

# Development of the Oil and Gas Resources of the United Kingdom 1985

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DEPARTMENT OF ENERGY





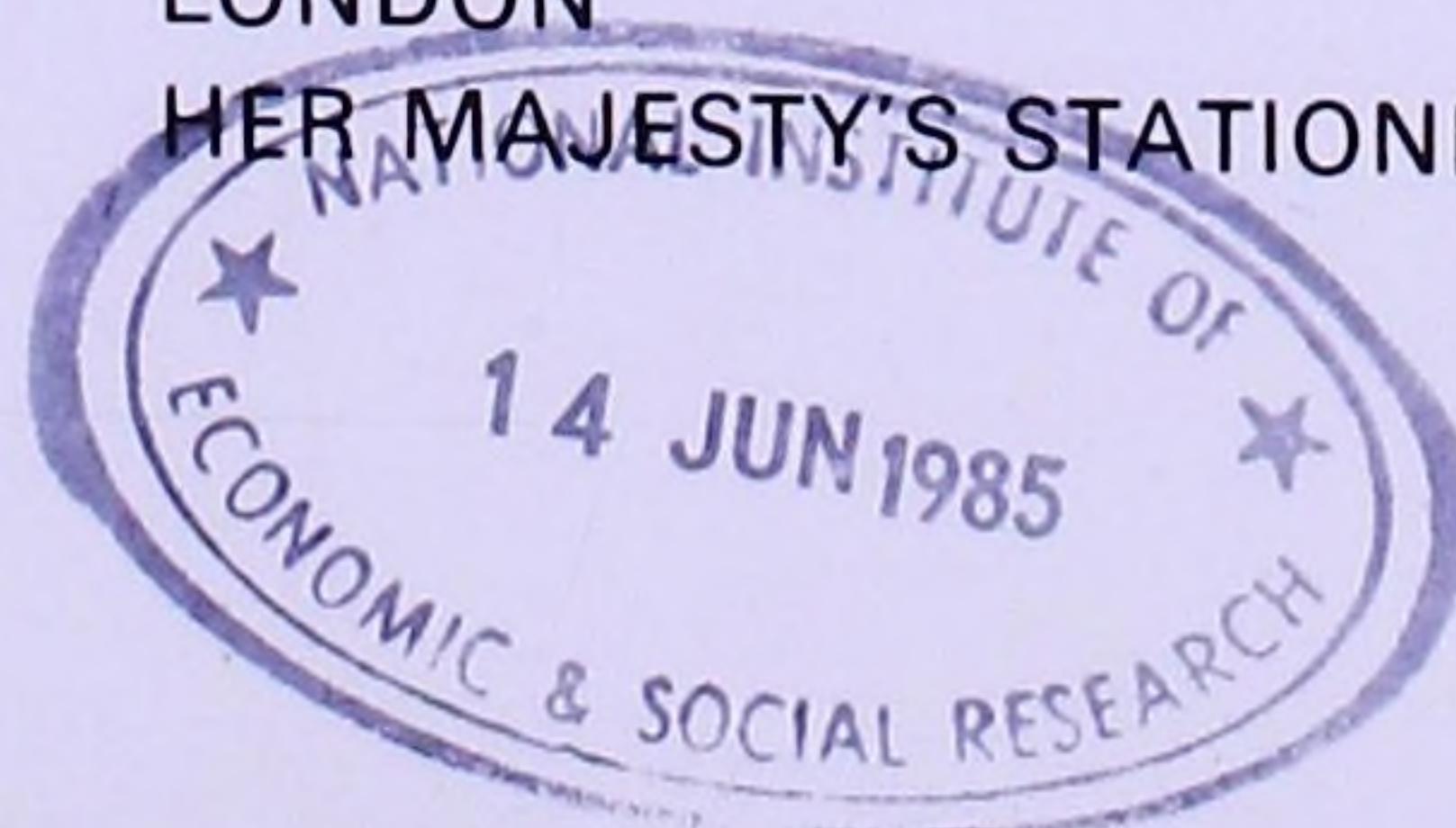




# Development of the oil and gas resources of the United Kingdom 1985

A report to Parliament by the Secretary of State for Energy  
April 1985

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# Contents

Page

**1 Summary**

**Part 1: Exploration**

- 3 1.1 Exploration drilling
  - (a) Offshore
  - (b) Onshore
- 4 1.2 Licensing
  - (a) Offshore
  - (b) Onshore

**Part 2: Reserves**

- 6 2.1 Discovered recoverable reserves
  - (a) Oil
  - (b) Gas
- 8 2.2 Undiscovered recoverable reserves
  - (a) Oil
  - (b) Gas
- 11 2.3 Estimated total potential of the UKCS

**Part 3: Development**

- 12 3.1 Development drilling
- 12 3.2 Development programmes
  - (a) Oil
  - (b) Gas
- 13 3.3 Review of fields under development
  - (a) Offshore oil and condensate
  - (b) Offshore gas

**Part 4: Production and downstream activities**

- 15 4.1 Oil production
- 15 4.2 Oil production forecasts
- 15 4.3 Oil disposal
- 15 4.4 Oil terminals
- 15 4.5 Gas production
- 16 4.6 Gas terminals
- 16 4.7 Gas flaring
- 17 4.8 Production and disposal of natural gas liquids
- 18 4.9 Review of fields in production
  - (a) Offshore oil
  - (b) Onshore oil
  - (c) Gas



**Part 5: Operational aspects**

24	5.1	Offshore employment
24	5.2	Training
24	5.3	Offshore safety
25	5.4	Offshore accidents and dangerous occurrences
25	5.5	Offshore emergency planning
26	5.6	Protection of installations
26	5.7	Environmental aspects

**Part 6: Economic and industrial aspects**

29	6.1	The economic impact on UKCS oil and gas
29	6.2	UKCS fiscal regime
30	6.3	Costs and investment
31	6.4	Comparison of UKCS and onshore oil and gas production with consumption in the UK
34	6.5	Offshore supplies industry
36	6.6	Research and development on safety
37	6.7	Geological and reservoir engineering research and development
38	6.8	Privatisation of BGC's oil interests
38	6.9	British National Oil Corporation

**Appendices**

39	1	Licensing
41	2	Drilling activity
48	3	Significant offshore hydrocarbon discoveries
52	4	Appraisal drilling on significant discoveries
55	5	Offshore oil and condensate fields under development
57	6	Offshore oil fields in production
63	7	Gas fields in production and under development
67	8	Oil production
69	9	Gas production
70	10	Oil produced and gas flared at producing oil fields
71	11	Gas flaring at oil terminals and producing oil fields
73	12	Oil production platforms
75	13	Major offshore pipelines
77	14	Expenditure by operators
79	15	Accident statistics
81	16	Oil production forecasts
82	17	British National Oil Corporation
83	18	Generalised stratigraphy and thickness
84	19	Map of the UKCS

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 of crude oil is approximately 7.5 barrels
- 1 cubic metre = 35.31 cubic feet
- 1 billion cubic metres of gas = 0.83 million tonnes of oil equivalent
- 1 cubic metre of gas = 36,364 British Thermal Units or 0.36 Therms
- 1 tonne of fuel oil = 40.6 million British Thermal Units or 406 Therms

The front cover shows the North Sea Hutton Tension Leg Platform in production, by courtesy of Conoco.

The back cover shows the North Sea Magnus steel platform at night, by courtesy of BP.



# Summary

This report describes the development of the oil and gas resources of the United Kingdom during 1984. Several significant events in the early months of 1985 are also included. It gives information about the economic, industrial and environmental aspects of oil and gas production.

1984 was a highly successful year:—

- a record number of wells were drilled
- a record number of new developments were approved
- a major increase in gas reserves
- a record year for the offshore supplies industry

## Exploration

1984 was a year of very significant activity and success. The highest level of drilling activity since exploration began in 1964 took place. A total of 182 offshore exploration and appraisal wells were started compared with 128 in 1983, the next highest year, and 116 in 1975. Thirty seven exploration and appraisal wells were drilled onshore.

## Development

Fourteen oil and gas developments and one major offshore pipeline were approved in 1984. In the first two months of 1985 a further six developments were approved. At the end of the year six offshore oil fields, one condensate field, six gas fields and one onshore oil field were under development. Additional developments were also in progress on an existing oil field and two existing gas fields, together with conversion of the Rough gas field to an offpeak storage facility. At the time of going to print 18 proposed oil and gas developments were being discussed with the Department.

## Reserves

After taking account of cumulative oil production to the end of 1984 — 698 million tonnes — the remaining recoverable reserves in present and future discoveries are now estimated to be in the range 1130–4780 million tonnes. After deducting cumulative gas production to the end of 1984 of 504 billion cubic metres (bcm), remaining gas reserves are estimated at 875–2443 bcm.

## Licensing

The Ninth Round was formally launched in June 1984 with a closing date of 17 December. It attracted a record level of response in terms of applications both for blocks offered on the usual discretionary terms as well as those offered for cash tender. Thirteen of the 15 cash tender blocks were applied for and licensed, raising over £120 million. During 1984 the Secretary of State awarded five onshore Production Licences and three exploration licences. The new Petroleum (Production) (Landward Areas) Regulations 1984 came into operation on 18 December 1984.

## Oil and gas production

Total oil production in 1984 was 125.9 million tonnes (including Natural Gas Liquids (NGL's)) compared with 114.9 million tonnes in 1983.

Two new offshore oil fields, Hutton and Deveron, came on stream during the year and the further development of the Beryl field, the B platform, and that of the Beatrice field, Beatrice B, also started producing. In addition, a new onshore field, Welton, came into production.

The offshore oil fields Innes and Highlander



started producing in the first two months of 1985. At the end of 1984 there were 27 offshore oil fields in production. Gas production in 1984 totalled 40 billion cubic metres (bcm) compared with 39.5 bcm in 1983.

A new offshore gas field, Victor, started production in 1984, and the offshore gas field South Morecambe did so in early 1985.

At the end of 1984 there were 7 offshore gas fields in production.

### **Gas Flaring**

The rate of gas flared on the UKCS continued to fall, from an average of 18 million cubic metres (mcm) a day in 1979 to less than 9 mcm a day in 1984. Over the same period oil production has increased by some 57 per cent.

### **Economic benefits**

Revenue from the sale of oil produced from the UKCS was £20.3 billion in 1984, compared with £17.0 billion in 1983. Revenue from the sale of gas was £1.2 billion, compared with £1.1 billion in 1983. Government income from taxes and royalties in the financial year 1984/85 amounted to about £12 billion compared with £9 billion in 1983/84. The figures do not take account of the full economic contribution of gas to the economy given that major items such as the levy under the Gas Levy Act 1971 on gas exempt from PRT accrue outside the UKCS fiscal regime.

### **Investment**

Gross capital investment in the oil and gas exploration and production industry as a whole was estimated to be £3.2 billion in 1984, representing about 24 per cent of total UK industrial investment.

### **UKCS fiscal regime**

A general reform of business taxation, involving in particular a lower corporation tax rate and revised levels of capital allowances for plant and machinery, was introduced by the 1984 Finance Act. This reform applies to the oil industry as it applies to industry generally. The other main measures in the Finance Act 1984 which affect the oil industry were changes in the tax treatment of transfers of licence interests and termination of Advance Corporation Tax repayments arising from the deduction of PRT for corporation tax.

### **Offshore supplies**

In 1984, the total value of orders reported by operators for oil and gas development work on the UKCS was £3.6 billion. The UK share, at 74 per cent was worth £2.65 billion.

### **British National Oil Corporation**

The Minister of State for Energy announced on 13 March 1985 that because of changes in market conditions, trading in participation oil by BNOC should cease. Legislation will be introduced to abolish BNOC and set up a small agency to carry out residual functions.



# Part 1: Exploration

## 1.1 Exploration drilling

### (a) Offshore

In 1984 106 exploration and 76 appraisal wells were started; a total of 182 wells. This is the highest level of activity for both categories since exploration began in 1964. Twenty-three discoveries were announced in 1984 — ten oil, one oil and gas, eight gas, one condensate, and three gas and condensate.

After 20 years of drilling on the UKCS 942 exploration wells have been started. From these wells 194 significant discoveries (see definition in Appendix 3) have been made. These results demonstrate the continuing remarkable success of drilling in the more mature parts of the UKCS in the North Sea.

Activity in each of the major geographical areas of the United Kingdom Continental Shelf (UKCS) in 1984 was as follows:

— *Northern North Sea* (East Shetland Basin)  
Sixteen exploration wells were commenced. Two oil discoveries, and one oil and gas discovery were made. Thirteen appraisal wells were commenced.

— *Moray Firth*  
Fifteen exploration wells and 26 appraisal wells were commenced. Five discoveries were made, four of oil and one of condensate.

— *Forth Approaches*  
One exploration well was drilled in this area.

— *Central North Sea*  
This continues to be the major area of

drilling activity: 37 exploration and 18 appraisal wells were started. Seven significant discoveries were made: four of oil and three of gas and condensate.

— *Mid North Sea High*  
No wells were drilled.

— *Southern North Sea*  
Twenty four exploration wells were commenced, compared with nine in each of the previous two years. Of these 17 were to fulfil Eighth Round work commitments.

Nineteen appraisal wells were started. Six gas discoveries were announced.

— *English Channel*  
Three exploration wells were drilled. A gas discovery was made in block 98/11.

— *South-West Approaches*  
No wells were drilled in this area.

— *Cardigan Bay*  
One exploration well was drilled, after some five years of inactivity.

— *Irish Sea*  
No exploration drilling was carried out.

— *West of Orkney*  
The first well in this area (202/19-1) was drilled by Shell.

— *West of Shetlands*  
Four exploration wells were started, one having a total depth of 18858 feet, the deepest well on the UKCS. Gas was discovered by BGC in block 214/30.

— *North of 62°N*  
The first wells to be drilled in this area were



started. Four exploration wells were started on three Seventh Round licences. One of the wells has already been announced as a non-commercial gas discovery.

One well (219/20-1) was drilled in a water depth of 2220 feet (676.6 m), the deepest yet on a production licence.

#### (b) Onshore

1984 was also a very active year onshore. Twenty five exploration wells and 12 appraisal wells were started. In addition an eight-well shallow drilling programme was

carried out in Fife. Interest has concentrated in the East Midlands and in Southern England.

Seven new discoveries were made and announced, three from wells started in 1983 and four from wells drilled last year.

Appendix 2 contains details of exploration and appraisal drilling activity in the years 1975 to 1984 by geographical area offshore and onshore and the number of new wells started in each of those areas during each year.

**Table 1:** Discoveries made on landward licences in 1984

Well Name	Company	Type of discovery	Licence No (County)
<i>Wells started in 1983</i>			
Nettleham 2	BP	Oil	PL.179 (Lincs)
Baxters Copse	CONOCO	Gas	PL.204 (W Sussex)
Hemswell	BP	Oil	PL.179 (Lincs)
<i>Wells drilled in 1984</i>			
Cropwell Butler 2	BP	Oil	PL.218 (Notts)
Broughton	BP	Oil	PL.185 (Humber)
Stainton	BP	Oil	PL.179 (Lincs)
Stockbridge	AMOCO	Oil	PL.233 (Hants)

(Note: some of the wells are not considered to be discoveries by the Operator)

## 1.2 Licensing

#### (a) Offshore

Preliminary proposals for the Ninth Round which were announced in February 1984 were outlined in last year's report. These proposals were discussed with the oil industry (through the UK Offshore Operators Association (UKOOA) and Association of British Independent Oil Exploration Companies (BRINDEX)), relevant local authorities and other outside organisations representing fishing and environmental interests before the final arrangements and the formal invitation to apply were published on 8 June in the Official Gazettes.

One hundred and ninety five blocks were put on offer. Fifteen, all in the mature oil province of the Northern North Sea, were for cash tender. The other 180 were offered

on the usual discretionary terms and included a number in the deeper water areas (in excess of 200 metres) of the Rockall and Faeroes Troughs. As an incentive to their exploration, the blocks in these latter areas were offered in pairs (26 pairs in Rockall and 10 pairs in Faeroes) with longer than normal periods of validity for licences — an initial term of 8 instead of 6 years and an extended term of 40 instead of 30 years.

The Round closed on 17 December 1984. More applications than ever before were received. There were 32 for 13 of the cash tender blocks and 117 for 107 of the discretionary blocks. Awards for the 13 cash tender blocks were announced on 23 January 1985. At the time of going to print the assessment of applications for other blocks was still proceeding.



Details of each of the nine rounds of licensing are shown in Appendix I.

(b) Onshore

During 1984 five production licences were awarded for areas in the Firth of Clyde, the Solway Firth, Liverpool Bay, the Humber estuary and the Solent and three exploration licences for areas in Humberside, Lincolnshire and Dorset.

The Petroleum (Production) (Landward Areas) Regulations 1984 were laid before Parliament on 26 November 1984 and

came into operation on 18 December 1984. The new arrangements provide for three types of landward licence, designed for the identifiable stages of exploration, appraisal and development. These were fully described in last year's report.

At the end of 1984 some 57,563 sq kms were under licence. About 33,837 sq kms were covered by 100 exploration licences and 23,313 sq kms by 116 production licences. The remainder was covered by 14 mining licences.



## Part 2: Reserves

This Part follows the form of presentation adopted in the 1984 Brown Book. It first considers oil and gas reserves in existing discoveries (section 2.1) and then gives estimates of undiscovered oil and gas (section 2.2). This separate consideration of discovered and undiscovered reserves is intended to reflect the different quality of the information available in respect of each section. The information about discovered reserves allows good estimates to be made on a field-by-field basis. The information about undiscovered reserves, on the other hand, has been obtained through a statistical assessment of the likely number and size of future discoveries.

### 2.1 Discovered recoverable reserves

#### (a) Oil

Estimates of initially recoverable reserves in present discoveries are set out in Table 2, together with the equivalent figures in brackets from last year's report for comparison. The estimates are calculated by adding the reserves of individual fields in each category and then rounding the total to the nearest 25 million tonnes.

Table 2 shows that the successes, resulting from a very high level of exploration and appraisal drilling, have increased the initially recoverable reserves on the UKCS. As in 1983, these successes have been mainly concentrated in the Central North Sea and are exemplified by increases of 50 million tonnes in the probable reserves and 25 million tonnes in the possible reserves of Category A2, (Other significant finds not yet fully appraised).

Development drilling has broadly confirmed

the estimates given in the 1984 Brown Book for Category A1, (Fields in production and under development). Development approval was given for three new offshore fields in 1984 (Deveron, Innes and Cyrus), and one new onshore field, Welton, (see additionally Section 3.2). The reserves of these four small fields have not changed the totals, rounded to the nearest 25 million tonnes, from those of last year. Eight new developments were under discussion at the end of the year.

The proven plus probable reserves initially in present discoveries have increased from 1950 million tonnes to 2000 million tonnes. After deducting cumulative production to date of 698 million tonnes, the remaining recoverable reserves stand at about 1300 million tonnes.

In order to derive a range for the initially recoverable reserves in present discoveries the lower end has been taken to be the proven reserves and the upper end the sum of the proven plus probable plus possible reserves, giving a range of 1500–2650 million tonnes. This compares with an equivalent range of 1500–2575 million tonnes from the estimates given in last year's report. After allowing for production to date of 698 million tonnes the remaining recoverable reserves in present discoveries are estimated to be within the range of 800–1950 million tonnes.

#### (b) Gas

Exploration and appraisal activity increased substantially during 1984 in the gas-prospective areas of the UKCS. An encouraging number of new gas discoveries was made, together with



**Table 2:** ESTIMATES OF RECOVERABLE OIL RESERVES IN PRESENT DISCOVERIES ON THE UKCS<sup>(1)</sup> AS AT 31 DECEMBER 1984 (EQUIVALENT FIGURES FOR 1983 ARE IN BRACKETS).

				Million tonnes <sup>(2)</sup>
Category	Proven*	Probable*	Proven plus Probable	Possible*
A Initially Recoverable Reserves				
1 Fields in production or under development	1450 (1450)	225 (225)	1675 (1675)	250 (250)
2 Other significant finds not yet fully appraised	50 (50)	275 (225)	325 (275)	400 (375)
Total initial reserves in present discoveries	1500 (1500)	500 (450)	2000 (1950)	650 (625)
B Remaining Recoverable Reserves				
Cumulative production to the end of 1984	698 (572)			
Total remaining reserves in present discoveries (Rounded to 25 million tonnes)	800 (925)	500 (450)	1300 (1375)	650 (625)

\*The terms 'proven', 'probable' and 'possible' are applied on a field by field basis and 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 (ie. those reserves which have a better than 90 per cent chance of being produced).
- (ii) Probable — those reserves which are not yet 'proven' but 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 cannot be regarded as 'probable' but are estimated to have a significant but less than 50 per cent chance of being technically and economically producible.

<sup>(1)</sup> Includes onshore and offshore discoveries.

<sup>(2)</sup> Figures are rounded to the nearest 25 million tonnes, and include gas liquids and liquefied products.

successful appraisal of earlier discoveries. The remaining recoverable reserves in present discoveries classed as proven and probable has been raised from 1149 bcm (40.6 tcf) to 1325 bcm (46.8 tcf), an increase of 176 bcm (6.2 tcf), or 15 per cent.

In the Southern Basin of the North Sea five new fields (North Sean, South Sean, Esmond, Forbes and Gordon) were approved for development and projects to

tap additional reserves were approved for the Indefatigable and Leman fields. Eleven new developments were under discussion at the end of the year.

A number of gas discoveries was made in previously undrilled structures in the Southern North Sea and in the Central North Sea. Additional reserves were also proved in some existing fields.

Gas reserves are defined as the quantities



of gas available for consumption obtainable from the sources listed in Table 3. Gas which has been or is expected to be flared or used offshore is not included. Liquids and liquefied products obtained from gas fields, condensate fields and from the associated gas in oil fields are included in the estimate of oil reserves in Table 2.

The approval of the Esmond and Sean areas has resulted in 23 bcm in the proven plus probable reserves of dry gas fields being transferred from Category A1(b)(i) to A1(a)(i). The successful outcome of exploration and appraisal drilling in the Southern Basin has more than compensated for this, the net result being to increase the proven plus probable reserves in the former category by 119 bcm.

Gas reserves in gas condensate fields (Category A2) have also increased as a result of new discoveries but during 1984 no new gas fields of this type were approved for development. The proven plus probable reserves have increased by 78 bcm and the possible reserves by 42 bcm. Associated gas reserves, (Category A3), remain virtually unchanged from last year.

The net result of these changes is to increase the proven plus probable recoverable gas reserves initially in present discoveries from 1615 to 1829 bcm (57.1 to 64.6 tcf). About 504 bcm (17.8 tcf) have been produced, leaving remaining recoverable gas of 1325 bcm (46.8 tcf), some 15 per cent above last year's figure of 1149 bcm (40.6 tcf).

In order to derive a range for the initially recoverable gas reserves in present discoveries the lower end has been taken to be the proven reserves and the upper end as the sum of the proven plus probable plus possible reserves, giving a range of 1229–2472 bcm (43.4–87.3 tcf). This compares with an equivalent range of 1178–2155 bcm (41.6–76.2 tcf) in last year's report.

## **2.2 Undiscovered recoverable reserves**

Table 4 gives the range for undiscovered oil and gas reserves for the five major geological areas of the UKCS. It should be emphasized that the forecasting of undiscovered reserves is more speculative than that for discovered reserves.

Updating of the major review reported in April 1984 has continued. The figures in Table 4 are derived from last year's analysis of the undrilled geological structures identified in the Northern North Sea, the Southern North Sea Basin and the Irish Sea modified by taking account of 1984 drilling. The methodology employed is exactly the same as last year though refinements have been made to the data used in the oil case. Standard statistical methods were employed to obtain the ranges for each of the areas defined in Table 4.

In this analysis no account has been taken of reserves in stratigraphic plays and in potential traps beyond the current level of seismic resolution and penetration, such as the Carboniferous in the Southern Gas Basin. Cut-off points for recoverable reserves of 25 million barrels for oil and 100 billion cubic feet for gas were applied to the computations for each identified structure. This does not imply that finds below these levels, if made, would necessarily be uneconomic.

The increased level of exploration drilling during 1984, which has resulted in 106 exploration wells being drilled and 23 discoveries being made (11 of oil and 12 of gas and gas condensate), has inevitably led to a reduction in the range of potential undiscovered reserves as structures have been drilled and the presence or absence of hydrocarbons in those structures has been established. As further drilling is carried out and studies made of the other areas the figures will change.

### **(a) Oil**

As a consequence of the high level of



**Table 3:** ESTIMATES OF RECOVERABLE GAS RESERVES IN PRESENT DISCOVERIES ON THE UKCS<sup>(1)</sup> AS AT 31 DECEMBER 1984. FIGURES IN BILLION CUBIC METRES. FIGURES IN BRACKETS ARE TRILLION CUBIC FEET. (ANY DISCREPANCIES IN TOTALS ARE DUE TO ROUNDING.)

Category	Proven*	Probable*	Proven plus Probable	Possible*
<b>A Initially Recoverable Reserves</b>				
1 Gas from dry gas fields				
a) Fields in production or under development				
i) Southern Basin	714 (25.2)	25 ( 0.9)	739 (26.1)	20 ( 0.7)
ii) Other areas <sup>(2)</sup>	187 ( 6.6)	37 ( 1.3)	224 ( 7.9)	31 ( 1.1)
Sub total	901 (31.8)	62 ( 2.2)	963 (34.0)	51 ( 1.8)
b) Other significant discoveries not yet fully appraised				
i) Southern Basin	156 ( 5.5)	210 ( 7.4)	365 (12.9)	176 ( 6.2)
ii) Other areas <sup>(2)</sup>	— ( —)	— ( —)	— ( —)	42 ( 1.5)
Sub total	156 ( 5.5)	210 ( 7.4)	365 (12.9)	218 ( 7.7)
Total dry gas	1057 (37.3)	272 ( 9.6)	1328 (46.9)	269 ( 9.5)
2 Gas from condensate fields <sup>(3)</sup>				
a) Fields in production or under development	40 ( 1.4)	8 ( 0.3)	48 ( 1.7)	14 ( 0.5)
b) Other significant discoveries not yet fully appraised	— ( —)	275 ( 9.7)	275 ( 9.7)	320 (11.3)
Total gas from condensate fields	40 ( 1.4)	283 (10.0)	323 (11.4)	334 (11.8)
3 Associated gas from oil fields <sup>(3)</sup>				
a) Fields in production or under development				
i) Currently delivering to shore	99 ( 3.5)	3 ( 0.1)	102 ( 3.6)	3 ( 0.1)
ii) Expected to be connected	31 ( 1.1)	14 ( 0.5)	45 ( 1.6)	8 ( 0.3)
Sub total	130 ( 4.6)	17 ( 0.6)	147 ( 5.2)	11 ( 0.4)
b) Other significant discoveries not yet fully appraised	3 ( 0.1)	28 ( 1.0)	31 ( 1.1)	28 ( 1.0)
Total associated gas	133 ( 4.7)	45 ( 1.6)	178 ( 6.3)	40 ( 1.4)
Total initial reserves in present discoveries	1229 (43.4)	600 (21.2)	1829 (64.6)	643 (22.7)
<b>B Remaining Recoverable Reserves</b>				
Cumulative production to end of 1984 <sup>(4)</sup>				
1 Dry gas				
a) Southern Basin	445 (15.7)			
b) Other areas	44 ( 1.6)			
2 Associated gas from oil fields	15 ( 0.5)			
Total cumulative production to end 1984	504 (17.8)			
Total remaining reserves in present discoveries	725 (25.6)	600 (21.2)	1325 (46.8)	643 (22.7)

notes \*The terms proven, probable and possible have the meanings defined in Table 2.

<sup>(1)</sup> Includes onshore and offshore discoveries.

<sup>(2)</sup> UK Frigg and Morecambe.

<sup>(3)</sup> All in Northern Sectors of the North Sea (North of 56° N).

<sup>(4)</sup> Excludes flared gas and gas used on platforms.



**Table 4:** ESTIMATES OF UNDISCOVERED RECOVERABLE RESERVES ON THE UKCS<sup>(1)</sup>  
RESERVES IN FUTURE DISCOVERIES BY GEOLOGICAL AREA

Area	Range of estimated reserves <sup>(4)(5)</sup>	
	Oil (million tonnes)	Gas (bcm, <sup>(6)</sup> tcf in brackets)
a) Northern and Central North Sea (56°N–62°N) <sup>(2)</sup>	300–1450	10–130 (0.3– 4.6)
b) West of Shetland	25– 350	not assessed
c) West of Scotland <sup>(3)</sup>	0– 550	not assessed
d) Southern Basin and Irish Sea	assumed nil	140–345 (5.0–12.1)
e) Remainder of UKCS <sup>(1)</sup>	5– 475	not assessed
TOTALS	330–2825	150–475 (5.3–16.7)
<sup>(1)</sup> Includes onshore and offshore assessments. <sup>(2)</sup> Gas associated with oil. <sup>(3)</sup> The bottom end of the range is taken as zero because no oil has been proved to date in this area. <sup>(4)</sup> Totals for each area have been rounded to 25 million tonnes or 5 billion cubic metres. <sup>(5)</sup> Every prospect included in the survey on which this table is based is estimated to contain reserves of at least 3.5 million tonnes of oil (25 million barrels) or 28 bcm of gas (100 tcf). <sup>(6)</sup> No account has been taken of projected fuel gas usage and flaring.		

exploration drilling and the data refinements referred to above, there has been a reduction in the estimate of undiscovered reserves in the Northern and Central North Sea from 450–1900 million tonnes to 300–1450 million tonnes. The ranges of undiscovered potential in the other geological areas where oil is thought likely to be found remains unchanged from the 1984 figures as no further studies have been undertaken and little drilling has been carried out. In these other areas it should not be assumed that any new study would lead to an increase in the reserves.

The total estimated undiscovered oil potential now lies in the range 330–2825 million tonnes compared with last year's estimates of 480–3275 million tonnes.

#### (b) Gas

The increased level of exploration drilling in the Southern North Sea (which has the effect of reducing the number of identified structures yet to be drilled) has also led to a reduction in the range of undiscovered potential for gas from 170–440 bcm (6.0–15.5 tcf) to 140–345 bcm (5.0–12.1 tcf).

For the Northern and Central North Sea the range of reserves widens from 15–130 bcm (0.5–4.6 tcf) to 10–130 bcm (0.3–4.6 tcf), taking into account gas from condensate prospects.

Total potential reserves of undiscovered gas, including gas from condensate prospects on the UKCS, are considered to be within the range 150–475 bcm (5.3–16.7 tcf), compared with last year's estimates of 185–570 bcm (6.5–20.1 tcf).

The ranges obtained for undiscovered reserves of oil and gas in the North Sea and Irish Sea, together with the earlier, less detailed estimates for the West of Scotland, West of Shetland and the remainder of the UKCS which are unchanged from last year, are given in Table 5. The eventual outcomes can be expected to be below the mid-point of the ranges.

Estimates of this kind for oil and gas must be treated with caution. However, the figures in Tables 4 and 5 indicate that there remains a good chance of finding considerable additional quantities of oil and gas in undrilled structures on the UKCS.



### 2.3 Estimated total potential of the UKCS

If the ranges estimated in Table 4 are added to the ranges for the known oil and gas recoverable reserves given in Section 2.1 the following ranges result for initially recoverable hydrocarbons on the UKCS:–

**Table 5:** *UKCS INITIALLY RECOVERABLE RESERVES*

	million tonnes	
Oil:	1500–2650 (discovered)	
	330–2825 (undiscovered)	
	<hr/> 1830–5475 <hr/>	
	bcm (tcf)	
Gas:	1229 (43.4)–2472 (87.3) (discovered)	
	150 ( 5.3)– 475 (16.7) (undiscovered)	
	<hr/> 1379 (48.7)–2947 (104.0) <hr/>	

Taking account of cumulative production to date of 698 million tonnes of oil and of 504 billion cubic metres of gas, total remaining reserves are estimated to be in the range of 1130–4780 tonnes of oil and 875–2443 bcm of gas. Ranges given in last year's report were 1410–5280 million tonnes of oil and 900–2260 bcm of gas.

There is a case on statistical grounds for narrowing the ranges quoted for total UKCS discovered oil and gas reserves. However, it is not yet possible to quantify with any accuracy the extent to which the ranges should be narrowed as reserves estimated for individual fields are not entirely independent of each other. As last year we have therefore preferred to quote ranges based on low end points of proven and high end points of proven plus probable plus possible reserves.



# Part 3: Development

## 3.1 Development drilling

In 1984 108 oil and gas development wells were started on the UKCS, a similar level of drilling to that in the two previous years. Twenty gas wells were started including the first development wells in Morecambe Bay. Drilling East of Scotland and East of Shetland remained at a similar level to that in 1983. The number of development wells drilled by mobile drilling rigs rose to about 30 per cent of the total. Although the number of wells drilled by fixed platform rigs fell, rig activity also rose due to an increase in well servicing and repair operations on existing wells.

Ten subsea satellite development wells were started in 1984. Appendix 2 contains details of all rig activity in the years 1975 to 1984 by geographical area offshore and onshore and the number of new wells started in each of those areas during each year.

## 3.2 Development programmes

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. In 1984 15 developments were approved: seven oil, seven gas and one pipeline. These are listed in Table 6. Six developments were approved in the first two months of 1985.

### Future developments

Proposals for 18 oil and gas developments are being discussed with the Department at

**Table 6:** *Developments approved in 1984*

Approval Dates	
<b>Oil</b>	
Beatrice C*	12 January 1984
South East Forties*	30 May 1984
Deveron	27 September 1984
North West Heather*	25 October 1984
Welton (Onshore)	1 November 1984
Innes	14 November 1984
Cyrus	27 November 1984
<b>Gas</b>	
North Sean } South Sean }	16 April 1984
Indefatigable (L & M)*	24 May 1984
Esmond } Forbes } Gordon }	25 May 1984
Leman East G*	5 July 1984
<b>Pipeline</b>	
Montrose-Forties	5 April 1984

\* Extensions to existing fields

the time of going to print, and discussions could begin during 1985 on proposals for another 15 developments.



### 3.3 Review of fields\* under development at the end of 1984

#### (a) Offshore oil and condensate

Field (Operator)	Date of production start up	Operator's estimate of (or actual) first year of peak production	Operator's estimated (or actual) peak production (million tonnes per year)	Transport system	Remarks
Alwyn North (Total)	1988	1989	4.36	Oil and NGLs piped to Sullom Voe via Ninian Central. Gas transported to St Fergus via the Frigg pipeline system.	Construction of 2 fixed steel platforms, one for drilling and accommodation, the other for production and process, is progressing.
Balmoral (British Sun)	1987	1987	1.68	Oil and NGLs transported via the Brae-Forties trunk line to Cruden Bay.	Drilling of development wells through the sub-sea template commenced in July 1984. Two wells have been completed. Production will be from 13 wells using a purpose-built floating production vessel.
North Brae (Marathon)	1988	1990	3.2	Liquid condensate piped to South Brae and then into the Brae-Forties pipeline to Cruden Bay. Dry residue gas along with additional gas from South Brae will be reinjected.	Detailed design of the facilities is well advanced, and major construction contracts have been placed. Platform due to be installed in 1987.
Clyde (Britoil)	1987	1988	2.4	Oil piped to Fulmar for tanker loading offshore. Gas piped to Fulmar and then to St Fergus via the new Fulmar pipeline.	Detailed design completed. Major fabrication progressing well. Jacket scheduled for installation 1985, Topsides 1986.
Cyrus (BP)	1988	1989	0.40	Oil will be stored on board the SWOPS <sup>(1)</sup> vessel and gas will be utilised for power generation.	The contract to build the SWOPS <sup>(1)</sup> placed with Harland and Wolff in March 1985
Highlander (Texaco)	Feb 1985	1986	0.8	Oil and gas to Tartan platform. From there oil will be sent to Flotta.	

<sup>(1)</sup> Single well oil production system



### 3.3 cont.

Field (Operator)	Date of production start up	Operator's estimate of (or actual) first year of peak production	Operator's estimated (or actual) peak production (million tonnes per year)	Transport system	Remarks
Highlander (cont)				Gas will be sent to St Fergus via the Frigg pipeline.	
Innes (Hamilton)	Jan 1985	1985	0.6	Oil transported by pipeline to Duncan/Argyll tanker loading facility.	Approved in November 1984. Transworld-58 installed on field in 1984. Production from a single well started in January 1985.
South East Forties (See Forties field section 4.9)					
(b) Offshore gas		(billion cubic metres per year)			
Esmond, Forbes and Gordon (Hamilton)	1985	1985	2.1	Pipeline to Bacton	Central Processing and wellhead platforms on Esmond, and two satellite platforms on Forbes and Gordon. Approval given in May 1984. Four jackets were installed in 1984. Five wells were drilled in 1984.
South Morecambe (HGB)	1985	1989	3.7	Pipeline to Barrow	Proceeding with hook-up on five platforms installed for stage I. First gas produced from two wells January 1985.
Rough storage (BGC)	1985	1987	1.1	Pipeline to Easington	New 'B' platform complex installed. First gas injection planned for Summer 1985.
Indefatigable extension (see Indefatigable field, Section 4.9)					
Leman extension (see Leman field, Section 4.9)					
North Sean and South Sean	1986	1987	1.7	Pipeline to Bacton	Annex B approval in April 1984 for these peak shaving fields.

\* The use of the term 'field' here and elsewhere in the report does not imply that all the fields listed are necessarily geologically separate accumulations or are regarded as separate fields for tax and royalty purposes.



# Part 4: Production and downstream activities

## 4.1 Oil production

Two new offshore oil fields came on stream in 1984, bringing the total number in production to 27. In addition, the Welton onshore oil field started production. Start up dates were: Hutton (6 August), Deveron (28 September), and Welton (17 November). Production from the additional development of the Beryl field ('Beryl B') began on 6 July. Total oil production increased from 114.9 million tonnes in 1983 to 125.9 million tonnes in 1984. This includes 4.1 million tonnes of heavier natural gases, 0.6 million tonnes of condensate, and 0.3 million tonnes of onshore crude oil (of which 0.2 million tonnes were produced from the Wytch Farm field and 0.1 million tonnes from other minor fields in the East Midlands and Dorset). Production from the individual oil fields is given in Appendix 8.

## 4.2 Oil production forecasts

Forecasts of petroleum production were given by the Minister of State for Energy in reply to a Parliamentary Question on 13 March 1985. The reply is reproduced at Appendix 16.

## 4.3 Oil disposal

Total disposals of UKCS oil in 1984 amounted to 125 million tonnes.

45.4 million tonnes were delivered to UK refineries, constituting 60 per cent of the total deliveries of oil to UK refineries. The 24.2 million tonnes of foreign crudes imported during the year compared with exports of UKCS crudes of 77 million tonnes.

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.

## 4.4 Oil terminals

The majority of UKCS oil production is received at four landward oil terminals located at Sullom Voe in the Shetlands, Flotta in the Orkneys, Hound Point on the Firth of Forth (which receives oil from Forties, Montrose and South Brae via Cruden Bay) and Nigg Bay on the Cromarty Firth. In 1984 these terminals received 98.3 million tonnes of crude oil, some 81 per cent of total UKCS production, the remainder being loaded into tankers offshore. Details of the four terminals are shown in table 7. A fifth landward oil terminal at Teesside receives oil from the Norwegian Ekofisk field. A pipeline was constructed by Amoco during the year to transport oil from their Montrose field to Forties, whence it flows via the Forties pipeline to Hound Point.

## 4.5 Gas production

In 1984 gas produced from the UKCS amounted to 40 billion cubic metres (1.4 trillion cubic feet). Production from the individual fields is set out in Appendix 9.

Supplies of UKCS gas to BGC (1.3 trillion cubic feet) in 1984 were at about the same level as in 1983 and accounted for 72 per cent of their total supplies. Deliveries of associated gas to shore by the Far North Liquids and Associated Gas System



**Table 7:** *Oil terminals receiving UKCS crude oil in 1984*

Terminal	Location	Fields connected	1984 Receipts (million tonnes)
1. Sullom Voe	Shetland	Brent, Thistle, Dunlin, Deveron, Murchison, North Cormorant and South Cormorant, Hutton, North West Hutton (Brent system)	56.1
		Ninian, Magnus and Heather (Ninian system)	
2. Flotta	Orkneys	Piper, Claymore, Tartan	15.7
3. Forties (landward)	Hound Point	Forties, South Brae, Montrose (via Cruden Bay)	24.3
4. Nigg Bay	Cromarty Firth	Beatrice	2.2
Total			98.3

(FLAGS), supplemented during 1984 with the commencement of deliveries from Magnus and Thistle, represented some 10.5 per cent of supplies. There was a slight decrease in supplies from certain Southern Basin fields, and imports rose as a result of increased output from the UK/Norwegian Frigg field (60.82 per cent of production from this field is deemed to come from Norway) and the commencement of deliveries from the Norwegian North East Frigg and Odin fields. Gas production from the Victor field started in September 1984, and the first gas from BGC's Morecambe development was delivered in January 1985.

#### 4.6 Gas terminals

There are eight gas terminals in the UK: three at Bacton, two at Easington and one at Theddlethorpe, which receive gas from the Southern Basin fields; and two at St Fergus to serve the Frigg pipeline system and FLAGS. Additional work is being undertaken at the Shell/Esso terminal at

Bacton to receive and process gas to be produced from the North Sea and South Sea fields and at the Amoco terminal at Bacton which will provide the landfall for gas from the Esmond, Forbes and Gordon fields through the pipeline constructed by Hamilton Brothers. Additional processing facilities are also being installed at St Fergus within the FLAGS terminal to handle gas to be transported through the Fulmar pipeline. A ninth terminal is under construction at Westfield Point near Barrow-in-Furness for gas from the Morecambe field and some of the gas handling and processing facilities at this terminal came into use in January 1985. Work is at an advanced stage at Easington where the BGC terminal is being expanded to deal with the large flow rate of gas that will result from the conversion of the Rough field to a seasonal storage facility.

#### 4.7 Gas flaring

The volume of offshore gas flaring has continued to fall during 1984, from a peak



average of about 18 million cubic metres a day in 1979 to less than 9 million cubic metres a day in 1984. Over the same period oil production has increased by some 57 per cent.

Under the terms of petroleum production licences, gas may only be flared with the consent of the Secretary of State for Energy, and the Government's strict flaring policy continues to be maintained and enforced. Consents for flaring at levels above those necessary to ensure safe operation are given only when there is no technically and/or economically feasible alternative means of gas disposal. No development plans for new fields will be approved unless satisfactory proposals are made for the collection of gas where this is technically and economically feasible.

Further information on gas flaring at oil terminals and producing fields is given in Appendix 11.

fractionator, of a new cracker for Esso which will also in due course use Mossmorran ethane.

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

1984 marked a major step forward for the natural gas liquids facilities associated with FLAGS, with the commissioning in November of Shell/Esso's fractionating plant at Mossmorran in Fife. All gases landed at St Fergus by FLAGS, other than BGC specification gas separated there, are now carried to Mossmorran by the new NGL pipeline, and ethane is no longer supplied to Peterhead power station. At Mossmorran, the mixed stream is fractionated into ethane, butane, propane and condensate ('natural gasoline') streams. The latter three are piped to the loading terminal constructed nearby at Braefoot Bay. In addition, the twin pipelines from Mossmorran to Grangemouth to carry ethane and ethylene were commissioned during the year. All the ethane from the fractionator at present goes to Grangemouth, for use as feedstock in BP's ethylene cracker there. Construction continues, on a site adjacent to the



## 4.9 Review of fields\* in production

Field (Operator)	Date of production start up	Operator's estimate of (or actual) first year of peak production	Operator's estimated (or actual) peak production (million tonnes per year)	Transport system <sup>(1)</sup>	Remarks
<i>(a) Offshore oil</i>					
Argyll (Hamilton)	June 1975	1977	1.1	Tanker loading offshore	Geological review underway on the Rotliegendes (Permian) reservoir. Transworld-58 production facility replaced by Deepsea Pioneer (see also Duncan field). One development well drilled in 1984.
Auk (Shell)	Dec 1975	1977	2.3	Tanker loading offshore	A geological review has been completed. Predicted field life extended beyond 1995. Four more development wells planned.
Beatrice (Britoil)	Sept 1981	1985	2.4	Oil and NGLs piped to Nigg Bay	Production from 'B' platform commenced in June from eight pre-drilled wells. 'C' satellite water injection platform installed to be operational early in 1985.
Beryl (Mobil)	'A' June 1976	1980	5	Tanker loading offshore. Gas is being re- injected until a disposal route is available.	Two production wells completed on Beryl A. Data gathering continued to determine a development plan for the Lower Beryl reservoir.
	'B' July 1984	1986	3.3		Beryl B production began in July 1984 with gas injection commencing in December 1984.
South Brae (Marathon)	July 1983	1985	5.0	Oil and NGLs piped to Cruden Bay via Forties. Gas re-injected until it can be transported to North Brae.	Six production wells completed during the year. Gas and water injection commenced in spring 1984. BP have proved the extension of South Brae into Block 16/7b. The two licence groups are holding discussions on future plans.
Brent (Shell)	Nov 1976	1984	19.9	Oil and NGLs piped to Sullom Voe via South Cormorant. Tanker loading facilities also available. Gas transported to St Fergus via FLAGS.	During 1984 plateau production level for oil was reached. Eight oil producing wells and three water injection wells were drilled during the year.



Field (Operator)	Date of production start up	Operator's estimate of (or actual) first year of peak production	Operator's estimated (or actual) peak production (million tonnes per year)	Transport system <sup>(1)</sup>	Remarks
Buchan (BP)	May 1981	1983	1.7	Tanker loading offshore	One dry well was drilled during the year. Buchan Alpha was taken off station in October 1984 for maintenance inspection and installation of gas lift equipment. A revised Annex B was approved in December.
Claymore (Occidental)	Nov 1977	1984	5.5	Oil and NGLs piped to Flotta. Extra fuel and lift gas supplied from Piper as necessary.	Three development wells (two in the Main Area and one in the Northern Area) were drilled to improve production and water injection pattern. The Scapa field to the south west is being tested from the platform.
North Cormorant (Shell)	Feb 1982	1986	6.2	Oil and NGLs piped to Sullom Voe via South Cormorant. Gas to St Fergus via Western Leg and FLAGS.	Four oil production wells and one water injector were drilled in 1984. At present a total of 13 wells is operating in the field.
South Cormorant (Shell)	Dec 1979	1984	2.6	Oil and NGLs piped to Sullom Voe. Gas transported to St Fergus via Western Leg and FLAGS.	One injection and one production well were completed in 1984. The total number of wells drilled from the Cormorant A platform is 14. By year end three oil production wells and one water injection well were completed from the Central Cormorant Underwater Manifold Centre (UMC).
Deveron (Britoil)	Sept 1984	1985	0.3	Oil and NGLs co-mingled with Thistle's are piped to Sullom Voe.	Approved September 1984, immediate start up using appraisal well drilled 1983. Two further wells to be drilled from Thistle platform. Oil co-mingled with Thistle's on platform for processing.
Duncan (Hamilton)	Nov 1983	1985	0.69	Tanker loading offshore.	No further drilling is planned until a re-evaluation of the area has taken place. The Deepsea Pioneer, which carries water injection capability, serves both Argyll and Duncan fields, replacing the Transworld-58.
Dunlin (Shell)	Aug 1978	1984	5.4	Oil and NGLs piped to Sullom Voe via South Cormorant.	Five wells were spudded this year, four have been completed. Shell were drilling the 33rd platform well at the end of the year.



## 4.9 cont.

Field (Operator)	Date of production start up	Operator's estimate of (or actual) first year of peak production	Operator's estimated (or actual) peak production (million tonnes per year)	Transport system <sup>(1)</sup>	Remarks
Forties (BP)	Sept 1975	1980	24.6	Oil and NGLs piped to Cruden Bay.	Seven development wells were drilled this year. A minimum facilities satellite platform development was approved in May 1984 for the south-east extension of Forties into Block 22/6a and is under construction.
Fulmar (Shell)	Feb 1982	1984	6.4	Tanker loading offshore. Gas is being re-injected until it can be transported by pipeline to St Fergus.	Four development wells (2 water injectors and 2 oil producers) were drilled in 1984.
Heather (Union)	Oct 1978	1982	1.7	Oil and NGLs piped to Sullom Voe via Ninian Central platform.	The NW Heather extension was brought on stream in 1984. 6 development wells were drilled this year.
Hutton (Conoco)	Aug 1984	1986	4.7	Oil and NGLs piped to Sullom Voe via NW Hutton and South Cormorant.	Production from Tension Leg Platform started 6 August. Initial production was from 6 pre-drilled wells. Water injection is planned for early 1985.
North West Hutton (Amoco)	April 1983	1984	2.5	Oil and NGLs piped to Sullom Voe via South Cormorant. Gas piped to St Fergus via the Western Leg and FLAGS.	Water injection has been implemented during 1984 and gas lift has recently commenced. Plant to remove H <sub>2</sub> S from the export gas has been installed and commissioned. Ten new development wells were spudded this year, and one well redrilled.
Magnus (BP)	Aug 1983	1985	5.8	Oil and NGLs piped to Sullom Voe via Ninian Central. Gas piped to St Fergus via the Northern Leg and FLAGS.	Four platform wells have now been completed, two injectors and two producers. A fifth well was being drilled at the end of the year.
Maureen (Phillips)	Sept 1983	1984	3.9	Tanker loading offshore.	Oil production rates were higher than predicted. Gas lift equipment was commissioned to deal with expected water encroachment in early 1985.



## 4.9 cont.

Field (Operator)	Date of production start up	Operator's estimate of (or actual) first year of peak production	Operator's estimated (or actual) peak production (million tonnes per year)	Transport system <sup>(1)</sup>	Remarks
Montrose (Amoco)	June 1976	1979	1.4	Oil and NGLs transported by a new pipeline to Forties and then by the existing pipeline to Cruden Bay, from Nov 1984.	One new development well was completed in 1984.
Murchison (Conoco)	Sept 1980	1983	5.4 <sup>(2)</sup>	Oil and NGLs piped to Sullom Voe via Dunlin and South Cormorant. Gas transported via the Northern Leg to Brent and from there via FLAGS to St Fergus.	One development well was drilled in 1984.
Ninian (Chevron)	Dec 1978	1982	15.1	Oil and NGLs piped to Sullom Voe. Gas transported to St Fergus via the Western Leg and FLAGS.	One appraisal well and one sidetrack production well were completed from the northern platform.
Piper (Occidental)	Dec 1976	1979	13	Oil and NGLs piped to Flotta. Gas transported to St Fergus via Frigg pipeline system.	Artificial lift programme underway with four downhole pumps operating by year end and provision for a further eight by end 1986.
Statfjord (Conoco)	Nov 1979	1988	28.5 <sup>(2)</sup>	Tanker loading offshore. Deliveries of UK Statfjord gas piped to St Fergus, via the Northern Leg and FLAGS, will commence in 1985. Norwegian gas deliveries to Karsto, via the Statpipe system, commence in 1985.	Production from the 'C' platform is due to begin in 1985.



## 4.9 cont.

Field (Operator)	Date of production start up	Operator's estimate of (or actual) first year of peak production	Operator's estimated (or actual) peak production (million tonnes per year)	Transport system <sup>(1)</sup>	Remarks
Tartan (Texaco)	Jan 1981	1984	1.4	Oil and NGLs piped to Flotta via Claymore. Gas transported to St Fergus via Piper and the Frigg pipeline system.	A revised development plan was discussed with the Department.
Thistle (Britoil)	Feb 1978	1982	6.0	Oil and NGLs piped to Sullom Voe. Gas now transported to St Fergus via the Northern Leg and FLAGS.	One production well was completed in 1984. Gas deliveries commenced March 1984 Northern Area '6' production test continuing. A third turbine generator was installed to ensure improved power supply reliability.
<i>(b) Onshore oil</i>					
Welton (BP)	Nov 1984	1986	0.12	Oil will be transported by rail. Gas used for fuel gas and H <sub>2</sub> S stripping. Acid gas will be incinerated.	Six well appraisal programme was successfully completed during year. Development approval in November. Two of the ten proposed development wells drilled in 1984.
Wytch Farm (BP)	March 1979	not assessed	not assessed	Oil piped to a rail terminal at Furzebrook. Gas is fed locally into the BGC grid	



#### 4.9 cont.

Field (Operator)	Date of production start up	Operator's estimate of (or actual) first year of peak production	Operator's estimated (or actual) peak production (billion cubic metres per year)	Transport system <sup>(1)</sup>	Remarks
(c) Gas					
Viking (Conoco)	Oct 1972	1974/75	9.5	Pipeline to Theddlethorpe	The tie in for the Victor satellite was completed.
Victor (Conoco)	Sept 1984	1984	2.6	Pipeline to the Viking B complex and thence to Theddlethorpe	Two production wells were drilled at the beginning of 1984. Production commenced in September 1984.
West Sole (BP)	Mar 1967	1971	1.1	Two pipelines to Easington	New onshore compression plant operated successfully during the year.
Leman East (Amoco)	July 1969	1975	8.8	Pipelines to Bacton	The 'H' and 'J' platforms commenced production in 1984. The 'G' platform (approved 1984) will commence production in 1985. The extra platforms will improve recovery of gas from area. Eight development wells were drilled.
Leman West (Shell)	Aug 1968	1976	10.4	Pipelines to Bacton	The 'F' and 'G' platforms will improve recovery of gas from areas which would otherwise not be fully drained.
Frigg (UK) (Elf Norge)	Sept 1977	1980	6.5	Two pipelines to St Fergus (via platform MCP01)	
Indefatigable (Shell)	Oct 1971	1974	2.8	Pipeline to Bacton	An extension to the field is underway with construction of a satellite jacket, and two development wells were drilled.
Indefatigable (Amoco)	Sept 1971	1977	4.1	Pipeline to Bacton	
Hewett (Phillips)	July 1969	1977	8.6	Two pipelines to Bacton	

\* The use of the term 'field' here and elsewhere in the report does not imply that all the fields listed are necessarily geologically separate accumulations or are regarded as separate fields for tax and royalty purposes.

(1) For fields connected to FLAGS, relatively wet gas including some NGLs is transported to St. Fergus. For those fields connected to the Frigg line, the gas needs to be rather dry, so most NGLs have to be injected into the crude for transmission to Flotta. For pipeline fields some NGLs are blended into the oil streams prior to pumping ashore.

(2) Including the Norwegian sector of the field.



# Part 5: Operational aspects

## 5.1 Offshore employment

A survey of the workforce employed offshore was conducted by the offshore operators in September 1984, on behalf of the Inland Revenue. The returns reveal that in 1984 the total workforce stood at some 31,300 personnel, compared with around 28,700 in 1983. Of the total, some 85 per cent were UK nationals. As before, the survey covered not only those employed on offshore installations but also construction workers and personnel on mobile drilling rigs, service vessels, support barges and survey teams.

## 5.2 Training

In 1984, good progress was made in the development of suitable standards for offshore safety training. This was largely through the work of the Working Party of the Health and Safety Commission's Oil Industry Advisory Committee (OIAC) which is considering safety training needs. Department of Energy officials chair the Working Party and provide the Secretariat. It met on five occasions during the year and completed work on several fronts. These included the development of standards for the training of radio-telephone operators and helicopter landing officers, both of which were approved for publication by OIAC; and standards for survival training and the training of ballast control operators all of which have now been approved by OIAC.

In connection with the training of divers, 516 divers were issued with Part I (offshore air diving) certificates, and 219 divers with Part II (bell diving) certificates in 1984.

The review and updating of the air and bell diving training standards has been completed and revised standards should be introduced shortly.

In 1984, certificates were issued to 2,119 persons who had passed examinations under the Offshore Installations (Well Control) Regulations 1980.

## 5.3 Offshore safety

During 1984, Inspectors from the Department of Energy continued to enforce health, safety and welfare legislation on and around offshore installations and at pipe laying operations. Four prosecutions were heard before courts in Scotland and England. One of these arose from an incident in 1982 in which three persons died when a bridge joining two installations failed. The fines imposed on the operating company and the contractor concerned were among the highest ever imposed for offences under the Health and Safety at Work etc Act 1974.

At the end of 1984 three other cases were being considered by the Procurator Fiscal in Scotland and another case has recently been heard before magistrates in England.

On 1 May 1984 the Offshore Installations (Application of Statutory Instruments) Regulations 1984 came into operation. These applied existing legal requirements for fire fighting equipment, life-saving apparatus, emergency procedures and operational safety, health and welfare to gas storage installations and accommodation installations which had been brought within the definition of an



installation in the Mineral Workings (Offshore Installations) Act 1971 by the Oil and Gas (Enterprise) Act 1982.

The development of other legislation continued during 1984. Further formal consultation with the industry was carried out in connection with the proposals for new offshore first aid regulations; no firm date for the making of regulations has been set.

Informal consultation on the means of establishing offshore safety committees and appointing safety representatives as recommended in the Burgoyne Report\* was also undertaken. A further round of consultations on more detailed proposals is expected in 1985 when the offshore industry's initial views have been received.

The Department of Energy continued to liaise closely with the Health and Safety Executive (HSE) to ensure that any health and safety legislation promulgated by HSE in relation to onshore activities is applied offshore where appropriate, and in a form relevant to the management structure which exists offshore. For example, in 1984 the Asbestos (Licensing) Regulations 1983 came into force and will apply to offshore activities. Extensive discussions with HSE in relation to their proposed Control of Substances Hazardous to Health Regulations have also taken place and industry is currently being consulted about the question of applying these regulations offshore.

Early in 1984 a final agreement was concluded with the industry in connection with the improvements to the braking systems on draw works (the winching mechanism for raising and lowering drilling equipment).

The Department of Energy hosted the Fourth Conference on Safety and Pollution Safeguards in the Development of North

West European Offshore Mineral Resources held in October. Substantial progress was made with the development of several standards relating to the safety of mobile offshore drilling units (including design, stability and life saving appliances). Denmark has now taken over the Chairmanship of this work.

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

In 1984 13 fatal accidents, 41 serious accidents and 188 dangerous occurrences were reported under the Offshore Installations (Inspectors and Casualties) Regulations 1973. Four of the fatalities resulted from a fire in the bottom of the utility leg of an installation in which 13 persons were working. Another potentially serious incident occurred on an installation when gas processing plant ruptured and flammable gas ignited; there was severe damage to plant and four men were injured. One of the year's fatalities involved drowning during diving operations.

Further information on accident statistics is given in Appendix 15.

During the year two air crew personnel were killed during a helicopter operation in which no passengers were being carried. These fatalities are not included in the statistics at Appendix 15. Another incident concerned the controlled ditching of a large helicopter carrying approximately 40 passengers. All were rescued without serious injury.

#### **5.5 Offshore emergency planning**

The Department of Energy's Offshore Emergencies Handbook was revised in December 1984 with an improved format to make it more effective in emergencies. The Handbook describes the main lines of communication to be followed and action to be taken by Government, industry and other organisations in the event of a major offshore emergency, such as blow-out, fire or structural failure.

\*Offshore Safety Report of the Committee chaired by Dr J H Burgoyne. March 1980 (Cmnd 7866)



The Department organises exercises in the NOROX series which test the lines of communication and the co-ordination of response in various offshore emergencies. Participants usually include an offshore operator, the police, HM Coastguard, the Marine Pollution Control Unit of Department of Transport, other Government agencies, and the armed services. A NOROX exercise was held in December 1984 which simulated a series of incidents including a helicopter crash, the collision of a vessel with the platform, oil pollution, and fire on the Heather Alpha platform on Block 2/5. The exercise covered search and rescue, fire control and evacuation of the platform, and tested the participants' response to pressure from the public, the press and broadcasting media.

### 5.6 Protection of installations

Contingency plans for the protection of installations against terrorist attack were tested in a variety of exercises during the year and Government arrangements continued for regular surveillance and patrolling of offshore oil and gas installations and pipelines.

During 1984 a further fourteen 500 metre safety zones, into which no unauthorised vessels are allowed to enter or remain, were established around permanent installations. These included platforms on the Rough, Leman, Victor, Esmond, Forbes, Gordon and South Morecambe gas fields, as well as the Beatrice and Hutton oil fields. Safety zones around the Thistle loading buoy and Ninian well 3/3-5a have been revoked following removal of these installations. There are now 133 safety zones established around permanent installations. During the year 87 safety zones were established to protect mobile offshore drilling units while they were on location. Following the recommendation in the Report of the Burgoyne Committee on Offshore Safety (1980) that safety zones should be established around mobile offshore drilling units, there has been an increase in demand

for safety zones around such units as Table 8 demonstrates.

**Table 8:** *Safety zones established for mobile offshore drilling units (1980-84)*

Year	No of safety zones established for mobile offshore drilling units
1980	9
1981	9
1982	11
1983	40
1984	87

The Department is reviewing safety zone legislation with a view to introducing a system under which all offshore installations automatically benefit from the protection of a safety zone.

### 5.7 Environmental aspects

The Prevention of Oil Pollution Act 1971 was amended in 1984 to enable control to be exercised over discharges resulting from operations with oil based drilling fluids. The Prevention of Oil Pollution Act 1971 (Application of section 1) Regulations 1984 (S.I. 1984/1684) which came into effect on 22 November 1984 extend the range of prohibited discharges to 'any oil produced directly or indirectly from crude oil' and will thus include diesel oil and the low toxicity oils now used on the UKCS.

Oil based drilling fluids continue to be used in the majority of wells drilled on the UKCS. During 1984 low toxicity muds replaced diesel based muds in exploration drilling almost completely and no new proposals have been received for the use of diesel based muds on production platforms.

Under the new Regulations exemptions are issued similar to those in force for oily water discharges. These incorporate conditions for the exempted discharges which were drawn up in consultation with the offshore industry in 1983 and 1984.

On 31 October and 1 November 1984 a Ministerial Conference took place in



Bremen in the Federal Republic of Germany on the control and elimination of pollution in the North Sea (The International Conference on the Protection of the North Sea). Discharges from offshore oil and gas platforms were among the subjects considered in detail. They were in general found to be adequately controlled and of relatively minor importance in comparison with the land based discharges.

Nonetheless it was stressed that every effort should be made to maintain or improve upon the present situation and to this end several recommendations were made to strengthen environmental surveillance and monitoring and to review technical standards and practices under the aegis of the Paris Commission.

Individual operators are responsible for dealing with oil spills at offshore

installations and 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 a quick and effective response to any pollution incident. The Government's primary role in pollution incidents would be to monitor the operators' activities and offer advice and assistance.

The number and size of oil spills reported to the Department of Energy in recent years are shown in Table 9.

Excluding the large spills noted below, the average size of spill over the past six years has been between one tonne and three tonnes.

**Table 9:** *Oil spills reported to the Department of Energy 1979-84*

Year	Number	Total amount (tonnes)	Number of producing platforms	Total stabilised crude oil from offshore oil fields (million tonnes)
1979	27	80	19	76.5
1980	86	1120 <sup>1</sup>	22	78.7
1981	71	104	26	87.7
1982	42	162 <sup>2</sup>	28	100.1
1983	62	186 <sup>3</sup>	32	110.5
1984	47	130 <sup>4</sup>	34	120.8

<sup>1</sup> includes one spill of 980 tonnes

<sup>2</sup> includes one spill of 50 tonnes and one spill of 45 tonnes

<sup>3</sup> includes one spill of 39 tonnes and one spill of 75 tonnes

<sup>4</sup> includes one spill of 69 tonnes

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, to allow them to discharge into the sea treated effluents containing small amounts of oil. The exemptions specify the permitted oil content of the discharge; for produced water the oil content must not normally exceed 40 parts per million (ppm). The total oil for all discharges made in this way for the years 1979 to 1984 is shown in Table 10.

The volume of produced water discharged

from oil production platforms is following the trend predicted by data taken from the field development plans. This trend will continue as the oil fields mature and the water content of the produced fluids increases. The oil content of the water discharged in the early life of the field is usually well below the permitted discharge level. However as the water to oil ratio increases so does the throughput of the water treatment plant and the oil content of the effluent rises towards the limit of 40 ppm (expressed as mg per kg).

In 1984 less oil was discharged than in



**Table 10:** *Oil discharge with produced water 1979–1984*

Year	Number of installations permitted to discharge oil	Total oil (tonnes)	Total water × 10 <sup>6</sup> tonnes <sup>1</sup>
1979	16	160	14
1980	20	236	20
1981	24	525	24
1982	26	927	31
1983	30	1700	48
1984	32	1430	56

<sup>1</sup> This includes a relatively constant yearly figure of 12–15 × 10<sup>6</sup> tonnes of storage displacement water which contains typically less than 10 ppm of oil.

1983 because improved water treatment facilities were installed on two major water producing platforms. However a number of installations may have difficulty in keeping within their exemption limits over the next few years unless they too improve their water treatment facilities.

Significant progress was made during 1984 towards a more complete coverage of chemicals used offshore through the Department's non-statutory Chemical

Notification Scheme. This has been achieved by direct contact and consultation with the manufacturers and by an acceptance by industry that environmental factors must be considered when selecting chemicals which may be discharged into the sea. Further information on environmental control onshore can be found in Department of Environment circular 2/85 "Planning control over Oil and Gas Operations".



# Part 6: Economic and Industrial Aspects

## 6.1 The economic impact of UKCS oil and gas

In 1984 UKCS oil and gas production accounted for nearly 6 per cent of the UK Gross National Product (GNP) at factor cost. Table 11 shows the contribution to GNP arising within the sector for the years 1980–1984. The figures in the table do not take account of the full economic contribution of gas to the economy given that major items such as the levy under the Gas Levy Act 1971 on gas exempt from PRT accrue outside the UKCS sector.

Total proceeds from the sale of oil and gas produced on the UKCS in 1984 are estimated to have been £20.3 billion and £1.2 billion respectively. Total tax and royalty receipts attributable to the UKCS are estimated to have been £12.0 billion in the financial year 1984/5. By comparison, the estimated yield from VAT and income tax in 1984/85 were £18.4 billion and £32.7 billion respectively. Table 12 shows Government receipts from royalties and taxes from each financial year 1979/80 to 1984/85.

**Table 11:** *Income from UKCS oil and gas production*

	1980	1981	1982	1983	1984 (provisional)
Value of sales and services rendered	9.6	13.3	15.6	18.3	21.8
less purchases of goods and services*	1.0	1.4	1.9	2.1	2.6
Value added by the sector	8.6	11.9	13.7	16.2	19.2
less interest, profit and dividends due abroad	2.2	2.4	2.6	3.0	3.3
GNP arising within the sector	6.4	9.5	11.1	13.2	15.9

\* Defined as operating plus exploration costs minus employment incomes

## 6.2 UKCS fiscal regime

The reform of business taxation introduced in the Finance Act 1984 applies to the oil industry as it applies to industry generally. The key features are that the rate of Corporation Tax is being reduced (from 45 per cent in 1984/85 to 40 per cent in 1985/86 and 35 per cent in 1986/87) as the 100 per cent first year capital allowances on plant and machinery are

phased out. (Oil exploration and appraisal expenditure will continue to qualify on the present basis for scientific research allowance which remains at 100 per cent).

The Finance Act 1984 also contained some specific changes in oil taxation, including the termination of repayments of Advance Corporation Tax arising from the deduction of PRT for Corporation Tax, and a package of measures concerning the tax treatment



**Table 12:** *Taxes and royalties attributable to UK and UKCS oil and gas*

£ million

Financial year	Royalties	SPD <sup>(1)</sup>	PRT <sup>(2)</sup>	Corporation <sup>(3)</sup> tax	Total
1979/80	628	—	1436	270	2334
1980/81	992	—	2410	480	3882
1981/82	1396	2025	2390	650	6461
1982/83	1632	2395	3274	460	7761
1983/84	1904	1	6016	900	8821
1984/85 (provisional)	2400	—	7200	2400	12000

<sup>(1)</sup> Supplementary Petroleum Duty.

<sup>(2)</sup> Petroleum Revenue Tax. Includes Advance Petroleum Revenue Tax (APRT).

<sup>(3)</sup> The Corporation Tax shown is the estimated proportion of the tax payable which can be attributed to UK and UKCS oil and gas, but before setting off any Advance Corporation Tax (ACT). It is estimated that the amounts of Corporation Tax satisfied by setting off ACT in the years 1979/80–1984/85 were:

	1979/80	1980/81	1981/82	1982/83	1983/84	1984/85
£ million	100	240	240	230	500	1200

of transfers of licence interests ("farm outs"). One provision in the farm out package ensures that past expenditure on exploration and appraisal can no longer be set against PRT liabilities generated by interests purchased in mature fields. There are also Corporation Tax changes relating to farm outs which affect the treatment of capital gains made by the seller and the capital allowances for plant and machinery available to the purchaser.

As foreshadowed in the Chancellor's 1984 Budget Statement, the Government has, in consultation with the oil industry, carried out a full and detailed review of the tax position of additional investment in existing fields. The Government's conclusion in the light of careful economic analysis of the evidence available to it (which included data for a wide range of possible incremental projects) is that a case for special fiscal incentives for incremental investment has not been made at the present time.

No major changes in oil taxation are being made this year, thus preserving stability in the tax regime applying to the oil industry. The Chancellor however proposes a number of minor changes in his 1985

Budget. One proposal is that onshore exploration and appraisal expenditure should no longer be eligible for the immediate PRT relief introduced in 1983. In addition a number of other modest tax changes are proposed in relation to the tests companies sometimes carry out before development to appraise the producing characteristics of particular oil-bearing structures.

### 6.3 Costs and investment

Estimates of exploration, development and operating expenditures made by operators and other licensees engaged in exploiting the oil and gas resources of the UKCS during the period 1976 to 1984 are presented in Appendix 14. However, drawing a meaningful distinction between expenditure on oil and gas developments continues to grow increasingly difficult, since where gas is produced in association with oil, any costs are of a joint nature. Where the costs of associated gas gathering systems for oil fields are separately identifiable, these are included in the figures for gas fields. This difficulty is likely to become more acute as associated gas developments increase in number.



Expenditure on exploration in 1984 totalled £1342 million, an increase of £325 million, or about 32 per cent, on the 1983 level. This large increase reflects the high level of exploration drilling which has been achieved.

Expenditure on the construction and installation of platforms and associated equipment and on related pipelines and terminals amounted in 1984 to £1908 million for the development of oil fields and £1271 million for the development of gas fields, compared with £1818 million and £1014 million for oil and gas fields respectively in 1983.

Operating costs for oil and gas fields in 1984 were £1423 million and £195 million respectively. The increased oil field expenditure in 1984 compared with expenditure of £1242 million in 1983, reflected the start-up of 2 new oil fields and the Beatrice B and Beryl B platforms and increased oil production during the year.

The costs of producing oil from offshore fields vary widely, depending on the characteristics of each field. Most fields which started production before 1980 were large and relatively cheap to develop by North Sea standards; the average cost of producing oil from these fields is estimated to be £6 per barrel in 1984 prices. At the average 1984 exchange rate, this is equivalent to \$8 per barrel. Many recent fields are both smaller and more expensive to develop, so that the average cost per barrel for fields which started production between 1980 and 1984 is estimated to be £9 (\$12). The overall average cost per barrel is £7 (\$9) for all the fields currently in production on the UKCS.

The corresponding cost per barrel for fields now under development is £13 (\$17). This is £1 higher than last year's figure of £12 and reflects the continuing trend towards the development of more costly fields. The dollar estimates are somewhat lower for both fields in production and under development because of the rise in the

value of the dollar between 1983 and 1984.

These estimates are based on the production and costs of the fields before payment of royalties and taxes. They include the costs of exploration, development and operation over the expected life of the fields, but exclude abortive exploration costs not attributable to individual fields. A real return on capital of 10 per cent is assumed. The figures can therefore be interpreted as the constant real oil price which, over the life of the fields, would yield a pre-tax real rate of return of 10 per cent.

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 the industry, is estimated to have been about £3.2 billion in 1984 compared with £2.8 billion in 1983. It formed about 24 per cent of the total UK industrial investment and 6 per cent of gross domestic fixed capital formation in 1984. Table 13 shows capital investment in the years 1980-84.

Total investment in the period 1965 to 1984 inclusive is estimated to have been about £25 billion. In 1984 prices this represents an investment of about £37 billion. In addition there has been exploration expenditure amounting to some £9 billion in 1984 prices over the same period.

The main sources of the funds deployed on the UKCS during 1984 were the internally generated resources of companies and loans from UK based banks. The latter provided approximately one quarter of the total requirement.

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

Table 14 and Figure 1 show the relationship between oil and gas production and total primary fuel consumption.



In 1984 UK oil production was 125.9 million tonnes, while the total UK consumption was about 90 million tonnes. Within this overall relationship, however, the UK remained part of the wider world oil

market and continued a substantial import and export trade. UK production of oil and gas in 1984 corresponded to about 65 per cent and 17 per cent of total primary fuel consumption respectively.

**Table 13:** *Capital investment in the oil and gas exploration and production industry*

	1980	1981	1982	1983	1984 (provisional)
Gross UK capital investment in the exploration and production industry (£ billion)*	2.4	2.9	3.1	2.8	3.2
— as a percentage of total UK industrial investment	20	24	25	22	24
— as a percentage of gross domestic fixed capital formation	6	7	7	6	6

\* Gross Domestic Fixed Capital Formation in Minimum List Heading 130 of the Standard Industrial Classification. It includes development expenditure by operators, licensees, drilling and other contractors and capital expenditure other than on specific fields and allows for the timing of imports to the UKCS.

**Table 14:** *UKCS and onshore oil and gas production compared with UK total primary fuel consumption*

million tonnes of oil or oil equivalent

	Total primary fuel consumption <sup>(1)</sup>						Oil produc- tion <sup>(3)</sup>	Gas produc- tion <sup>(4)</sup>
	Total <sup>(2)</sup>	Coal	Pet- roleum	Natural gas	Nuclear elec- tricity	Hydro elec- tricity		
1980	202.7	71.1	80.8	41.8	7.8	1.2	80.5	32.5
1981	196.2	69.6	74.8	42.4	8.1	1.3	89.5	32.4
1982	193.7	65.1	75.6	42.2	9.4	1.4	103.2	33.0
1983	194.1	65.6	72.5	44.0	10.6	1.4	114.9	34.0
1984 (Provisional)	193.8	46.4	89.6	45.2	11.5	1.2	125.9	33.5

(1) Includes oil and gas for non-energy use and international marine bunkers.

(2) Due to rounding, the sum of the constituent items may not equal the total.

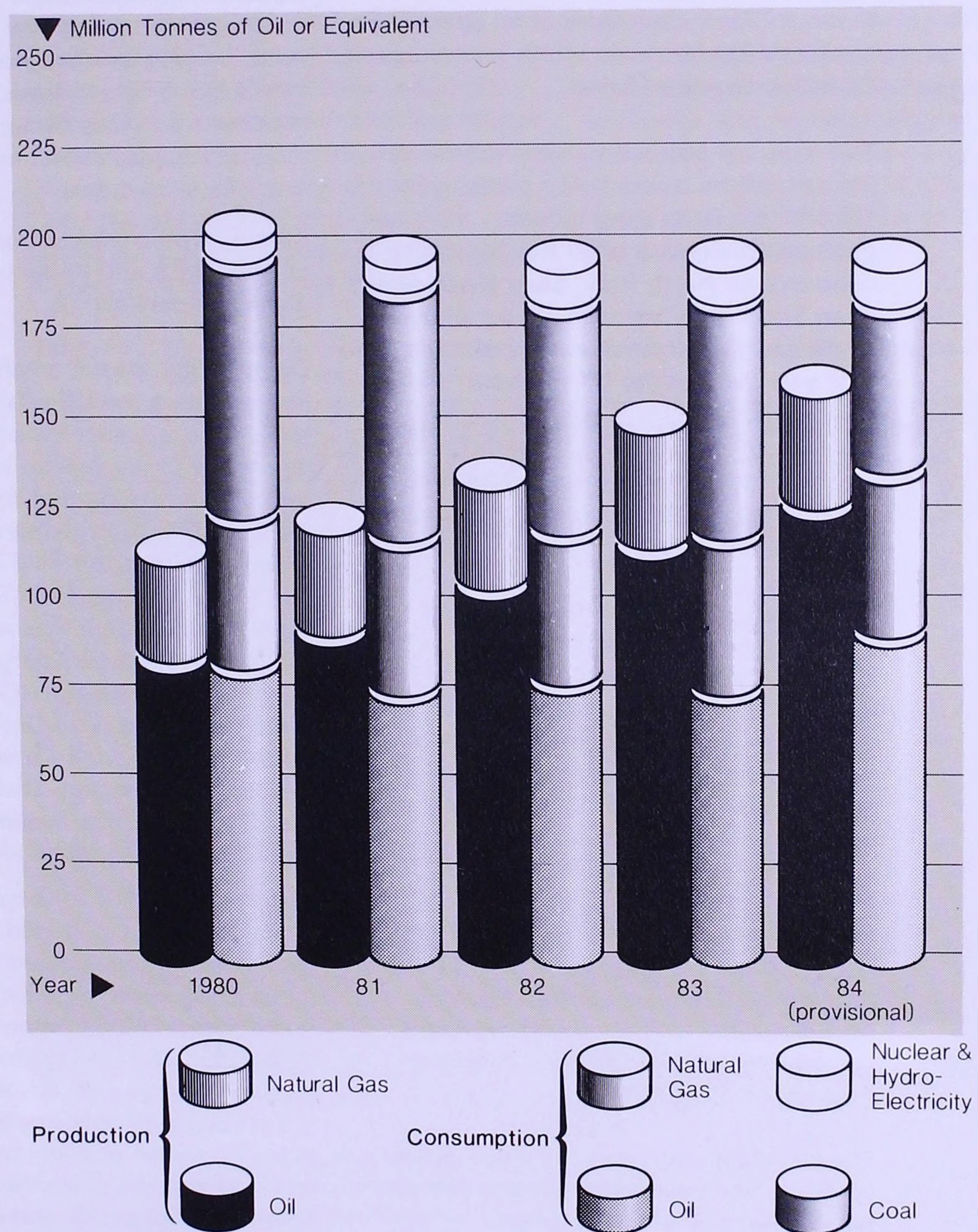
(3) Crude oil together with condensate and heavier natural gas liquids.

(4) Includes land and colliery methane and associated gas produced and used mainly on Northern sector oil production platforms. Excludes gas flared or reinjected.



Figure 1

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



(Figures are given in Table 14 )



## 6.5 Offshore supplies industry

In 1984 the total value of orders reported by operators for oil and gas development work in the UKCS was £3.6 billion. The UK share was 74 per cent worth £2.65 billion and greater than the value of all orders placed in 1983 (£2.61 billion). Table 15 gives a breakdown of the value of these orders. Since 1979 the UK has gained an average 72 per cent share of an annual market which has been worth an average of £3 billion over the period.

This year has also seen a very substantial increase in the orders being placed with the UK offshore fabricating industry. In particular the award of all the fabricating contracts for North Brae, Sean North and Sean South together with Clyde, Alwyn North and Esmond helped to make this the best year ever for the UK offshore fabricators.

Future prospects remain sound with new developments continuing to come forward at a significant rate.

During the year the Offshore Supplies Office increased its efforts to promote the UK offshore supplies industry both at home and abroad. At home procurement for the UKCS continues to be carefully monitored to ensure that UK suppliers are given a full and fair opportunity to tender for and win orders on a competitive basis.

The analysis by sector of the orders placed for oil and gas development work on the UKCS (Table 15 page 35) 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 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 processes of the 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 orders.

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

During 1984 greater emphasis was placed on promoting the UK offshore supplies industry in overseas markets. At the beginning of the year an export policy section was established within the Offshore Supplies Office. At the same time, following a visit to China in November 1983 by the Secretary of State for Energy, a separate China Unit was set up. The Minister of State for Energy visited India in February and a further visit to China took place in December. In October senior OSO officials attended the Canadian Offshore Resources Exposition. These three markets promise worthwhile openings for North Sea technology in the wider world.

The key to a full involvement in offshore fields at home and abroad lies in the development and retained capability to exploit new and cost-effective technologies. Much future UKCS exploration and field development will require technological advance to deal with the problems of economically marginal fields, heavy oil production, enhanced oil recovery and the difficulties associated with deep water locations, and deep and complex strata. Such development should additionally enhance the capacity of British industry to supply overseas markets and ensure a long-term future for the UK's offshore industry.



Financial contributions to R & D projects are provided under the Science and Technology Act 1965. Applications for funding assistance have continued at a similar level to previous years. More supported projects are being commercialised. The Hydralok pile fixing system was used very effectively on the Balmoral and S E Forties templates and the technique is attracting considerable attention. Electro-chemical machining (electrolytic grinding) of holes in submerged areas of structures, originally conceived as a method for arresting fatigue cracks has proved very attractive for making large pressure relief and access apertures. This particular project illustrates the successful commercialising of a concept initiated in a research laboratory. The

VULCAN acoustic emission system for monitoring active cracks in offshore structures has been convincingly demonstrated and is gaining the acceptance of the industry. The system is of considerable significance to offshore safety.

Support for underwater technology has resulted in the market entry of two advanced remotely operated underwater vehicles. Equipment is being developed which should lead to improvements in underwater inspection techniques. Studies are under way on the design of systems for exploiting marginal fields using equipment installed on the seabed. It is intended that these should pave the way to a major development programme.

**Table 15:** *An analysis of orders\* placed for goods and services for developments on the UKCS during 1984 (1983 percentages are in brackets)*

Sector		Value of orders placed £ million			
		Total	UK Share	UK%	
Exploration					
A	Surveying	56	45	80	(81)
B	Exploration and appraisal drilling	386	231	60	(34)
Sub-total		442	276	62	(37)
Development					
C	Production platforms	962	777	81	(91)
D	Installation operations	259	176	68	(66)
E	Plant and equipment	437	333	76	(84)
F	Submarine pipelines	169	107	63	(61)
G	Development drilling	44	25	57	(64)
H	Terminals	77	75	97	(99)
Sub-total		1948	1493	77	(83)
Production					
I	Maintenance	91	79	87	(91)
Sub-total		91	79	87	(91)
General Services (excluded wherever possible from A-I above)					
J	Transport	231	183	79	(73)
K	Diving and underwater services	88	77	88	(85)
L	Drilling tools and equipment	584	373	64	(69)
M	Support of personnel offshore	116	73	63	(57)
N	Miscellaneous	106	98	92	(95)
Sub-total		1125	804	71	(74)
Grand Total		3606	2652	74	(72)

\* The figures represent orders over £100,000 in value for all sectors.



## **6.6 Research and development on safety**

Increasingly the Department has been able to carry out research into offshore safety jointly with the offshore operators and Certifying Authorities. During the financial year 1984/85 the total R & D funding on this aspect of the Department's responsibilities was estimated to be £3.7 million.

A wide range of research results has been used to draw up guidance on Foundations and Site Investigations which covers the foundations of piled jackets, gravity structures and jack-ups together with the necessary measurements of soil conditions at the site. Potential causes of failure and their avoidance are, of course, included. The draft Guidance Notes together with the background document are now on circulation for comment by the industry.

During the year it has also been possible to produce a draft common standard for hydrocarbon fire testing between the UK and Norwegian authorities which has now been published for general use.

Work completed during the year includes the assessment of unsupported lengths of subsea pipeline (spans) which occur as a result of the natural movement of the sea acting on the pipe itself and on the sea bed. Under some circumstances the shorter of these spans can remain stable and cause no inconvenience. In other circumstances the longer spans if left to develop can cause severe damage to the pipeline. The cost of remedial action could be of the order of £1 million and a method has now been developed for assessing in each case whether remedial action is necessary. This assessment method will be the subject of Departmental guidance to operators.

Some concern about the strength and toughness of girth welds in subsea pipelines gave rise to an investigation of the different methods and materials used in welding. Confidence in the techniques generally used offshore was established but

it was felt that some guidance on certain techniques and materials was necessary. This draft guidance is under discussion with the industry.

Offshore installations placed in some busy shipping areas of the sea around the UK could face a high risk of collision. Consequently a study funded by the Department in 1984 has evolved a method of assessing at the design stage the risks of collision from general shipping at any site on the UK continental shelf.

The separate problem of collisions with shipping directly associated with the development of the field itself, such as supply vessels, has also been the subject of research, which is now being formulated into general guidance for the industry.

Research on emergency evacuation from offshore structures has continued jointly with UKOOA, the International Association of Drilling Contractors and the British Rig Owners Association, and has been extended to cover semi-submersibles as well as fixed platforms. Assistance has also been given to a UK manufacturer to develop a device which could be fitted retrospectively to lifeboats in order to provide extra thrust and to orientate the lifeboat away from the platform during the launch.

In oceanography investigations have been made of reducing the high costs of collecting data on wave heights and currents. The alternative methods to the conventional deployment of data gathering buoys are remote sensing, including shore based Radar techniques, and mathematical modelling of the storms themselves. Both of these are under evaluation.

There is a growing use of risk assessment techniques to provide more objectively based tools for decision making and these will be pursued although their use is generally limited by the amount of data available.

To make results from research more readily



available the Department's reports on R & D which relate to safety offshore are now being published as a new HMSO series of Offshore Technology Reports. The first was published in December 1984 and the series will include all the wholly funded Departmental reports and as many as possible of the jointly funded ones.

## **6.7 Geological and reservoir engineering research and development**

### *Hydrocarbon sub-surface mapping*

The interpretation work on data supplied by operators as part of the conditions of their licences continued and forms the basis of the undiscovered reserve estimates given in Part 2. Detailed work was carried out on the Jurassic (Brent Formation) in an attempt to understand its distribution and mode of deposition better. All blocks put up for the Ninth Round of Licensing were evaluated, and work has begun on blocks for the Tenth Round. The Department contributed some £2 million towards this work.

The current thrust of the research programme is directed towards more detailed studies of individual reservoirs in order to evaluate fully this potential. This programme of work increasingly involves direct collaboration with oil industry research efforts and we are working together with an increasing number of companies in order to convert technical potential into actual recovery of economic oil.

The Minister of State for Energy opened the Department of Energy's Core Store at Gilmerton in Edinburgh in October 1984. Facilities are present there for reviewing released core material and the space available should permit core to be received well into the 1990's.

### *Regional mapping*

The geological mapping of the seabed and sub-strata around the United Kingdom Continental Shelf, which was begun in

1972 is well on schedule for completion in 1990. Ninety five per cent of the data for the geophysical maps covering aero magnetic gravity and shallow seismic information has been acquired, whilst the geological sampling and drilling programme is some 85 per cent complete. The Department annually contributes £3.5 million towards this work.

Some 328 maps are targetted for publication by the end of 1990 and at the present time 125 of these have already been published; a further 23 are at the Ordnance Survey and 60 are under active compilation. Overall the publication programme is 38 per cent complete.

The range of maps which are published include:—

- Bouguer Gravity — Anomaly
- Aeromagnetic — Anomaly
- Gravity Free Air — Anomaly
- Solid Geology
- Quaternary Geology
- Sea Bed Sediments
- Quaternary/Sea Bed Sediments

Maps may be obtained from any HMSO dealer or from the British Geological Survey, Murchison House, West Mains Road, Edinburgh.

### *Reservoir engineering research and enhanced oil recovery*

Work continues in support of our reservoir engineering activities. The reservoir simulation code PORES, developed by the Atomic Energy Research Establishment, Harwell on behalf of the Department, BGC and Britoil is now commercially available. The enhanced oil recovery (EOR) research programme is continuing with the work predominantly centred at the Atomic Energy Establishment, Winfrith with a supporting programme at academic institutions. Preliminary assessment has shown that a technical potential of between 100–300 million tonnes of oil may be recoverable from reservoirs on the UKCS. However, it is realised that formidable technical and logistical problems remain to be solved in order to improve the



economics of bringing this more difficult oil to shore. The Department contributed some £3.3 million towards this work.

### **6.8 Privatisation of BGC's oil interests**

Various oil assets previously belonging to BGC were privatised during 1984. The sale of Enterprise Oil plc (formerly British Gas North Sea Oil Holdings Ltd) was completed on 27 June 1984 by way of a stock market flotation. The 212 million shares were offered for sale at a price of £1.85 each. The net proceeds of the sale, £382 million, accrued directly to the Exchequer.

BGC's 50 per cent interest in Petroleum Licence PL.089, which includes the Wytch Farm Oil field, was sold on 18 May 1984, to a consortium of oil companies known as the Dorset Bidding Group. The terms of the

sale involved a payment to BGC of £85 million on completion, a further £130 million when production reaches 20,000 barrels per day and a 40 per cent net production interest when total production reaches 25 million barrels. The initial payment of £85 million was placed by BGC in a special non-interest bearing facility with the National Loans Fund pending settlement of tax liabilities arising from the sale.

### **6.9 British National Oil Corporation**

The Minister of State for Energy announced on 13 March 1985 that trading in participation oil by BNOC should cease. Legislation will be introduced to abolish BNOC and set up a small agency to carry out residual functions. The Minister of State's statement to the House of Commons is reproduced in Appendix 17.



# Appendix 1 Licensing

Offshore production and exploration licences are issued under the Petroleum (Production) Act 1934, as extended offshore by the Continental Shelf Act 1964. Details of each round are given below.

Round (year)	Area under offer	No of blocks on offer	No of appli- cations	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	63	117	106	37	61
Fourth (1971/ 1972)	North Sea Irish Sea Celtic Sea Orkney/ Shetland Basin	421 for dis- cretionary award; 15 for cash tender	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	44	28	64
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



Round (year)	Area under offer	No of blocks on offer	No of appli- cations	No of companies in consortia	No of blocks applied for	Licences		
						No of blocks	No awarded	No of companies
Eighth (1982/ 1983)	North Sea	169 for dis- cretionary award;	40	94	76	70	55	81
	West Orkney Basin							
	East Shetland Basin	15 for cash tender	20	47	8			
	Unst							
	Fair Isle							
Ninth (1984/ 1985)	Forth Approaches					13	13	28
	Bristol Channel							
	North Sea	180 for dis- cretionary awards;	117	134	107			
	West Shetland Basin							
	Rockall Trough	15 for cash tender	32	52	13			
	Faeroes Trough							
	Morecambe Bay							
	Celtic Sea							
	English Channel							



## Appendix 2 Drilling activity

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

	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984
East of England	2	3	5	—	—	—	1	9	9	24
East of Scotland	49	25	23	20	22	19	37	36	45	53
East of Shetland	23	25	24	11	4	7	7	11	9	20
West of England/ Wales	2	4	4	3	—	—	—	4	1	1
West of Shetland	3	1	11	1	3	6	2	3	4	5
Channel and SW Approaches	—	—	—	2	4	—	1	5	9	3
Total all areas	79	58	67	37	33	32	48	68	77	106

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

	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984
East of England	1	1	—	—	—	—	1	8	17	19
East of Scotland	11	13	20	11	8	13	15	24	18	44
East of Shetland	24	13	17	8	7	8	10	11	13	13
West of England/ Wales	1	1	1	3	—	—	—	—	3	—
West of Shetland	—	—	—	3	—	1	—	—	—	—
Total all areas	37	28	38	25	15	22	26	43	51	76

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

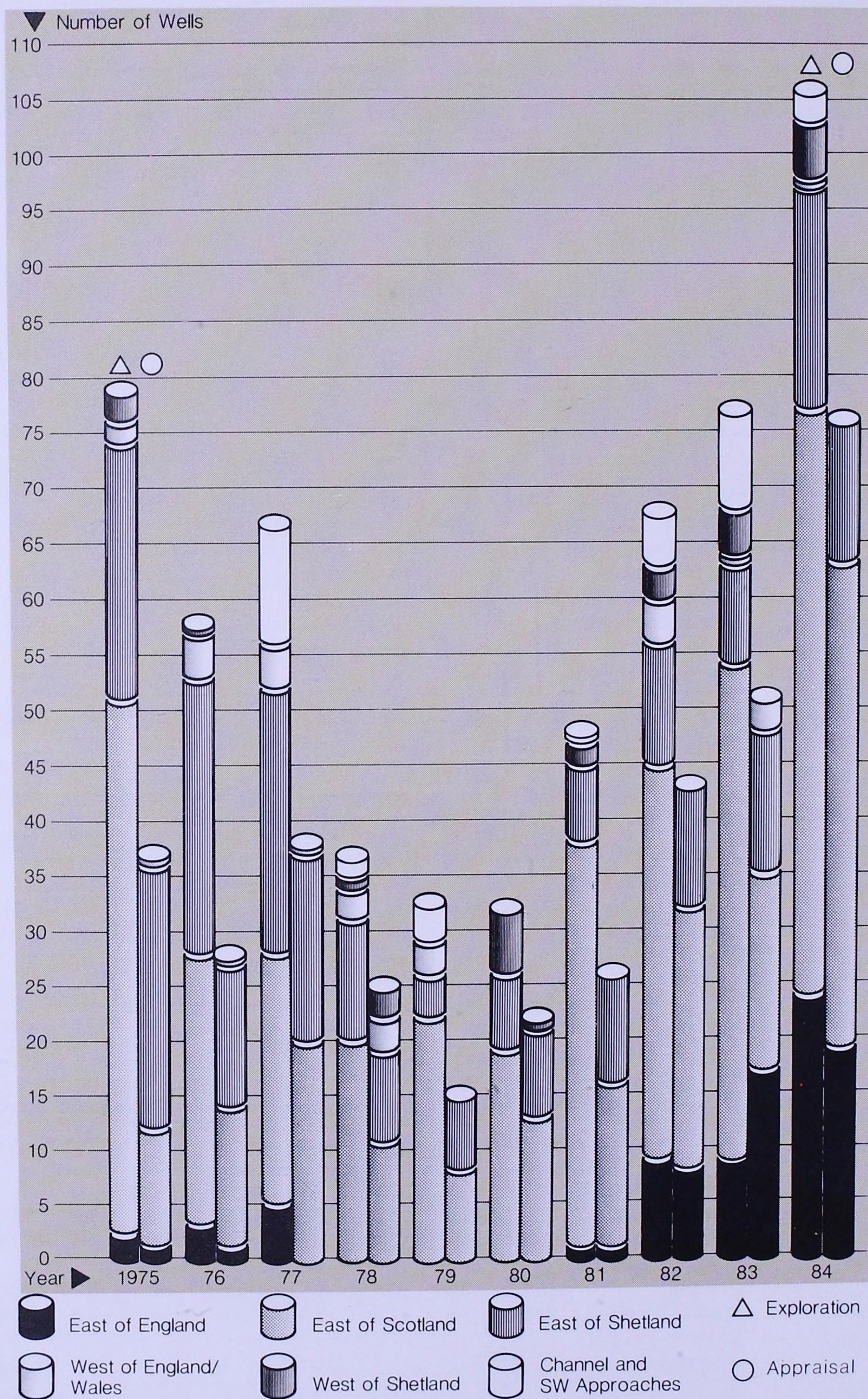
	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984
East of England	13	7	7	7	2	—	4	11	10	18
East of Scotland	7	37	60	35	37	45	39	36	34	37
East of Shetland	1	10	29	54	63	77	94	71	51	51
West of England/ Wales	—	—	—	—	—	—	—	—	—	2
Total all areas	21	54	96	96	102	122	137	118	95	108

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

	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984
East of England	1.6	1.5	1.4	0.6	0.5	—	1.2	4.9	7.3	13.0
East of Scotland	12.0	8.4	9.5	9.3	9.6	12.8	16.3	15.8	19.2	22.9
East of Shetland	13.6	9.9	10.1	5.9	4.5	6.3	6.5	6.9	5.3	10.4
West of England/ Wales	0.2	1.0	0.8	1.1	0.2	—	0.2	0.9	0.7	0.6
West of Shetland	0.3	0.4	1.8	1.1	0.4	1.5	0.4	0.8	0.5	1.8
Channel and SW Approaches	—	—	—	0.1	0.9	—	—	0.8	1.2	0.4
Total all areas	27.7	21.2	23.6	18.1	16.1	20.6	24.6	30.1	34.2	49.0

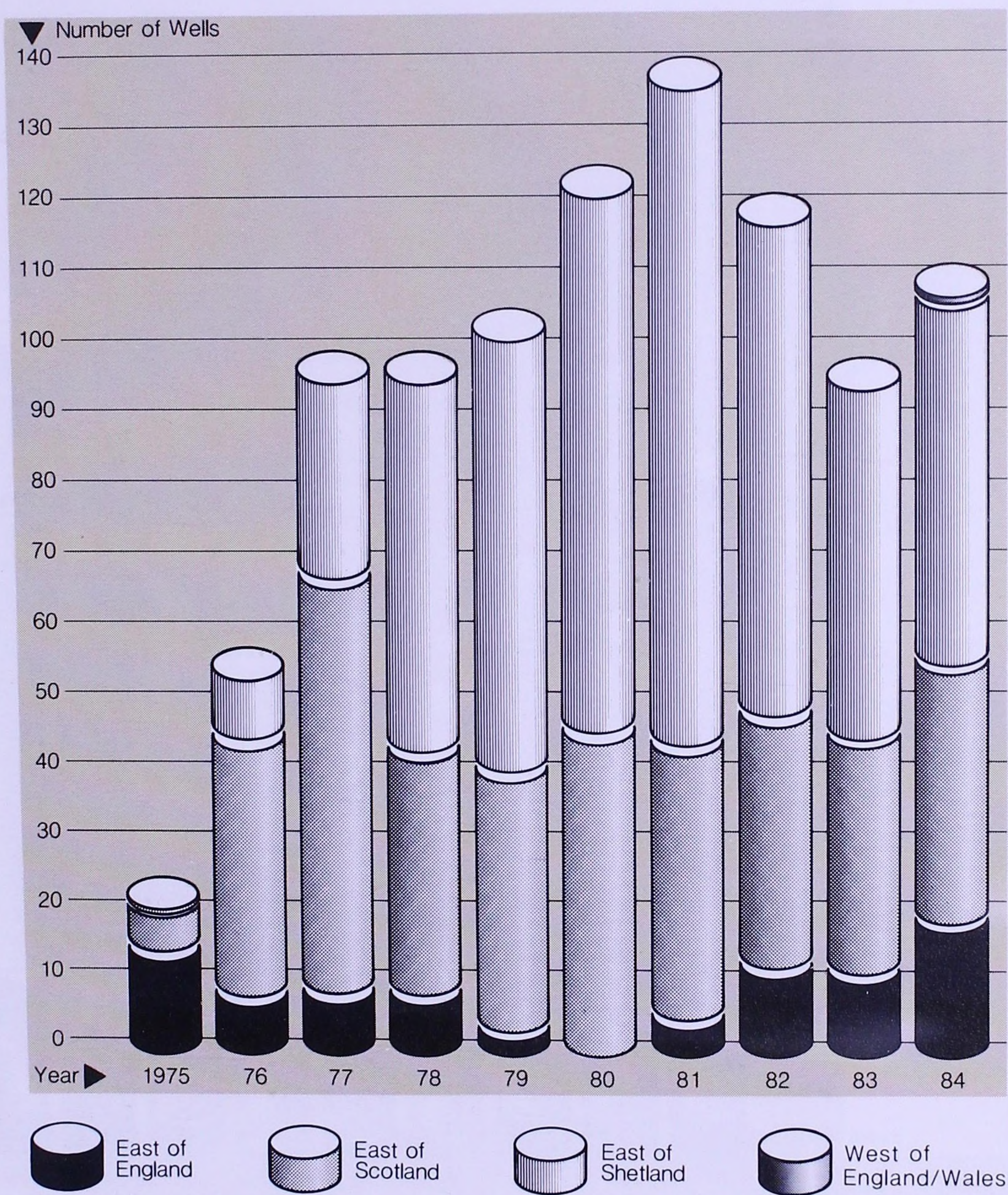


# Offshore exploration/appraisal wells drilled each year 1975-1984



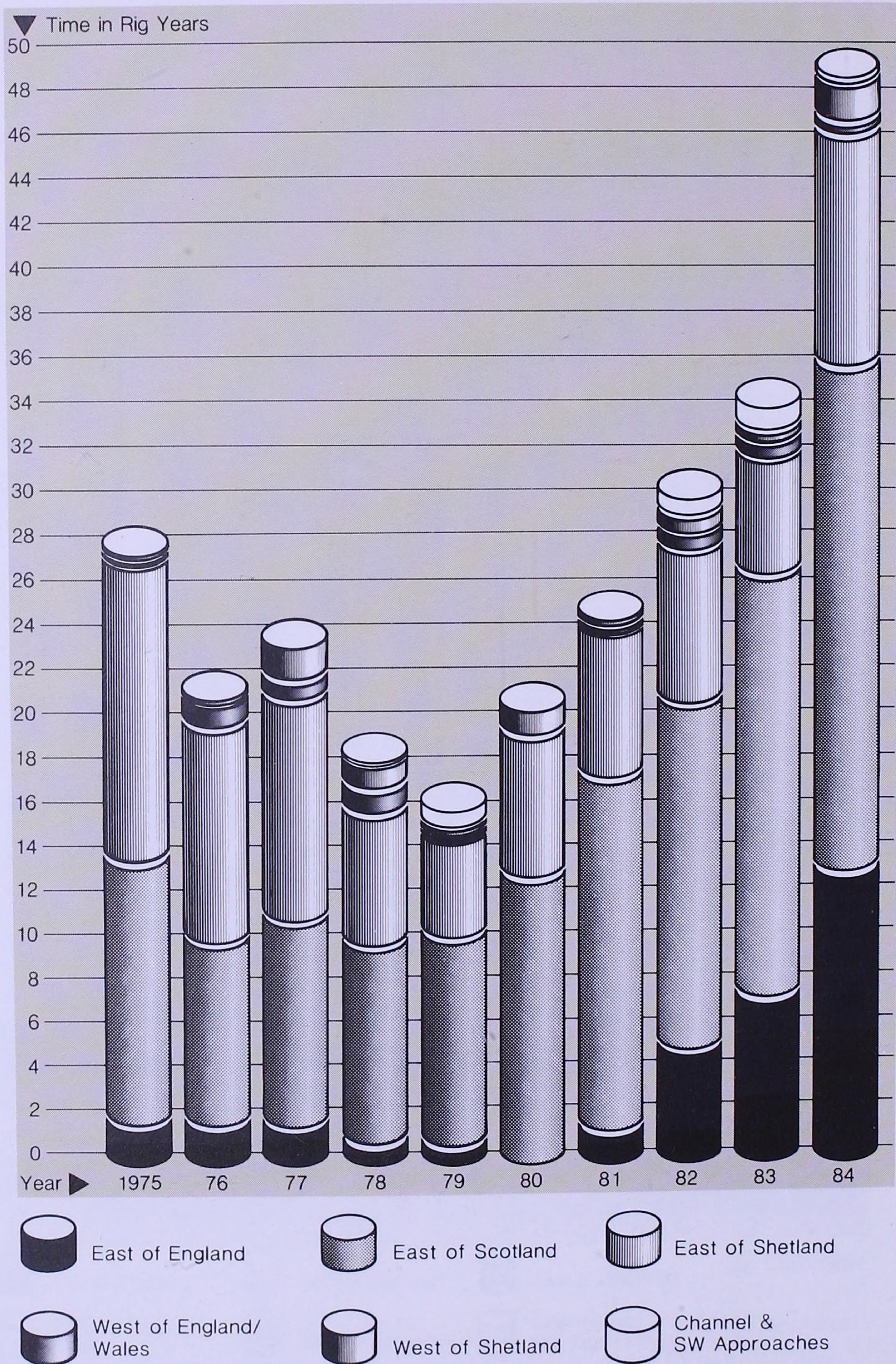


# Offshore development wells drilled each year 1975-1984



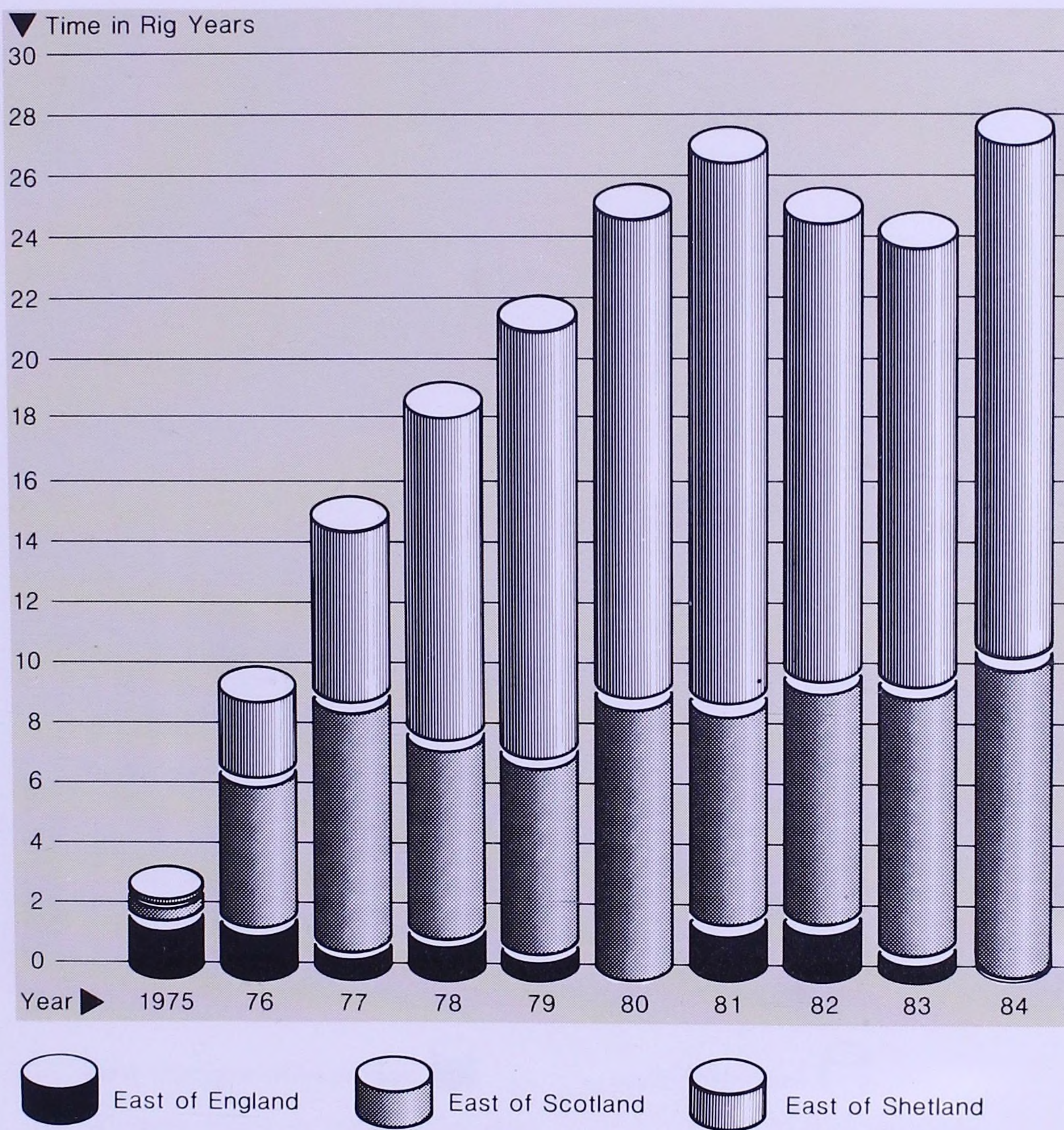


# Mobile rig activity Rig time spent in UK Continental Shelf





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



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

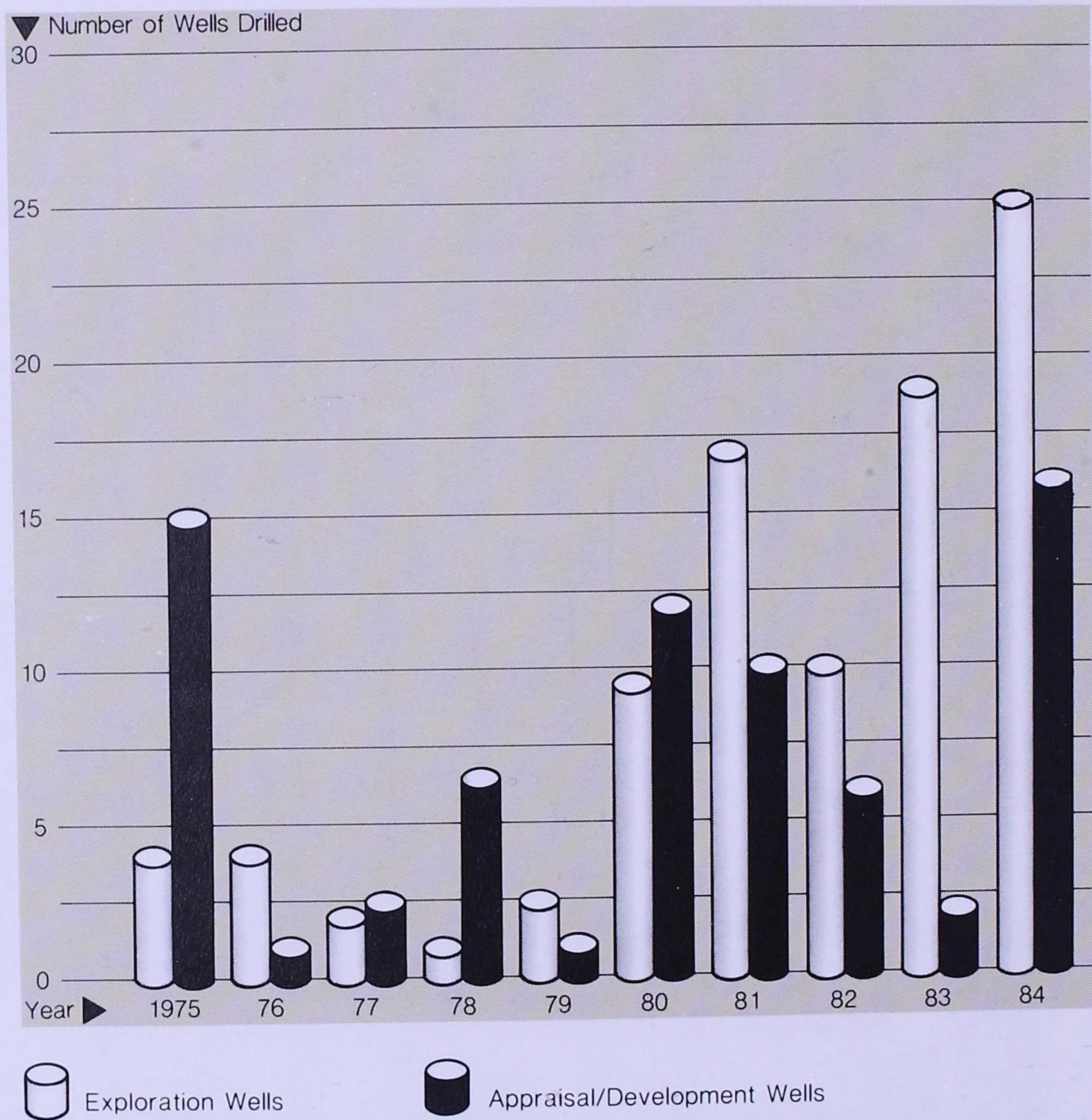
	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984
East of England*	1.5	1.4	0.7	1.0	0.5	—	1.4	1.4	0.4	0.01
East of Scotland	0.9	4.7	8.2	6.6	6.5	9.0	7.4	8.1	9.0	10.4
East of Shetland	0.2	3.2	6.0	11.0	14.5	16.2	18.2	15.5	14.7	17.2
Total all areas	2.6	9.3	14.9	18.6	21.5	25.2	27.0	25.0	24.1	27.6

\* 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



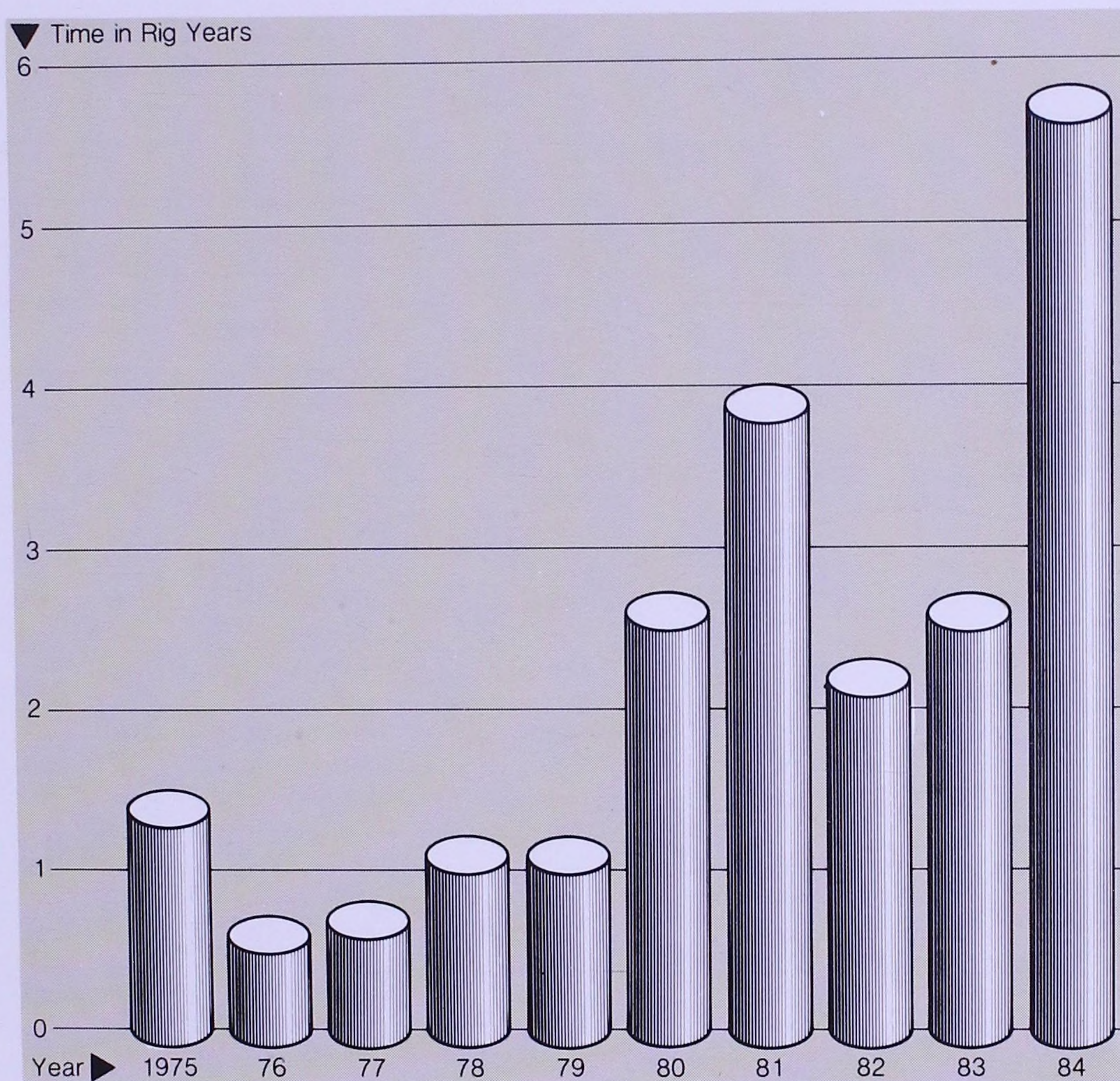
(F) Onshore drilling; number of wells drilled

	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984
Exploration wells	4	4	2	1	2½	9½	17	10	19	25
Appraisal/ Development wells	15	1	2½	6½	1	12	10	6	2	16

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

	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984
Activity (rig years)	1.4	0.6	0.7	1.1	1.1	2.6	3.9	2.2	2.6	5.7



# Appendix 3 Significant\* offshore hydrocarbon discoveries announced by the end of February 1985 in discovery date order

Field <sup>(1)</sup> name	Block and well number	Licence number	Licence round	Operator at end of 1984	Date discovered	Type	Category <sup>(2)</sup>	Area <sup>(3)</sup>
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
LEMAN BANK	49/26-1	P.007	1	Shell	April 1966	Gas	FIP	SNSB
Ann	49/06-1	P.028	1	Phillips	May 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 <sup>(5)</sup>	P.005	1	Hadson	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	Gas & Cond.	SD	SNSB
	44/23-1	P.003 <sup>(4)</sup>	1	Texas Gas	January 1968	Gas	SD	SNSB
ROUGH	47/08-1	P.030 <sup>(6)</sup>	1	BGC	May 1968	Gas	FIP	SNSB
NORTH SEAN	49/25-1	P.054	2	Shell	April 1969	Gas	FUD	SNSB
YARE	49/28-3	P.037	1	Arco	May 1969	Gas	FUD	SNSB
GORDON	43/20-1	P.002	1	Hamilton	June 1969	Gas	FUD	SNSB
	41/24a-1	P.034	1	Total	September 1969	Gas	SD	SNSB
	41/25a-1 <sup>(5)</sup>	P.039	1	Total	September 1969	Gas	SD	SNSB
MONTROSE	22/18-1	P.020	1	Amoco	December 1969	Oil	FIP	CNSB
SOUTH SEAN	49/25-2	P.054	2	Shell	January 1970	Gas	FUD	SNSB
FORBES	43/08-1	P.048	1	Hamilton	January 1970	Gas	FUD	SNSB
	47/13-1	P.050	1	Conoco	April 1970	Gas	SD	SNSB
South Valiant	49/21-2	P.039	1	Conoco	July 1970	Gas	SD	SNSB
North Valiant	44/16-2	P.033	1	Conoco	November 1970	Gas	SD	SNSB
FORTIES	21/10-1	P.246	2	BP	November 1970	Oil	FIP	CNSB
VIKING	49/16-3	P.033	1	Conoco	January 1971	Gas	FIP	SNSB
AUK	30/16-1	P.116	3	Shell	February 1971	Oil	FIP	CNSB
	30/02-1	P.098	3	Britoil	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	SD	CNSB
VICTOR	49/22-2	P.025	1	Conoco	May 1972	Gas	FIP	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
CORMORANT	211/26-1	P.232	4	Shell	September 1972	Oil	FIP	ESB
SOUTH								
DEVERON	211/18-1	P.236	4	Britoil	September 1972	Oil	FIP	ESB
Amethyst	47/14a-1	P.005	1	Britoil	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	FIP	ESB
	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	Britoil	July 1973	Oil	FIP	ESB
	3/14a-1	P.090	2	Total	November 1973	Oil	SD	ESB
HUTTON	211/28-1A	P.204	4	Conoco	December 1973	Oil	FIP	ESB
HEATHER	2/05-1	P.242	4	Union	December 1973	Oil	FIP	ESB
THAMES	49/28-4	P.037	1	Arco	December 1973	Gas	FUD	SNSB
N.W. Dunlin	211/23-3	P.296	4	Shell	February 1974	Oil	SD	ESB



Field <sup>(1)</sup> name	Block and well number	Licence number	Licence round	Operator at end of 1984	Date discovered	Type	Category <sup>(2)</sup>	Area <sup>(3)</sup>
NINIAN	3/03-1	P.202	4	Chevron	April 1974	Oil	FIP	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.	SD	ESB
Bruce	9/08-1	P.209	4	Hamilton	July 1974	Condensate	SD	ESB
MAGNUS	211/12-1	P.193	4	BP	July 1974	Oil	FIP	ESB
BUCHAN	21/01-1	P.241	4	BP	August 1974	Oil	FIP	MFB
CORMORANT NORTH	211/21-2	P.232	4	Shell	August 1974	Oil	FIP	ESB
	9/13-4	P.139	4	Mobil	August 1974	Oil & Cond.	SD	ESB
	211/18-6	P.236	4	Britoil	August 1974	Oil	SD	ESB
MORECAMBE	110/02-1	P.153	4	Hydro- carbons GB	September 1974	Gas	FUD	ISB
	15/23-1Z	P.324	4	Texaco	October 1974	Oil	SD	MFB
	211/13-1	P.296	4	Shell	November 1974	Condensate	SD	ESB
	2/05-6	P.242	4	Union	December 1974	Oil	SD	ESB
TARTAN	15/16-1	P.237	4	Texaco	January 1975	Oil	FIP	MFB
Mabel	16/29-4	P.110	3	Phillips	February 1975	Oil	SD	ESB
STATFJORD	211/24-4	P.104	3	Conoco	February 1975	Oil	FIP	ESB
	14/20-1	P.294	4	Texaco	February 1975	Oil	SD	MFB
	3/04-4	P.119	3	Texaco	March 1975	Oil	SD	ESB
N.W. HUTTON	211/27-3	P.184	4	Amoco	April 1975	Oil	FIP	ESB
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
Tern	210/25-1	P.296	4	Shell	May 1975	Oil	SD	ESB
NORTH BRAE	16/07-1	P.108	3	Marathon	May 1975	Condensate	FUD	ESB
	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
Scapa	14/19-9	P.250	4	Occidental	July 1975	Oil	SD	MFB
	211/26-4	P.296	4	Shell	August 1975	Oil	SD	ESB
	3/04-6	P.119	3	Texaco	August 1975	Oil	SD	ESB
BALMORAL	16/21-1	P.201	4	British Sun	August 1975	Oil	FUD	MFB
West Brae	16/07-2	P.108	3	Marathon	August 1975	Oil	SD	ESB
	15/30-1	P.103	3	Conoco	September 1975	Condensate	SD	MFB
	211/18-9	P.236	4	Britoil	September 1975	Oil	SD	ESB
MURCHISON	211/19-2	P.104	3	Conoco	September 1975	Oil	FIP	ESB
ALWYN NORTH	3/09a-1	P.090	2	Total	October 1975	Oil	FUD	ESB
	15/13-2	P.198	4	BP	October 1975	Oil	SD	MFB
Ivanhoe	15/21-3	P.218	4	Monsanto	October 1975	Oil	SD	MFB
	211/13-3	P.296	4	Shell	December 1975	Oil	SD	ESB
FULMAR	30/16-6	P.256	3	Shell	December 1975	Oil	FIP	CNSB
	21/02-2	P.244	4	Zapex	December 1975	Condensate	SD	CNSB
	23/27-3	P.114	3	Ranger	March 1976	Oil	SD	CNSB
Audrey	49/11a-1	P.028	1	Phillips	March 1976	Gas	SD	SNSB
	23/26a-1	P.057	2	BP	April 1976	Oil	SD	CNSB
	15/27-1	P.226	4	Phillips	April 1976	Oil	SD	MFB
HIGHLANDER	14/20-5	P.324	4	Texaco	April 1976	Oil	FUD	MFB
	9/19-2	P.103	3	Conoco	May 1976	Oil & Cond.	SD	ESB
	211/27-6	P.184	4	Amoco	May 1976	Oil	FIP	ESB
Eider	211/16-2	P.296	4	Shell	May 1976	Oil	SD	ESB
Columba	3/07-1	P.203	4	Chevron	June 1976	Oil	SD	ESB
	14/20-6A	P.324	4	Texaco	June 1976	Oil	SD	MFB
	49/29-2	P.105	3	Mobil	June 1976	Gas	SD	SNSB
Toni/Thelma	16/17-1	P.225	4	Phillips	July 1976	Oil	SD	ESB



Field <sup>(1)</sup> name	Block and well number	Licence number	Licence round	Operator at end of 1984	Date discovered	Type	Category <sup>(2)</sup>	Area <sup>(3)</sup>
N.E. Halibut	211/18-12	P.236	4	Britoil	July 1976	Oil	SD	ESB
BEATRICE	11/30-1	P.187	4	Britoil	September 1976	Oil	FIP	MFB
	3/07-2	P.203	4	Chevron	November 1976	Oil	SD	ESB
Don	211/18-13	P.236	4	Britoil	January 1977	Oil	SD	ESB
	211/19-6	P.104	3	Conoco	January 1977	Oil	SD	ESB
	16/22-2	P.240	4	Total	May 1977	Oil	SD	ESB
BRAE SOUTH	16/07a-8	P.108	3	Marathon	July 1977	Oil	FIP	ESB
Clair	206/08-1A	P.165	4	BP	July 1977	Oil	SD	WSB
	3/29-2	P.198	4	BP	August 1977	Gas	SD	ESB
Galley	15/23-4	P.324	4	Texaco	August 1977	Oil	SD	MFB
	3/14a-4	P.090	2	Total	August 1977	Condensate	SD	ESB
	16/26-2	P.213	4	Gulf	October 1977	Condensate	SD	ESB
	210/15-2	P.226	4	Phillips	October 1977	Oil	SD	ESB
	14/18-1	P.263	5	Occidental	May 1978	Oil	SD	MFB
	2/10a-4	P.234	4	Chevron	May 1978	Oil	SD	ESB
CLYDE	30/17b-2	P.266	5	Britoil	June 1978	Oil	FUD	CNSB
Bressay	3/28a-2	P.234	4	Chevron	September 1978	Oil	SD	ESB
	21/24-1	P.021	1	Texaco	November 1978	Oil	SD	CNSB
	9/18a-3A	P.103	3	Conoco	March 1979	Oil	SD	ESB
	30/17b-5	P.266	5	Britoil	May 1979	Oil	SD	CNSB
Tiffany	16/17-8A	P.225	4	Phillips	July 1979	Oil	SD	ESB
	9/19-5A	P.103	3	Conoco	July 1979	Gas	SD	ESB
North Gannet	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
CYRUS	16/28-4	P.092	3	BP	October 1979	Oil	FUD	ESB
West Gannet	21/25-2	P.013	1	Shell	December 1979	Oil	SD	CNSB
Stirling	16/21a-2	P.201	4	British Sun	March 1980	Oil	SD	MFB
N.E. Brae	16/03a-1	P.108	3	Marathon	April 1980	Condensate	SD	ESB
	22/05a-1A	P.066	2	Amoco	October 1980	Gas & Cond.	SD	CNSB
DUNCAN	30/24-15	P.073	2	Hamilton	January 1981	Oil	FIP	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
Ettrick	20/02-1	P.317	6	Britoil	April 1981	Oil	SD	CNSB
Joanne	30/07a-1	P.032	1	Phillips	May 1981	Oil	SD	CNSB
	9/09b-2	P.276	5	BP	July 1981	Condensate	SD	ESB
	3/14a-7	P.090	2	Total	August 1981	Oil	SD	ESB
	21/15a-2	P.120	3	Britoil	August 1981	Oil	SD	CNSB
	29/05a-1	P.188	4	Arco	September 1981	Oil & Cond.	SD	CNSB
Kittiwake	21/18-2	P.351	7	Shell	September 1981	Oil	SD	CNSB
	3/04-8	P.119	3	Texaco	October 1981	Oil	SD	ESB
Emerald	2/15-1	P.327	7	Chevron	October 1981	Oil	SD	ESB
	13/29-1	P.307	6	Ultramar	December 1981	Oil	SD	MFB
	211/23-7	P.258	4	Shell	February 1982	Oil	SD	ESB
South Piper	15/17-9	P.220	4	Occidental	March 1982	Oil	SD	MFB
South Gannet	21/30-4	P.013	1	Shell	June 1982	Oil	SD	CNSB
ESMOND	43/13a-1	P.002	1	Hamilton	June 1982	Gas	FUD	SNSB
	113/26-1	P.287	5	Hydro- carbons GB	August 1982	Gas	SD	ISB
Central Gannet	21/30-6A	P.013	1	Shell	September 1982	Oil	SD	CNSB
Drake	22/05b-2	P.356	7	Superior	September 1982	Gas & Cond.	SD	CNSB
Glamis	16/21a-6	P.201	4	British Sun	November 1982	Oil	SD	MFB
Vanguard	49/16-7Z	P.033	1	Conoco	December 1982	Gas	SD	SNSB
	12/27-1	P.373	7	Burmah	January 1983	Gas	SD	MFB



Field <sup>(1)</sup> name	Block and well number	Licence number	Licence round	Operator at end of 1984	Date discovered	Type	Category <sup>(2)</sup>	Area <sup>(3)</sup>
Clipper	48/19a-2A	P.008	1	Shell	February 1983	Gas	SD	SNSB
	47/09b-5A	P.302	6	BGC	February 1983	Gas	SD	SNSB
	16/07b-20Z	P.340	7	BP	March 1983	Oil	SD	ESB
INNES	31/26-3	P.288	Sole	Amerada	March 1983	Oil	SD	CNSB
	30/24-24	P.073	2	Hamilton	April 1983	Oil	FIP	CNSB
	42/30-2	P.001	1	BP	April 1983	Gas	SD	SNSB
Ravenspurn	42/29-2	P.001	1	BP	April 1983	Gas	SD	SNSB
Cleeton	49-21-6	P.039	1	Conoco	April 1983	Gas	SD	SNSB
Vulcan	48/13a-4	P.008	1	Shell	May 1983	Gas	SD	SNSB
Barque	16/08b-2Z	P.341	7	Conoco	May 1983	Oil	SD	ESB
BURE	22/05b-3	P.356	7	Superior	May 1983	Oil & Gas	SD	CNSB
	49/28-8	P.037	1	Arco	May 1983	Gas	FUD	SNSB
	16/21a-8	P.201	4	British Sun	June 1983	Oil	SD	MFB
Rob Roy	49/25a-5	P.054	2	Shell	June 1983	Gas	SD	SNSB
	9/08a-8	P.209	4	Hamilton	August 1983	Oil	SD	ESB
	48/15a-1	P.130	4	Conoco	August 1983	Gas	SD	SNSB
	16/18-1	P.312	7	Mobil	September 1983	Condensate	SD	ESB
	9/24b-1A	P.338	7	BP	September 1983	Condensate	SD	ESB
	30/17b-9	P.266	5	Britoil	October 1983	Oil	SD	CNSB
	2/10a-6	P.234	4	Chevron	December 1983	Oil	SD	ESB
	29/08b-2	P.227	4	Unionoil	December 1983	Oil	SD	CNSB
	15/22-4	P.185	4	Amoco	January 1984	Oil	SD	MFB
	16/13a-2Z	P.219	4	Deminex	January 1984	Condensate	SD	ESB
	53/04a-5	P.039	1	Arco	January 1984	Gas	SD	SNSB
	22/24a-2	P.092	3	BP	February 1984	Gas & Cond.	SD	CNSB
	22/02-2	P.354	7	Burmah	February 1984	Oil	SD	CNSB
	21/24-2	P.021	1	Texaco	February 1984	Oil	SD	CNSB
	211/22a-3	P.201	4	British Sun	March 1984	Oil	SD	ESB
	30/06-3Z	P.011	1	Shell	May 1984	Oil	SD	CNSB
	15/21a-11	P.218	4	Monsanto	May 1984	Oil	SD	MFB
	29/02a-2	P.224	4	Conoco	June 1984	Gas & Cond.	SD	CNSB
	42/15b-1	P.137	4	Zapex	June 1984	Gas	SD	SNSB
	9/13a-23	P.139	4	Mobil	July 1984	Oil & Gas	SD	ESB
	49/05-2	P.455	8	Ultramar	July 1984	Gas	SD	SNSB
	214/30-1	P.303	6	British Gas	August 1984	Gas	SD	WSB
	22/19-1	P.357	7	Occidental	August 1984	Gas & Cond.	SD	CNSB
	98/11-2	P.406	7	British Gas	August 1984	Gas	SD	ECB
	21/30-12	P.013	1	Shell	September 1984	Oil	SD	CNSB
	16/03a-4	P.108	3	Marathon	September 1984	Oil	SD	ESB
	49/04-1	P.468	8	BP	October 1984	Gas	SD	SNSB
	9/09a-6	P.090	2	Total	November 1984	Oil	SD	ESB
	16/08a-4	P.295	3	Shell	December 1984	Oil	SD	ESB
	44/21-2	P.450	8	BP	December 1984	Gas	SD	SNSB
	48/11b-4	P.460	8	Conoco	December 1984	Gas	SD	SNSB

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

<sup>(1)</sup> Fields in production or under development are shown in capital letters.

<sup>(2)</sup> FIP, Fields in Production; FUD, Fields Under Development; SD, Significant Discovery.

<sup>(3)</sup> 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; ECB, English Channel Basin. The location of the major basins of the UKCS is shown in the map at Appendix 19.

<sup>(4)</sup> Licence relinquished.

<sup>(5)</sup> Block relinquished.

<sup>(6)</sup> 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 4 Appraisal drilling on significant discoveries

Field name	Block and well number	Licence number	Operator	Type	Activity in 1984
Emerald	2/5-10	P.242	Union	Oil	No drilling took place.
	{ 2/10a-4 2/15-1	P.234 P.237	Chevron	Oil & Gas	A successful appraisal well was drilled.
	3/2-1	P.204	Conoco	Oil	An unsuccessful appraisal well was drilled.
SW Ninian/ Columba	{ 3/7-1 3/8a-3	P.203 P.199	Chevron BP	{ Oil	No drilling took place.
Alwyn	{ 3/14a-1 3/14a-7	P.090 P.090	Total Total	Oil Oil	Two successful appraisal wells were drilled.
	3/27-1	P.333	LASMO	Oil	No drilling took place.
Bruce	3/28a-1	P.234	Chevron	Oil	No drilling took place.
	{ 9/8-1 9/9b-2	P.209 P.276	Hamilton BP	Gas & Cond. and Oil	Four appraisal wells were completed and another was drilling at the end of 1984. The extent of the oil accumulation is now thought to be restricted to a small area around 9/8a-8. Successful drilling has taken place in adjacent block 9/9a.
	9/12-1 9/13-4	P.254 P.139	Union Mobil	Oil & Gas	No drilling took place.
	9/19-2 9/19-5	P.103	Conoco	Oil	No drilling took place.
	13/29-1	P.307	Ultramar	Oil	An appraisal well was drilled in 13/28.
Scapa	14/19-9	P.250	Occidental	Oil	The appraisal well drilled from the Claymore platform was put on extended production test during 1984. Two more appraisal wells were drilled in 1984. Development options are under consideration.
	14/20-6	P.324	Texaco	Oil	No drilling took place on this very small accumulation.
South Piper	15/17-9	P.220	Occidental	Oil	Two successful appraisal wells were drilled in 1984.
Ivanhoe	15/21-3	P.218	Monsanto	Oil	Two successful appraisal wells were drilled. Development options for the area are under consideration.



Field name	Block and well number	Licence number	Operator	Type	Activity in 1984
Rob Roy	15/21a-11	P.218	Monsanto	Oil	Three appraisal wells were drilled on this 1984 discovery of which one was successful.
Galley	15/23-IZ 15/23-4	P.237	Texaco/ Occidental	Oil	A disappointing appraisal well was drilled.
	15/30-1 16/26-2	P.103 P.213	Conoco Gulf	Condensate Condensate	No drilling took place. One appraisal well was drilled.
N E Brae	16/3a-1	P.108	Marathon	Condensate	One successful appraisal well was drilled which was commenced in 1983.
	16/7-2	P.108	Marathon	Oil	No drilling took place.
	16/7b-20	P.340	BP	Oil	Three more appraisal wells were drilled and operations continued on a fourth.
	16/8b-2	P.341	Conoco	Oil	One appraisal well was drilled and operations continued on another.
T-block	16/17-1 16/17-8A	P.225	Phillips	Oil	Two appraisal wells were drilled on the Tiffany structure.
Glamis	16/21a-6	P.201	British Sun	Oil	A second appraisal well was drilled.
	16/21a-8	P.201	British Sun	Oil	See 16/21a-6.
Ettrick	{ 20/2-1 20/3-2A	P.317 P.273	Britoil Amoco	Oil	Two appraisal wells were drilled, one each by Amoco and Britoil.
Gannet North	21/25-1	P.013	Shell	Oil	One appraisal well was drilled.
Gannet West	21/25-2 21/30-3	P.013	Shell	Oil	One appraisal well was drilled.
Gannet South	21/30-4	P.013	Shell	Oil	One appraisal well was drilled.
Gannet Central	21/30-6A	P.013	Shell	Oil	Two appraisal wells were drilled.
Gannet East	22/26a-2	P.013	Shell	Oil	No drilling took place.
South Montrose	22/18-1	P.291	Amoco	Oil	A successful appraisal well was drilled.
Drake	22/5b-2	P.356	Superior	Gas & Cond.	Three dry appraisal wells were drilled.
	22/5b-3	P.356	Superior	Oil & Cond.	No drilling took place.
Lomond	23/21-1	P.101	Amoco	Condensate	One appraisal well was drilled.
Joanne	30/7a-1	P.032	Phillips	Oil	Two appraisal wells were drilled.
Cleeton	42/29-2	P.001	BP	Gas	No drilling took place. A development programme is under consideration.



Field name	Block and well number	Licence number	Operator	Type	Activity in 1984
Ravenspurn	42/30-1	P.001	BP	Gas	No drilling took place. A development plan is under consideration.
Amethyst	47/14a-1	P.005	Britoil	Gas	Two successful appraisal wells were drilled.
West Sole (N)	48/6-25	P.001	BP	Gas	One successful appraisal well was drilled at the limit of northern lobe.
Barque	48/13a-4	P.008	Shell	Gas	Three successful appraisal wells were drilled.
Clipper	48/19a-2A	P.008	Shell	Gas	Two successful wells were drilled.
Audrey	49/11a-1 48/15a	P.028 P.130	Phillips Conoco	Gas	Three successful wells were drilled. A development plan is under consideration.
Vanguard	49/16-7	P.033	Conoco	Gas	No drilling took place. A development plan is under consideration.
South Valiant North Valiant	49/21-2 49/16-2	P.039 P.033	Conoco Conoco	Gas Gas	No drilling took place. A development plan is under consideration.
Vulcan	49/21-6 48/25b	P.039 P.130	Conoco	Gas	Two successful wells were drilled to delineate the western extension. A development plan is under consideration.
Yare	49/28-3	P.037	Arco	Gas	One appraisal well was drilled.
Thames	49/28-4	P.037	Arco	Gas	Two appraisal wells were drilled.
Bure	49/28-8	P.037	Arco	Gas	No drilling took place.
Clair	208/8-1	P.165	BP	Oil	No drilling took place.
Tern	210/25-1	P.296	Shell	Oil	No drilling took place. The development plan for this field was approved in February 1985.
Eider	211/16-2	P.296	Shell	Oil	An appraisal well was successfully tested. Development plans are under discussion.
N E Halibut Don	211/18-12 211/18-13	P.236 P.236	Britoil	Oil Oil	An appraisal well was drilled.

A development plan for the Thames Complex was approved.



# Appendix 5 Offshore oil and condensate fields under development

This table gives information on the seven fields under development at the end of 1984

Field name	Block numbers and licence number	Licensees	Company interest in block (%) at the end of 1984	Extension into other UK blocks		Date of Discovery	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 1984		
Alwyn North	3/9a P.090	Total Oil Marine plc Elf UK plc *BNOC	33½ 66½ Nil	Part 3/4a P.416	Total Oil Marine plc/ 33½ Elf UK plc/66½ *BNOC/Nil	Oct 1975	26.18
Balmoral	16/21a P.201	British Sun Oil Co Ltd Deminex UK North Sea Ltd Clyde Petroleum plc Hampton North Sea Ltd Thomson North Sea Ltd *BNOC	62 15 10 5 8 Nil	16/21b P.344	Britoil plc/40 Arpet Petroleum Ltd/ 35 Goal Petroleum Ltd/ 12.5 Carless Exploration plc/12.5	Aug 1975	8.9
North Brae (condensate)	16/7a P.108	Marathon Oil UK Ltd Britoil plc Bow Valley Exploration (UK) Ltd Westar Exploration (UK) Ltd Westar Oil (UK) Ltd L.L. & E. (UK) Inc Kerr-McGee Oil (UK) Ltd Sovereign Oil & Gas plc Norsk-Hydro Oil & Gas Ltd *BNOC	38 20 14 6.3 1.4 6.3 8 4 2 Nil			May 1975	24 liquids 17 bcm gas
Clyde	30/17b P.266	Britoil plc Shell UK Ltd Esso Exploration & Production UK Ltd *BNOC	51 24.5 24.5 Nil			June 1978	20.5
Cyrus	16/28 P.092	BP Petroleum Development Ltd	100			June 1976	1.3
Highlander	14/20 P.324	Texaco North Sea UK Ltd	100			April 1976	4.7



Field name	Block numbers and licence number	Licensees	Company interest in block (%) at the end of 1984	Extension into other UK blocks		Date of Discovery	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 1984		
Innes	30/24 P.073	Hamilton Oil Great Britain plc	28.8			Mar 1983	0.30
		Hamilton Bros Petroleum UK Ltd	7.2				
		RTZ Oil & Gas Ltd	25.0				
		Blackfriars Oil Co Ltd	12.5				
		The Trans-European Co Ltd	2.5				
		Texaco North Sea UK Ltd	24.0				
		*BNOC	Nil				

<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.

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



# Appendix 6 Offshore oil fields in production

This table gives information on the 27 fields in production at the end of 1984

Field name	Block numbers and licence number	Licensees	Company interest in block (%) at the end of 1984	Extension into other UK blocks		Date of Discovery	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 1984		
Argyll	30/24 P.073	Hamilton Oil Gt Britain plc	28.8			Aug 1971	7.7
		Hamilton Bros Petroleum (UK) Ltd	7.2				
		RTZ Oil & Gas Ltd	25				
		Blackfriars Oil Co Ltd	12.5				
		Trans-European Co Ltd	2.5				
		Texaco North Sea UK Ltd	24				
		*BNOC	Nil				
Auk	Part 30/16 P.116	Shell UK Ltd	50			Feb 1971	14.3
		Esso Exploration & Production UK Ltd	50				
		*BNOC	Nil				
Beatrice	11/30a P.187	Britoil plc	28			Sept 1976	17
		Deminex UK Oil & Gas Ltd	22				
		Kerr-McGee Oil (UK) Ltd	25				
		Lasmo North Sea Ltd	15				
		Hunt Oil (UK) Ltd	10				
		*BNOC	Nil				
Beryl	9/13a P.139	Mobil Producing North Sea Ltd	50			'A' accumulation Sept 1972 'B' accumulation May 1975	66 39.9
		Amerada Hess Exploration Ltd	20				
		Texas Eastern UK Ltd	20				
		Enterprise Oil plc	10				
		*BNOC	Nil				
South Brae	16/7a P.108	Marathon Oil UK Ltd	38			July 1977	40
		Britoil plc	20				
		Bow Valley Exploration (UK) Ltd	14				
		Westar Exploration (UK) Ltd	6.3				
		Westar Oil (UK) Ltd	1.4				
		L.L. & E. (UK) Inc	6.3				
		Kerr-McGee Oil (UK) Ltd	8				
		Sovereign Oil & Gas plc	4				
		Norsk-Hydro Oil & Gas Ltd	2				
		*BNOC	Nil				



Field name	Block numbers and licence number	Licensees	Company interest in block (%) at the end of 1984	Extension into other UK blocks		Date of Discovery	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 1984		
Brent	211/29a P.117	Shell UK Ltd Esso Exploration & Production UK Ltd *BNOC	50 50 Nil			July 1971	230.4
Buchan	21/1a P.241	BP Petroleum Development Ltd Transworld Petroleum (UK) Ltd Tricentrol CCP Ltd Goal Petroleum plc Clyde Petroleum plc Sulpetro (UK) Ltd Charterhouse Petroleum Mitre Ltd Charterhall Oil Ltd Lochiel Exploration (UK) Ltd *BNOC	27.1 14 6.3 5 14 14 14 4.6 1.0 Nil	20/5a P.294	Texaco North Sea UK Ltd/100 *BNOC/Nil	Aug 1974	8.8
Claymore	Part 14/19a P.249	Occidental Petroleum (Caledonia) Ltd Texaco Britain Ltd Union Texas Petroleum Ltd Thomson Scottish Petroleum Ltd AB Exploration Ltd AGIP (UK) Ltd Anvil Petroleum Ventures Ltd Coalite Oilex Ltd Dawsea plc Dow Chemical Co Ltd Floyd Oil & Gas (UK) Ltd Pict Petroleum plc Texas Gas Exploration (UK) Corp Third Triton Petroleum (UK) Ltd Transworld Petroleum (UK) Ltd Sovereign Oil and Gas plc *BNOC	23.4 21.2 20.0 20.0 0.5 2.5 0.5 1.0 1.0 5.0 0.5 0.5 0.6 0.5 0.8 2.0 Nil			June 1974	54.2
North Cormorant	Part 211/21a P.258	Shell UK Ltd Esso Exploration & Production UK Ltd *BNOC	50 50 Nil			Aug 1974	56.5
South Cormorant	211/26a P.232	Shell UK Ltd Esso Exploration & Production UK Ltd *BNOC	50 50 Nil			Sept 1972	26.8



Field name	Block numbers and licence number	Licensees	Company interest in block (%) at the end of 1984	Extension into other UK blocks		Date of Discovery	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 1984		
Deveron	211/18a P.236	Britoil plc	15.6			Sept 1972	1.9
		Burmah Oil Exploration Ltd	8.4				
		Deminex UK Oil & Gas Ltd	42.5				
		Santa Fe (UK) Ltd	16.875				
		Tricentrol Exploration UK Ltd	10				
		Charterhouse Petroleum Development Ltd	1				
		Charterhouse Oil & Gas Ltd	1.40625				
		Ultramar North Sea Ltd	1.40625				
		Britoil (Alpha) Ltd	2.8125				
		*BNOC	Nil				
Duncan	30/24 P.073	Hamilton Oil Gt Britain plc	28.8			Jan 1981	2.3
		Hamilton Bros Petroleum (UK) Ltd	7.2				
		RTZ Oil & Gas Ltd	25				
		Blackfriars Oil Co Ltd	12.5				
		Trans-European Co Ltd	2.5				
		Texaco North Sea UK Ltd	24				
		*BNOC	Nil				
Dunlin	211/23a P.232	Shell UK Ltd	50	211/24a P.104	Conoco Ltd/33⅓	July 1973	41.5
		Esso Exploration & Production UK Ltd	50		Gulf Oil (Great Britain) Ltd/16⅓		
		*BNOC	Nil		Gulf (UK) Offshore Investments Ltd/16⅓		
					Britoil plc/33⅓		
Forties	21/10 P.246				*BNOC/Nil	Nov 1970	270
		BP Oil Development Ltd	88.25	22/6a P.084	Shell UK Ltd/50		
		Trafalgar House Oil & Gas Ltd	1		Esso Exploration & Production UK Ltd/50		
		OK Exploration (UK) Ltd	1				
		Berkeley Exploration & Production plc	.25				
		Candecca Resources plc	.50				
		Century Power and Light Ltd	.25				
		Charterhall Oil Ltd	.25				
		Charterhouse Petroleum Development Ltd	.50				
		Charterhouse Oil & Gas Ltd	.75				
		Dawsea plc	.25				
		Elf UK plc	1.50				
		Hispanoil (UK) Ltd	.25				
		Industrial Scotland Energy plc	.25				
		Norsk Hydro Oil & Gas Ltd	.25				
		Norwich Union (Hydrocarbons) Ltd	.25				
		Plascom Ltd	.25				



Field name	Block numbers and licence number	Licensees	Company interest in block (%) at the end of 1984	Extension into other UK blocks		Date of Discovery	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 1984		
Forties (cont)							
		RTZ Oil & Gas Ltd	1				
		Saxon Oil plc	.25				
		Sovereign Oil & Gas plc	.50				
		Texaco North Sea UK Co	1				
		Ultramar North Sea Ltd	1				
		Union Jack Oil Co Ltd	.25				
		Petrolex plc	.25				
		*BNOC	Nil				
Fulmar	Part 30/16 P.256	Shell UK Ltd	50	30/11b P.185	Amoco UK Petroleum Ltd/25.77	Dec 1975	56
		Esso Exploration & Production UK Ltd	50		Enterprise Oil plc/Enterprise (E & P) Ltd/25.77		
		*BNOC	Nil		Amerada Hess Exploration Ltd/18.08		
			Texas Eastern UK Ltd/10.38				
					Mobil Producing North Sea Ltd/20		
Heather	2/5 P.242	Unocal Exploration and Production Co (UK) Ltd	31.25			Dec 1973	8-12
		Texaco Exploration Ltd	31.25				
		Tenneco Gt Britain Ltd	31.25				
		DNO (Heather Oilfield) Ltd	6.25				
		*BNOC	Nil				
Hutton	211/28a P.204	Conoco Ltd	33½	211/27b P.473	Amoco UK Petroleum Ltd/25.77	Dec 1973	26.3
		Gulf Oil (Gt Britain) Ltd	33½		Enterprise (E & P) Ltd/25.77		
		Britoil plc	33½		Mobil Producing North Sea Ltd/20		
		*BNOC	Nil		Amerada Hess Exploration Ltd/18.08		
					Texas Eastern UK Ltd/10.38		
					*BNOC/Nil		
North West Hutton	211/27 P.184	Amoco UK Petroleum Ltd	25.77			April 1975	37.5
		Enterprise Oil plc					
		Enterprise (E & P) Ltd	25.77				
		Amerada Hess Exploration Ltd	18.08				
		Texas Eastern UK Ltd	10.38				
		Mobil Producing North Sea Ltd	20				
		*BNOC	Nil				



Field name	Block numbers and licence number	Licensees	Company interest in block (%) at the end of 1984	Extension into other UK blocks		Date of Discovery	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 1984		
Magnus	211/12a P.193	BP Petroleum Development Ltd *BNOC	100 Nil	211/7a P.193	BP Petroleum Development Ltd/100 *BNOC/Nil	July 1974	75
Maureen	16/29a P.110	Phillips Petroleum Co UK Ltd Fina Exploration Ltd AGIP (UK) Ltd Century Power and Light Ltd Ultramar Exploration Ltd *BNOC	33.78 28.96 17.26 11.50 8.50 Nil			Feb 1973	21
Montrose	Part 22/17 P.019	Amoco UK Petroleum Ltd Enterprise Oil plc Enterprise (E & P) Ltd Amerada Hess Exploration Ltd Texas Eastern UK Ltd *BNOC	30.77 30.77 23.08 15.38 Nil	Part 22/18 P.020	Amoco UK Petroleum Ltd/30.77 Enterprise Oil plc/ Enterprise (E & P) Ltd/30.77 Amerada Hess Exploration Ltd/23.08 Texas Eastern UK Ltd/ 15.38 *BNOC/Nil	Dec 1969	12.1
Murchison (UK)	211/19a P.104	Conoco Ltd Gulf Oil (Gt Britain) Ltd Gulf (UK) Offshore Investments Ltd Britoil plc *BNOC	33½ 16½ 16½ 33½ Nil			Sept 1975	42.7 <sup>(2)</sup>
Ninian	3/3 P.202	Chevron Petroleum Co Ltd ICI Petroleum Ltd Murphy Petroleum Ltd Ocean Exploration Ltd Britoil plc *BNOC	24 26 10 10 30 Nil	3/8a P.199	BP Petroleum Development Ltd/50 Ranger Oil UK Ltd/20 Lasma North Sea Ltd/ 30 NOC/Nil	April 1974	143
Piper	15/17a P.220	Occidental Petroleum UK Ltd Texaco Britain Limited Union Texas Petroleum Limited Thomson North Sea Ltd *BNOC	36.5 23.5 20 20 Nil			Jan 1973	118.7
Statfjord (UK)	211/24 a & b P.104 211/24c	Conoco Ltd Gulf Oil (Gt Britain) Ltd Gulf (UK) Offshore Investments Ltd	33½ 16½ 16½	211/25a P.104 211/25b P.293	Conoco Ltd/33½ Gulf Oil (Gt Britain) Ltd/16½	April 1974	384 <sup>(3)</sup>



Field name	Block numbers and licence number	Licensees	Company interest in block (%) at the end of 1984	Extension into other UK blocks		Date of Discovery	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 1984		
Statfjord (UK) (cont)	P.293	Britoil plc *BNOC	33½ Nil		Gulf (UK) Offshore Investments Ltd/16½ Britoil plc 33½ *BNOC/Nil		
Tartan	15/16a and 14/20a P.237	Texaco North Sea UK Ltd *BNOC	100 Nil			Jan 1975	8.2
Thistle <sup>(4)</sup>	211/18a P.236	Britoil plc Burmah Oil Exploration Ltd  Santa Fe (UK) Ltd Tricentrol Exploration UK Ltd  Charterhouse Petroleum Development Ltd Charterhouse Oil & Gas Ltd Ultramar North Sea Ltd Britoil (Alpha) Ltd *BNOC	15.6 8.4  16.875 10  1 1.40625 1.40625 2.8125 Nil	Part 211/19a P.475	Britoil Plc/15.6 Burmah Oil Exploration Ltd/8.4 Deminex UK Oil & Gas Ltd/42.5 Santa Fe (UK) Ltd/16.875 Tricentrol Exploration UK Ltd/10.0 Charterhouse Petroleum Development Ltd/1.0 Charterhouse Oil & Gas Ltd/1.40625 Ultramar North Sea Ltd/1.40625 Britoil (Alpha) Ltd/2.8125 *BNOC/Nil	July 1973	53 <sup>(3)</sup>

(1) 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.

(2) Including the Norwegian sector of the field.

(3) Estimate currently under review.

(4) 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 Offshore gas fields in production and under development

This table gives information on the seven fields in production and four under development at the end of 1984

Field name (block number and licence number)	Licensees/Company interest in block at the end of 1984 (%)	Extension into other UK blocks		Date of Discovery	Operator's estimate of recoverable reserves originally present in field (billion cubic metres) <sup>(1)</sup>
		Block number and licence number	Licensees/Company interest in block (%) at the end of 1984		
Gas fields in production					
West Sole (48/6) P.001	BP Petroleum Development Ltd/100			Dec 1965	48
Leman (49/26) P.007	Shell UK Ltd/50 Esso Exploration and Production UK Ltd/50	49/27 P.016	Amoco UK Petroleum Ltd/30.77 BGC/30.77 Amerada Hess Exploration Ltd/23.08 Texas Eastern (UK) Ltd/15.38	April 1966	298
		49/28 P.037	Arpet Petroleum Ltd (Arpet)/33½ British Sun Oil Co Ltd/23½ Deminex UK North Sea Ltd/10 Superior Oil (UK) Ltd/20 Canadian Superior Oil (UK) Ltd/3½ 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 UK Petroleum Ltd/30.77  BGC/30.77 Amerada Hess Exploration Ltd/23.08 Texas Eastern UK Ltd/15.38	49/23 P.016	Amoco UK Petroleum Ltd/30.77 BGC/30.77 Amerada Hess Exploration Ltd/23.08 Texas Eastern (UK) Ltd/15.38	June 1966	127
		49/19 P.008	Shell UK Ltd/50 Esso Exploration and Production UK Ltd/50		
		49/24 P.007	Shell UK Ltd/50 Esso Exploration and Production UK Ltd/50		



Field name (block number and licence number)	Licensees/Company interest in block at the end of 1984 (%)	Extension into other UK blocks		Date of Discovery	Operator's estimate of recoverable reserves originally present in field (billion cubic metres) <sup>(1)</sup>
		Block number and licence number	Licensees/Company interest in block (%) at the end of 1984		
Hewett <sup>(2)</sup> (48/29) P.037	Arpet Petroleum Ltd/33⅓ British Sun Oil Co Ltd/ 23⅓ Deminex UK North Sea Ltd/10 Superior Oil (UK) Ltd/ 20 Canadian Superior Oil (UK) Ltd/3⅓ Sinclair (UK) Oil Co Ltd/10	48/30	Phillips Petroleum Co UK Ltd/35	Oct 1966	112
		P.028	Fina Exploration Ltd/30 AGIP (UK) Ltd/15 Century Power & Light Ltd/7.22 Plascom Ltd/4.26 Lasmo North Sea Ltd/8.52		
		52/5a	Phillips group as above		
		P.028			
		52/4a	Phillips Petroleum Co UK Ltd/19		
		P.112	AGIP (UK) Ltd/8.1 Fina Exploration Ltd/16.3 Century Power & Light Ltd/3.9 Lasmo North Sea Ltd/4.6 Plascom Ltd/2.3 Arpet Petroleum Ltd/15.3 British Sun Oil Co Ltd/10.7 Deminex UK North Sea 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	Arpet Group as for Block 48/29		
		P.037			
Viking (49/17) P.033	Conoco Ltd/50 Britoil plc/50	49/12a	Conoco Ltd/50	Dec 1965	84
		P.033	Britoil plc/50		
Frigg (UK) (10/1) P.118	Total Oil Marine plc/33⅓ Elf UK plc/66⅔	49/16	Conoco Ltd/50	May 1972	90
		P.033	Britoil plc/50		
		9/10a	Total Oil Marine plc/33⅓		
		P.404	Elf UK plc/66⅔		
Victor (49/22-2) P.025	Conoco Ltd/25 Mobil Producing North Sea Ltd/50 Britoil plc/25	9/5a	BP Petroleum Development Ltd/100	May 1972	20
		P.194			
		49/17	Conoco Ltd/25		
		P.033	Mobil Producing North Sea Ltd/50 Britoil plc/25		



Field name (block number and licence number)	Licensees/Company interest in block at the end of 1984 (%)	Extension into other UK blocks		Date of Discovery	Operator's estimate of recoverable reserves originally present in field (billion cubic metres) <sup>(1)</sup>
		Block number and licence number	Licensees/Company interest in block (%) at the end of 1984		
Gas fields under development					
Esmond (43/13a) P.002	Hamilton Oil Great Britain plc/48 Hamilton Bros Petroleum (UK) Ltd/12 RTZ Oil & Gas Ltd/25 Blackfriars Oil Co Ltd/12.5 The Trans-European Co Ltd/2.5	43/12 P.447	Lasmo North Sea plc/50 Occidental Petroleum (Caledonia) Ltd/35 Thomson North Sea Ltd/15	June 1982	16.2
Forbes (43/8-1) P.002	Hamilton Oil Great Britain plc/48 Hamilton Bros Petroleum (UK) Ltd/12 RTZ Oil & Gas Ltd/25 Blackfriars Oil Co Ltd/12.5 The Trans-European Co Ltd/2.5	43/8a P.048	Hamilton Oil Great Britain plc/11.25 Hamilton Bros Petroleum (UK) Ltd/45 RTZ Oil and Gas Ltd/23.4 Blackfriars Oil Co Ltd/11.7 The Trans-European Co Ltd/2.3 Whitehall Petroleum Ltd/4.9 Rycade (UK) Ltd/1.6	Jan 1970	
Gordon (43/15a & 43/20a) P.002	Hamilton Oil Great Britain plc/48 Hamilton Bros Petroleum (UK) Ltd/12 RTZ Oil & Gas Ltd/25 Blackfriars Oil Co Ltd/12.5 The Trans-European Co Ltd/2.5			June 1969	
North Sean and South Sean (49/25a) P.054	Shell UK Ltd/25 Esso Exploration & Production UK Ltd/25 Union Texas Petroleum Ltd/25 Britoil plc/25			North Sean April 1969 South Sean Jan 1970	13
South Morecambe (100/2a) P.153	Hydrocarbons Great Britain Ltd/100	110/3a P.251 110/8a P.251 110/7a P.099	Hydrocarbons Great Britain Ltd/100	Sept 1974	102



Field name (block number and licence number)	Licensees/Company interest in block at the end of 1984 (%)	Extension into other UK blocks		Date of Discovery	Operator's estimate of recoverable reserves originally present in field (billion cubic metres) <sup>(1)</sup>
		Block number and licence number	Licensees/Company interest in block (%) at the end of 1984		
Rough (storage) (47/8b) P.323	BGC/100	47/3d P.323	BGC/100	May 1968	10.2 <sup>(3)</sup>

<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> The Hewett field includes accumulations formerly known as Dotty and Deborah.

<sup>(3)</sup> At start of original production from the field in 1975. Since storage gas will be injected into the field during the summer periods, the total winter offtake during its total life will considerably exceed this figure.



## Appendix 8 Oil production<sup>(1)</sup>

	Total from 1975 to end 1978	1979	1980	1981	1982	1983	1984	Cumula- tive total from 1975 (million tonnes)
Offshore fields <sup>(5)</sup>								
Argyll	3.1	0.8	0.8	0.5	1.0	0.7	0.4	7.3
Auk	4.8	0.8	0.6	0.6	0.6	0.6	0.6	8.7
Beatrice	—	—	—	0.2	1.6	1.5	2.2	5.6
Beryl	6.0	4.7	5.4	4.7	4.4	3.8	4.3	33.3
S Brae	—	—	—	—	—	1.0	3.9	4.9
Brent	5.2	8.8	6.8	11.1	15.2	18.7	20.0	85.6
Buchan	—	—	—	0.9	1.4	1.6	1.1	5.0
Claymore	3.3	4.0	4.4	4.5	4.8	4.7	5.0	30.9
N Cormorant	—	—	—	—	1.3	2.1	4.4	7.9
S Cormorant	—	0.04	1.1	0.7	0.9	1.5	1.7	5.9
Deveron	—	—	—	—	—	—	0.1	0.1
Duncan	—	—	—	—	—	0.1	0.6	0.6
Dunlin	0.7	5.7	5.2	4.7	3.9	3.5	3.1	26.7
Forties	53.8	24.5	24.6	22.8	22.2	21.7	20.3	189.9
Fulmar	—	—	—	—	2.6	5.7	6.0	14.3
Heather	0.1	0.8	0.7	1.2	1.7	1.3	1.2	7.1
Hutton	—	—	—	—	—	—	1.3	1.3
North West Hutton	—	—	—	—	—	1.9	2.4	4.4
Magnus	—	—	—	—	—	1.5	5.6	7.2
Maureen	—	—	—	—	—	0.8	3.8	4.6
Montrose	2.1	1.3	1.2	1.1	0.9	0.7	0.8	8.0
Murchison (UK)	—	—	0.4	3.1	4.4	4.5	2.9	15.3
Ninian	0.04	7.7	11.4	14.3	15.0	13.7	11.6	73.7
Piper	20.9	13.2	10.4	9.8	9.8	9.6	8.9	82.6
Statfjord (UK)	—	0.04	0.5	1.2	1.8	3.0	3.5	10.1
Tartan	—	—	—	0.7	0.6	1.1	1.2	3.6
Thistle	2.6	3.9	5.3	5.5	6.0	5.1	4.2	32.5



	Total from 1975 to end 1978	1979	1980	1981	1982	1983	1984	Cumula- tive total from 1975 (million tonnes)
Total stabilised crude oil from offshore fields <sup>(2)</sup>	102.8	76.5	78.7	87.7	100.1	110.5	120.8	677.0
Stabilised crude oil from onshore fields <sup>(2)</sup>	0.4	0.1	0.2	0.2	0.2	0.3	0.3	1.7
Liquefied products from oil and gas fields								
Condensate <sup>(3)</sup>	1.6	0.4	0.4	0.4	0.5	0.6	0.6	4.5
Heavier natural gases <sup>(4)</sup>	1.1	0.8	1.1	1.2	2.4	3.5	4.1	14.3
Total production	105.8	77.9	80.5	89.5	103.2	114.9	125.9	697.5

- (1) All figures are rounded to the nearest 100,000 tonnes except where start-up occurred late in the year (Ninian in 1978, South Cormorant and Statfjord UK 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.
- (2) Includes the condensate and residual dissolved gases present in the disposal of stabilised crude by the industry. Wytch Farm is the major onshore producer.
- (3) A mixture of pentane and higher hydrocarbons which arise mainly from the processing of natural gas.
- (4) Ethane, propane and butane produced in the treatment of liquid or gaseous hydrocarbons at pipeline terminals.
- (5) Beryl A, Brent, Claymore, Dunlin, Deveron, Heather, Montrose, Murchison, Ninian, Piper and Thistle have short term production consents, usually for 3-6 months. The other fields have development programme approval or long-term consents.



## Appendix 9 Gas production

Million cubic metres

	Total to end 1978	1979	1980	1981	1982	1983	1984	Cumula- tive total to end 1984
West Sole Field	19,687	1,365	1,445	1,455	1,512	1,719	1,899	29,082
Leman Field	127,030	13,831	9,482	13,207	11,675	11,985	9,376	196,586
Hewett Area	53,809	6,288	6,568	5,048	4,108	3,851	3,631	83,303
Indefatigable Field	40,606	6,006	6,878	5,613	5,720	4,700	5,590	75,113
Victor Field	—	—	—	—	—	—	472	472
Viking Area	32,879	4,397	4,689	3,307	4,381	3,413	3,197	56,263
Rough Field	2,516	1,005	467	99	101	27 <sup>(6)</sup>	55 <sup>(7)</sup>	4,270
Frigg Field <sup>(1)</sup>	3,521	5,345	6,374	7,057	6,569	6,948	7,781	43,595
Piper Field <sup>(2)</sup>	4	536	521	520	629	782	739	3,732
FLAGS <sup>(3)</sup>	—	—	—	—	2,144	4,297	5,356	11,797
Other <sup>(4)</sup>	471	455	866	1,098	1,437	1,807	2,066	8,200
Total production <sup>(5)</sup>	280,523	39,228	37,290	37,404	38,276	39,529	40,162	512,413

(1) UK share only (39.18 per cent).

(2) Gas used offshore or delivered to land via the Frigg pipeline system.

(3) Gas delivered to land via FLAGS.

(4) Associated gas, mainly methane, produced and used mainly on Northern Basin oil production platforms.

(5) Gross production ie includes own use for drilling, production and pumping operations, but excludes gas flared.

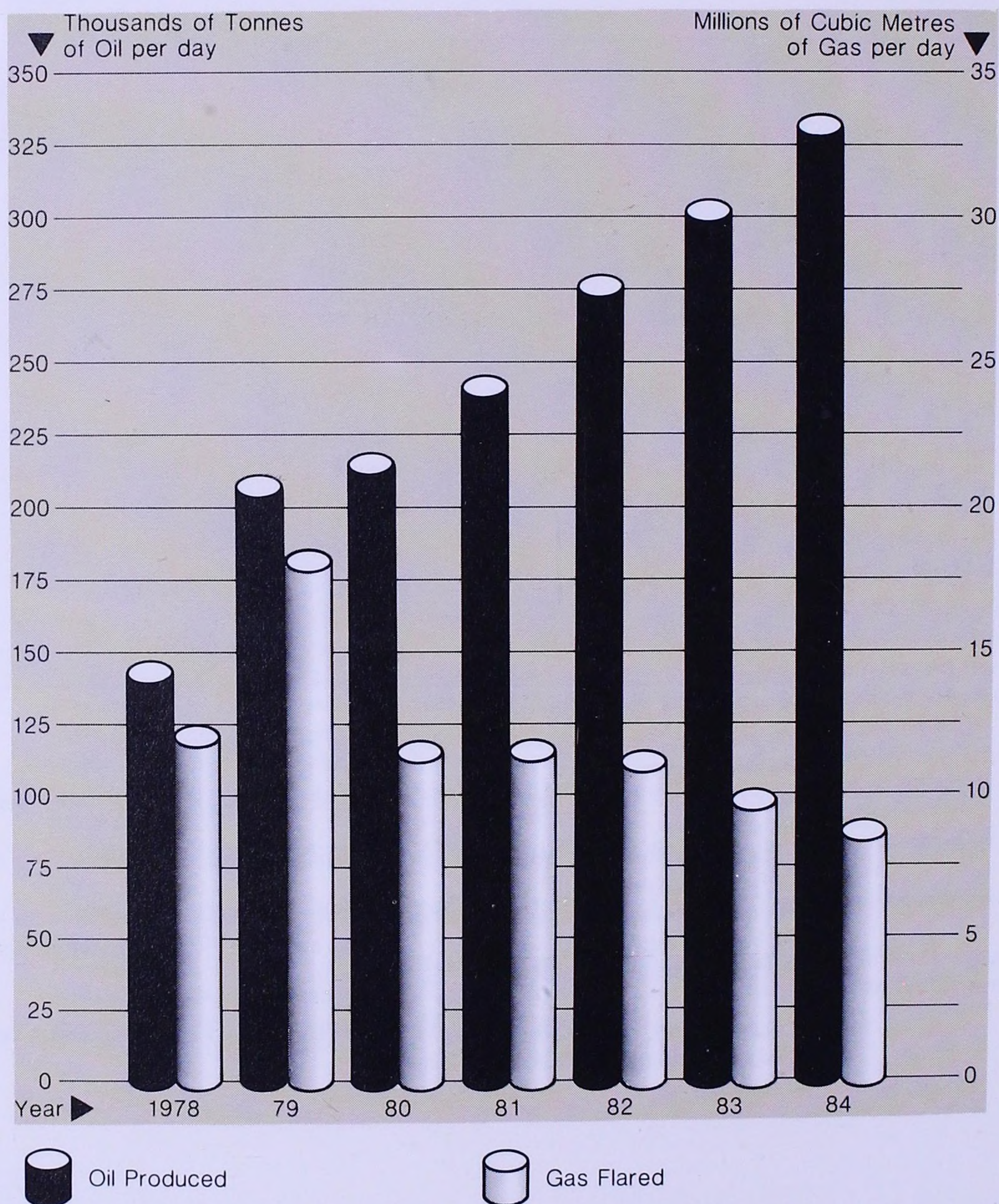
(6) Production in respect of a 2 month period only; field remained available for production for most of 1983 whilst work on converting the field to a seasonal storage facility continued.

(7) Production in respect of a 4 month period only.

West Sole, Leman, Hewett, Indefatigable, Viking and Rough have production consents for 6 months; Frigg has a production consent for 12 months.



## Appendix 10 Oil produced and gas flared at producing oil fields





# Appendix 11 Gas flaring at oil terminals and producing offshore oil fields

	Average gas flaring rate in 1984 in million cubic metres a day (figures for million cubic feet a day in brackets)	Remarks
<b>Oil terminals</b>		
Flotta	0.06 (2)	Slight reduction in flaring compared with 1983 despite some increase in oil receipts
Sullom Voe	0.47 (17)	Significant reduction in flaring compared with 1983 mainly due to improved processing and operating efficiency both offshore and at the terminal.
<b>Producing oil fields</b>		
Argyll	0.06 (2)	Small isolated field—no alternative economic outlet for gas.
Auk	0.06 (2)	Small isolated field—no alternative economic outlet for gas.
Beatrice	0.05 (2)	Small amounts flared offshore and at Nigg.
Beryl A	0.21 (7)	High gas reinjection efficiency.
Beryl B	0.25 (8)	Gas to be re-injected into reservoir for later recovery.
South Brae	1.21 (43)	Gas is being reinjected for later use at North Brae.
Brent	0.75 (27)	Gas transported via FLAGS. NGLs injected into oil pipeline to Sullom Voe.
Buchan	0.16 (6)	Small isolated field—no alternative outlet for gas.
Claymore	0.06 (2)	Small amount flared—no surplus gas.
North Cormorant	0.07 (3)	Gas transported via Western Leg and FLAGS. NGLs injected into oil pipeline to Sullom Voe.
South Cormorant	0.13 (5)	Gas transported via Western Leg and FLAGS. NGLs injected into oil pipeline to Sullom Voe.
Deveron	0.00 (0)	All gas used as fuel on nearby Thistle platform.



Field	Average gas flaring rate in 1984 in million cubic metres a day (figures for million cubic feet a day in brackets)	Remarks
<b>Producing oil fields (cont.)</b>		
Duncan	0.14 (5)	Small isolated field — no alternative economic outlet for gas.
Dunlin	0.15 (5)	NGLs injected into oil pipeline to Sullom Voe.
Forties	1.77 (63)	NGLs injected into pipeline to Cruden Bay.
Fulmar	0.33 (12)	Gas injected into reservoir until gas pipeline is available.
Heather	0.17 (6)	All dry gas not used is flared — no alternative outlet.
Hutton	0.06 (2)	All dry gas not used is flared — no alternative outlet.
North West Hutton	0.12 (4)	Gas transported via Western Leg and FLAGS. NGLs injected into oil pipeline to Sullom Voe.
Magnus	0.50 (18)	Gas transported via Northern Leg and FLAGS. NGLs injected into crude and transported via Ninian System to Sullom Voe.
Maureen	0.78 (27)	Isolated field — no alternative economic outlet for gas.
Montrose	0.27 (9)	Isolated field — no alternative economic outlet for gas.
Murchison	0.13 (5)	Gas transported via Northern Leg and FLAGS. NGLs injected into oil pipeline to Sullom Voe.
Ninian	0.37 (13)	LPGs transported to Sullom Voe and gas via Western Leg and FLAGS.
Piper	0.49 (17)	Gas transported via Frigg system to St Fergus.
Statfjord	0.09 (3)	Gas reinjected into the reservoir until pipeline is available.
Tartan	0.04 (2)	Gas transported through Piper/Claymore/Frigg system.
Thistle	0.20 (7)	Gas transported via Northern Leg and FLAGS. NGLs injected into oil pipeline to Sullom Voe.



## Appendix 12 Oil production platforms

Field	Operator	Platform Contractor	Site	Platform type	Installation date
PLATFORMS INSTALLED					
Argyll/ Duncan	Hamilton	Converted by Peterhead Engineering	Cromarty Firth	Converted Drilling Rig	Dec 1984
Auk Beatrice A	Shell Britoil	Redpath Dorman Long	Methil	Steel	July 1974
		Dragados y Construcciones	Almeria, Spain	Steel	Sept 1979
		Dragados y Construcciones	Almeria, Spain	Steel	June 1980
Beatrice B	Britoil	RGC Offshore	Methil	Steel	June 1983
Beryl A	Mobil	Norwegian Contractors	Stavanger, Norway	Concrete	July 1975
Beryl B	Mobil	Redpath de Groot Caledonian	Methil	Steel	May 1983
Brae A	Marathon	McDermott Scotland	Ardersier	Steel	April 1982
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
North Cormorant	Shell	Redpath de Groot Caledonian	Methil	Steel	April 1981
		Union Industrielle et d'Entreprise	Cherbourg, France		
South Cormorant	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



Field	Operator	Platform Contractor	Site	Platform type	Installation date
Fulmar (well-head jacket) (platform)	Shell	Redpath de Groot Caledonian	Methil	Steel	July 1979
Heather	Unocal	Highlands Fabricators McDermott Scotland	Nigg Bay Ardersier	Steel	June 1980 May 1977
Hutton	Conoco	{ Highlands Fabricators McDermott Scotland McDermott Scotland	Nigg Bay Ardersier	Steel	Sept 1984 Sept 1981
North West Hutton	Amoco		Ardersier		
Innes	Hamilton	Converted by Peterhead Engineering	Cromarty Firth	Converted Drilling Rig	Dec 1984
Magnus	BP	Highlands Fabricators	Nigg Bay	Steel	April 1982
Maureen	Phillips	{ Ayrshire Marine Constructors HDN Offshore Structures	Hunterston Loch Kishorn	Steel	June 1983
Montrose	Amoco		Le Havre, France		
Murchison	Conoco	McDermott Scotland	Ardersier	Steel	August 1979
Ninian	Chevron				
Central		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	Steel	June 1975
			Le Havre, France		
Tartan	Texaco	{ Redpath de Groot Caledonian Union Industrielle et d'Entreprise	Methil	Steel	June 1979
			Cherbourg, France		
Thistle	Britoil	Laing Offshore	Teesside	Steel	August 1976
PLATFORMS UNDER CONSTRUCTION					
Alwyn North Total (NAA)		RGC Offshore	Methil	Steel	May 1985
Alwyn North Total (NAB)		RGC Offshore	Methil	Steel	May 1986
Brae B	Marathon	McDermott Scotland	Ardersier	Steel	April 1987
Clyde	Britoil	McDermott Scotland	Ardersier	Steel	July 1985



# Appendix 13 Major Offshore 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-Bacton	35	30	Natural Gas	Shell/Esso	1968
Hewett-Bacton	20	30	Natural Gas	Phillips/Arpet	1969
Leman-Bacton	38	30	Natural Gas	Amoco	1969
Leman-Bacton	40	30	Natural Gas	Amoco/Shell/Esso	1970
Indefatigable-Leman	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-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-Crudon 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	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	Britoil	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
North Cormorant-Western Leg	14	11	Natural Gas	Shell	1980
Ninian-Western Leg	11	11	Natural Gas	Chevron	1980
Beatrice-Nigg Bay	49	16	Crude Oil	Britoil	1981
West Sole-Easington	44	24	Natural Gas	BP	1982
Brent-St Fergus	281	36	Associated Gas	Shell	1982
South Cormorant-Brent	25	16	Associated Gas	Shell	1982
Thistle-Northern Leg	6	6	Natural Gas	Britoil	1982
Tartan-Piper	11	18	Associated Gas	Texaco	1983
North Cormorant-Cormorant 'A'	11	20	Crude Oil	Shell	1983
Brae-Forties	73	30	Crude Oil	Marathon	1983
Magnus-Brent (NLGP)	49	20	Associated Gas	BP	1983
Magnus-Ninian	57	24	Crude Oil	BP	1983
North West Hutton-Cormorant 'A'	8	20	Crude Oil	Amoco	1983
Hutton (TLP)-North West Hutton	3	12	Crude Oil	Conoco	1984
Montrose-Forties	29	14	Crude Oil	Amoco	1984



Pipelines, from-to	Length (miles)	Diameter (inches)	Material conveyed	Operator
<i>Awaiting commissioning/under construction</i>				
Morecambe-Westfield Pt	23	36	Natural Gas	BGC
Rough-Easington	18	36	Natural Gas	BGC
Fulmar-St Fergus	180	20	Natural Gas	Shell
Esmond-Bacton	126	24	Natural Gas	Hamilton Bros
Clyde-Fulmar	8	16	Crude Oil	Britoil
Clyde-Fulmar	8	16	Natural Gas	Britoil
Statfjord-NLGP	14	12	Natural Gas	Conoco



# Appendix 14

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

### TOTAL EXPLORATION EXPENDITURE

£ million

	Q1	Q2	Q3	Q4	Year
1976	69.7	70.5	70.8	90.4	301.4
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	90.2	132.6	161.7	165.7	550.2
1982	185.3	217.8	213.3	263.7	880.1
1983	260.5	219.4	252.7	284.2	1016.8
1984	233.0	325.5	384.3	399.4P	1342.2P

### DEVELOPMENT EXPENDITURE<sup>(1)</sup>

£ million

	Total	Platform structures	Modules and equipment	Offshore loading systems	Pipelines	Terminals	Production wells <sup>(2)</sup>	Appraisal wells <sup>(2)</sup>	Other expenditure
<b>Oil fields</b>									
1976	1507.4	566.4	569.9	38.6	141.7	71.4	95.5	17.7	6.2
1977	1558.7	462.0	695.0	10.7	64.8	139.9	155.9	8.3	22.1
1978	1690.4	245.2	828.8	14.8	68.4	260.8	242.5	12.9	17.0
1979	1845.9	242.2	839.9	25.7	93.5	278.7	337.2	7.4	21.3
1980	2163.0	282.1	955.9	34.3	92.6	346.8	415.2	23.1	13.0
1981	2491.3	438.6	983.8	38.7	182.8	164.7	520.1	50.3	12.3
1982	2371.3	404.6	1107.0	26.4	102.0	144.4	565.5	—	21.4
1983 Q1	433.7	80.9	209.6	— 1.3	7.3	— 10.7	144.2	—	3.7
Q2	512.7	97.8	235.7	0.2	18.0	3.1	152.3	—	5.6
Q3	419.2	72.2	188.2	2.5	25.8	6.9	121.4	—	2.2
Q4	452.5	119.9	177.8	0.8	8.2	27.9	116.6	—	1.3
Year	1818.1	370.8	811.3	2.2	59.3	27.2	534.5	—	12.8
1984 Q1	392.8	108.4	146.5	1.3	6.9	1.4	124.9	—	3.4
Q2	521.9	178.6	157.3	0.3	31.3	4.1	149.7	—	0.6
Q3	411.9	90.3	138.1	2.9	28.5	14.3	137.8	—	—
Q4 P	581.7	158.5	254.8	0.5	54.7	3.3	109.9	—	—
Year P	1908.3	535.8	696.7	5.0	121.4	23.1	522.3	—	4.0
<b>Gas fields<sup>(3)</sup></b>									
1976	373.5	144.6	81.8	—	102.6	22.2	22.3	—	—
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	216.8	4.7	81.3	—	38.3	90.6	1.9	—	—
1981	279.5	39.7	45.8	—	42.9	137.7	13.4	—	—
1982	608.5	129.9	59.0	—	199.2	181.4	38.7	—	0.3
1983 Q1	200.0	36.3	73.0	—	23.8	52.3	14.6	—	—
Q2	226.4	36.2	82.7	—	34.7	63.0	9.8	—	—
Q3	268.1	47.7	130.2	—	31.6	44.5	13.6	—	0.5
Q4 P	319.4	93.9	118.6	—	37.5	43.9	25.1	—	0.4
Year P	1013.9	214.1	404.5	—	127.6	203.7	63.1	—	0.9
1984 Q1	323.8	92.3	121.1	—	24.3	52.0	34.0	—	0.2
Q2	311.6	91.7	96.9	2.7	69.8	31.5	18.4	—	0.5
Q3	346.9	76.1	128.2	0.5	80.7	34.1	27.3	—	—
Q4 P	288.9	66.8	109.4	—	41.2	38.8	32.6	—	0.1
Year P	1271.2	326.9	455.6	3.2	216.0	156.4	112.3	—	0.8

Note: The figures in the above table have been revised to take account of corrections recently received from some operators.



## TOTAL OPERATING EXPENDITURE

£ million

	Q1	Q2	Q3	Q4	Year
Oil fields					
1976	11.6	16.5	22.5	30.7	81.3
1977	35.9	38.7	41.2	43.1	158.9
1978	45.9	56.1	66.3	89.9	258.2
1979	80.1	97.9	120.3	128.3	426.6
1980	129.1	162.3	148.4	178.7	618.5
1981	202.8	220.2	249.7	256.1	928.8
1982	243.8	263.4	290.6	342.4	1140.2
1983	259.8	295.1	310.8	375.9	1241.6
1984	326.5	346.1	352.5	398.1P	1423.2P
Gas fields <sup>(3)</sup>					
1976	7.5	15.5	12.2	13.3	48.5
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	34.3	124.0
1982	32.7	36.1	45.8	47.9	162.7
1983	43.6	41.7	54.1	35.8	175.2
1984	35.4	50.8	52.1	56.8P	195.1P

P Indicates provisional figures.

- <sup>(1)</sup> The Frigg gas field's reserves were subject to an adjustment of the UK and Norwegian shares effective from 15 April 1977 and the Murchison oil field was subject to adjustments of reserves in 1979 and 1983, resulting in reimbursement of the UK licensees by the Norwegian licensees of a proportion of the expenditure 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 and in Table 13 but they have not been deducted from the expenditure figures.
- <sup>(2)</sup> For oil fields in 1983 and 1984 and for gas fields throughout, expenditure on appraisal wells has been combined with expenditure on production wells to avoid the risk of disclosing figures for individual fields. The total expenditure on appraisal wells on oil and gas fields was £40.1 million in 1983 and £22.9 million in 1984.
- <sup>(3)</sup> Expenditure on gas fields includes that on FLAGS 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 <sup>1</sup>	Estimated numbers employed on installations	Number of fatal accidents		Number of serious accidents	
					Installations	Vessels	Installations	Vessels
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
1982	30.1	25.0	67	21,500 <sup>2</sup>	11	2	37	2
1983	34.2	24.1	74	28,700 <sup>2</sup>	7	2	41	6
1984	49.1	27.6	84	31,300 <sup>2</sup>	12	1	35	6

<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, serious accidents and dangerous occurrences by activity

	Deaths												
	Pre 73	73	74	75	76	77	78	79	80	81	82	83	84
Construction				2	4			5			3		
Drilling	20*		5	2	2	2		1		3	3	3	1
Production												3	
Maintenance	2				1	4				1	1		7
Diving	3	1	3	3 <sup>+</sup>	6	2	2	3					1
Helicopters					1			1					
Boats	6	1	3	1	1	1	2		3	2	2	2	1
Cranes	4	1	1	2	2	2			1			1	
Domestic Structures <sup>(1)</sup>											1		
Unallocated <sup>(2)</sup>											3		
Total	35	3	12	10	17	11	4	10	4	6	13	9	13



	Serious accidents													Dangerous Occurrences				
	Pre 73	73	74	75	76	77	78	79	80	81	82	83	84	80	81	82	83	84
Construction	2			5	12	4	5	4	2	1	1	5		4	11		4	1
Drilling	64*	10	13	26	21	20	10	16	15	24	13	10	6	25	23	40	25	19
Production	2		1	2	4	2	4	2	3	2	1	3	1	11	14	15	21	10
Maintenance	5	1	3	6	4	1	5	13	13	22	11	8	10	21	26	31	34	27
Diving	7	1			2	5	5	1	4	3	7	9		2	7	8	7	7
Helicopters					4						1	1		3	1	1	1	4
Boats	2		2	4	7	5	7	3	3	5	2	5	6	19	22	23	28	26
Cranes	20	5	6	7	3	3	4	3	4	1	3	6	6	32	29	50	32	62
Domestic Structures <sup>(1)</sup>								1	1	1						6	3	2
Unallocated <sup>(2)</sup>	26	5														7	7	11
													10					19
Total	129	22	25	50	27	40	40	43	45	59	39	47	41	118	135	181	162	188

\* Sea Gem accounts for 13 of the Pre 1973 fatal accidents and six serious accidents.

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

<sup>(1)</sup> Incidents in this category resulted from the failure of part of an installation or from damage to the structure owing to bad weather.

<sup>(2)</sup> Up 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 reclassified under the other headings.



## Appendix 16 Oil production forecasts

The Minister of State for Energy gave the following reply to a Parliamentary Question on 13 March 1985:

"The latest forecasts for United Kingdom petroleum production in the years 1985 to 1989 are as follows:-

	<i>Million tonnes</i>
1985	120 – 135
1986	110 – 130
1987	95 – 125
1988	85 – 120
1989	80 – 115

As in previous years, these forecasts represent a range of levels of possible petroleum production for each year. The ranges make allowance for the considerable technical and geological uncertainty which influence the rate of oil production from both mature and recently developed fields.

The figures comprise stabilised crude oil and natural gas liquids (NGLs). Production of the latter has built up rapidly in the last few years as follows:

	<i>Million tonnes of NGLs</i>
1981	1.5
1982	2.9
1983	4.1
1984	4.8 (provisional)

NGLs are expected to account for some 5 million tonnes annually of total petroleum production in 1985 to 1989.

Total production in 1984 of stabilised crude and NGLs is estimated to have been 125.9 million tonnes."



## Appendix 17 British National Oil Corporation

The Minister of State made the following announcement to Parliament on 13 March 1985:

"With permission, Mr Speaker, I wish to make a statement about the British National Oil Corporation. I hope it is for the convenience of the House that I should make this statement now in view of the debate arranged for tomorrow.

In the summer of last year the Government reviewed the institutional arrangements and operations of BNOC. It then concluded that the balance of advantage lay in retaining the Corporation in its present form, given the contribution it was able to make to deriving full benefit from our oil resources.

Since then the environment in which BNOC has to operate has undergone important changes. BNOC has traditionally operated by purchasing and selling oil under term contracts at prices fixed for a period of months ahead. Its purchases under participation contracts have been in this form which, as I explained to the Select Committee on Energy, has enabled BNOC to make a contribution to stability of markets in the short term.

There has however now been a major change in the structure of the oil market away from term contracts and towards spot and similar short-term transactions. This trend is unlikely to be reversed in the near future.

In these circumstances BNOC could avoid the risk of losses only by linking its prices for participation oil closely and continuously to movement in the spot market. Such a system would mean that BNOC could no longer contribute to stability in the market. The Government has concluded that this shifts the balance of advantage decisively against the retention of BNOC in its present form. I see no advantage in retaining a public sector body to operate on that basis.

The change in market structure I have described has led me to the conclusion that BNOC should no longer purchase oil by exercising its options under participation agreements. Dealing in participation oil has been the dominant part of BNOC's activities.

The Government considers it essential to retain powers that would enhance security of supply if that proved to be necessary. We will therefore retain the participation agreements themselves so that we can activate them to have access to these oil supplies should the need arise.

We will also retain the arrangements under which we have the power to receive oil from Continental Shelf licensees as royalty in kind.

These two factors together mean that security of supply will continue to be safeguarded.

I see a need in present circumstances to retain one other function of BNOC, namely the management as agent for the Government of the Government oil pipeline system. This system is important for both defence and civil purposes.

The retention of these three functions – custody of the participation agreements, disposal of oil received as royalty in kind and management of the Government pipeline system – requires the establishment of a small Government Oil and Pipelines Agency as a successor body to BNOC. The abolition of BNOC and the establishment of the Agency for the purposes I have described will require legislation and I intend to introduce this in the present Session of Parliament.

Finally I wish to express the Government's thanks for the valuable work carried out by the Chairman, Board and staff of BNOC."



# Appendix 18 Generalised stratigraphy and thickness

U.K. Southern North Sea

Lithology	Lithostratigraphic Nomenclature	System oil and gas fields
	Quaternary Group	QUATERNARY
	Tertiary Groups	TERTIARY
	Chalk Group	CRETACEOUS
	Cromer Knoll Group	
	Humber Group	JURASSIC
	West Sole Group	
	Lias Group	
	Haisborough Group	TRIASSIC
	Bacton Group	HEWETT, ESMOND, FORBES GORDON, MORECAMBE (IRISH SEA)
	Zechstein Group	PERMIAN
	Rotliegendes Group	INDEFATIGABLE, LEMAN, ROUGH, VIKING, VICTOR, SEAN, WEST SOLE
	Westphalian 'Coal Measures' Group	CARBON - IFEROUS
	Namurian 'Coal Measures' and 'Millstone Grit' Groups	
	Dinantian 'Shale and Limestone' Groups	
	Basement	DEVONIAN TO ORDOVICIAN

	Clay, Shale etc		Dolomite
	Halite		Siltstone
	Anhydrite		Sandstone
	Marl		Volcanics
	Chalk		Coals
	Limestone		Granitic Basement

U.K. Central to Northern North Sea

Lithology	Lithostratigraphic Nomenclature	SYSTEM oil and gas fields
	Quaternary Group	QUATERNARY
	Nordland Group	TERTIARY
	Hordaland Group	FRIGG
	Moray and Rogaland Groups	FORTIES, MAUREEN, MONTROSE
	Montrose Group	
	Chalk and Shetland Groups	CRETACEOUS
	Cromer Knoll Group	
	Humber Group	* 1 JURASSIC
	Brent and Fladen Groups	* 2
	Dunlin Group	
	Triassic Group	STATFJORD TRIASSIC
	Zechstein Group	ARGYLL, AUK PERMIAN
	Rotliegendes Group	
	Carboniferous Groups	CARBON - IFEROUS
	Old Red Sandstone Group	DEVONIAN BUCHAN
	Basement	SILURIAN TO ORDOVICIAN

Approx  
1000m

Major  
Unconformities

\* 1 BRAE, CLAYMORE, FULMAR,  
MAGNUS, PIPER, TARTAN

\* 2 BEATRICE, BERYL, BRENT,  
CORMORANT, DUNLIN,  
HEATHER, HUTTON, MURCHISON,  
NINIAN, THISTLE, NORTH WEST HUTTON



# **Appendix 19    Map of the UK Continental Shelf Spring 1985**

This is the definitive map of the United Kingdom Continental Shelf.

A folded copy, 40 inches wide, is in the gusseted pocket opposite.

Flat copies for display are available from HMSO at the addresses listed on the reverse of the title page. Price is £7.50 net, including cardboard roll and postage.

ISBN 011 411567 2.



This annual report to Parliament by the Secretary of State for Energy describes the development of the oil and gas resources of the United Kingdom in 1984. It contains the Department of Energy's estimates of oil and gas reserves on the UK Continental Shelf and facts and figures on oil and gas exploration, development, production and operational activities. It also includes financial and economic information about the impact of oil and gas production on the UK.

A series of useful appendices covers specific aspects of oil and gas development such as licences issued, wells drilled, significant discoveries, oil and gas fields in production and under development, production statistics and expenditure by operators.

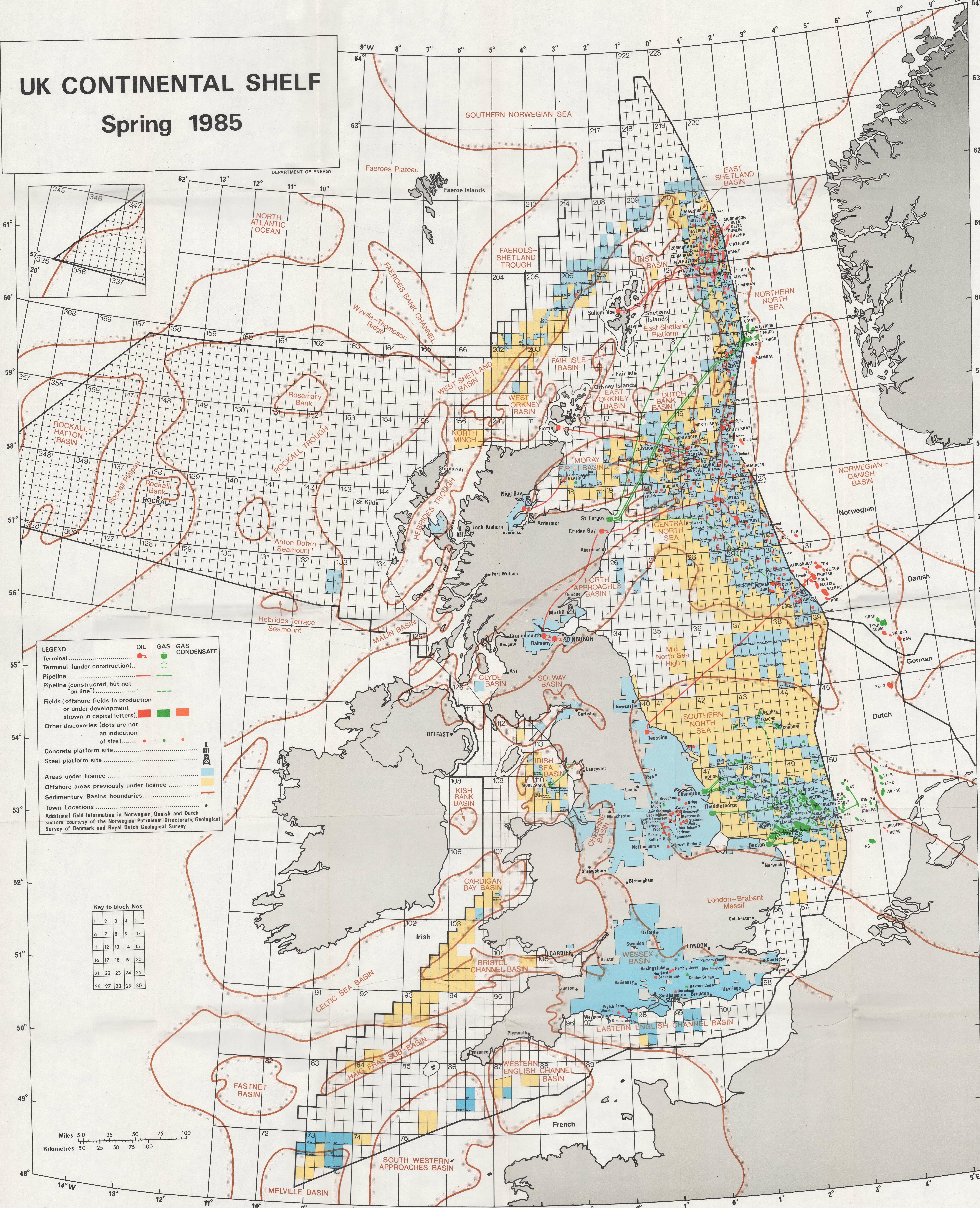
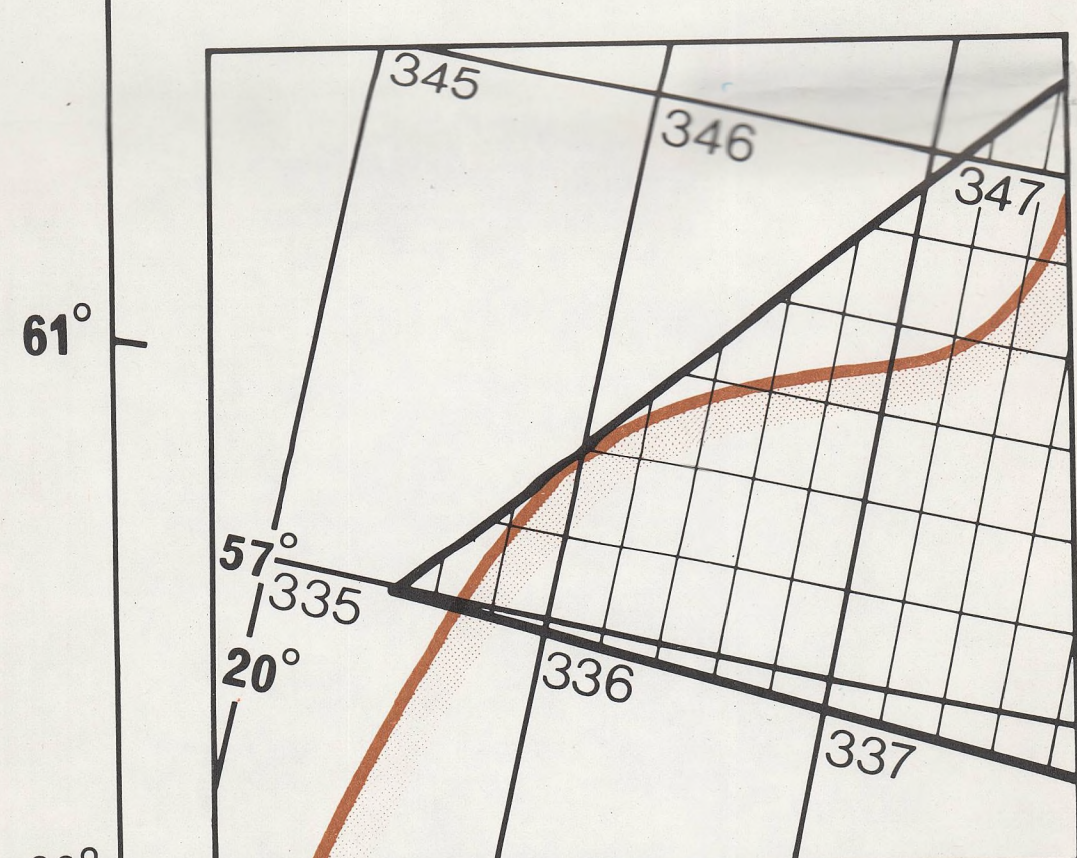
This publication is essential for those needing a comprehensive review of the UK oil and gas scene.



# UK CONTINENTAL SHELF

## Spring 1985

DEPARTMENT OF ENERGY

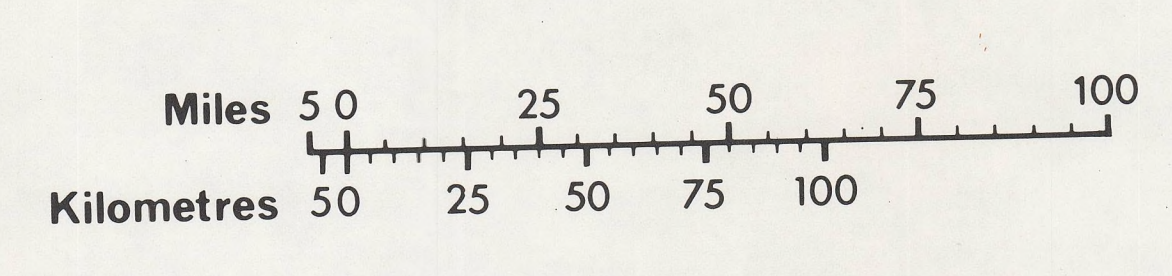


**LEGEND**

- OIL
- GAS
- GAS CONDENSATE
- Terminal (under construction).....
- Pipeline (constructed, but not on line).....
- Fields (offshore 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.....
- Areas under licence.....
- Offshore areas previously under licence.....
- Sedimentary Basins boundaries.....
- Town Locations.....
- 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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