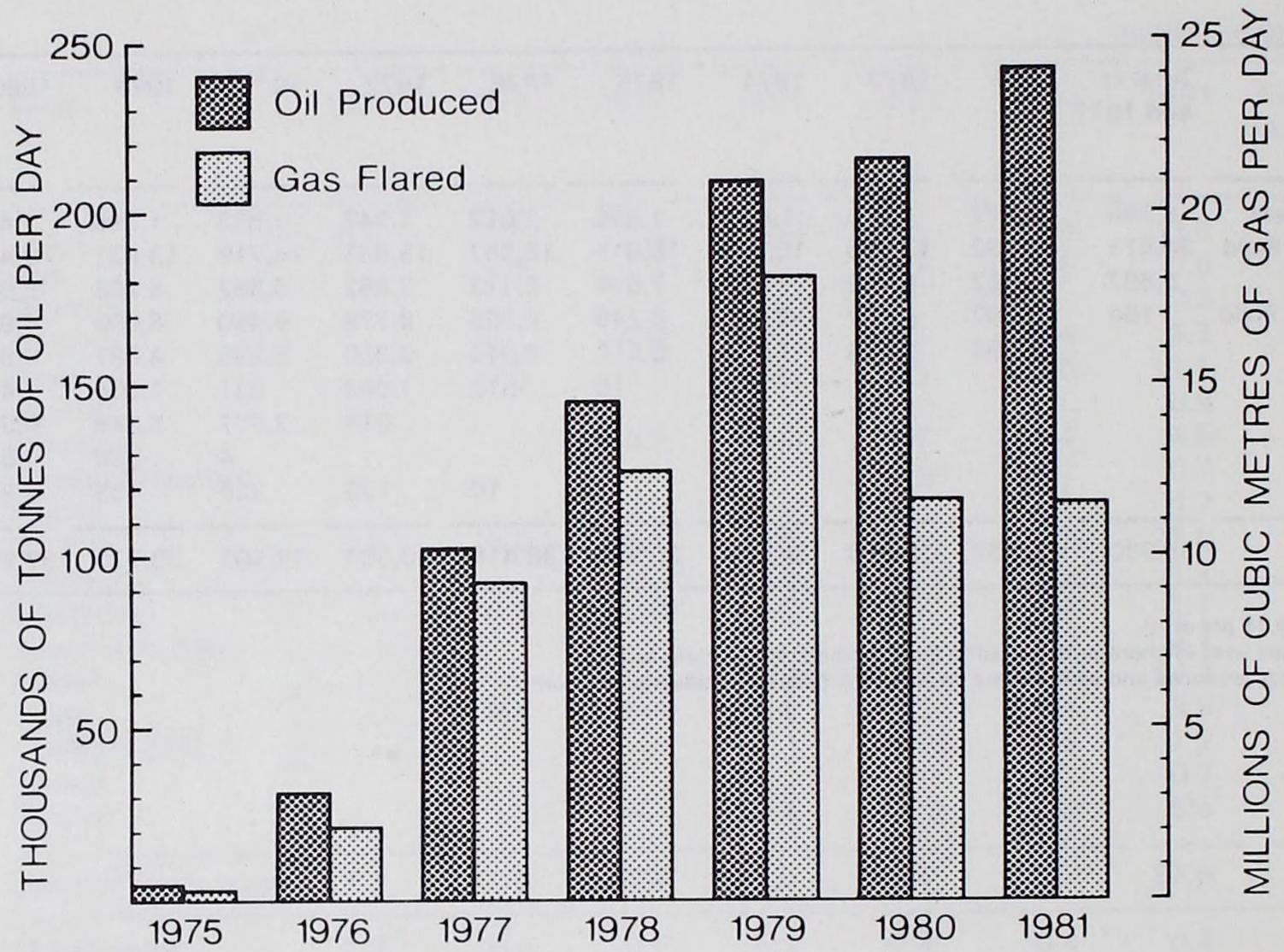
<sup>1</sup> UK share (39.18 per cent).

<sup>2</sup> Associated gas used offshore or delivered to land via the Frigg pipeline system.

<sup>3</sup> Associated gas produced and used mainly on Northern Basin oil production platforms.

# Appendix 10

## Oil produced and gas flared at producing oil fields



# Appendix 11

## Gas flaring at producing oil fields

Field	Average gas flaring rate in 1981 in million cubic metres a day (figures for million cubic feet a day in brackets)	Note of measures taken to reduce flaring
Argyll	0.08 (3)	Small isolated field – no alternative economic outlet for gas.
Auk	0.07 (2)	Small isolated field – no alternative economic outlet for gas.
Beatrice	0.02 (1)	Small amounts flared offshore and at Nigg.
Beryl A	0.28 (10)	High gas re-injection efficiency.
Brent	3.34 (118)	Commissioning of Brent 'Charlie' led to high flare.
Buchan	0.16 (6)	Small isolated field – no alternative economic outlet for gas.
Claymore	0.04 (1)	Small amount flared – no surplus gas.
South Cormorant	0.22 (8)	No economic alternative to flaring until FLAG system is commissioned and Sullom Voe facilities come on stream.
Dunlin	0.50 (18)	NGL injected into the oil pipeline to Sullom Voe.
Forties	2.19 (77)	NGL injected into the oil pipeline to Cruden Bay. Economics of exporting dry gas have not so far been attractive.
Heather	0.23 (8)	No alternative economic outlet for gas. NGL injected into the oil pipeline to Sullom Voe.
Montrose	0.41 (14)	Small isolated field – no alternative economic outlet for gas.
Murchison (UK)	0.87 (31)	Re-injection of gas into the reservoir began during 1981 – will continue (reservoir permitting) until the Northern Leg pipeline is available. NGL injected into the oil pipeline to Sullom Voe.
Ninian	1.33 (47)	NGL injected into the oil pipeline to Sullom Voe. Flaring will be considerably reduced when the FLAG system is commissioned.
Piper	0.51 (18)	Improvements in equipment reliability reduced flaring. Gas delivered to land via the Frigg pipeline system.
Statfjord (UK)	0.05 (2)	High gas re-injection efficiency.
Tartan	0.34 (12)	Flare relatively high due to discovery of hydrogen sulphide in reservoir, precluding export of dry gas and NGL. A sweetening plant is being installed. Small amount of NGL re-injected at end of 1981 but there are a limited number of locations available for this purpose.
Thistle	0.57 (20)	Some gas re-injected into the reservoir. NGL injected into the oil pipeline to Sullom Voe.
<i>Terminals</i>		
Flotta	0.09 (3)	LPG transported in tankers and specially converted vessels. Methane is used for fuel and supplied to North of Scotland Hydro Electric Board.
Sullom Voe	0.24 (8)	The start of commissioning of gas handling and LPG recovery facilities has required some flaring of gas since mid 1981.

# Appendix 12

## Oil production platforms

Field	Operator	Platform contractor	Site	Platform type	Installation date
<b>PLATFORMS INSTALLED</b>					
Argyll	Hamilton	Converted by Wilson-Walton	Teesside	Converted Drilling Rig	March 1975
Auk	Shell	Redpath Dorman Long	Methil	Steel	July 1974
Beatrice	BNOC	Dragados y Construcciones	Almeria, Spain	Steel	Sept 1979
		Dragados y Construcciones	Almeria, Spain	Steel	June 1980
Beryl	Mobil	Norwegian Contractors	Stavanger, Norway	Concrete	July 1975
Brent A	Shell	Redpath Dorman Long	Methil	Steel	May 1976
B		Norwegian Contractors	Stavanger, Norway	Concrete	August 1975
C		McAlpine/Sea Tank	Ardyne Point	Concrete	June 1978
D		Norwegian Contractors	Stavanger, Norway	Concrete	July 1976
Buchan	BP	Conversion by Lewis Offshore	Stornoway	Converted Drilling Rig	Sept 1980
Claymore	Occidental	Union Industrielle et d'Entreprise	Cherbourg, France	Steel	July 1976
Cormorant (North)	Shell	{ Redpath de Groot Caledonian Union Industrielle et d'Entreprise }	{ Methil Cherbourg, France }	Steel	April 1981
Cormorant (South)	Shell	McAlpine/Sea Tank	Ardyne Point	Concrete	May 1978
Dunlin	Shell	Andoc	Rotterdam, Holland	Concrete	July 1977
Forties FA	BP	Laing Offshore	Teesside	Steel	June 1974
FB		Laing Offshore	Teesside	Steel	June 1975
FC		Highlands Fabricators	Nigg Bay	Steel	August 1974
FD		Highlands Fabricators	Nigg Bay	Steel	June 1975
Fulmar (well-head jacket)	Shell	Redpath de Groot Caledonian	Methil	Steel	July 1979
		Highlands Fabricators	Nigg Bay	Steel	June 1980
Heather	Unocal	McDermott Scotland	Ardersier	Steel	May 1977
Hutton NW	Amoco	McDermott Scotland	Ardersier	Steel	Sept 1981
Montrose	Amoco	Union Industrielle et d'Entreprise	Le Havre, France	Steel	August 1975
Murchison	Conoco	McDermott Scotland	Ardersier	Steel	August 1979
Ninian Central	Chevron	Howard Doris	Loch Kishorn	Concrete	May 1978
North		Highlands Fabricators	Nigg Bay	Steel	July 1978
South		Highlands Fabricators	Nigg Bay	Steel	June 1977
Piper	Occidental	{ McDermott Scotland Union Industrielle et d'Entreprise }	{ Ardersier Le Havre, France }	Steel	June 1975
Tartan	Texaco	{ Redpath de Groot Caledonian Union Industrielle et d'Entreprise }	{ Methil Cherbourg, France }	Steel	June 1979
Thistle	BNOC	Laing Offshore	Teesside	Steel	August 1976
<b>PLATFORMS UNDER CONSTRUCTION</b>					
Beryl B	Mobil	Redpath de Groot Caledonian	Methil	Steel	March 1983
Brae	Marathon	McDermott Scotland	Ardersier	Steel	April 1982
Hutton	Conoco	{ Highlands Fabricators McDermott Scotland }	{ Nigg Bay Ardersier }	Steel	Sept 1983
Magnus	BP	Highlands Fabricators	Nigg Bay	Steel	May 1982
Maureen	Phillips	{ Ayrshire Marine Constructors HDN Offshore Structures }	{ Hunterston Loch Kishorn }	Steel	April 1983

# Appendix 13

## Major North Sea pipelines

Pipelines, from — to	Length (miles)	Diameter (inches)	Material conveyed	Operator	Year commissioned
<i>Operating:</i>					
West Sole — Easington	42	16	Natural Gas	BP	1967
Leman Bank — Bacton	35	30	Natural Gas	Shell/Esso	1968
Hewett — Bacton	20	30	Natural Gas	Phillips/Arpet	1969
Leman Bank — Bacton	38	30	Natural Gas	Amoco	1969
Leman Bank — Bacton	40	30	Natural Gas	Amoco/Shell/Esso	1970
Indefatigable — Leman Bank	25	30	Natural Gas	Amoco/Shell/Esso	1971
Viking — Theddlethorpe	86	28	Natural Gas	Conoco	1972
Hewett — Bacton	20	30	Natural Gas	Phillips/Arpet	1973
Leman Bank — Bacton	36	30	Natural Gas	Amoco/Shell/Esso	1973
Rough — Easington	18	16	Natural Gas	Amoco	1975
Ekofisk — Teesside	220	34	Crude Oil	Phillips	1975
Forties — Cruden Bay	111	32	Crude Oil	BP	1975
Piper — Flotta	124	30	Crude Oil	Occidental	1976
Frigg — St Fergus No. 1	220	32	Natural Gas	Total	1977
Claymore — Piper Trunkline	8	30	Crude Oil	Occidental	1977
South Cormorant — Sullom Voe	93	36	Crude Oil	Shell/Esso	1978
Piper — Claymore	22	16	Associated Gas	Occidental	1978
Thistle — Dunlin	7	16	Crude Oil	BNOC	1978
Heather — Ninian	22	16	Crude Oil	Union Oil	1978
Piper — Frigg (MCP-01)	33	18	Associated Gas	Occidental	1978
Frigg — St Fergus No. 2	220	32	Natural Gas	Total	1978
Ninian — Sullom Voe	105	36	Crude Oil	BP	1978
Dunlin — South Cormorant	17	24	Crude Oil	Shell	1978
Brent — South Cormorant	22	30	Crude Oil	Shell	1979
Murchison — Dunlin	12	16	Crude Oil	Conoco	1980
Tartan — Claymore	17	24	Crude Oil	Texaco	1980
Beatrice — Nigg Bay	49	16	Crude Oil	BNOC	1981
<i>Awaiting commissioning/ under construction:</i>					
Tartan — Piper	11	18	Associated Gas	Texaco	
Brent — St Fergus	281	36	Associated Gas	Shell	
South Cormorant — Brent	25	16	Associated Gas	Shell	
Brae — Forties	73	30	Crude Oil	Marathon	
Magnus — Ninian	57	24	Crude Oil	BP	
West Sole — Easington	44	24	Natural Gas	BP	

# Appendix 14

## Expenditure by operators and other production licensees upon exploration, development and operating activities

### TOTAL EXPLORATION EXPENDITURE

£ million

	Q1	Q2	Q3	Q4	Year
1977	70.4	96.5	103.4	104.5	374.8
1978	65.2	65.6	61.5	68.9	261.2
1979	57.1	48.8	59.2	75.7	240.8
1980	67.4	87.7	109.0	114.7	378.8
1981	91.0	132.7	161.7	172.9P	558.3P

### DEVELOPMENT EXPENDITURE (1)

£ million

	Total	Platform structures	Modules and equipment	Offshore loading systems	Pipelines	Terminals	Production wells(2)	Appraisal wells(2)	Other expenditure
Oil fields									
1977	1555.6	462.0	691.9	10.7	64.8	139.9	155.9	8.3	22.1
1978	1709.6	265.2	828.0	14.8	68.4	260.8	242.5	12.9	17.0
1979	1852.6	243.6	838.9	25.7	99.8	278.7	337.2	7.4	21.3
1980 Q1	423.0	48.0	185.9	8.2	2.6	86.8	86.3	1.7	3.5
Q2	548.3	80.9	245.3	8.7	20.0	85.5	96.8	8.1	3.0
Q3	566.5	74.9	236.0	7.0	47.9	82.4	107.4	7.7	3.2
Q4	633.9	78.3	288.7	10.4	30.0	92.1	124.7	5.6	4.1
Year	2171.7	282.1	955.9	34.3	100.5	346.8	415.2	23.1	13.8
1981 Q1	540.3	124.1	199.0	4.7	19.9	77.2	104.7	7.7	3.0
Q2	672.6	111.8	251.7	11.4	60.1	85.7	131.9	17.9	2.1
Q3	639.2	98.8	254.9	16.2	62.0	63.4	130.4	10.6	2.9
Q4P	614.1	116.3	264.4	6.2	31.4	38.2	144.8	10.1	2.7
Year P	2466.2	451.0	970.0	38.5	173.4	264.5	511.8	46.3	10.7
Gas fields (3)									
1977	344.3	51.6	65.2	—	178.0	26.9	22.6	—	—
1978	282.9	13.2	50.6	—	147.4	47.2	24.5	—	—
1979	191.3	2.6	77.5	—	41.1	52.4	17.7	—	—
1980 Q1	34.2	—	17.2	—	4.1	12.7	0.2	—	—
Q2	47.5	1.3	21.1	—	8.5	16.2	0.4	—	—
Q3	63.7	1.4	19.8	—	8.0	34.1	0.4	—	—
Q4	71.4	2.0	23.2	—	17.7	27.6	0.9	—	—
Year	216.8	4.7	81.3	—	38.3	90.6	1.9	—	—
1981 Q1	48.1	3.7	13.2	—	4.3	26.7	0.2	—	—
Q2	72.2	10.9	13.5	—	11.3	31.3	5.2	—	—
Q3	82.7	9.9	10.8	—	15.8	44.7	1.5	—	—
Q4P	70.6	15.3	8.3	—	10.5	35.0	1.5	—	—
Year P	273.6	39.8	45.8	—	41.9	137.7	8.4	—	—

## TOTAL OPERATING EXPENDITURE

£ million

	Q1	Q2	Q3	Q4	Year
<b>Oil fields</b>					
1977	35.9	38.7	41.2	43.1	158.9
1978	45.9	56.1	66.3	89.9	258.2
1979	76.9	93.2	116.3	122.7	409.1
1980	120.7	155.4	140.4	167.9	584.4
1981	190.1	203.5	231.0	232.9P	857.5P
<b>Gas fields</b>					
1977	8.5	10.7	12.7	15.8	47.7
1978	15.0	18.3	22.8	31.6	87.7
1979	20.9	22.2	23.0	26.6	92.7
1980	26.3	26.1	30.6	24.5	107.5
1981	24.2	29.8	35.7	34.0P	123.7P

## Notes:

P Indicates provisional figures.

- (1) The Frigg gas field's reserves were subject to an adjustment of the UK and Norwegian shares effective from 15 April 1977 and the development of the Murchison oil field was subject to a unitisation agreement with the Norwegian licensees of the adjacent Norwegian block on 5 April 1979, resulting in reimbursement of the UK licensees by the Norwegian licensees of a proportion of the expenditures incurred for the development of these fields prior to these dates. These settlements have been treated as sales of fixed assets to Norway in the balance of payments and in the capital formation item of the National Accounts but they have not been deducted from the expenditure figures.
- (2) In the case of gas fields the expenditure upon production wells also includes that on appraisal wells.
- (3) Expenditure upon the development of gas fields includes that upon the Brent field associated gas (FLAG) system and the other associated gas gathering pipelines.

# Appendix 15

## Accident statistics

Year	Mobile drilling activity (rig years)	Fixed platform drilling activity (rig years)	Fixed platforms (1)	Estimated numbers employed on installations	Number of fatal accidents		Number of serious accidents	
					Installations	Vessels	Installations	Vessels
1971	5.2	3.7	11	1,260	4	0	15	2
1972	8.8	3.8	16	1,850	3	0	17	0
1973	13.3	3.2	19	2,430	2	1	22	0
1974	24.5	2.8	23	4,030	9	3	19	6
1975	27.7	2.6	29	6,300	9	1	46	4
1976	21.2	9.4	39	9,200	16	1	50	7
1977	23.6	14.9	50	12,100	10	1	35	5
1978	18.1	18.6	55	12,500	0	4	33	7
1979	16.1	21.5	58	10,500	7	3	39	4
1980	20.6	25.2	60	22,000 <sup>2</sup>	1	3	42	3
1981	24.6	27.0	64	21,000 <sup>2</sup>	4	2	54	5

<sup>1</sup> For the purposes of this Table, "Fixed platforms" refers to oil and gas platforms which are on location either drilling, producing or under construction.

<sup>2</sup> The estimated number employed includes construction workers and the personnel of mobile drilling rigs, service vessels, support barges and survey teams, and is not directly comparable with numbers shown for previous years.

## Deaths and serious accidents by activity

	Deaths											Serious accidents											Dangerous Occurrences		
	Pre 72	72	73	74	75	76	77	78	79	80	81	Pre 72	72	73	74	75	76	77	78	79	80	81	79	80	81
Construction					2	4			5		2				5	12	4	5	4	2	1	3	4	11	
Drilling	18*	2		5	2	2	2		1		3	57*	7	10	13	26	21	20	10	16	15	24	13	25	23
Production												2			1	2	4	2	4	2	3	2	7	11	14
Maintenance	2					1	4				1	3	2	1	3	6	4	1	5	13	13	22	23	21	26
Diving	2	1	1	3	3+	6	2	2	3		6	6	1	1			2	5	5	1	4	3	8	2	7
Helicopters						1			1							4							1	3	1
Boats	6		1	3	1	1	1	2		3	2	2			2	4	7	5	7	3	3	5	16	19	22
Cranes	4		1	1	2	2	2			1		15	5	5	6	7	3	3	4	3	4	1	20	32	29
Domestic																				1	1	1	2	1	2
Unallocated <sup>+</sup>												24	2	5											
Total	32	3	3	12	10	17	11	4	10	4	6	111	17	22	25	50	57	40	40	43	45	59	93	118	135

\* Sea Gem accounts for 13 of the Pre 1972 fatal accidents and six serious accidents.

+ One further diver died from natural causes while diving from an offshore installation.

<sup>+</sup> From 1965 to 1973 the statistics included a group of accidents from slips, falls etc which were unassociated with working operations. Only the fatal accidents in this group have been re-classified under the other headings.

# Appendix 16

## Production forecasts

The Secretary of State for Energy gave the following reply to a Parliamentary Question on 4 March 1982:

"The latest forecasts for United Kingdom petroleum production in the years 1982, 1983, 1984 and 1985 are as follows:

	million tonnes
1982	90-105
1983	90-115
1984	95-125
1985	95-130

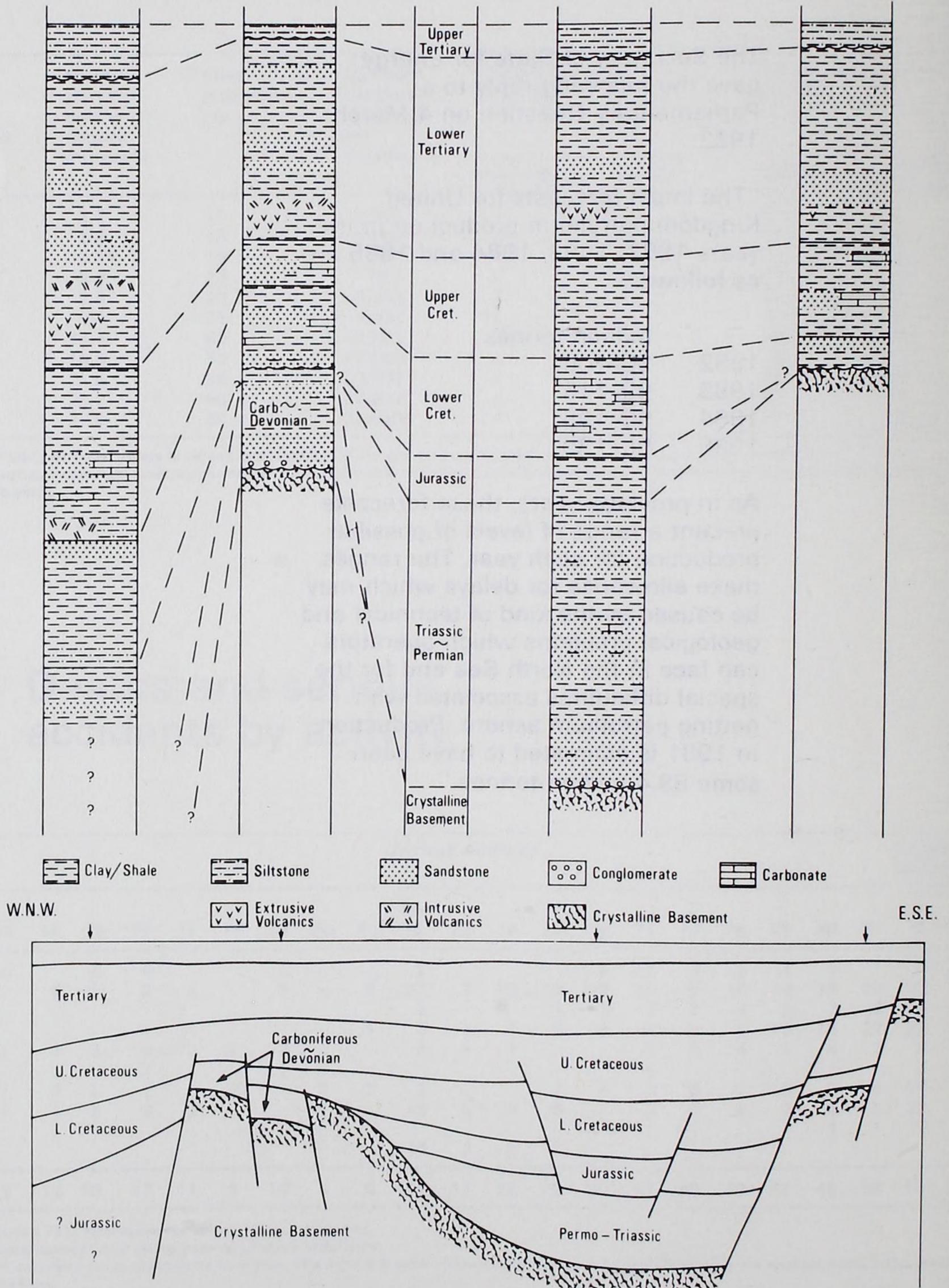
As in previous years, these forecasts present a range of levels of possible production for each year. The ranges make allowance for delays which may be caused by the kind of technical and geological problems which operators can face in the North Sea and for the special difficulties associated with getting petroleum ashore. Production in 1981 is estimated to have been some 89.4 million tonnes."

# Appendix 17

## Stratigraphy and schematic cross-section of the West Shetland area

(The stratigraphy is not related to specific well data.)

Not to Scale



# Appendix 18

## Map of the UK Continental Shelf

(as at Spring 1982)

### **Notes:**

#### **Licences on land**

The major part of the licensed area on land is covered by 105 exploration licences. These grant to the holder rights to carry out within the licensed area geological survey work and shallow drilling to a maximum depth of 350 metres, for the purpose of obtaining geological information only.

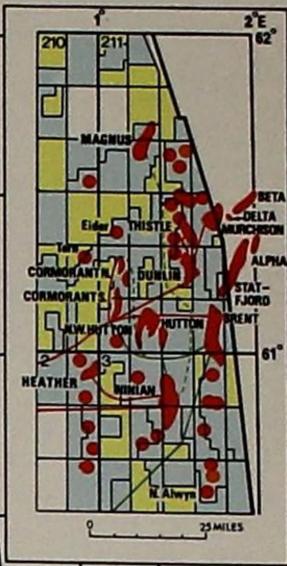
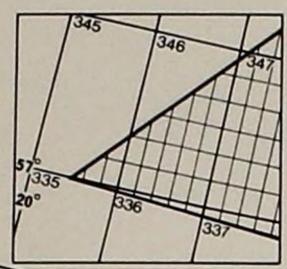
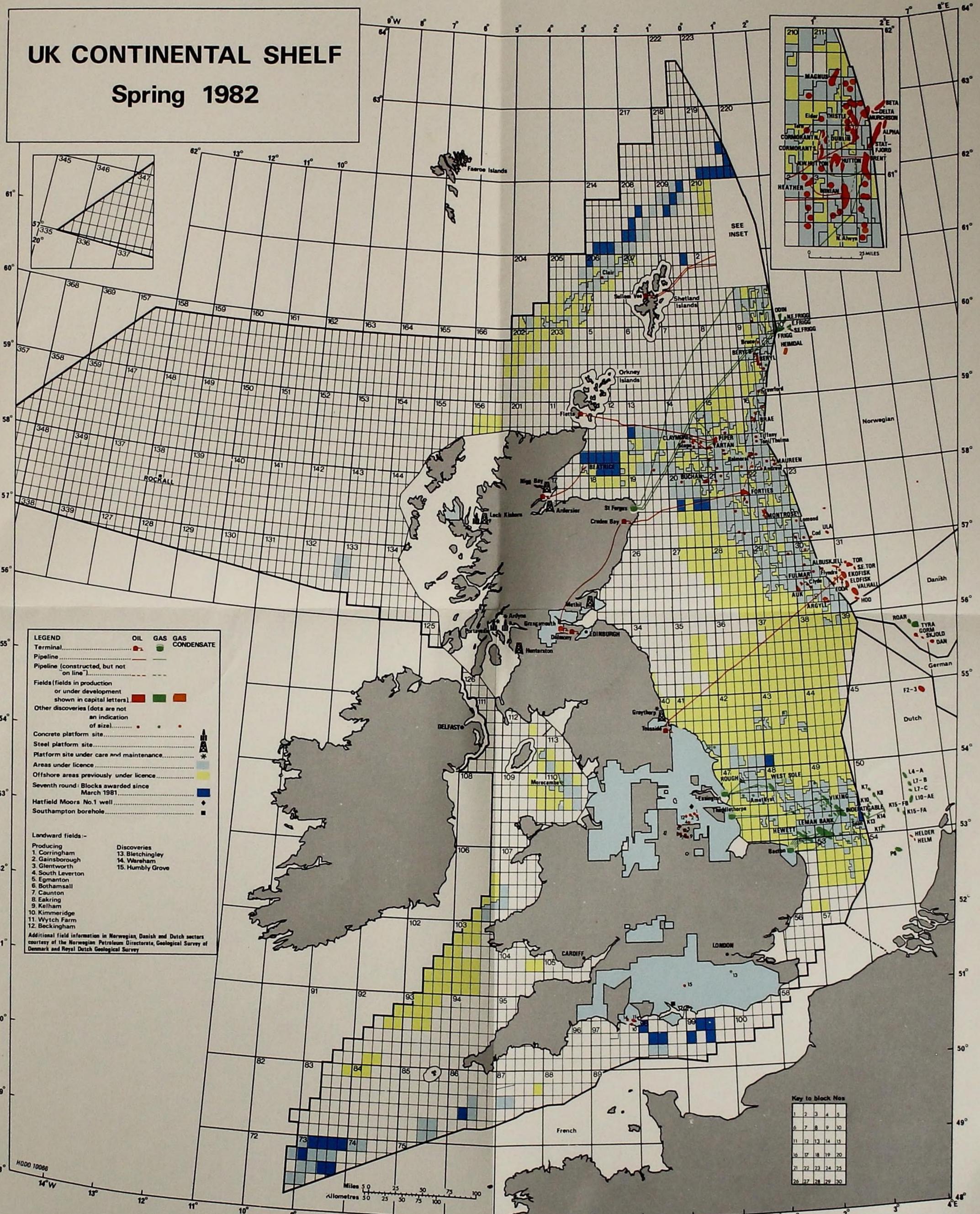
Deeper drilling, and the exploitation of any discovery of hydrocarbons, may only be undertaken under production and mining licences, of which 57 and 14 such licences respectively are currently in force.

All statutory permissions, including planning permission where necessary, and the permission of owners and occupiers of land, must be obtained before any operations are carried out under landward licences.



# UK CONTINENTAL SHELF

## Spring 1982



**LEGEND**

Terminal.....		<b>OIL</b>		<b>GAS</b>		<b>GAS CONDENSATE</b>
Pipeline.....						
Pipeline (constructed, but not on line).....						
Fields (fields in production or under development shown in capital letters).....						
Other discoveries (dots are not an indication of size).....						
Concrete platform site.....						
Steel platform site.....						
Platform site under care and maintenance.....						
Areas under licence.....						
Offshore areas previously under licence.....						
Seventh round: Blocks awarded since March 1981.....						
Hatfield Moors No.1 well.....						
Southampton borehole.....						

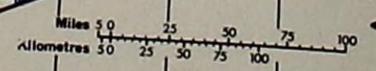
**Landward fields -**

Producing	Discoveries
1. Corringham	13. Bletchingley
2. Gainsborough	14. Wareham
3. Glenworth	15. Humby Grove
4. South Leverton	
5. Eglington	
6. Bothamsall	
7. Causton	
8. Eakring	
9. Kelham	
10. Kimmeridge	
11. Wytch Farm	
12. Beckingham	

Additional field information in Norwegian, Danish and Dutch sectors courtesy of the Norwegian Petroleum Directorate, Geological Survey of Denmark and Royal Dutch Geological Survey

**Key to block Nos**

1	2	3	4	5
6	7	8	9	10
11	12	13	14	15
16	17	18	19	20
21	22	23	24	25
26	27	28	29	30



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