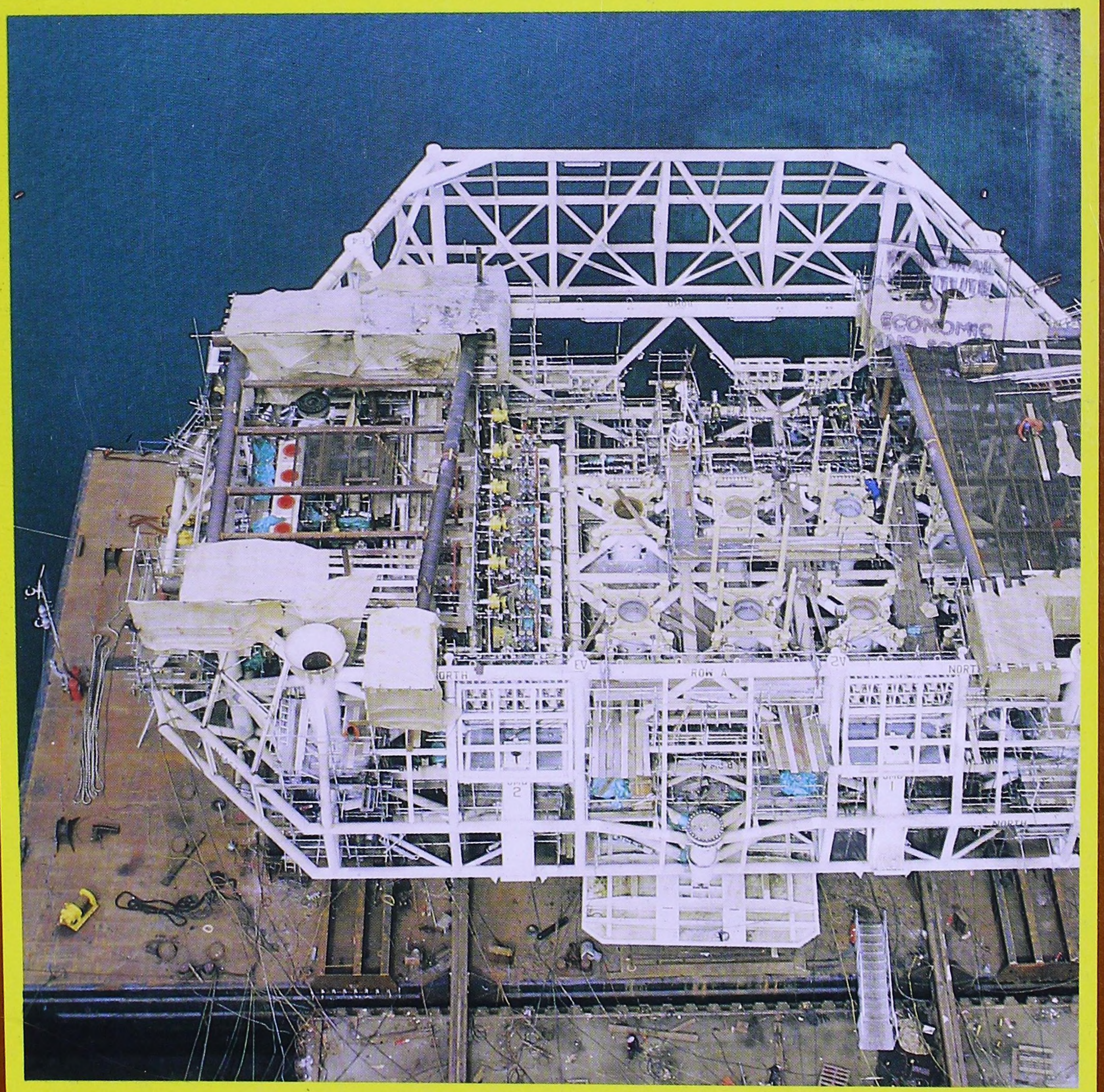
Development of the Oil and Gas Resources of the United Kingdom



1987
DEPARTMENT OF ENERGY

Front Cover Photograph

(Courtesy Occidental Petroleum (Caledonia) Ltd)

Occidental Consortium's 960 ton Scapa subsea oil production template pictured at Lewis Offshore, Stornoway.

Subsea technology was designated a priority area for offshore oil and gas research and development by the Department's Offshore Energy Technology Board in 1986.

During the year two subsea satellite oilfields, Petronella and Scapa, were inaugurated by the Rt Hon Alick Buchanan-Smith MP, Minister of State for Energy, establishing the UK Continental Shelf at the forefront of world offshore subsea development.

DEPARTMENT OF ENERGY

Development of the oil and gas resources of the United Kingdom 1987

A report to Parliament by the Secretary of State for Energy
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Throughout the text one thousand million (10^9) is referred to as one billion and one million million (10^{12}) as one trillion

Useful approximate conversion factors:

1 tonne of crude oil is approximately 7.5 barrels
1 barrel (US) of crude oil is approximately 35 Imperial gallons
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

Petroleum exploration and licensing in Northern Ireland are the responsibility of the Department of Economic Development. Enquiries may be directed to:

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Glossary of terms

Associated Gas	Natural gas associated with oil accumulations, which may be dissolved in the oil at reservoir conditions (solution gas) or may form a cap of free gas above the oil (gas cap)
Dry Gas	Natural gas composed mainly of methane with only minor amounts of ethane, propane and butane and little or no heavier hydrocarbons in the gasoline range
Wet Gas	Natural gas having significant amounts of heavier hydrocarbons in the gasoline range
LPG	Liquefied Petroleum Gas. Essentially propane and/or butane meeting fuel use specifications, gaseous at normal temperatures and pressures but held in the liquid state by pressure to facilitate storage and transport
NGLs	Natural Gas Liquids. A mixture of liquids derived from natural gas, including propane, butane, ethane and gasoline components (pentanes plus)
LNG	Liquefied Natural Gas. Natural gas, gaseous at normal temperatures and pressures, but held in the liquid state at very low temperatures to facilitate storage and transport
Condensate	A mixture of pentane and higher hydrocarbons

Summary

This report (the 1987 "Brown Book") describes the development of the oil and gas resources of the United Kingdom during 1986. Significant events in the early months of 1987 are also included. It gives information about the economic, industrial and environmental aspects of oil and gas production.

1986 was a challenging year, not least because of the problems posed for offshore oil developments by a weak world oil market and falling oil prices. Despite this, the UK continued to be attractive to the industry and activity held up comparatively well.

Exploration

During the year 113 offshore exploration and appraisal wells were started compared with 157 for 1985. Fourteen discoveries of oil, gas and condensate were announced. Onshore, 55 exploration and appraisal wells were drilled, the highest annual total to date. Six new discoveries were made.

After 22 years of drilling on the UKCS, 1109 exploration wells have been started from which 242 significant discoveries have been announced. Even in a year of worldwide exploration downturn the UKCS still remains a region of high potential.

Development

Fourteen oil and gas projects comprising nine fields and five additions to existing fields were approved in 1986. In the first two months of 1987 one further field was approved. At the end of 1986, seven offshore oil fields, six offshore gas fields, and one onshore oil field from which production had yet to commence were under development. Work was also in progress on additions to two existing oil fields and two existing gas fields. At the time of going to print 11 proposed oil/gas projects were being discussed with the Department.

Reserves

After taking account of cumulative oil production to the end of 1986 – 952 million tonnes – the remaining recoverable oil reserves in present discoveries are now estimated to lie in the range 710–2050 million tonnes.

For gas – after deducting cumulative production to the end of 1986 of 578 net billion cubic metres (bcm) – the remaining gas reserves are estimated at 634–2016 bcm.

Recoverable reserves from future discoveries are estimated to be in the range 300 to 2390 million tonnes for oil and 175–820 bcm for gas.

Licensing

On 25 March 1986 the Secretary of State announced the award of 75 new style exploration licences (EXLs) under the Petroleum (Production) (Landward Areas) Regulations 1984, thus concluding the first onshore round awards. A further seven EXLs were awarded in December 1986, all of which were for areas formerly under old style exploration licences (XLs).

The response to the Tenth Round of offshore licensing was very positive and clearly confirmed the oil industry's long term interest in the UKCS despite current oil price uncertainties.

Oil and gas production

At the end of 1986 there were 32 offshore oil fields in production and a number of onshore fields. Total oil production in 1986 was 127.0 million tonnes (including Natural Gas Liquids (NGLs)) compared with 127.5 million tonnes in 1985.

At the end of 1986 there were 17 offshore and one onshore gas fields in production. Gas production in 1986 totalled 45 bcm compared with 43 bcm in 1985.

Gas Flaring

The rate of gas flared on the United Kingdom Continental Shelf (UKCS) continued to fall, from an average of 18 million cubic metres (mmcm) a day in 1979 to about 5.5 mmcm a day in 1986. Over the same period 16 new oil fields commenced production.

Economic benefits

Proceeds from the sale of oil produced from the UKCS were £9.3 billion in 1986, compared with £19.7 billion in 1985. Proceeds from the sale of gas were £1.9 billion, compared with £1.7 billion in 1985. Government income from taxes and royalties in the financial year 1986/87 amounted to about £4.8 billion compared with £11.4 billion in 1985/86. The figures do not take account of the full contribution of gas to the exchequer given that major items such as the levy under the Gas Levy Act 1981 on gas exempt from Petroleum Revenue Tax (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 £2.5 billion in 1986, representing about one-sixth of total UK industrial investment.

UKCS fiscal regime

There were no major changes to the UKCS fiscal regime announced in the 1986 Budget. Of the measures that were included, one of the most significant was the decision to ensure that the onshore/offshore boundary coincided with the UK coastline for Petroleum Revenue Tax (PRT) purposes thus providing for the continuance of immediate PRT relief on exploration and appraisal activity in inshore waters.

With the sharp fall in oil prices in 1986 three main measures were subsequently taken to help maintain the pace of development. The Chancellor announced in his Autumn Statement, the repayment of some £300 million of Advance Petroleum Revenue Tax. Two further measures were proposed by the Chancellor in the 1987 Budget. These are a 10 per cent cross field allowance against PRT for certain new field expenditure and provision to extend PRT relief to research which would not otherwise qualify.

Offshore supplies

In 1986, the total value of orders reported by operators for oil and gas development work on the UKCS was £2.2 billion. The UK share, at 82 per cent was worth £1.8 billion.

Part 1: Exploration

1.1 Exploration drilling

(a) Offshore
In 1986 73 exploration and 40 appraisal wells were started, a total of 113 wells (Appendix 2). Although less than last year's total of 157 well starts, the contribution from the mature provinces of Northern North Sea (including associated East Shetland Platform), Moray Firth, Central North Sea and Southern Gas Basin continued to account for about 90% of this drilling activity as it did in 1985.

Fourteen discoveries were announced in 1986, five oil, one oil and gas, seven gas and one gas and condensate. Again these successes are dominated by the discoveries in mature areas. Details of all significant discoveries announced to the end of 1986 are given in Appendix 3, and those for 1986 are discussed below under the individual areas.

Northern North Sea (including East Shetland Platform)

Twenty exploration and 14 appraisal wells were started in this region and three significant discoveries were announced. The area continues to provide new discoveries which, although small, are in some cases significant in that they extend existing older discoveries and fields. Many of these extensions are likely to be developed as incremental additions to existing fields. The continued high level of appraisal drilling in the area also confirms this trend.

Moray Firth

Twelve exploration and four appraisal wells were drilled and although only three significant discoveries were made, the region remains highly prospective. Although conventional plays are present throughout the geological section in this mature area, new subtle oil and gas traps are still being recognised and evaluated with differing degrees of success.

Central North Sea

Seventeen exploration and five appraisal wells were drilled in the Central North Sea and three significant discoveries have been announced. As with the Moray Firth area, the mature Central North Sea area exhibits plays throughout the geological column and discoveries are continuing to be made in areas and in rocks that previously had been considered to be non-prospective.

Forth Approaches

One exploration well was drilled in this area. No significant discoveries have as yet been made in this region.

Southern North Sea

Twelve exploration and 17 appraisal wells were drilled in the Southern Gas Basin and four significant discoveries were announced.

Wells evaluated extensions to existing discoveries as well as testing new Carboniferous plays. Structurally, the area is still difficult to evaluate (even after 22 years of drilling) and the continuing success reflects new interpretations with more sophisticated seismic depth conversion methods.

Mid North Sea High, Morecambe Bay, Rockall and North of 62°

No drilling was carried out in any of these areas in 1986.

English Channel

One unsuccessful exploration well was drilled.

South West Approaches

Two exploration wells were drilled completing drilling commitments. There has been no significant discovery yet in this area.

Cardigan Bay

One exploration well was drilled in 1986. No significant discoveries have yet been made in this area.

West of Shetlands

Seven exploration wells were drilled and one significant gas discovery was made in block 206/1–2. Chevron's 213/27–2 well was drilled under 2625 feet of water, the greatest depth at which a commercial well has yet been drilled on the UKCS.

(b) Onshore

A record level of exploration and appraisal drilling was reached in 1986. Thirty-seven exploration wells and 18 appraisal wells were started (see Appendix 2). Exploration activity was highest in the East Midlands and in Southern England. In addition, wells were also drilled in the Central Lowlands of Scotland, the Cheshire Basin and the Northumberland Basin.

Six new discoveries were announced, three of which started drilling in 1985. Five of them were in the East Midlands and one in Southern England. Appendix 4 gives details of these discoveries.

The appraisal drilling activity was mainly concentrated in Southern England continuing the evaluation of recent discoveries. Appendix 5 contains more information on appraisal drilling on significant discoveries.

1.2 Licensing

(a) Offshore

Proposals for the Tenth Round were announced on 22 April 1986. These identified the areas in which it was intended to offer blocks with the main objectives of consolidating on the Ninth Round and encouraging exploration in areas which merited more extensive examination.

Following consultations about these proposals with the UK Offshore Operators' Association (UKOOA), the Association of British Independent Exploration Companies (BRINDEX) and with the fishing and environmental organisations concerned, final arrangements for the Round were announced on 15 July 1986. Full details and the formal invitation to apply were published in Official Gazette Notices on 25 July 1986.

The Round offered a total of 127 blocks. Most were in or on the fringes of the proven oil and gas areas of the Northern North Sea and the Southern North Sea. A small number (18) were in frontier areas including six in deeper waters (in excess of 500 metres depth) in the Faeroes Trough.

A breakdown is as follows:

Mature and 'fringe' areas	
Northern North Sea:	24
Southern North Sea	26
Moray Firth	36
Central North Sea	23
Frontier	
Rockall Trough:	7
Mid-North Sea High:	5
Faeroes Trough (Deep Water):	6

The terms followed the same general lines as in the Ninth Round except for the indexation of annual rental charges against movements in oil prices.

The closing date for applications was 17 February 1987. Seventy-five applications covering a total of 61 blocks were received. These applications were still being processed at the time of going to print. All licence awards will be made at the Secretary of State's discretion.

Details of each of the Nine Rounds are set out in Appendix 1.

(b) Onshore

The final results of the first onshore round were announced on 25 March 1986. Seventy-five new style exploration licences (EXLs) were awarded, adding to the 20 which had been announced on 12 December 1985.

On 30 September 1986 10 applications were received for EXLs for acreage covered by old style exploration licences (XLs). These resulted in the award of seven EXLs announced on 10 December 1986. One appraisal licence (AL) was awarded on 12 September 1986, to appraise a well at Crosby Warren, Humberside.

The new onshore licensing arrangements provide for three types of licences, designed for the identifiable stages of exploration, appraisal and development. These are fully described in the 1984 Report.

The first Onshore Licensing Round resulted in a large increase in the total onshore area under licence. At the end of 1986, 297 petroleum licences of various kinds covered 61,779 sq kms compared with 239 covering 52,967 sq kms a year earlier. The breakdown of these figures is as follows:

Table 1: *AREA COVERED BY ONSHORE PETROLEUM LICENCES*

	1986		1985	
	No.	Area (sq kms)	No.	Area (sq kms)
MLs[1]	14	413	14	413
XLs	69	21,789	89	28,130
PLs[2]	112	17,711	116	21,001
EXLs	101	21,854	20	3,423
ALs	1	12	–	–
Total	297	61,779	239	52,967

Notes
(1) Mining licences
(2) Production licences

Part 2: Reserves

As in previous years the UKCS reserves are considered under two main headings; the discovered in Section 2.1 and the undiscovered in Section 2.2.

This separation is necessary in order to reflect the very different quality of information available in respect of each category. Whereas the information on discovered reserves allows good estimates to be made on a field-by-field basis from measured data taken in wells, the estimate of undiscovered reserves has been obtained through a predictive statistical assessment of the likely number and size of future discoveries.

However, it is additionally important to realise that although hydrocarbons may be 'discovered' by drilling, in the early stages it may be difficult to establish if such hydrocarbons can be treated as recoverable until additional appraisal has been carried out and they will only be included in the data base of reserves if they can be considered economically and technically producible according to the definitions given on p 7. It may be, therefore, that in specific cases newly discovered reserves do not meet even the minimum requirement of the 'possible' discovered reserves definition and hence are not included in this section. Only after appraisal wells have been drilled and the reservoir evaluated is there some certainty about such reserves. At that stage, depending upon the probability of development, proportions of the reserves may be placed in the 'proven', 'probable' and 'possible' categories.

The discovered reserves in Tables 2 and 3 have been prepared on a similar basis to last year. The inclusion and allocation of reserves into the various categories are based on judgements regarding their technical and economic recovery. These judgements remain broadly the same as in last year's Brown Book despite the fact that oil prices fell sharply in 1986. The reason for this is that the reserves figures are based on a very long term view of the future, and the Department is satisfied that the judgements involved remain valid given the views on longer term oil prices currently voiced within the industry.

Undiscovered reserves have even greater uncertainties attached to them. Under the Licence obligations, Exploration and Production Licensees supply copies of all data acquired to the Secretary of State. Thus the Department, having access to all UKCS geological and geophysical data, is in a unique position to assess it.

Such assessments are used for a variety of purposes e.g. selection of blocks for Licensing Rounds; background for work programme discussions with potential Licensees; delimitation of fields and development areas; and to assess the ranges of UKCS hydrocarbon potential.

As noted in the 1986 Brown Book, and again here, detailed assessments have been and are being made of undiscovered reserves using the methodology described. These assessments enable the Department to make each year a 'best guess' of the ranges of UKCS potential.

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 10 million tonnes. Table 2 includes liquids and liquefied products obtained from gas fields, condensate fields and associated gas in oil fields.

Although exploration and appraisal drilling was not at the same high order as in 1985, further encouraging discoveries were made, mainly in the Central and Northern North Sea.

For Category A1 there has been an overall increase in the proven initially recoverable reserves of some 90 million tonnes mainly resulting from favourable production history which has allowed reserves to be upgraded from probable and possible to proven. There have also been some significant increases in the reserves of certain onshore fields.

Now that Petronella has been approved for development there has been a minor transfer of reserves from A2 into A1 (Ivanhoe and Rob Roy were transferred last year).

Table 2: *ESTIMATES OF RECOVERABLE OIL RESERVES IN PRESENT DISCOVERIES ON THE UKCS[1] AS AT 31 DECEMBER 1986 (EQUIVALENT FIGURES FOR 1985 ARE IN BRACKETS).*

					Million tonnes[2]
Category	Proven*	Probable*	Proven plus Probable	Possible*	Maximum Possible[3]
A Initially Recoverable Reserves					
1 Fields in production or under development	1630 (1540)	180 (250)	1810 (1790)	240 (250)	2050 (2040)
2 Other significant finds not yet fully appraised	30 (40)	440 (230)	470 (270)	480 (400)	950 (670)
Total initial reserves in present discoveries	1660 (1580)	620 (480)	2280 (2060)	720 (650)	3000 (2710)
B Remaining Recoverable Reserves					
Cumulative production to the end of 1986	952 (825)				
Total remaining reserves in present discoveries	710 (750)	620 (480)	1330 (1230)	720 (650)	2050 (1880)

*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 a better than 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.

(1) Includes onshore and offshore discoveries.
(2) Figures are rounded to 10 million tonnes. All figures include gas liquids and liquefied products.
(3) Maximum possible – the sum of the proven, probable and possible reserves.

For Category A2 the Department carried out a thorough re-evaluation of prospects discovered prior to December 1985 resulting in a small downgrade in the proven but a major increase in the probable reserves. New discoveries in 1986 have also increased the probable and possible reserves.

The net effect of these changes is an increase in the estimate of the proven plus probable initially recoverable reserves in present discoveries from 2060 to 2280 million tonnes. The possible reserves have also increased by some 70 million tonnes so that the maximum possible total has now increased from 2710 to 3000 million tonnes.

After deducting cumulative production to the end of 1986, the remaining proven plus probable reserves stand at 1330 million tonnes, a net increase of 100 million tonnes since the end of 1985.

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 1660–3000 million tonnes. This compares with an equivalent range of 1580–2710 million tonnes from the estimates given in last year's report. After allowing for cumulative production to date of 952 million tonnes the remaining recoverable reserves in present discoveries are estimated to be within the range 710–2050 million tonnes.

(b) Gas

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 from gas fields, condensate fields and from the associated gas in oil fields are included in the estimate of oil reserves in Table 2.

Overall the total initial reserves show little change from last year. The largest changes occur in dry gas discoveries not yet fully appraised i.e. the A1(b)(i) and A1(b)(ii) categories.

Exploration and appraisal activity continued during 1986 albeit at a lower level than in 1985, and this has helped to firm up the encouraging results of earlier finds, particularly those in the Carboniferous.

The Cleeton and South Ravenspurn fields together with Vanguard, Vulcan and South Valiant were approved during the year and this has resulted in a transfer from Category A1(b)(i) into Category A1(a)(i). The Audrey field was approved very early in 1987 and this too has been included as a transfer into Category A1(a)(i). Also in Category A1(b)(i) there have been some new additions which have been roughly balanced by further downgrading of reserves in some of the complex low permeability reservoirs highlighted last year.

Little has changed with respect to the associated gas figures but some increased allowance has been made to cover added gas utilisation in Category A3(a)(i).

Increased appraisal has allowed better definition of some known condensate fields and discoveries and this has led to a reduction in the possible reserves with upgrading of the probable reserves.

The net effect of these changes has been a small increase in the overall total of proven plus probable plus possible initially recoverable reserves in present discoveries from 2551 bcm (90.1 tcf) to 2594 bcm (91.6 tcf).

However increased appraisal and re-evaluation of some Southern Gas Basin and other dry gas discoveries has allowed upgrading of reserves from possible to probable such that the proven plus probable reserves have increased from 1778 bcm (62.8 tcf) to 1903 bcm (67.2 tcf).

After deducting cumulative production to date of 578 bcm (20.4 tcf) the remaining proven plus probable reserves have increased from 1242 bcm (43.9 tcf) to 1325 bcm (46.8 tcf).

In order to derive a range for the initially recoverable gas reserves in present

Table 3: *ESTIMATES OF RECOVERABLE GAS RESERVES IN PRESENT DISCOVERIES ON THE UKCS[1] AS AT 31 DECEMBER 1986 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*	Maximum Possible[5]
A Initially Recoverable Reserves					
1 Gas from dry gas fields					
(a) Fields in production or under development					
(i) Southern Basin	844 (29.8)	79 (2.8)	923 (32.6)	73 (2.6)	996 (35.2)
(ii) Other areas[2]	175 (6.2)	37 (1.3)	212 (7.5)	37 (1.3)	249 (8.8)
Sub total	1019 (36.0)	116 (4.1)	1135 (40.1)	110 (3.9)	1245 (44.0)
(b) Other significant discoveries not yet fully appraised					
(i) Southern Basin	42 (1.5)	215 (7.6)	257 (9.1)	159 (5.6)	416 (14.7)
(ii) Other areas	– (–)	26 (0.9)	26 (0.9)	37 (1.3)	63 (2.2)
Sub total	42 (1.5)	241 (8.5)	283 (10.0)	196 (6.9)	479 (16.9)
Total dry gas	1061 (37.5)	357 (12.6)	1418 (50.1)	306 (10.8)	1724 (60.9)
2 Gas from condensate fields[3]					
(a) Fields in production or under development	40 (1.4)	8 (0.3)	48 (1.7)	14 (0.5)	62 (2.2)
(b) Other significant discoveries not yet fully appraised	– (–)	224 (7.9)	224 (7.9)	275 (9.7)	499 (17.6)
Total gas from condensate fields	40 (1.4)	232 (8.2)	272 (9.6)	289 (10.2)	561 (19.8)
3 Associated gas from oil fields[3]					
(a) Fields in production or under development					
(i) Currently delivering to shore	88 (3.1)	8 (0.3)	96 (3.4)	12 (0.4)	108 (3.8)
(ii) Expected to be connected	23 (0.8)	20 (0.7)	43 (1.5)	5 (0.2)	48 (1.7)
Sub total	111 (3.9)	28 (1.0)	139 (4.9)	17 (0.6)	156 (5.5)
(b) Other significant discoveries not yet fully appraised	– (–)	74 (2.6)	74 (2.6)	79 (2.8)	153 (5.4)
Total associated gas	111 (3.9)	102 (3.6)	213 (7.5)	96 (3.4)	309 (10.9)
Total initial reserves in present discoveries	1212 (42.8)	691 (24.4)	1903 (67.2)	691 (24.4)	2594 (91.6)
B Remaining Recoverable Reserves					
Cumulative production to end of 1986[4]					
1 Dry gas					
(a) Southern Basin	497 (17.6)				
(b) Other areas	52 (1.8)				
2 Associated gas from oil fields	29 (1.0)				
Total cumulative production to end of 1986	578 (20.4)				
Total remaining reserves in present discoveries	634 (22.4)	691 (24.4)	1325 (46.8)	691 (24.4)	2016 (71.2)

Notes

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

(1) Includes onshore and offshore discoveries.

(2) UK Frigg and South Morecambe.

(3) All in Northern Sectors of the North Sea (North of 56°N).

(4) Excludes flared gas and gas used on platforms.

(5) Maximum possible – the sum of the proven, probable and possible reserves.

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, i.e. maximum possible, giving a range of 1212–2594 bcm (42.8–91.6 tcf). This compares with an equivalent range of 1184–2551 bcm (41.8–90.1 tcf) in last year's report.

2.2 Undiscovered recoverable reserves

Forecasting of reserves yet to be found is subject to greater uncertainty than the calculation of the estimates of reserves which have been discovered.

The 1987 estimates for undiscovered recoverable reserves are shown in Table 4 by geological area.

Three of the six areas listed:

(a) Northern and Central North Sea
(d) Southern Basin and Irish Sea, and
(e) East Midlands and South East England

have been assessed in detail using the methodology employed in the preparation of the 1986 Brown Book.

Detailed work continues in these areas as new well and seismic data become available. A statistical treatment is applied to identified geological features, without taking account of stratigraphical plays or possible traps which are currently beyond the level of seismic resolution and penetration.

The relative paucity of data in the remaining three areas:

(b) West of Shetland
(c) West of Scotland
(f) Remainder of the UKCS (including land basins other than area (e))

has precluded the calculation of reserve figures using the above rigorous methodology.

While no changes have been made in the methodology used, the benefits of the high levels of activity, both seismic and drilling, during recent years are reflected in the data base on which the calculations are made.

Those structures which have been evaluated and which proved to contain oil and/or gas (i.e. discoveries) may eventually be transferred to, and included in, the discovered reserves category. Some of these reserves, but not all, have merited inclusion this year.

As in previous years, cut-off points have been applied to both the oil and gas calculations. These cut-offs have been maintained at last year's value of 15 million barrels in the case of oil and 100 bcf in the case of gas for off-shore. Onshore, the cut-off of 0.5 million barrels used in 1986 has been retained. These cut-offs do not imply that finds below these levels, if made, would necessarily be uneconomic.

(1) Oil

The estimate for undiscovered oil now lies in the range of 300–2390 million tonnes as compared with a range last year of 295–2235 million tonnes.

In the Northern and Central North Sea (area (a)), reassessment has continued using recently acquired seismic and well data. Additional prospects have been identified by this work, resulting in an upward shift of the undiscovered reserve figures for the area.

Recent discoveries of a non-structural (i.e. stratigraphic) nature are encouraging. As explained above, such prospects have not been included in this analysis, but are additional potential reserves both in this and other areas.

Although no detailed assessments have yet been undertaken in the West of Shetland (area (b)), the figures have been modified slightly, due to the disappointing drilling results in recent years – only 7 wells were drilled in 1986, one of which was a discovery.

The figures for the two landward basins – East Midlands and South-East England – which were assessed for the first time last year, essentially remain the same. The reduction at the top end results from a modification of the database due to drilling in 1986.

The numbers for West of Scotland (area (c)) remain similar to 1986.

(2) Gas
The estimated range for undiscovered gas, associated gas and condensate has changed to 175–820 bcm (6.23–28.9 tcf) from 220 – 835 bcm (7.75–29.4 tcf) last year, as a result of this year's review.

(a) *Dry Gas*
(i) Southern Basin and Irish Sea (area (d)):

The undiscovered range for dry gas in these basins changes to 160–700 bcm (5.7–24.7 tcf) this year, from 210–740 bcm (7.4–26.1 tcf) last year, reflecting the effects of 1986 drilling on the number of potential accumulations available for assessment.

The range remains large, reflecting the uncertainty associated with these plays.

(ii) *Other areas*
Some dry gas probably occurs in areas (a), (b), (c), (e) and (f), but it cannot be separately assessed meaningfully.

(b) *Associated gas and condensate*
For the Northern and Central North Sea (area (a)), the range of reserves changes to 15–120 bcm (0.53–4.2 tcf) this year, from 10–95 bcm (0.35–3.3 tcf) last year, reflecting the identification of new prospects in the area using the most recent seismic data available.

Estimates of undiscovered reserves must be treated with caution. They provide only a broad indication of the ultimate remaining potential, and the limits of the ranges should not be considered as minima or maxima. The most likely outcome for both oil and gas may be expected to lie in the lower halves of the ranges.

Table 4: *ESTIMATES OF UNDISCOVERED RECOVERABLE RESERVES ON THE UKCS*[1] *RESERVES IN FUTURE DISCOVERIES BY GEOLOGICAL AREA.*

Area	*Range of estimated reserves*[4]	
	Oil (million tonnes)	Gas (bcm,[8] tcf in brackets)
(a)* Northern and Central North Sea (56°N–62°N)[2][4][5]	260–1070	15–120 (0.53–4.2)
(b) West of Shetland[4]	20– 320	not assessed
(c) West of Scotland[3][4]	0– 520	not assessed
(d)* Southern Basin and Irish Sea[5]	assumed nil	160–700 (5.7–24.7)
(e)* East Midlands and South East England[6]	15– 30	not assessed
(f) Other areas of the UKCS[7] (including other land)	5– 450	not assessed
TOTALS	300–2390	175–820 (6.23–28.9)

Notes
(1) Includes onshore and offshore assessments.
(2) Gas associated with oil.
(3) The bottom end of the range is taken as zero as no oil has been proved to date in this area.
(4) Totals for each offshore area have been rounded to 10 million tonnes of oil or 5 billion cubic metres of gas.
(5) Every offshore prospect included in the detailed survey on which this table is based is estimated to contain reserves of at least 2 million tonnes of oil (15 million barrels) or 2.8 bcm of gas (0.1 tcf).
(6) Onshore, every prospect is estimated to contain reserves of at least 0.5 million barrels of oil. The figures have been rounded to 5 million barrels.
(7) In this case, the lower end of the range has been rounded to 5 million tonnes to take account of land basins not included in the main study.
(8) No account has been taken of projected fuel oil usage or flaring.
* Areas where detailed studies have been carried out.

2.3 Estimated total potential of the UKCS

As pointed out in the introduction in "Part 2: Reserves" the quality of information available in respect of the discovered and undiscovered reserves is very different.

However, if the ranges in Table 4 are added to the ranges for the discovered oil and gas recoverable reserves given in section 2.1 the following ranges result for the initially recoverable hydrocarbons on the UKCS:

Table 5: *UKCS INITIALLY RECOVERABLE RESERVES*

	million tonnes	
Oil:	1660–3000	(discovered)
	300–2390	(undiscovered)
Total	1960–5390	
	bcm (tcf)	
Gas:	1212 (42.8)–2594 (91.6)	(discovered)
	175 (6.23)– 820 (28.9)	(undiscovered)
Total	1387 (49.03)–3414 (120.5)	

Taking account of cumulative production to date of 952 million tonnes of oil and 578 billion cubic metres of gas, total remaining reserves are estimated to be in the ranges 1008–4438 million tonnes of oil and 809–2836 billion cubic metres of gas.

There is a case on statistical grounds for narrrowing the ranges quoted for total UKCS discovered oil and gas reserves. However, it is still 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 in recent years therefore the Department has 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 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, or under a development or production programme approved by him. In 1986, 14 projects were approved: six oil, seven gas and one pipeline. These are listed in Table 5. One development was approved in the first two months of 1987.

Table 5: *PROJECTS APPROVED IN 1986*

	Approval Date
(a) **Oil**	
Ivanhoe	January
Rob Roy	January
Petronella	April
Thistle (Area 6)*	July
Innes (revised development plan)*	December
Stainton (onshore)	December
(b) **Gas**	
South Valiant	February
Vanguard	February
Vulcan	February
North Hewett*	March
Cleeton	May
South Ravenspurn	May
South Morecambe (Stage 2)*	October
Pipelines	
Auk-Fulmar*	April

*Incremental projects, ie further development within the petroleum revenue tax areas of existing fields.

Future developments

Proposals for 11 oil and gas projects were being discussed with the Department at the time of going to print, and discussions could begin during 1987 on proposals for a further 15–20 new and incremental projects.

3.2 Development drilling

In 1986 a total of 85 oil and gas development wells were started on the UKCS. Thirty six were gas development wells, a higher proportion than in recent years. An apparent sharp decline in oil well starts East of Scotland does not properly reflect the real trend in development. Wells in the Balmoral field and for the South East Forties platform were pre-drilled while the platforms for those developments were under construction. This inflated the number of well starts in 1985 and reduced the figures for 1986 correspondingly. An average for the two years would give a more realistic indication of the trend in development drilling in this area. Six new subsea development wells were started. During 1986 over 50 per cent of fixed platform rig activity was directed at oil well servicing and repair.

Details of development drilling in individual fields can be found in the tables in Sections 3.3, fields under development and 4.10, fields in production.

Appendix 2 contains tables showing details of oil rig activity in the years 1977 to 1986 by geographical area offshore and onshore and the number of new development wells started in each of those areas during each year.

3.3 Fields† under development

(a) Offshore oil and condensate

Field name (operator)	Block number and licence number	Licensees	Approximate company interest in block (%) at the end of 1986	*Extension into other UK blocks* Block number and licence number	Licensees/Company interest in block (%) at the end of 1986	Date of discovery
North Alwyn (Total)	3/9a P.090	Total Oil Marine plc Elf UK plc *OPA	33 1/3 66 2/3 Nil	Part 3/4a P.416	Total Oil Marine plc/ 33 1/3 Elf UK plc/66 2/3 *OPA/Nil	Oct 1975
Clyde (Britoil)	30/17b P.266	Britoil plc Shell UK Ltd Esso Exploration and Production UK Ltd *OPA	51 24.5 24.5 Nil			June 1978
Cyrus (BP)	16/28 P.092	BP Petroleum Development Ltd	100			Oct 1979
Eider (Shell)	211/16a P.296	Shell UK Ltd Esso Exploration and Production UK Ltd	50 50			May 1976
Ivanhoe (Amerada Hess)	15/21a P.218	Deminex UK Oil and Gas Ltd Kerr-McGee Oil (UK) plc Pict Petroleum plc Whitehall Petroleum Ltd Amerada Hess Ltd	43.33 10.83 3.75 3.75 38.34			1975
Rob Roy (Amerada Hess)	15/21a P.218	Deminex UK Oil and Gas Ltd Kerr McGee Oil (UK) plc Pict Petroleum plc Whitehall Petroleum Ltd Amerada Hess Ltd	43.33 10.83 3.75 3.75 38.34			1984

Date of production start up	Operator's estimate of first year of peak production	Operator's estimate of recoverable reserves originally present in the field (million tonnes)[1]	Operator's estimated peak production (million tonnes per year)	Transport system	Remarks
1988	Oil 1989 Gas 1989	26.18 27 bcm	4.36 2.7 bcm	Oil and NGLs piped to Sullom Voe via Ninian Central. Gas transported to St Fergus via the Frigg UK Association pipeline system	Further major construction works were completed in 1986, including the installation of the process platform (NAB) jacket in May and its module support frame in June. Installation of the remaining modules is scheduled for late spring/early summer 1987.
1987	1988	20.5	2.4	Oil piped to Fulmar for tanker loading offshore. Gas piped to Fulmar and then to St Fergus via the new Fulmar pipeline.	Development drilling in progress. First oil expected March 1987.
1988	1989	1.7	0.45	Oil will be stored on board the SWOPS[2] vessel.	Construction of SWOPS[2] vessel is progressing. Produced gas will be used for power generation.
1989	1990	11.5	2.2	Oil piped via North Cormorant to Sullom Voe.	Construction has commenced. Gas used for power generation.
1989	Oil 1989 Gas 1988	11.85 1.96 bcm	2.5 0.41 bcm	Pipeline	Drilling of seven development wells will commence in June 1987 and be complete by 1989. A further nine wells will be drilled after production commences. Conversion of the semi-submersible AH001 will start in 1987 and be completed in early 1989. Construction of the two subsea production manifolds and the riser base manifold will begin in Autumn 1987 and be complete in third quarter 1988. Oil and gas pipelines will be laid during 1988.

3.3 Fields† under development

(a) Offshore oil and condensate (continued)

Field name (operator)	Block number and licence number	Licensees	Approximate company interest in block (%) at the end of 1986	*Extension into other UK blocks* Block number and licence number	Licensees/Company interest in block (%) at the end of 1986	Date of discovery
Tern (Shell)	210/25a P.296	Shell UK Ltd Esso Exploration and Production UK Ltd	50 50			May 1975

(b) Offshore gas

Audrey (Phillips)	49/11a P.028 (Part)	Phillips Petroleum Company United Kingdom Ltd	35	48/15a P.130 (Part)	Conoco Ltd/50 Britoil plc/50	1975
		Fina Exploration Ltd	30			
		Agip (UK) Ltd	15			
		Century Power and Light Ltd	7.22			
		RTZ Oil and Gas (UK) Ltd	4.26			
		LASMO North Sea plc	8.52			
Cleeton (BP)	42/29 P.001	BP Petroleum Development Ltd	100			1982
South Ravenspurn (BP)	42/30 P.001	BP Petroleum Development Ltd	100	42/29 P.001	BP Petroleum Development Ltd/100	1983
				43/26 P.380	Tricentrol Exploration UK Ltd/25 Hamilton Oil Great Britain plc/15 Hamilton Brothers Petroleum (UK) Ltd/7.5 Trafalgar House Oil and Gas Ltd/10 Enterprise Oil plc/20 Kleinwort Benson Energy Ltd/7.5 Blackfriars Oil and Gas Ltd/15	

Date of production start up	Operator's estimate of first year of peak production	Operator's estimate of recoverable reserves originally present in the field (million tonnes)[1]	Operator's estimated peak production (million tonnes per year)	Transport system	Remarks
1989	1991	23.8	2.7	Oil piped via North Cormorant to Sullom Voe.	Construction contracts have been placed. Gas used for power generation.
		(bcm)	(bcm/year)		
Oct 1988	1990	30	2.8	By pipeline into LOGGS system separation before onward transmission to Conoco's Theddlethorpe processing plant	Unmanned platform controlled from Conoco's 'V' field complex. Project approval given in February 1987.
1988	The combined Cleeton/South Ravenspurn plateau production will be reached in 1990/1	8	2.48	Pipeline to Dimlington	Wellhead tower bridged to Process/Quarters platform.
1989		25.9		Pipeline to Cleeton	Three unmanned satellite wellhead platforms. Gas routed to Cleeton for processing/onward transmission.

3.3 Fields† under development

(b) Offshore gas (continued)

Field name (operator)	Block number and licence number	Licensees	Approximate company interest in block (%) at the end of 1986	*Extension into other UK blocks* Block number and licence number	Licensees/Company interest in block (%) at the end of 1986	Date of discovery
South Valiant (Conoco)	49/21 P.039	Arco British Ltd	12.5			1970
		Marathon Petroleum North Sea (GB) Ltd	12.5			
		Cities Services (UK) Ltd	12.5			
		Britoil (Exploration) Ltd	25			
		Britoil (Development) Ltd	12.5			
		Conoco Ltd	25			
Vanguard (Conoco)	49/16 P.033	Conoco (UK) Ltd	50			1982
		Britoil plc	50			
Vulcan (Conoco)	48/25b P.130	Britoil plc	50	49/21 P.039	Arco British Ltd/12.5	1983
		Conoco Ltd	50		Marathon Petroleum North Sea (GB) Ltd/12.5	
					Cities Services (UK) Ltd/12.5	
					Britoil (Exploration) Ltd/25	
					Britoil (Development) Ltd/12.5	
					Conoco Ltd/25	

(c) Onshore oil

Stainton (BP)	L.46/23 PL.179	BP Petroleum Development Ltd	50			1984
		British Gas plc	50			

† 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) 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) Single well oil production system.

* Oil and Pipeline Agency (OPA) is a co-licensee as a consequence of its participation agreement.

Date of production start up	Operator's estimate first year of peak production	Operator's estimate of recoverable reserves originally present in the field (billion cubic metres)[1]	Operator's estimated peak production (billion cubic metres per year)	Transport system	Remarks
1988	1991	41	3.00	Pipeline to Theddlethorpe via new gas gathering/ processing platform on Block 49/16	Satellite wellhead platform.
1988	1991				Satellite wellhead platform.
1988	1991				Two satellite wellhead platforms. Gas routed to new gathering/processing station on Block 49/16.
		(million tonnes)	(million tonnes per year)		
1987	1987	0.031	0.004	Road tanker to Welton Rail Terminal	Single production well.

Part 4: Production and downstream activities

4.1 Oil production

Two new offshore oil fields, Petronella and Balmoral, came on stream in November 1986, bringing the total number in production to 32. Total oil production decreased from 127.5 million tonnes in 1985 to 127.0 million tonnes in 1986. This includes 5.1 million tonnes of heavier natural gases, 0.7 million tonnes of condensate and 0.5 million tonnes of onshore crude oil (of which 0.3 million tonnes were produced from the Wytch Farm field and the remainder from minor fields in the East Midlands, Hampshire and Dorset). Production from the individual offshore oil fields is given in Appendix 6.

4.2 Oil production forecasts

Forecasts of petroleum production were given by the Minister of State in reply to a Parliamentary Question on 9 March 1987. The reply is reproduced at Appendix 14.

4.3 Oil disposal

Total disposals of UKCS oil in 1986 amounted to 127.9 million tonnes. A total of 41.2 million tonnes was delivered to UK refineries, constituting 52 per cent of the total deliveries of oil to UK refineries. The 30.7 million tonnes of foreign crudes imported during the year compared with exports of UKCS crude of 83 million tonnes. These exports were 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.

Table 6: *OIL TERMINALS RECEIVING UKCS CRUDE OIL IN 1986*

Terminal	Location	Fields connected	1986 Receipts (million tonnes)
1. Sullom Voe	Shetlands	Brent, Thistle, Dunlin, Deveron, Murchison, North Cormorant, South Cormorant, Hutton, North West Hutton (Brent system) Ninian, Magnus and Heather (Ninian system)	54.8
2. Flotta	Orkneys	Piper, Claymore, Tartan, Highlander, Scapa, Petronella	15.3
3. Forties (landward)	Hound Point (via Cruden Bay)	Forties, South Brae, Montrose, Balmoral, Buchan, Heimdal	22.8
4. Nigg Bay	Cromarty Firth	Beatrice	2.0
		Total	94.9

4.4 Gas production

In 1986 gas produced from the UKCS amounted to 45 billion cubic metres (1.6 trillion cubic feet). Production from the individual fields is set out in Appendix 7.

Supplies of UKCS gas to British Gas of 41 bcm (1.5 trillion cubic feet) in 1986 were slightly higher than in 1985 and accounted for 76 per cent of their total supplies. Nineteen eighty six saw the first deliveries from the Thames field, and from the North and South Sean fields. The first arrival of Fulmar gas at St Fergus also occurred in 1986. There was a slight increase in overall supplies from the Southern Basin fields. Imports of gas from the UK/Norwegian Frigg field (60.82 per cent of production over the life of the field is deemed to come from Norway), the Norwegian North East Frigg and Odin fields, and associated gas from the UK/Norwegian Murchison field (22.2 per cent of production over the life of the field is deemed to come from Norway) showed a slight overall decrease.

Deliveries of associated gas to shore by the Far North Liquids and Associated Gas System (FLAGS) represented some 12 per cent of total supplies (UK plus imports) to British Gas.

4.5 Gas terminals

There are now nine operational gas terminals in the UK: three at Bacton, two at Easington and one at Theddlethorpe, which receive gas from the Southern Basin fields; two at St Fergus to serve the Frigg pipeline system and FLAGS/Fulmar pipelines; and one at Westfield Point near Barrow-in-Furness to serve the South Morecambe field. A new terminal is under construction at Dimlington near Easington initially to accommodate production from the Cleeton and South Ravenspurn fields and a terminal extension is being built at Theddlethorpe to accommodate production from the North Valiant, Vanguard, Vulcan and Audrey fields.

4.6 Gas flaring

Under the terms of petroleum production licences, gas may only be flared with the consent of the Secretary of State. An average of about 5.5 million cubic metres of gas a day was flared at offshore installations during 1986, a fall of some 1.1 million cubic metres a day from the previous year. This is the seventh consecutive year that flaring has fallen, and reflects the maintenance of the Government's strict flaring policy, and improved equipment efficiencies at existing fields and new fields coming onstream.

Further information on gas flaring at oil terminals and producing fields is given in Appendix 9.

4.7 Offshore pipelines

In an otherwise relatively quiet year for new offshore pipeline construction, the major events were the commissioning of the 65 mile long 30 inch diameter gas pipeline from Shell's Fulmar field to St Fergus in Scotland and Arco's 56 mile long 24 inch diameter gas pipeline from their Thames Field to Bacton in East Anglia.

With the start up of the Statpipe system on the Norwegian continental shelf, Elf commissioned the 8 inch diameter NGL export pipeline from the Heimdal platform in the Norwegian sector to Marathon's South Brae platform. At South Brae the NGLs are mixed with crude oil from the South Brae field and carried to the Forties platform and on to Cruden Bay.

BP constructed and commissioned a 12 inch diameter oil line from their Buchan field to the Forties field where the oil enters the Forties to Cruden Bay trunk pipeline.

A leak occurred in November 1986 at a fractured weld on the Piper to Flotta oil pipeline at the Claymore tee piece. Although a substantial amount of oil was released, it was dispersed without the use of chemicals. The damaged section of pipe has been replaced.

The Submarine Pipe-Lines Safety (Amendment) Regulations 1986 (SI 1986 No 1985) came into operation on 18 December 1986. The main effect of these Regulations was to give pipeline operators more freedom in the timing of their annual inspections (to take advantage of weather windows, or vessel market fluctuations for example) whilst still maintaining the requirement of an annual inspection of each pipeline.

A list of the major pipelines on the UK Continental Shelf is given in Appendix 11.

4.8 Onshore pipelines

In December 1986 a Public Inquiry into the route of the export pipeline from the Wytch Farm development opened to consider objections to BP's proposals.

4.9 Production and disposal of natural gas liquids (NGLs)

NGLs continued to be brought ashore with crude oil supplies via the major terminals and also through the FLAGS pipeline system at St Fergus. Production of NGLs from the UKCS in 1986 was 5.8 million tonnes.

The largest single quantity of NGLs was landed at St Fergus where natural gas meeting British Gas' specification was extracted and supplied to the national gas grid (see 4.5 above). The remaining mixture was piped to Mossmoran for fractionating. The resulting ethane went to the adjacent Fife ethylene plant whilst the propane, butane and condensate were shipped out from the nearby loading terminal at Braefoot Bay.

4.10 Review of fields† in production

(a) Offshore oil and condensate

Field name (operator)	Block number and licence number	Licensees	Approximate company interest in block (%) at the end of 1986	*Extension into other UK blocks* Block number and licence number	Licensees/Company interest in block (%) at the end of 1986	Date of discovery
Argyll (Hamilton)	30/24 P.073	Hamilton Oil Gt Britain plc	28.8	30/25a P.073	Hamilton Oil Great Britain plc/48	Aug 1971
		Hamilton Bros Petroleum (UK) Ltd	7.2		Hamilton Bros Petroleum (UK) Ltd/12	
		RTZ Oil and Gas Ltd	25		RTZ Oil and Gas Ltd/25	
		Blackfriars Oil and Gas Ltd	12.5		Blackfriars Oil and Gas Ltd/12.5	
		Kleinwort Benson Energy Ltd	2.5		Kleinwort Benson Energy Ltd/2.5	
		Texaco North Sea UK Ltd	24		*OPA/Nil	
		*OPA	Nil			
Auk (Shell)	Part 30/16 P.116	Shell UK Ltd	50			Feb 1971
		Esso Exploratior and Production UK L d	50			
		*OPA	Nil			
Balmoral (North Sea Sun Oil Co)	16/21a P.201	British Sun Oil Co Ltd	62	16/21b P.344	Summit North Sea Oil Ltd/40	Aug 1975
		Deminex UK Balmoral Ltd	15		Arco British Ltd/35	
		Clyde Petroleum plc	10		Goal Petroleum plc/12.5	
		Hampton North Sea Ltd	5		Carless Exploration Ltd/12.5	
		International Thomson plc	8		*OPA/Nil	
		*OPA	Nil			
Beatrice (Britoil)	11/30a P.187	Britoil plc	28			Sept 1976
		Deminex UK Oil and Gas Ltd	22			
		Kerr-McGee Oil (UK) plc	25			
		Lasmo North Sea plc	15			
		Hunt Oil (UK) Ltd	10			
		*OPA	Nil			
Beryl (Mobil)	9/13a P.139	Mobil North Sea Ltd	50			'A' accumulation Sept 1972
		Amerada Hess Ltd	20			
		Texas Eastern (UK) Ltd	20			
		Enterprise Oil plc	10			
		*OPA	Nil			'B' accumulation May 1975

Date of production start up	Operator's estimate of (or actual) first year of peak production	Operator's estimate of recoverable reserves originally present in the field (million tonnes)[3]	Operator's estimated (or actual) peak production (million tonnes per year)	Transport system[1]	Remarks
June 1975	1977	8.8	1.1	Tanker loading offshore	Production facility Deep Sea Pioneer shared with Duncan and Innes fields. Gas lift for six wells in this field. A revised Annex B has been approved.
Dec 1975	1977	11.7	2.3	Pipeline to Fulmar thence to Tanker Loading offshore	An Annex B update was submitted and an Annex A approved in August 1986. The Auk to Fulmar pipeline became operational in August 1986 for oil transportation. Gas is used for fuel.
Nov 1986	1987	8.9	1.68	Oil and NGLs transported via the Brae-Forties trunk line to Cruden Bay	Well completions, pipeline and flowline tie-ins, and installation of purpose built floating production facility took place in 1986. Development involves 13 producing wells and six peripheral water injection wells.
Sept 1981	1985	17	2.6	Oil and NGLs piped to Nigg Bay	Power supply from the shore commissioned in December 1986.
June 1976	1980	66	5	Tanker loading offshore. Gas is being re-injected until a disposal route is available	
July 1984	1989	39.9	2.9		

4.10 Review of fields† in production contd.

(a) Offshore oil and condensate

Field name (operator)	Block number and licence number	Licensees	Approximate company interest in block (%) at the end of 1986	*Extension into other UK blocks* Block number and licence number	Licensees/Company interest in block (%) at the end of 1986	Date of discovery
Brae (Marathon)	16/7a P.108	Marathon Oil North Sea (GB) Ltd	38			'A' Accumulation July 1977
		Britoil plc	20			
		Bow Valley Exploration (UK) Ltd	14			'B' Accumulation (Condensate) May 1975
		Dyas Exploration (UK) Ltd	6.3			
		Dyas Oil (UK) Ltd	1.4			
		L.L. and E. (UK) Inc	6.3			
		Kerr-McGee Oil (UK) plc	8			
		Sovereign Oil and Gas plc	4			
		Norsk Hydro Oil and Gas Ltd	2			
		*OPA	Nil			
Brent (Shell)	Part 211/29 P.117	Shell UK Ltd	50			July 1971
		Esso Exploration and Production UK Ltd	50			
		*OPA	Nil			
Buchan (BP)	21/1a P.241	BP Petroleum Development Ltd, Sulpetro (UK) Ltd	41.08	20/5a P.294	Texaco North Sea UK Ltd/100 *OPA/Nil	Aug 1974
		Transworld Petroleum (UK) Ltd	14.00			
		Tricentrol CCP Ltd	6.40			
		Goal Petroleum plc	5.00			
		Clyde Petroleum plc	14.00			
		Fina Petroleum Mitre Ltd	14.00			
		Charterhall Oil Ltd	4.52			
		Highland Exploration Ltd	1.00			
		*OPA	Nil			

Date of production start up	Operator's estimate of (or actual) first year of peak production	Operator's estimate of recoverable reserves originally present in the field (million tonnes)[3]	Operator's estimated (or actual) peak production (million tonnes per year)	Transport system[1]	Remarks
July 1983	1985	40	5.0	Oil and NGLs piped to Cruden Bay via Forties. Gas re-injected until it can be transported to the Brae B Platform.	Seven wells were started in 1986, of which six have been completed. Jacket fabrication for the Brae B platform is well advanced and module fabrication is nearly complete. Installation is scheduled for 1987. Dry residue gas along with additional gas from the Brae A platform will be reinjected.
1988	1990	24 liquids 17 bcm gas	3.2		
Nov 1976	1984	232.7	19.9	Oil and NGLs piped to Sullom Voe via South Cormorant. Tanker loading facilities also available. Gas transported to St Fergus via FLAGS.	Three oil producers and one gas injection well were drilled.
May 1981	1983	10.03	1.6	Oil and NGLs transported by pipeline to Cruden Bay via the Forties system.	Gas lift on this field is operating. A pipeline to the Forties field was completed in October 1986, replacing offshore tanker loading system.

4.10 Review of fields† in production contd.

(a) Offshore oil and condensate

Field name (operator)	Block number and licence number	Licensees	Approximate company interest in block (%) at the end of 1986	*Extension into other UK blocks* Block number and licence number	Licensees/Company interest in block (%) at the end of 1986	Date of discovery
Claymore (Occidental)	Part 14/19 P.249	Occidental Petroleum (Caledonia) Ltd	23.4			May 1974
		Texaco Britain Ltd	21.2			
		Union Texas Petroleum Ltd	20.0			
		International Thomson plc	20.0			
		AB Exploration Ltd	0.5			
		AGIP (UK) Ltd	2.5			
		BEP Ventures Ltd	0.5			
		Coalite Oilex Ltd	1.0			
		North Sea and General Oil Operations plc	1.0			
		Dow Chemical Co Ltd	5.0			
		Pict Petroleum plc	0.5			
		CSX Oil and Gas (UK) Corp	0.6			
		Goal Petroleum plc	0.5			
		Transworld Petroleum (UK) Ltd	0.8			
		Sovereign Oil and Gas plc	2.5			
		*OPA	Nil			
North Cormorant (Shell)	Part 211/21a P.258	Shell UK Ltd	50			Aug 1974
		Esso Exploration and Production UK Ltd	50			
		*OPA	Nil			
South Cormorant (Shell)	Part 211/26a P.232	Shell UK Ltd	50			Sept 1972
		Esso Exploration and Production UK Ltd	50			
		*OPA	Nil			

Date of production start up	Operator's estimate of (or actual) first year of peak production	Operator's estimate of recoverable reserves originally present in the field (million tonnes)[3]	Operator's estimated (or actual) peak production (million tonnes per year)	Transport system[1]	Remarks
Nov 1977	1984	61.4	5.5	Oil and NGLs piped to Flotta. Extra fuel and lift gas supplied from Piper and Scapa as necessary.	During 1986, two water injection wells were drilled through the South Claymore water injection template, making a total of three. Four wells were drilled from the platform.
Feb 1982	1986	54.5	5.0	Oil and NGLs piped to Sullom Voe via South Cormorant. Gas to St Fergus via Western Leg and FLAGS	Four producers and one injector were drilled and one producer abandoned in 1986.
Dec 1979	1986	25.4	2.2	Oil and NGLs piped to Sullom Voe. Gas transported to St Fergus via Western Leg and FLAGS.	One oil producer and two UMC water injectors were completed in 1986.

4.10 Review of fields† in production contd.

(a) Offshore oil and condensate

Field name (operator)	Block number and licence number	Licensees	Approximate company interest in block (%) at the end of 1986	*Extension into other UK blocks* Block number and licence number	Licensees/Company interest in block (%) at the end of 1986	Date of discovery
Deveron (Britoil)	211/18a P.236	Britoil plc	15.95			Sept 1972
		Premier Oil Exploration Ltd	8.05			
		Deminex UK Oil and Gas Ltd	42.5			
		Santa Fe (UK) Ltd	22.5			
		Tricentrol Exploration UK Ltd	10			
		Fina Petroleum Development Ltd	1			
		*OPA	Nil			
Duncan (Hamilton)	30/24 P.073	Hamilton Oil Gt Britain plc	28.8			Jan 1981
		Hamilton Bros Petroleum (UK) Ltd	7.2			
		RTZ Oil and Gas Ltd	25			
		Blackfriars Oil and Gas Ltd	12.5			
		Kleinwort Benson Energy Ltd	2.5			
		Texaco North Sea UK Ltd	24			
		*OPA	Nil			
Dunlin (Shell)	Part 211/23a P.232	Shell UK Ltd	50	211/24a P.104	Conoco Ltd/33 1/3 Gulf Oil (North Sea) Ltd/16 2/3 Gulf (UK) Offshore Investments Ltd/16 2/3 Britoil plc/33 1/3 *OPA/Nil	July 1973
		Esso Exploration and Production UK Ltd	50			
		*OPA	Nil			

Date of production start up	Operator's estimate of (or actual) first year of peak production	Operator's estimate of recoverable reserves originally present in the field (million tonnes)[3]	Operator's estimated (or actual) peak production (million tonnes per year)	Transport system[1]	Remarks
Sept 1984	1988	2.4	0.33	Oil and NGLs co-mingled with Thistle's are piped to Sullom Voe.	
Nov 1983	1985	2.3	0.69	Tanker loading offshore	Production facility Deep Sea Pioneer shared with Argyll and Innes fields. Water injection to two wells in this field. Gas used for fuel and gas lift at Argyll.
Aug 1978	1979	41.9	5.7	Oil and NGLs piped to Sullom Voe via South Cormorant.	Two oil producers were drilled and one well drilled and suspended during 1986.

4.10 Review of fields† in production contd.

(a) Offshore oil and condensate

Field name (operator)	Block number and licence number	Licensees	Approximate company interest in block (%) at the end of 1986	*Extension into other UK blocks* Block number and licence number	Licensees/Company interest in block (%) at the end of 1986	Date of discovery
Forties (BP)	21/10 P.246	BP Petroleum Development Ltd	87.71	22/6a P.084	Shell UK Ltd/50 Esso Exploration and Production UK Ltd/50 *OPA/Nil	Nov 1970
		Trafalgar House Oil and Gas Ltd	1.06			
		Whitehall Production Ltd	0.47			
		Berkeley Exploration and Production plc	0.53			
		Candecca Resources plc	0.53			
		Century Power and Light Ltd	0.26			
		Charterhall Oil Ltd	0.26			
		Fina Petroleum Development Ltd	0.53			
		Fina Hydrocarbons Ltd	0.80			
		North Sea and General Oil Operations plc	0.26			
		Elf UK plc	1.58			
		Hispanoil (UK) Ltd	0.26			
		Industrial Scotland Energy plc	0.26			
		Norsk Hydro Oil and Gas Ltd	0.80			
		Clyde Petroleum (Exploration) Ltd	0.26			
		RTZ Oil and Gas Ltd	1.06			
		RTZ Oil and Gas (UK) Ltd	0.26			
		Saxon Oil Ltd	0.26			
		Sovereign Oil and Gas plc	0.53			
		Clyde Petroleum plc	0.80			
		Ultramar Exploration Ltd	1.06			
		Union Jack Oil plc	0.26			
		Aran Energy Exploration Ltd	0.26			
		*OPA	Nil			

Date of production start up	Operator's estimate of (or actual) first year of peak production	Operator's estimate of recoverable reserves originally present in the field (million tonnes)[3]	Operator's estimated (or actual) peak production (million tonnes per year)	Transport system[1]	Remarks
Sept 1975	1978	319	24.6	Oil and NGLs piped to Cruden Bay.	Platform FE in SE Forties installed Q4/1986 and onstream Q1/1987. Gas used for fuel.

4.10 Review of fields† in production contd.

(a) Offshore oil and condensate

Field name (operator)	Block number and licence number	Licensees	Approximate company interest in block (%) at the end of 1986	*Extension into other UK blocks* Block number and licence number	Licensees/Company interest in block (%) at the end of 1986	Date of discovery
Fulmar (Shell)	Part 30/16 P.256	Shell UK Ltd Esso Exploration and Production UK Ltd *OPA	50 50 Nil	30/11b P.185	Amoco UK Petroleum Ltd/25.77 Enterprise Oil plc/ Enterprise (E and P) Ltd/25.77 Amerada Hess Ltd/18.08 Texas Eastern (UK) Ltd Ltd/10.38 Mobil North Sea Ltd/20	Dec 1975
Heather (Unocal)	2/5 P.242	Unocal UK Ltd Texaco Exploration Ltd Tenneco Gt Britain Ltd DNO (Heather Oilfield) Ltd *OPA	31.25 31.25 31.25 6.25 Nil			Dec 1973
Highlander (Texaco)	14/20b P.324	Texaco North Sea UK Ltd	100			April 1976
Hutton (Conoco)	211/28a P.204	Conoco Ltd Gulf Oil (North Sea) Ltd Britoil plc *OPA	33 1/3 33 1/3 33 1/3 Nil	211/27b P.473	Amoco UK Petroleum Ltd/25.77 Enterprise Oil plc/25.77 Mobil North Sea Ltd/20 Amerada Hess Ltd/18.08 Texas Eastern (UK) Ltd/10.38 *OPA/Nil	Dec 1973
North West Hutton (Amoco)	211/27a P.184	Amoco UK Petroleum Ltd Enterprise Oil plc Amerada Hess Ltd Texas Eastern (UK) Mobil North Sea Ltd *OPA	25.77 25.77 18.08 10.38 20 Nil			April 1975

Date of production start up	Operator's estimate of (or actual) first year of peak production	Operator's estimate of recoverable reserves originally present in the field (million tonnes)[3]	Operator's estimated (or actual) peak production (million tonnes per year)	Transport system[1]	Remarks
Feb 1982	1986	56	7.6	Tanker loading offshore. Gas is transported by pipeline to St Fergus.	Gas transportation started in July 1986.
Oct 1978	1982	12–14	1.7	Oil and NGLs piped to Sullom Voe via Ninian Central platform.	Approval was given in 1985 to connect the platform to the Western leg of FLAGS system via a 6" pipeline for the import of fuel gas. This in now installed. Three wells were drilled in 1986.
Feb 1985	1986	7.4	1.5	Oil and gas to Tartan platform. From there oil is sent to Flotta.	Subsea gas lift system was commissioned in 1986. Gas is used for fuel.
Aug 1984	1986	26.3	4.7	Oil and NGLs piped to Sullom Voe via North West Hutton and South Cormorant.	Water injection began early in 1986.
April 1983	1984	22.6	2.5	Oil and NGLs piped to Sullom Voe via South Cormorant. Gas piped to St Fergus via the Western Leg and FLAGS.	Three production wells were completed in 1986.

4.10 Review of fields† in production contd.

(a) Offshore oil and condensate

Field name (operator)	Block number and licence number	Licensees	Approximate company interest in block (%) at the end of 1986	*Extension into other UK blocks* Block number and licence number	Licensees/Company interest in block (%) at the end of 1986	Date of discovery
Innes (Hamilton)	30/24 P.073	Hamilton Oil Great Britain plc	28.8			Mar 1983
		Hamilton Bros Petroleum (UK) Ltd	7.2			
		RTZ Oil and Gas Ltd	25.0			
		Blackfriars Oil and Gas Ltd	12.5			
		Kleinwort Benson Energy Ltd	2.5			
		Texaco North Sea UK Ltd	24			
		*OPA	Nil			
Magnus (BP)	211/12a P.193	BP Petroleum Development Ltd	100	211/7a P.193	BP Petroleum Development Ltd/100	July 1974
		*OPA	Nil		*OPA/Nil	
Maureen (Phillips)	16/29a P.110	Phillips Petroleum Co United Kingdom Ltd	33.78			Feb 1973
		Fina Exploration Ltd	28.96			
		AGIP (UK) Ltd	17.26			
		Century Power and Light Ltd	11.50			
		Ultramar Exploration Ltd	8.50			
		*OPA	Nil			
Montrose (Amoco)	Part 22/17 P.019	Amoco UK Petroleum Ltd	30.77	Part 22/18 P.020	Amoco UK Petroleum Ltd/30.77	Dec 1969
		Enterprise Oil plc	30.77		Enterprise Oil plc/30.77	
		Amerada Hess Ltd	23.08		Amerada Hess Ltd/23.08	
		Texas Eastern (UK) Ltd	15.38		Texas Eastern (UK) Ltd/15.38	
		*OPA	Nil		*OPA/Nil	

Date of production start up	Operator's estimate of (or actual) first year of peak production	Operator's estimate of recoverable reserves originally present in the field (million tonnes)[3]	Operator's estimated (or actual) peak production (million tonnes per year)	Transport system[1]	Remarks
Jan 1985	1985	0.55	0.6	Oil transported by pipeline to Duncan/Argyll tanker loading facility.	Production from two wells is now tied into the Deep Sea Pioneer, which also serves the Argyll and Duncan fields. Gas used for fuel and gas lift at Argyll.
Aug 1983	1985	89	6.2	Oil and NGLs piped to Sullom Voe via Ninian Central. Gas piped to St Fergus via the Northern Leg and FLAGS.	In 1986 three production wells and two injection wells were completed.
Sept 1983	1984	24.5	3.9	Tanker loading offshore.	
June 1976	1979	13.1	1.4	Oil and NGLs transported by pipeline to Forties and then by pipeline to Cruden Bay.	One production well was completed in 1986. Two wells were converted to water injection.

4.10 Review of fields† in production contd.

(a) Offshore oil and condensate

Field name (operator)	Block number and licence number	Licensees	Approximate company interest in block (%) at the end of 1986	*Extension into other UK blocks* Block number and licence number	Licensees/Company interest in block (%) at the end of 1986	Date of discovery
Murchison (UK) (Conoco)	211/19a P.104	Conoco Ltd	33 1/3			Sept 1975
		Gulf Oil (North Sea) Ltd	16 2/3			
		Gulf (UK) Offshore Investments Ltd	16 2/3			
		Britoil plc	33 1/3			
		*OPA	Nil			
Ninian (Chevron)	3/3 P.202	Chevron Petroleum Co Ltd	24	3/8a P.199	BP Petroleum Development Ltd/50	April 1974
		ICI Petroleum Ltd	26		Ranger Oil (UK) Ltd/20	
		Murphy Petroleum Ltd	10		Lasmo North Sea plc/30	
		Ocean Exploration Ltd	10		*OPA/Nil	
		Britoil plc	30			
		*OPA	Nil			
Petronella (Texaco)	14/20b P.324	Texaco North Sea UK Ltd	100			Feb 1975
Piper (Occidental)	Part 15/17 P.220	Occidental Petroleum (Caledonia) Ltd	36.5			Jan 1973
		Texaco Britain Limited	23.5			
		Union Texas Petroleum Limited	20			
		International Thomson plc	20			
		*OPA	Nil			
Scapa (Occidental)	Part 14/19 P.250 P.249	Occidental Petroleum (Caledonia) Ltd	36.50			July 1975
		Texaco Britain Ltd	23.5			
		Union Texas Petroleum Ltd	20			
		International Thomson plc	20			
		*OPA	Nil			

Date of production start up	Operator's estimate of (or actual) first year of peak production	Operator's estimate of recoverable reserves originally present in the field (million tonnes)[3]	Operator's estimated (or actual) peak production (million tonnes per year)	Transport system[1]	Remarks
Sept 1980	1983	42.7[2]	5.4[2]	Oil and NGLs piped to Sullom Voe via Dunlin and South Cormorant. Gas transported to St Fergus via Northern Leg and FLAGS.	A redetermination of equity share was completed in Sept. 1986.
Dec 1978	1982	141	15.1	Oil and NGLs piped to Sullom Voe. Gas transported to St Fergus via the Western Leg and FLAGS.	Platform operations consisted mainly of workover and side-tracks. Two producing wells and three water injection wells were drilled.
Dec 1986	1987	2.1	0.6	Oil and Gas to Tartan. From there oil to Flotta and gas to St Fergus.	One subsea production well and tie in to Tartan completed.
Dec 1976	1979	126.9	13	Oil and NGLs piped to Flotta. Gas transported to St Fergus via Frigg pipeline system.	Eight downhole pumps were operational by the end of 1986, as part of a programme to maintain production from high water cut wells. Two wells were drilled from the platform.
Sept 1985	1988	5.6	1.2	Oil and NGLs piped to Flotta via Claymore.	An eight slot subsea production template, pipelines and control umbilicals were installed during the summer of 1986. First oil was produced through the template on 14 November. During 1986, one water injection well was drilled and one producer was completed; further development drilling is in progress.

4.10 Review of fields† in production contd.

(a) Offshore oil and condensate

Field name (operator)	Block number and licence number	Licensees	Approximate company interest in block (%) at the end of 1986	*Extension into other UK blocks* Block number and licence number	Licensees/Company interest in block (%) at the end of 1986	Date of discovery
Statfjord (UK) (Mobil Exploration Norway)	211/24 a & b P.104 211/24c P.293	Conoco Ltd Gulf Oil (North Sea) Ltd Gulf (UK) Offshore Investments Ltd Britoil plc *OPA	33 1/3 16 2/3 16 2/3 33 1/3 Nil	211/25a P.104 211/25b P.293	Conoco Ltd/33 1/3 Gulf Oil (North Sea) Ltd/16 2/3 Gulf (UK) Offshore Investments Ltd/16 2/3 Britoil plc/33 1/3 *OPA/Nil	April 1974
Tartan (Texaco)	15/16a and 14/20a P.237	Texaco North Sea UK Ltd *OPA	100 Nil			Jan 1975
Thistle[4] (Britoil)	211/18a P.236	Britoil plc Premier Oil Exploration Ltd Deminex UK Oil and Gas Ltd Santa Fe (UK) Ltd Tricentrol Exploration UK Ltd Fina Petroleum Development Ltd Fina Hydrocarbons Ltd Ultramar Exploration Ltd Britoil (Alpha) Ltd *OPA	15.6 8.4 42.5 16.87 10 1 1.41 1.41 2.81 Nil	Part 211/19a P.475	Britoil plc/15.6 Premier Oil Exploration Ltd/8.4 Deminex UK Oil and Gas Ltd/42.5 Santa Fe (UK) Ltd/16.87 Tricentrol Exploration UK Ltd/10.0 Fina Petroleum Development Ltd/1.0 Fina Hydrocarbons Ltd/1.41 Ultramar Exploration Ltd/1.41 Britoil (Alpha) Ltd/2.81 *OPA/Nil	July 1973

Date of production start up	Operator's estimate of (or actual) first year of peak production	Operator's estimate of recoverable reserves originally present in the field (million tonnes)[3]	Operator's estimated (or actual) peak production (million tonnes per year)	Transport system[1]	Remarks
Nov 1979	1988	384[2]	35.6[2]	Tanker loading offshore. UK share of gas piped to St Fergus via Northern Leg and FLAGS, and the Norwegian share piped to Karsto via the Statpipe system.	
Jan 1981	1987	11.3	1.4	Oil and NGLs piped to Flotta via Claymore. Gas transported to St Fergus via Piper and the Frigg pipeline system.	Two further development wells were completed during 1986. Modifications for Petronella tie in were completed.
Feb 1978	1982	53	6.0	Oil and NGLs piped to Sullom Voe. Gas transported to St Fergus via the Northern Leg and FLAGS.	

4.10 Review of fields† in production contd.

(b) Offshore gas

Field name (operator)	Block number and licence number	Licensees	Approximate company interest in block (%) at the end of 1986	*Extension into other UK blocks* Block number and licence number	Licensees/Company interest in block (%) at the end of 1986	Date of discovery
Esmond (Hamilton)	43/13a P.002	Hamilton Oil Great Britain plc	48	43/12 P.447	Lasmo North Sea plc/50	June 1982
		Hamilton Bros Petroleum (UK) Ltd	12		Occidental Petroleum (Caledonia) Ltd/35	
		RTZ Oil and Gas Ltd	25		International Thomson plc/15	
		Blackfriars Oil and Gas Ltd	12.5			
		Kleinwort Benson Energy Ltd	2.5			
Forbes (Hamilton)	43/8a P.002	Hamilton Oil Great Britain plc	45	43/13a P.002	As Esmond group (43/13a)	Jan 1970
		Hamilton Bros Petroleum (UK) Ltd	11.25			
		RTZ Oil and Gas Ltd	23.4			
		Blackfriars Oil and Gas Ltd	11.7			
		Kleinwort Benson Energy Ltd	2.3			
		Whitehall Petroleum Ltd	4.69			
		Rycade (UK) Ltd	1.56			
Gordon (Hamilton)	43/15a 43/20a P.002	Hamilton Oil Great Britain plc	48			June 1969
		Hamilton Bros Petroleum (UK) Ltd	12			
		RTZ Oil and Gas Ltd	25			
		Blackfriars Oil and Gas Ltd	12.5			
		Kleinwort Benson Energy Ltd	2.5			
Frigg (UK) (Elf Norge)	10/1 P.118	Total Oil Marine plc	33 1/3	9/10a P.404	Total Oil Marine plc/33 1/3	May 1972
		Elf UK plc	66 2/3		Elf UK plc/66 2/3	
				9/5a P.194	BP Petroleum Development Ltd/100	

Date of production start up	Operator's estimate of (or actual) first year of peak production	Operator's estimate of recoverable reserves originally present in the field (billion cubic metres)[3]	Operator's estimated (or actual) peak production (billion cubic metres per year)	Transport system[1]	Remarks
1985	1986			Pipeline to Bacton	
1985	1986	16.2	2.1	Piped to Bacton via Esmond	
1985	1986			Piped to Bacton via Esmond.	
Sept 1977	1980	74	5	Two pipelines to St Fergus (via platform MCP01)	Recoverable reserves have been downgraded.

4.10 Review of fields† in production contd.

(b) Offshore gas

Field name (operator)	Block number and licence number	Licensees	Approximate company interest in block (%) at the end of 1986	*Extension into other UK blocks* Block number and licence number	Licensees/Company interest in block (%) at the end of 1986	Date of discovery
Hewett[5] (Phillips)	48/29 P.037 (Part)	Arco British Ltd	43 1/3	48/30 P.028 (Part)	Phillips Petroleum Co United Kingdom Ltd/35	Oct 1966
		British Sun Oil Co Ltd	23 1/3		Fina Exploration Ltd/30	
		Deminex UK Oil and Gas Ltd	10		AGIP (UK) Ltd/15	
		Superior Oil (UK) Ltd	20		Century Power and Light Ltd/7.22	
		Canadian Superior Oil (UK) Ltd	3 1/3		RTZ Oil and Gas UK Ltd/4.26	
					Lasmo North Sea plc/8.52	
				52/5a P.028	Phillips group as above	
				52/4a P.112	Phillips Petroleum Co United Kingdom Ltd/18.97	
					Fina Exploration Ltd/16.26	
					AGIP (UK) Ltd/8.13	
					Century Power and Light Ltd/3.91	
					RTZ Oil and Gas (UK) Ltd/2.31	
					Lasmo North Sea plc/4.62	
					Arco British Ltd/19.85	
					British Sun Oil Co Ltd/10.7	
					Deminex UK Oil and Gas Ltd/4.58	
					Superior Oil (UK) Ltd/9.16	
					Canadian Superior Oil (UK) Ltd/1.53	
				48/28a P.037	Arco Group as for Block 48/29	

Date of production start up	Operator's estimate of (or actual) first year of peak production	Operator's estimate of recoverable reserves originally present in the field (billion cubic metres)[3]	Operator's estimated (or actual) peak production (billion cubic metres per year)	Transport system[1]	Remarks
July 1969	1977	109	8.6	Two pipelines to Bacton.	

4.10 Review of fields† in production contd.

(b) Offshore gas

Field name (operator)	Block number and licence number	Licensees	Approximate company interest in block (%) at the end of 1986	*Extension into other UK blocks* Block number and licence number	Licensees/Company interest in block (%) at the end of 1986	Date of discovery
Indefatigable (Shell)	49/19 P.008 49/24 P.007	Shell UK Ltd Esso Exploration and Production UK Ltd	50 50			June 1966
Indefatigable (Amoco)	49/18 P.016	Amoco UK Petroleum Ltd British Gas plc Amerada Hess Ltd Texas Eastern (UK) Ltd	30.77 30.77 23.08 15.38	49/23 P.016 49/19 P.008 49/24 P.007	Amoco UK Petroleum Ltd/30.77 British Gas plc/30.77 Amerada Hess Ltd/23.08 Texas Eastern (UK) Ltd/15.38 Shell UK Ltd/50 Esso Exploration and Production UK Ltd/50	June 1966
Leman (Amoco)	49/27 P.016	Amoco UK Petroleum Ltd British Gas plc Amerada Hess Ltd Texas Eastern (UK) Ltd	30.77 30.77 23.08 15.38	49/28 P.037	Arco British Ltd/43 1/3 British Sun Oil Co Ltd/23 1/3 Deminex UK Oil and Gas Ltd/10 Superior Oil (UK) Ltd/20 Canadian Superior Oil (UK) Ltd/3 1/3	April 1966
Leman (Shell)	49/26 P.007	Shell UK Ltd Esso Exploration and Production UK Ltd	50 50	53/2 P.025 53/1a P.025	Mobil North Sea Ltd/100	April 1966
North Sean and South Sean (Shell)	49/25a P.054	Shell UK Ltd Esso Exploration and Production UK Ltd Union Texas Petroleum Ltd Britoil plc	25 25 25 25			North Sean April 1969 South Sean Jan 1970

Date of production start up	Operator's estimate of (or actual) first year of peak production	Operator's estimate of recoverable reserves originally present in the field (billion cubic metres)[3]	Operator's estimated (or actual) peak production (billion cubic metres per year)	Transport system[1]	Remarks
Oct 1971	1974	127	2.8	Pipeline to Bacton.	Development of N platform with a total of two wells is in progress. Additional development of M platform with four wells was completed in 1986.
Sept 1971	1977		4.1	Pipeline to Bacton.	
July 1969	1975	298	8.8	Pipelines to Bacton.	
Aug 1968	1976		10.4	Pipelines to Bacton.	The 'F' and 'G' platforms will commence production in 1987 and will improve recovery of gas from areas which would otherwise not be fully drained.
1986	1987	13	1.7	Pipeline to Bacton.	Two well jackets and one production platform were installed. Drilling of ten development wells was completed in 1986.

4.10 Review of fields† in production contd.

(b) Offshore gas

Field name (operator)	Block number and licence number	Licensees	Approximate company interest in block (%) at the end of 1986	*Extension into other UK blocks* Block number and licence number	Licensees/Company interest in block (%) at the end of 1986	Date of discovery
South Morecambe (HGB)	110/2a 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
Rough Storage (British Gas plc)	47/8b P.323	British Gas plc	100	47/3d P.323	British Gas plc/100	May 1968
Thames, Yare and Bure (Arco)	49/28 P.037	Arco British Ltd British Sun Oil Co Ltd Deminex UK Oil and Gas Ltd Superior Oil (UK) Ltd Canadian Superior Oil (UK) Ltd	43.33 23.33 10 20 3.33			Thames 1973 Yare 1969 Bure 1983
West Sole (BP)	48/6 P.001	BP Petroleum Development Ltd	100			Sept 1965
Victor (Conoco)	49/22-2 P.025	Conoco Ltd Mobil North Sea Ltd Britoil plc	25 50 25	Part 49/17 P.033	Conoco Ltd/25 Mobil North Sea Ltd/50 Britoil plc/25	May 1972
Viking (Conoco)	49/17 P.033	Conoco Ltd Britoil plc	50 50	49/12a P.033 49/16 P.033	Conoco Ltd/50 Britoil plc/50 Conoco Ltd/50 Britoil plc/50	Dec 1965

Date of production start up	Operator's estimate of (or actual) first year of peak production	Operator's estimate of recoverable reserves originally present in the field (billion cubic metres)[3]	Operator's estimated (or actual) peak production (billion cubic metres per year)	Transport system[1]	Remarks
Jan 1985	1990	114	3.7	Pipeline to Barrow.	A further eight wells were brought into production during 1986, bringing the total available production wells to thirteen. Annex B approval for two further drilling platforms was granted in 1986.
Feb 1985	1987	See Remarks.	1.1	Pipeline to Easington.	Four new wells were drilled during 1986. Original recoverable reserves estimated at 10.2bcm. Since storage gas will be injected into the field during summer periods, the total winter offtake during its total life will considerably exceed this figure.
1986	1986	13.0	1.5	Pipeline to Bacton.	Central processing platform and wellhead platform on Thames. One subsea well each on Yare and Bure. Facilities installed and development drilling completed in 1986.
Mar 1967	1971	53.6	1.74	Two pipelines to Easington.	The recoverable reserves are now quoted to the year 2005.
Sept 1984	1984	22.6	2.6	Pipeline to the Viking B complex and thence to Theddlethorpe.	
Oct 1972	1974/75	84	9.5	Pipeline to Theddlethorpe.	

4.10 Review of fields† in production contd.

(c) Onshore oil

Field name (operator)	Block number and licence number	Licensees	Approximate company interest in block (%) at the end of 1986	*Extension into other UK blocks* Block number and licence number	Licensees/Company interest in block (%) at the end of 1986	Date of discovery
Farley's Wood (BP)	L46/21 PL.215	BP Petroleum Development Ltd	25			April 1983
		British Gas plc	25			
		Candecca Resources plc	25			
		Floyd Oil and Gas (UK) Ltd	25			
Humbly Grove (Carless)	LR21/ LQ25 PL.116	Carless Exploration Ltd	28.125			1980
		Marinex Petroleum plc	14.0625			
		Britoil plc	7.5			
		Cambrian Exploration Ltd	25			
		Sulpetro (UK) Ltd	12.65625			
		Fina Petroleum Mitre Ltd	12.65625			
Nettleham (BP)	L46/23 PL.179	BP Petroleum Development Ltd	50			March 1983
		British Gas plc	50			
Welton (BP)	L46/23 PL.179	BP Petroleum Development Ltd	50			May 1981
		British Gas plc	50			
Wytch Farm (BP)	L97/10, L98/6 PL.089	BP Petroleum Development Ltd	50			Dec 1973
		Carless Exploration Ltd	7.5			
		Clyde Petroleum (Dorset) Ltd	7.5			
		Goal Petroleum plc	5.0			
		Premier Oil Dorset Ltd	12.5			
		Tricentrol Wytch Farm Ltd	17.5			

Date of production start up	Operator's estimate of (or actual) first year of peak production	Operator's estimate of recoverable reserves originally present in the field (million tonnes)[3]	Operator's estimated (or actual) peak production (million tonnes per year)	Transport system[1]	Remarks
July 1985	1986	0.019	0.005	Road tanker to BP Midland Rail terminal.	
May 1986	1987	1.3	0.12	Pipeline and rail.	
Sept 1985	1986	0.088	0.014	Road tanker to Welton Rail terminal.	Oil will be produced by a pipeline direct to Welton facilities commencing 1987.
Nov 1985	1987	1.32	0.12	Oil is transported by rail. Gas used for fuel gas and H2S stripping. Acid gas inerated. inc	Reserves do not include secondary reservoirs which are under review.
Mar 1979	1990	31	3.00	Oil is piped to a rail terminal at Furzebrook. Gas fed to local British Gas plc grid.	

4.10 Review of fields† in production contd.

(d) Onshore gas

Field name (operator)	Block number and licence number	Licensees	Approximate company interest in block (%) at the end of 1986	*Extension into other UK blocks* Block number and licence number	Licensees/Company interest in block (%) at the end of 1986	Date of discovery
Hatfield (Taywood)	L46/11 PL.161	Taylor Woodrow Energy Ltd	14.25			1981
		RTZ Oil and Gas Ltd	25			
		Elf (UK) Onshore Ltd	10			
		James Finlay plc	9.5			
		Candecca Resources plc	41.25			

Date of production start up	Operator's estimate of (or actual) first year of peak production	Operator's estimate of recoverable reserves originally present in the field (billion cubic metres)[3]	Operator's estimated (or actual) peak production (billion cubic metres per year)	Transport system[1]	Remarks
Jan 1986	1986	0.103	0.014	Pipeline to customer.	Construction completed, production started in January 1986.

† 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.

(3) 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.

(4) The interests shown refer to the Thistle field area of block 211/18a only.

(5) The Hewett field includes accumulations formerly known as Dotty and Deborah.

* OPA is a co-licensee as a consequence of its participation agreements.

Part 5: Operational aspects

5.1 Offshore employment

A survey of the workforce employed offshore was conducted by the offshore operators in September 1986, on behalf of the Inland Revenue. The returns reveal that in 1986 the total offshore workforce stood at some 22,300 personnel, compared with around 29,000 in 1985. Of the total, some 91 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

Although there has been a downturn in certain areas of training (notably drilling), the Offshore Petroleum Industry Training Board (OPITB) has formalised training standards for offshore personnel. In addition, a scheme for OPITB approval of suitable training establishments was set up in 1986.

The two industry training associations, Petroleum Training Association Limited (PETANS) and Scottish Offshore Training Association Limited (SCOTA), have continued to provide wide training for the offshore workforce and a third industry training association, Humberside Offshore Training Association Limited (HOTA), was formed in 1986. The Department continues its support of OPITB and the three training associations.

Following publication of the fifth Training Guidance Note on the selection and training of crane drivers, it was recognised that there was little in the way of published training guidance which could be used as aids to the stated training requirement. A video was therefore commissioned based on Training Guidance Note Five; the initial programme outline was completed by the end of 1986 and production is underway.

The introduction of the Ionising Radiations Regulations 1985 highlighted the need to identify the main problems associated with their application offshore. A further video was therefore commissioned and work has proceeded rapidly with an outline programme being completed by the end of 1986.

Following full consultation, revised diving training standards were published and came into operation on 1 November 1986. The Diving Supervisors' Certification Scheme was also published during the year for introduction on 1 January 1987. It was partially sponsored by the Department and was organised by the Association of Offshore Diving Contractors in consultation with the Department and the Norwegian Petroleum Directorate. The Department's Diving Inspectorate conducted 20 inspections of diving training schools both at home and abroad.

5.3 Offshore health and safety

During the year Inspectors from the Department enforced health, safety and welfare standards on and around offshore installations and at pipe-laying operations. Some 143 general inspections were carried out together with 20 visits on specific matters and 18 investigations of accidents and other occurrences. In addition the Diving Inspectorate carried out 96 inspections of diving spreads and nine accident investigations.

Three prosecutions were undertaken during the year. One was for an offence in relation to an incident involving summonses under sections 2 and 3 of the Health and Safety at Work Act. The second case was more unusual in that it involved a contravention of Regulation 3 of The Offshore Installations (Well Control) Regulations 1980 by the forgery of a well control certificate. The third concerned the forging of a Bell Diving Certificate of Training. There was one prosecution pending at the end of 1986.

The Oil Industry Advisory Committee Working Party on Contract Labour and Occupational Health and Safety is working on guidelines for the setting up of Occupational Health Services with a view to publication early in 1987.

Discussions continued on the proposals for new standards of first aid offshore, which will require minor changes to existing legislation. Although these discussions delayed the making of new Regulations, it is expected that they will be made early in 1987.

Consideration of new proposals on the Reporting of Accidents and Dangerous Occurrences has continued. By the end of 1986 a first draft of outline proposals had been completed, but it will be some time before a consultative document can be circulated to the industry. The working party on proposals concerning the appointment of safety representatives and committees met during the year. As a result, the employers' side agreed to produce a paper on the way forward; this is expected shortly.

5.4 Offshore accidents and dangerous occurrences

In 1986 there were three fatalities, 101 serious accidents and 167 dangerous occurrences reported. These figures represent a material reduction in the figures for 1985. However, they are still above those reported for 1984 in respect of serious accidents and dangerous occurrences. There will be a full evaluation of all the relevant circumstances and appropriate measures will be taken to ensure, so far as practicable, a continued reduction of all offshore accidents.

Two of the fatalities occurred when a 48 ton caisson being raised within a jacket was caught on an obstruction whilst lifting continued. This caused the two wire rope slings supporting the caisson to fail and the whiplash from the wire ropes caused the fatal injuries.

Further information on the accident statistics is given in Appendix 13.

5.5 Research and development on safety

The Department continued to receive the support of offshore operators and Certifying Authorities to accomplish its R & D programme, although the fall in oil prices made financial support from the industry more difficult. However, the Department was able to start the North European Storm Study (NESS) at a cost of £1.8m of which £1.6m is provided by the industry. Using modern computer modelling techniques NESS will "hindcast" a complete database of waves, winds, storm surges and currents covering the whole North European area for a period of 25 years. This technique is much more cost effective than the physical measurements at sea which have been necessary up to now in order to fix the design requirements for offshore structures.

During the year draft guidance arising from research and development has been prepared on the resistance to collision damage required by platforms and on the design of concrete structures. In addition the Department published a consultative document on Offshore Immersion Suits dealing with the sometimes conflicting requirements for a suit when the wearer is actually in the water, or is in a helicopter or on an installation or a lifeboat before entering the water.

Other work on emergency evacuation continued throughout the year in conjunction with the industry. Joint tests were also carried out with the Canadian Government (COGLA) on a proposed method for the safer launching of lifeboats from offshore structures.

The year also saw the completion of the four-year UK Offshore Steels programme. This was a £3m programme funded by the Department together with 12 oil companies, Certifying Authorities, offshore contractors and steels producers. The project was completed on time and cost and the implications for design, construction, inspection and operations are being absorbed by all those concerned.

A list of Offshore Technology Reports published through HMSO in 1986 is given in Table 7. In addition the Department was responsible for the publication of three video films, one dealing with electrical safety under water and two covering the causes and treatment of decompression sickness. They are intended to help the training of divers, supervisors and others and are accompanied by instruction booklets.

The production of a video on the duties of an attendant in a diving bell is underway.

Table 7: *DEPARTMENT OF ENERGY OFFSHORE TECHNOLOGY REPORTS ISSUED BY HMSO IN 1986*

Number	*Title*	*Date issued*
OTH 84 206 (ISBN 0 11 411903 1)	Classification and Identification of Typical Blemishes Visible on the Surface of Concrete Underwater	13. 1.86
OTH 86 207 (ISBN 0 11 412851 0)	Fatigue Assessment of North Sea Fixed Platforms – A Summary Report	20. 1.86
OTH 85 224 (ISBN 0 11 412854 5)	Boat Impact Study	10. 2.86
OTH 86 227 (ISBN 0 11 412855 3)	Energy Industry Ocean Data Around the UK	13. 3.86
OTH 86 217 (ISBN 0 11 412857 X)	The Risk of Ship/Platform Collisions in the Area of the United Kingdom Continental Shelf	18. 4.86
OTH 85 223 (ISBN 0 11 412852 9)	The Strength of Grouted Pile/Sleeve Connections for Offshore Structures/Static Tests Relating to Sleeve Buckling	18. 4.86
OTH 86 229 (ISBN 0 11 412856 1)	Review of the Department of Energy's Offshore Fire Research Programme	21. 5.86
OTH 86 226 (ISBN 0 11 412859 6)	The Offshore Mean Wind Profile	22. 5.86
OTH 86 228 (ISBN 0 11 412858 8)	Estimating Wave Time Parameters for Engineering Applications	29. 5.86
OTH 86 215 (ISBN 0 11 412853 7)	Research on the Behaviour of Piles as Anchorages for Buoyant Structures – Summary Report	23. 7.86
OTH 86 210 (ISBN 0 11 412850 X)	The Strength of Grouted Pile/Sleeve Connections – A Composite Report on a Programme of Tests	26. 8.86
OTH 86 219 (ISBN 0 11 412861 8)	North Sea Seismicity	5. 9.86
OTH 86 232 (ISBN 0 11 412866 9)	Corrosion Fatigue Crack Growth in BS4360 grade 500 Structural Steel in Sea Water under Narrow Band Variable Amplitude Loading	23. 9.86
OTH 86 225 (ISBN 0 11 412868 5)	A Simple Model of Fatigue Growth in Welded Joints	21.10.86
OTH 86 212 (ISBN 0 11 412867 7)	Structural Assessment of an Early Southern North Sea Platform	17.11.86
OTH 86 231 (ISBN 0 11 412869 3)	The Development of Guidelines for the Assessment of Submarine Pipeline Spans – Overall Summary Report	17.11.86

5.6 Offshore emergency planning

The Department has continued the NOROX series of exercises to test the lines of communication and co-ordination of responses to a major emergency offshore. The NOROX exercise held in November 1986 on the Beryl A platform on Block 9/13 simulated a range of incidents including explosion, fire, oil pollution and helicopter crash. The exercise covered procedures for fire control, search and rescue and medical response to casualties and included simulated pressure from the public, press and broadcasting media. Participants included Mobil North Sea Ltd, Government agencies, Grampian Police, Grampian Health Board, Bristow Helicopters and the armed services.

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

At the end of 1986 there were 176 safety zones established around permanent installations (including subsea installations). As Table 8 shows, the demand for safety zones around mobile installations continued to increase. During the year 109 safety zones were established to protect such units while they were on location.

During 1986 a further six safety zones were established around permanent installations. These included platforms on the Leman, Sean, Thames, North Alwyn and Forties fields. In addition, safety zones were made around subsea wells in the Beryl and Petronella fields and around the Scapa Template.

The Petroleum Bill (see Part 6.7) contains provision for the automatic establishment of safety zones for installations visible above the sea's surface. Safety zones around subsea installations will continue to be made by order.

Table 8: *NUMBER OF SAFETY ZONES ESTABLISHED FOR MOBILE OFFSHORE DRILLING UNITS (1980–86)*

Year	1980	1981	1982	1983	1984	1985	1986
Number	9	9	11	40	87	95	109

5.7 Environmental aspects

Individual operators are responsible for dealing with oil spills at offshore installations and each is required to have plans for such eventualities. Each operator is required to have adequate pollution control equipment to deal with smaller spills of oil and can use the more extensive resources of the United Kingdom Offshore Operator's Association (UKOOA) to deal with larger spills. Operators engaged in oil and gas activity in areas close to the shore are required to make special contingency arrangements to ensure a quick and effective response to any pollution incident. An important element of these special plans is the requirement to consult with all local authorities before any drilling or production takes place. The Government's primary role in pollution incidents would be to monitor the operator's activities and offer advice and assistance.

Recent Dutch overflights of all North Sea oil installations indicated that not all spills of oil were being reported. Discussions with the offshore industry, both individual operators and UKOOA, have emphasised the requirement to report all spills and there has been a marked increase in the number of such reports as shown in Table 9. Additionally, the Department of Energy, in co-operation with the Marine Pollution Control Unit of the Department of Transport, has arranged for regular overflights of all installations to be carried out using an aeroplane fitted with remote sensing equipment.

Table 9: *OIL SPILLS REPORTED TO THE DEPARTMENT OF ENERGY 1979–1986*

	1979	1980	1981	1982	1983	1984	1985[7]	1986
Number	27	86	71	42	62	47	87	166
Total amount (tonnes)	80	1120[1]	104	162[2]	186[3]	130[4]	310[5]	3540[6]
Number of producing platforms	19	22	26	28	32	34	36	36
Total stabilised crude oil produced from offshore oilfields (million tonnes)	76.5	78.8	87.7	100.1	110.5	120.8	122.0	120.7

(1) includes one spill of 980 tonnes
(2) includes one spill of 50 tonnes and one spill of 45 tonnes
(3) Includes one spill of 75 tonnes and one spill of 39 tonnes
(4) includes one spill of 69 tonnes
(5) includes one spill of 80 tonnes and three spills of 35 tonnes
(6) includes one spill of 3,000 tonnes and six spills of over 25 tonnes
(7) figures vary slightly from those shown in the 1986 Brown Book

If spills of over 25 tonnes are excluded from the data in Table 9 it can be seen that the number of small spills reported (between one and two tonnes on average) has doubled. This is thought to reflect the increase in reporting, not an increase of actual spills. Of the seven spills over 25 tonnes, the largest was a spill of 3,000 tonnes from a pipeline (the last such occurrence being 980 tonnes spilled in 1980). Of the remaining six large spills five were of oil-based drilling mud, the largest of which was a deliberate discharge resulting from an emergency operation to stabilise a drilling rig during a severe storm when 146 tonnes of oil were discharged.

The Secretary of State has the power to exempt operators from certain parts of the Prevention of Oil Pollution Act (POPA) 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 by weight (ppm). The total oil for all discharges made in this way for the years 1979 to 1986 is shown in Table 10.

It can be seen from Table 10 that the increase in the quantity of oil discharged from 1985 to 1986 is in proportion to the increase in the quantity of water discharged.

Oil-based drilling fluids continue to be used in the majority of wells drilled on the UKCS. As was the case in 1985 no diesel-based drilling fluids were used but only drilling fluids based on acceptable low toxicity oils.

Exemptions are issued under POPA for the discharge of oil-contaminated drill cuttings. They incorporate conditions for the exempted discharges which were initially drawn up in consultation with the offshore industry in 1983 and 1984. As a result of experience and in accordance with international agreement, these conditions have recently been revised.

Table 10: *OIL DISCHARGED WITH PRODUCED WATER 1979–1986*

	1979	1980	1981	1982	1983	1984	1985[2]	1986
Number of installations permitted to discharge oil	16	20	24	26	30	32	34	34
Total oil (tonnes)	160	236	525	927	1700	1430	2150	2710
Total water (million tonnes)[1]	14	20	24	31	48	56	73	94

(1) For 1979 to 1984 this includes a relatively constant figure of 12–15 million tonnes of storage displacement water rising to 18 million tonnes for 1985 and 1986. Storage displacement water contains typically less than 10 ppm of oil.
(2) Figures vary slightly from those shown in the 1986 Brown Book

Table 11: *OIL DISCHARGED ON DRILL CUTTINGS 1981–1986*

	1981	1982	1983	1984	1985[2]	1986
Wells drilled	211	229	223	290	290	198
Wells drilled using oil based mud	76	114	145	220	211	139
Oil discharged (tonnes)[1]	5800	8600	14500	19800	20200	13000

(1) From 1981 to 1984 the weight of oil discharged is an estimate.

(2) Figures vary from those in the 1986 Brown Book as some data were not available at the time of publication.

Drilling activity has decreased during 1986 and there has been a reduction in the oil discharged on drilling cuttings as shown in Table 11. Additionally, improved operator awareness has produced a reduction in the average level of oil on cuttings.

Further progress was made during 1986 towards a more complete coverage of chemicals used offshore through the Department's non-statutory Chemical Notification Scheme. Operators are frequently asking chemical suppliers to show that a product has been notified under the scheme before they consider using it.

During 1986 the Inner Moray Firth Code of practice was revised. This Code was first issued prior to the 7th licensing round to provide ground rules for the conduct of exploration, development and production activities in the Inner Moray Firth, with special regard to the interests of fishing activity in the area.

5.8 Abandonment of disused installations and pipelines

The decommissioning and removal of disused offshore installations and pipelines (commonly referred to as "abandonment") will become a matter of increasing importance as offshore oil and gas fields approach the end of their productive life; the first removals of major fixed installations in the North Sea are expected to take place in the first half of the 1990s. The Government has continued to review the major factors which will affect abandonment, including legislation, removal standards, costs, and fishing and environmental aspects. Discussions have taken place and will continue with the offshore oil and gas developers and the fishing industry. The Government has told the industry that it will review the tax rules governing abandonment before any major clearance works are undertaken.

The Government's main objective will be to institute an effective abandonment regime which, whilst taking account of the requirements of international law, the safety of navigation, fishing and environmental interests, will aim to minimise the costs of abandonment in each case. The Petroleum Bill which, inter alia, will establish a legislative regime empowering the Secretary of State to require owners of installations and pipelines to prepare abandonment programmes, and to make Regulations and set appropriate standards, was at an advanced stage of its passage through Parliament at the time of going to print (see Part 6.7).

5.9 Reservoir engineering research and enhanced oil recovery

Work continues on the Department's reservoir simulation programme which provides a direct support to the in-house reservoir engineering group in the area of numerical modelling.
An enhanced oil recovery (EOR) research programme is continuing with the main activity at the Winfrith Atomic Energy Establishment and a supporting programme at various UK universities. This work is being concentrated on the evaluation of specific field application of EOR techniques and software development. An advanced chemical flood simulator, SCORPIO, developed under this programme is now commercially available. The Department contributed some £3.5 million towards this work.

Part 6: Economic and industrial aspects

6.1 The economic impact of UKCS oil and gas

In 1986 UKCS oil and gas production accounted for about 2 per cent of the UK Gross National Product (GNP) at factor cost. Table 12 shows the contribution to GNP arising within the sector for the years 1981-1986.

Total proceeds from the sale of oil and gas produced on the UKCS in 1986 are estimated to have been £9.3 billion and £1.9 billion respectively. The total value of sales of oil and gas produced onshore was £34 million from sales of 0.5 million tonnes of oil and 10 million cubic metres of gas, making a small but still useful contribution to the UK economy.

Total tax and royalty receipts attributable to the UKCS are estimated to have been £4.8 billion in the financial year 1986/7. This figure does not take account of the full contribution of gas to the exchequer given that major items such as the levy under the Gas Levy Act 1981 on gas exempt from Petroleum Revenue Tax (PRT) accrue outside the UKCS sector. By comparison, the estimated yield from VAT and income tax in 1986/7 were £21.5 billion and £38.4 billion respectively. Table 13 shows Government receipts from royalties and taxes from each financial year 1977/8 to 1986/7.

Table 12: *INCOME FROM UKCS OIL AND GAS PRODUCTION*

£ billion

	1981	1982	1983	1984	1985	1986 (provisional)
Value of sales and services rendered	13.3	15.6	18.3	22.1	21.9	11.6
less purchases of goods and services*	1.4	1.9	2.1	2.8	3.3	2.7
Value added by the sector	11.9	13.7	16.2	19.4	18.7	8.9
less interest, profit and dividends due abroad	2.4	2.6	2.9	3.0	3.6	1.4
GNP arising within the sector	9.5	11.1	13.3	16.3	15.1	7.5

* defined as operating plus exploration costs minus employment incomes.

6.2 UKCS fiscal regime

There were no major changes to the fiscal regime announced in the 1986 Budget. Of the changes that were made the most significant was the Chancellor's decision to ensure that the onshore/offshore boundary for the purposes of PRT coincides with the UK coastline (one consequence of this is that exploration and appraisal activity in inshore waters will continue to be eligible for immediate PRT relief). Other measures included an alternative long-term basis for the valuation of certain light gases sold other than at arm's length, and clarification of the rules for determining the chargeable field for tariff receipts in cases where fields approved on the same day share common facilities (e.g. pipelines) which are also used by licensees in other fields. The revision of the corporation tax rules for mines and oil well allowances also affected the oil industry. The Chancellor reaffirmed that he would continue to keep the economics of incremental investment under review.

Table 13: *TAXES AND ROYALTIES ATTRIBUTABLE TO UK AND UKCS OIL AND GAS*

Financial Year	1977/8	1978/9	1979/80	1980/1	1981/2	1982/3	1983/4	1984/5	1985/6	1986/7 (provisional)
£ million										
Royalty	228	289	628	992	1396	1632	1904	2426	2057	900
Supplementary Petroleum Duty	—	—	—	—	2025	2395	—	—	—	—
Petroleum Revenue Tax[1]	—	183	1435	2410	2390	3274	6017	7177	6375	1300
CORPORATION TAX Total before ACT	10	93	250	341	681	521	877	2427	2923	2700
CORPORATION TAX Set-off ACT	—	40	78	97	270	202	430	1239	1092	1100
CORPORATION TAX Main Stream CT	10	53	172	244	411	319	447	1188	1831	1600
Total Revenues	238	565	2313	3743	6492	7822	8798	12030	11360	4800[2]

[1] Includes Advance Petroleum Revenue Tax (APRT).
[2] Constituent figures do not add up due to rounding.

During 1986/87 a review of the fiscal regime was undertaken in the light of the substantial fall in oil prices. This review has resulted in three measures being introduced to encourage development of the North Sea to go ahead and so provide further opportunities for the offshore supplies industry.

On 6 November 1986 the Chancellor announced, in his Autumn Statement, that he was to introduce urgent legislation for the early repayment of some £300 million of outstanding Advance Petroleum Revenue Tax, the consequent Advance Petroleum Revenue Tax Act received Assent on 18 December 1986.

Two further reliefs were proposed by the Chancellor in his 1987 Budget. These are across-field allowance up to 10 per cent of a company's expenditure incurred in developing new offshore fields, outside the Southern Basin, against any PRT liability of the company; and a similar allowance of certain expenditure on UKCS related research which had not qualified after three years for PRT relief on a field basis.

There were also other more technical proposals included in the 1987 Budget relating to PRT and advance corporation tax (ACT).

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 1977 to 1986 are presented in Appendix 12. However, where gas is produced in association with oil, the joint nature of costs make it difficult to draw a meaningful distinction between oil and gas costs.

Expenditure on exploration in 1986 totalled £1019 million, a reduction of £431 million or

about 30 per cent on the 1985 figure. This reduction reflects the decrease in the number of offshore exploration and appraisal wells described in Part 1.

Expenditure on the construction and installation of platforms and associated equipment and on related pipelines and terminals amounted in 1986 to £1709 million for the development of oil fields and £628 million for the development of gas fields, compared with £1859 million and £940 million respectively in 1985. Expenditure on oilfields has been roughly stable for the past four years, while expenditure on gas projects has fallen from the peak in 1984, when the South Morecambe, Esmond/Forbes/Gordon complex, Fulmar gas pipeline and Rough gas storage projects were being developed. Expenditure on the projects approved in 1986 (see Part 3) will become significant in 1987 and later years.

Operating costs for oil and gas fields in 1986 were £1730 million and £412 million respectively, five per cent lower in total than the figure for 1985. For oil, this represents an average of £2 ($3) of operating expenditure for each barrel produced.

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 £7 per barrel in 1986 prices. At the average 1986 exchange rate, 13 per cent higher than in 1985, this is equivalent to $10 per barrel. Many recent fields are both smaller and more expensive to develop, so the average cost per barrel for fields which started production between 1980 and 1986 is estimated to be £10 ($14). The overall average cost per barrel of all offshore oil fields in production by the end of 1986 is £7 ($11).

The corresponding overall cost per barrel for oilfields now under development is £11 ($16). This is lower than last year's figure of £14 and reflects successful attempts to reduce the development costs of some of these projects.

The above figures exclude Southern Basin gas fields but they take into account both associated gas produced with oil and incremental expenditure on existing fields including the development of significant new reservoirs within the field boundary. The average cost per barrel of this incremental investment remains relatively low.

The overall cost per barrel of all offshore projects approved during 1986 was £8 ($11). Unlike the above figures, this includes Southern Basin gas fields (converting their production to an oil equivalent basis) as well as new oilfields and incremental oil and gas projects.

These overall estimates, which are rounded to the nearest £ or $, are based on the production and costs of the fields before the 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 would yield a pre-tax real rate of return of 10 per cent.

The gross capital investment in the mineral oil and natural gas extraction industry as a whole, including that of drilling contractors and other contractors providing services to the industry is estimated to have been about £2.5 billion in 1986, £0.3 billion down on the previous year. It formed about 17 per cent of total UK production industries investment and four per cent of gross domestic fixed capital formation in 1986. Table 14 shows capital investment in the years 1981–1986, at around £3 billion per year before the recent slight decline due to the timing of individual major projects.

Total investment in the period 1965 (the start of major UK offshore development) to 1986 is estimated to have been about £31 billion. In 1986 prices this represents an investment of about £44 billion. In addition there has been exploration amounting to some £12 billion in 1986 prices over the same period.

The main sources of funds deployed on the UKCS during 1986 were the internally generated resources of companies and loans from UK-based banks. The latter provided about one quarter of the total requirement.

Table 14: *CAPITAL INVESTMENT IN THE OIL AND GAS EXPLORATION AND PRODUCTION INDUSTRY*

	1981	1982	1983	1984	1985	1986 (provisional)
Gross UK capital investment in the exploration and production industry (£ billion)*	2.9	3.1	2.9	3.2	2.8	2.5
– as a percentage of total UK production industries investment	24	25	22	23	20	17
– as a percentage of gross domestic fixed capital formation	7	7	6	6	5	4

* 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.

6.4 Comparison of UK oil and gas production with consumption

Table 15 and Figure 1 show the relationship between oil and gas production and total primary fuel consumption.

In 1986 UK oil production was 127.0 million tonnes, while the total UK consumption was 77 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 1986 corresponded to about 61 per cent and 19 per cent of total primary fuel consumption respectively.

Table 15: *UKCS AND ONSHORE OIL AND GAS PRODUCTION COMPARED WITH UK TOTAL PRIMARY FUEL CONSUMPTION*

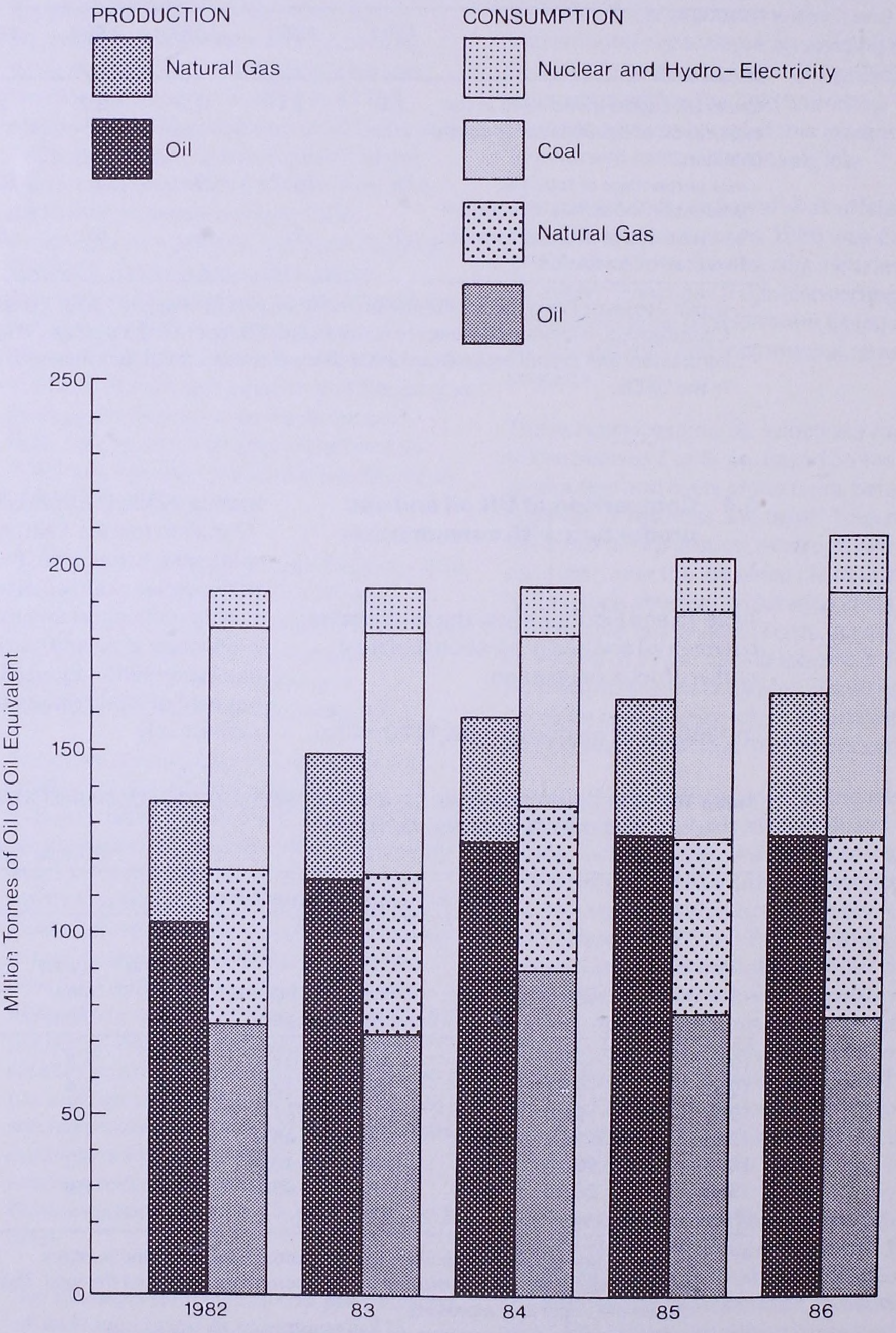
million tonnes of oil or oil equivalent

	Total primary fuel consumption[1]							
	Total[2]	Coal	Petroleum	Natural gas	Nuclear electricity	Hydro electricity	Oil production[3]	Gas production[4]
1981	196.2	69.6	74.8	42.4	8.1	1.3	89.5	32.4
1982	193.6	65.1	75.5	42.2	9.4	1.4	103.2	33.0
1983	194.0	65.6	72.4	44.0	10.6	1.4	114.9	34.0
1984	194.1	46.5	89.9	45.0	11.5	1.2	125.9	33.2
1985	203.0	62.0	78.3	48.4	13.0	1.3	127.5	37.1
1986 (Provisional)	208.6	67.1	77.4	49.1	12.6	1.4	127.0	38.9

(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. The total for 1986 also includes net imports of electricity.
(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



6.5 Offshore supplies industry

In 1986 the total value of orders reported by operators for oil and gas development work on the UKCS was £2.23 billion. The UK share of 82 per cent is an all-time high. Since 1980 the UK has gained an average 74 per cent share of an annual market which has been worth an average of £2.77 billion over the period.

The drop in oil prices is a new factor which has created some uncertainty in oil companies' investment plans resulting in a decrease in value of orders placed from the previous year. However, Shell's award of the construction contracts for the Tern and Eider jackets in the first half of 1986 and the Conoco/V-fields complex and BP/Villages project have generated significant orders for industry. The total investment involved in projects approved in 1986 (see part 3) is more than £2 billion.

The Offshore Supplies Office continues to assist in the promotion of the UK offshore supplies industry both at home and abroad. In support of this policy during 1986 the UK offshore supply vessel sector was declared an area of special interest.

Procurement for the UKCS is 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 (Table 16 page 67) is based on data collated from returns supplied by each operator under a voluntary arrangement agreed with 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 10.

The events of 1986 underline the need for UK offshore supply companies to become aggressive in international marketing. Support for UK industry in overseas markets continued to feature prominently in the work of the Offshore Supplies Office.

During the Secretary of State's visit to Moscow in April 1986, a Memorandum of Understanding was signed with the Soviet Union which hopefully will lead to Anglo/Soviet co-operation in the energy sector. OSO will have responsibility for oil and gas and will liaise through an Oil and Gas Working Group with the Soviet State Committee for Science and Technology.

In May the Minister of State met the Indian Petroleum Minister when he visited the UK to promote India's third oil and gas licensing round. Also in May, the newly created Canadian Newfoundland Offshore Petroleum Board visited OSO for discussions. In June senior OSO officials attended the Offshore Newfoundland 86 Exhibition in St John's, Newfoundland.

In addition to the Soviet Union, India, Canada and China, Angola, a low cost area with a still active market, continued to attract interest. In October OSO led a successful business mission to Luanda involving a presentation on marginal field technology to Sonangol, the State oil company and discussions with all the local operating companies. It is hoped that this presentation may lead to initiatives to develop Angola's smaller fields.

In December the Burmese Minister for Energy visited the UK for discussions with

the Secretary of State on various matters including oil and gas prospects.

The series of OSO-backed Export Seminars launched by the Minister of State in September 1985 and completed in February 1986 was supplemented by a further one-day conference in December when a number of prominent speakers considered future opportunities in the light of the changed market conditions that occurred during 1986.

The need for development of new cost-effective innovative techniques for oil and gas exploration and production to cope with future developments in even harsher, deeper waters, the economics of marginal fields, and fluctuating oil prices played an increasingly important role in 1986.

Reflecting the significance of R & D in future UKCS exploration and development, the Offshore Energy Technology Board (OETB), under the Chairmanship of the Minister of State for Energy, continued its task of planning a UK strategy for the development of offshore technology for application on the UKCS and world-wide between now and the end of the century. The OETB, whose representatives include prominent members of the oil and gas industries and supplies companies, assessed that the UK would derive most benefit from concentrating its R & D efforts in four main areas:

- subsea systems and equipment for subsea production;
- weight reduction with cost reduction as the overall aim through the development of design techniques and process equipment and the use of new lighter materials;
- exploration with emphasis on locating and evaluating oil-bearing strata with greater precision;
- drilling and production technology with emphasis on specialist areas such as measurement while drilling, horizontal drilling and new techniques of production logging leading to improvements in cost-effectiveness and economic increases in the percentage recovery of reserves.

The Board circulated details of the priority areas and the criteria used to identify them. There has been widespread agreement from both the oil company operators and the major UK suppliers that these are the areas which will be of most benefit to the UK offshore supplies industry.

The Board has initiated further action in each of the priority areas. It has commissioned initial feasibility and fact-finding studies in subsea technology, lightweight materials and topside design to achieve weight reduction. The Department, advised by the OETB Programme Committee, has continued with its role of providing part funding for high-risk R & D projects in oil and gas technology initiated by industry.

Table 16: *AN ANALYSIS OF ORDERS* PLACED FOR GOODS AND SERVICES FOR DEVELOPMENTS ON THE UKCS DURING 1986 (1985 PERCENTAGES ARE IN BRACKETS)*

Sector		Value of orders placed £ million			
		Value	UK Share	UK%	
Exploration					
A	Surveying	59	49	83	(78)
B	Exploration and appraisal drilling	100	92	92	(67)
	Sub-total	159	141	89	(69)
Development					
C	Production platforms	480	395	82	(93)
D	Installation operations	88	68	77	(35)
E	Plant and equipment	263	227	86	(81)
F	Submarine pipelines	209	123	59	(63)
G	Development drilling	97	89	92	(64)
H	Terminals	91	86	95	(98)
	Sub-total	1228	988	80	(82)
Production					
I	Maintenance	97	94	97	(94)
	Sub-total	97	94	97	(94)
General Services (excluded wherever possible from A–I above)					
J	Transport	190	167	88	(85)
K	Diving and underwater services	69	62	90	(84)
L	Drilling tools and equipment	309	240	78	(69)
M	Support of personnel offshore	84	56	67	(58)
N	Miscellaneous	95	86	91	(96)
	Sub-total	747	611	82	(76)
Grand Total		2231	1834	82	(80)

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

6.6 Privatisation of the British Gas Corporation

The Gas Act, given Royal Assent on 25 July 1986, allowed the property, rights and liabilities of the British Gas Corporation to be transferred to a public limited company, British Gas plc. The sale of shares in this company was successfully completed in December 1986 and total proceeds to the Government arising from the sale were some £7.75 billion. Now it is in the private sector, British Gas plc in its upstream operations will be treated in the same way as all other UKCS operators and will be subject to the same controls and restrictions.

6.7 Petroleum Bill

The Petroleum Bill was introduced into Parliament on 14 November 1986. Its major provisions, concerning the abandonment of disused offshore oil and gas installations and submarine pipelines, are discussed in Part 5.8, but the Bill also includes a number of other provisions worth noting.

The Bill makes various technical changes to licence Model Clauses to update the procedures relating to the administration of royalties, including metering requirements. It also proposes new insurance arrangements for onshore pipelines and provides for the automatic creation of safety zones around offshore installations (see also Part 5.6).

Appendix 1 Offshore licensing rounds

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)	Areas under offer	No of blocks on offer	No of applications	No of blocks applied for	No of companies in consortia	Licences		
						No awarded	No of blocks	No of companies
First (1964)	North Sea	960	31	394	61	53	348	51
Second (1965)	North Sea Irish Sea English Channel	1102	21	127	54	37	127	44
Third (1970)	North Sea Irish Sea Orkney/Shetland Basin	157	34	117	63	37	106	61
Fourth (1971/ 1972)	North Sea Irish Sea Celtic Sea Orkney/ Shetland Basin	421 for discretionary award; 15 for cash tender	92 31	271 15	228 73	118	282	213
Fifth (1976/ 1977)	North Sea Irish Sea Celtic Sea Orkney/ Shetland Basin English Channel/ South Western Approaches West of Scotland	71	53	51	133	28	44	64
Sixth (1978/ 1979)	North Sea West Shetland Basin Cardigan Bay Bristol Channel South Western Approaches	46	55	46	94	26	42	59

(Appendix 1 contd.)

Round (year)	Areas under offer	No of blocks on offer	No of applications	No of blocks applied for	No of companies in consortia	Licences		
						No awarded	No of blocks	No of companies
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	97	204	90	90	157
Eighth (1982/1983)	North Sea West Orkney Basin East Shetland Basin Unst Fair Isle Forth Approaches Bristol Channel	169 for discretionary award; 15 for cash tender	40 20	76 8	94 47	55	70	81
Ninth (1984/1985)	North Sea West Shetland Basin Rockall Trough Faeroes Trough Irish Sea Celtic Sea English Channel	180 for discretionary award; 15 for cash tender	117 32	107 13	134 52	89	93	103
Tenth (1986/1987)	North Sea Rockall Trough Faeroes Trough	127	75	61	84	No awards at time of going to print.		

Appendix 2 Drilling activity

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

	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
East of England	5	—	—	—	1	9	9	24	17	12
East of Scotland	23	20	22	19	37	36	45	53	48	34
East of Shetland	24	11	6	7	7	11	9	20	19	16
West of England/ Wales	4	3	—	—	—	4	1	1	1	1
West of Shetland	11	1	3	6	2	3	4	5	8	7
Channel and SW Approaches	—	2	3	—	1	5	9	3	—	3
Total all areas	67	37	34	32	48	68	77	106	93	73

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

	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
East of England	—	—	—	—	1	8	17	19	24	17
East of Scotland	20	11	8	13	15	24	18	44	26	13
East of Shetland	17	8	7	8	10	11	13	13	13	10
West of England/ Wales	1	3	—	—	—	—	3	—	—	—
West of Shetland	—	3	—	1	—	—	—	—	1	—
Total all areas	38	25	15	22	26	43	51	76	64	40

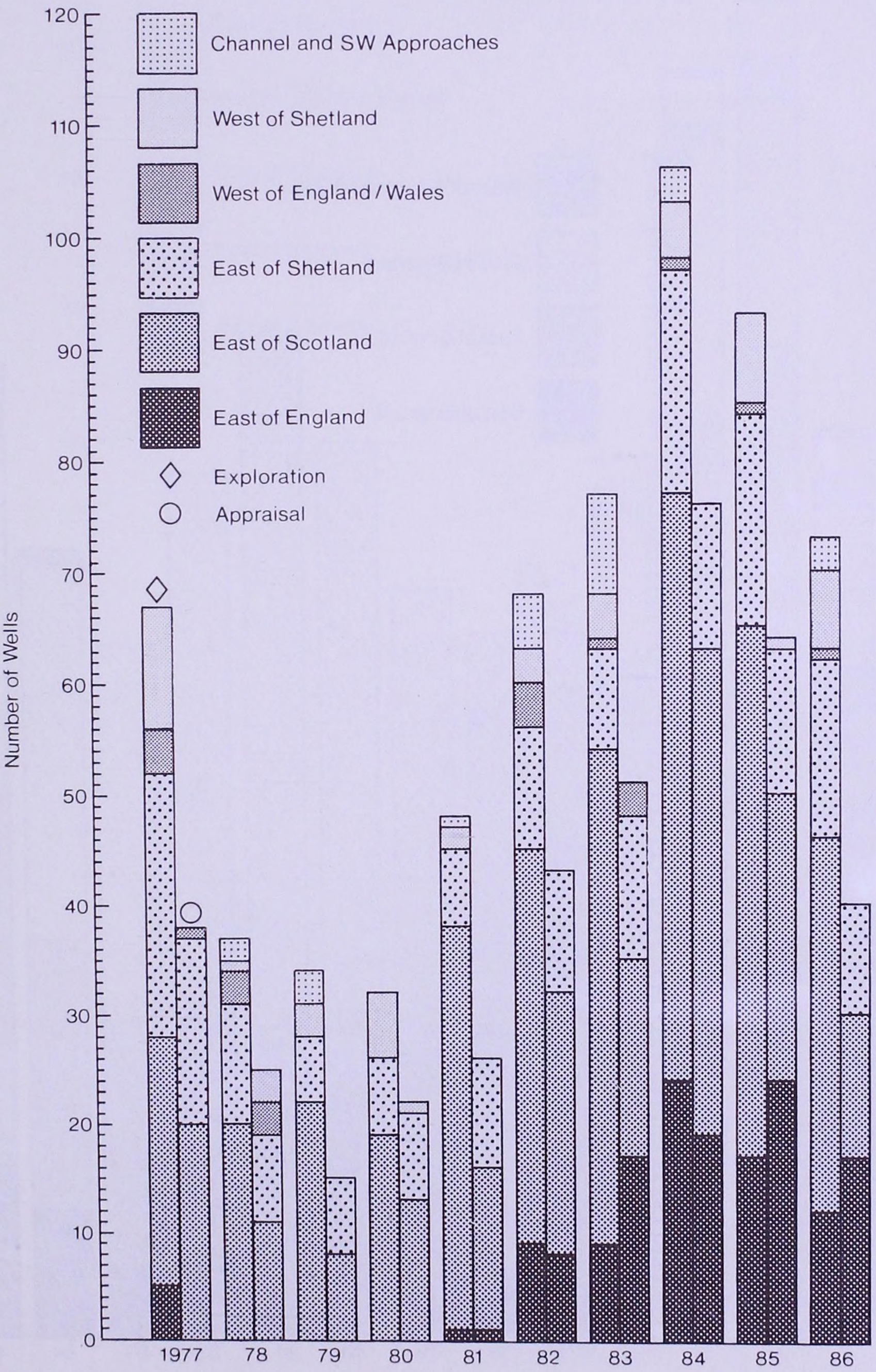
(C) Offshore development drilling; development wells started in each geographical area

	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
East of England	7	7	2	—	4	11	10	18	28	32
East of Scotland	60	35	37	45	39	36	34	37	49	15
East of Shetland	29	54	63	77	94	71	51	51	47	34
West of England/ Wales	—	—	—	—	—	—	—	2	9	4
Total all areas	96	96	102	122	137	118	95	108	133	85

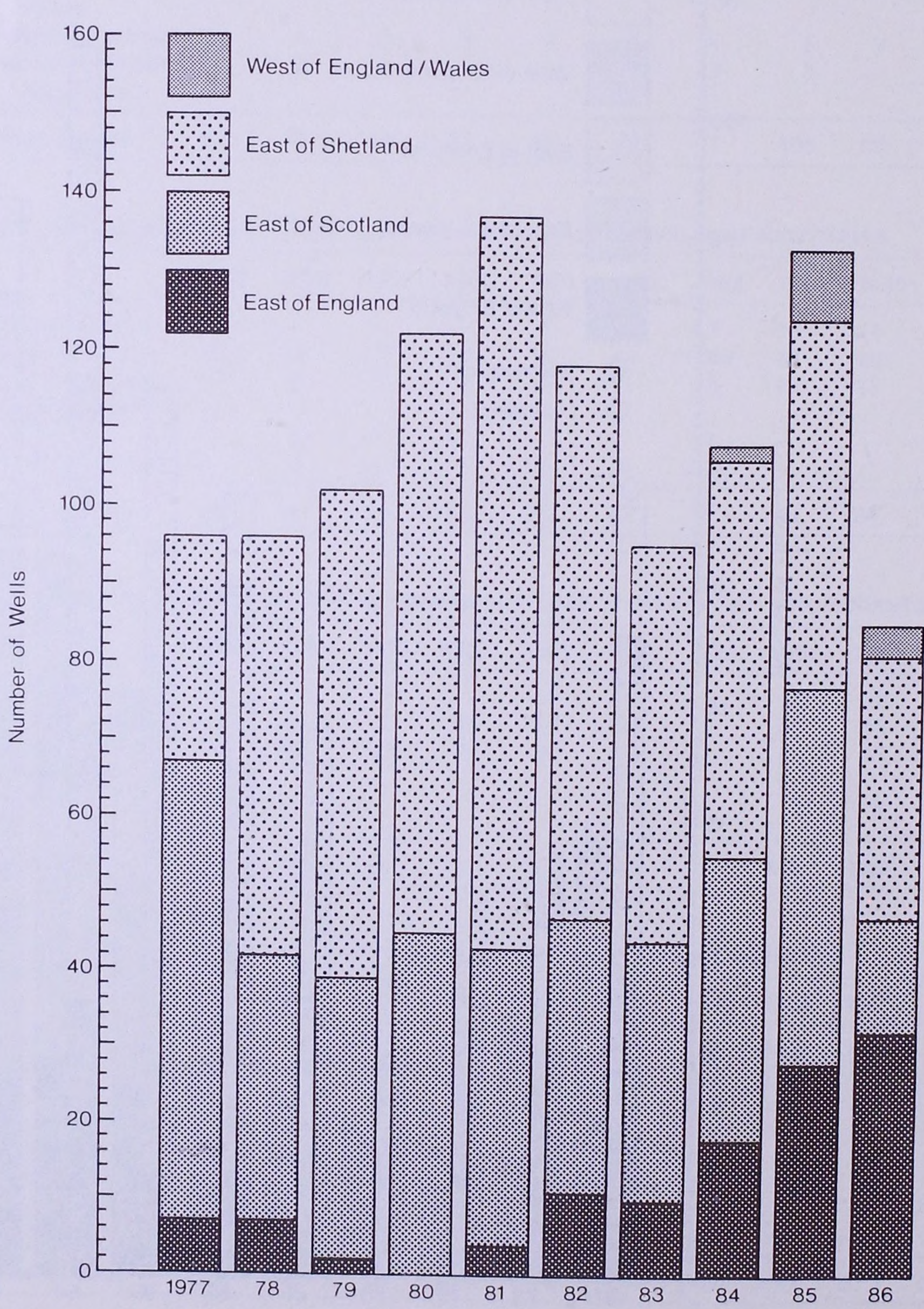
(D) Mobile rig activity; rig time (in rig years) breakdown by geographical areas

	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
East of England	1.4	0.6	0.5	—	1.2	4.9	7.3	13.0	15.4	12.3
East of Scotland	9.5	9.3	9.6	12.8	16.3	15.8	19.2	22.9	23.1	13.8
East of Shetland	10.1	5.9	4.5	6.3	6.5	6.9	5.3	10.4	9.3	6.2
West of England/ Wales	0.8	1.1	0.2	—	0.2	0.9	0.7	0.6	1.6	1.3
West of Shetland	1.8	1.1	0.4	1.5	0.4	0.8	0.5	1.8	2.3	1.4
Channel and SW Approaches	—	0.1	0.9	—	—	0.8	1.2	0.4	—	0.3
Total all areas	23.6	18.1	16.1	20.6	24.6	30.1	34.2	49.1	51.7	35.3

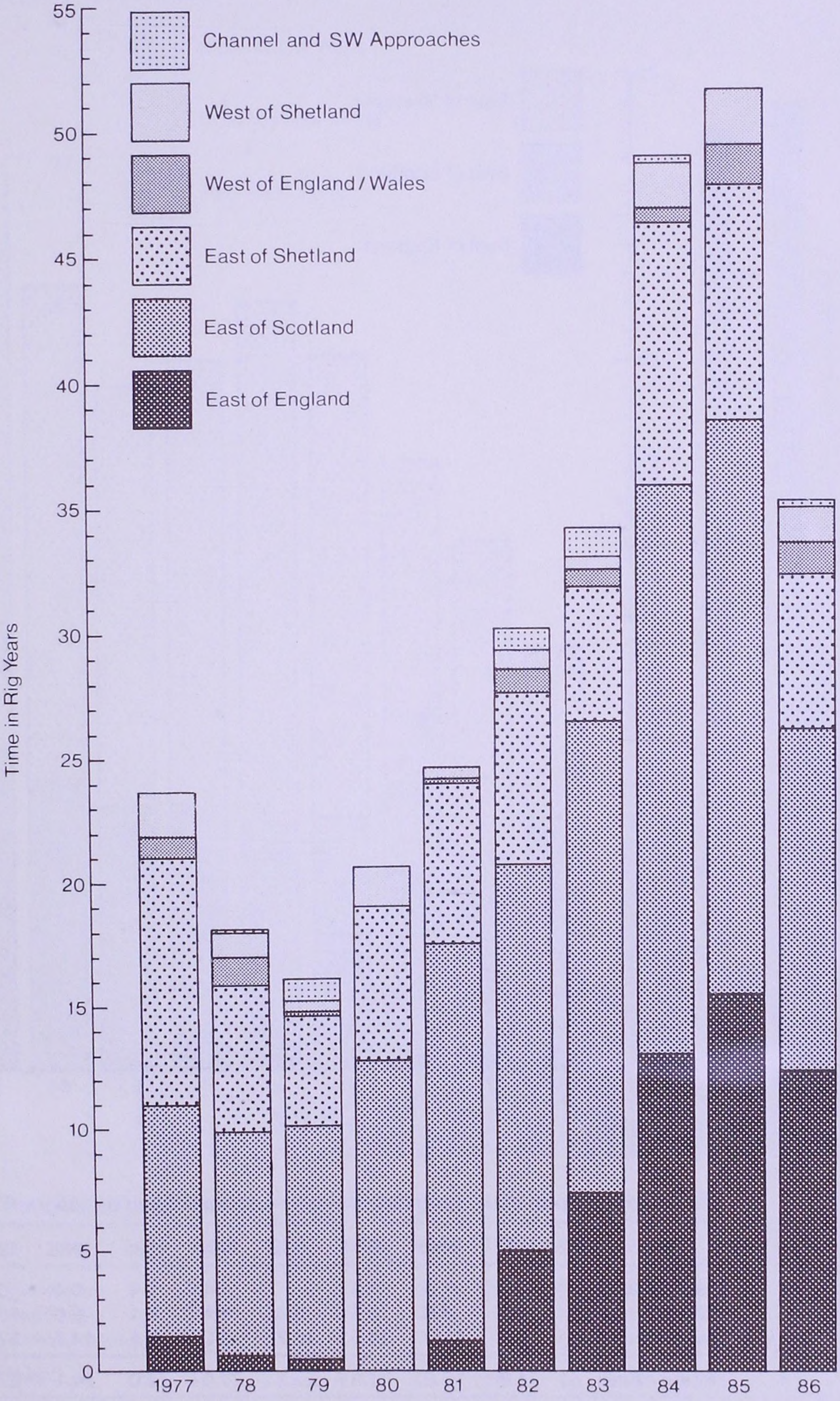
Offshore exploration/appraisal wells drilled each year 1977—1986



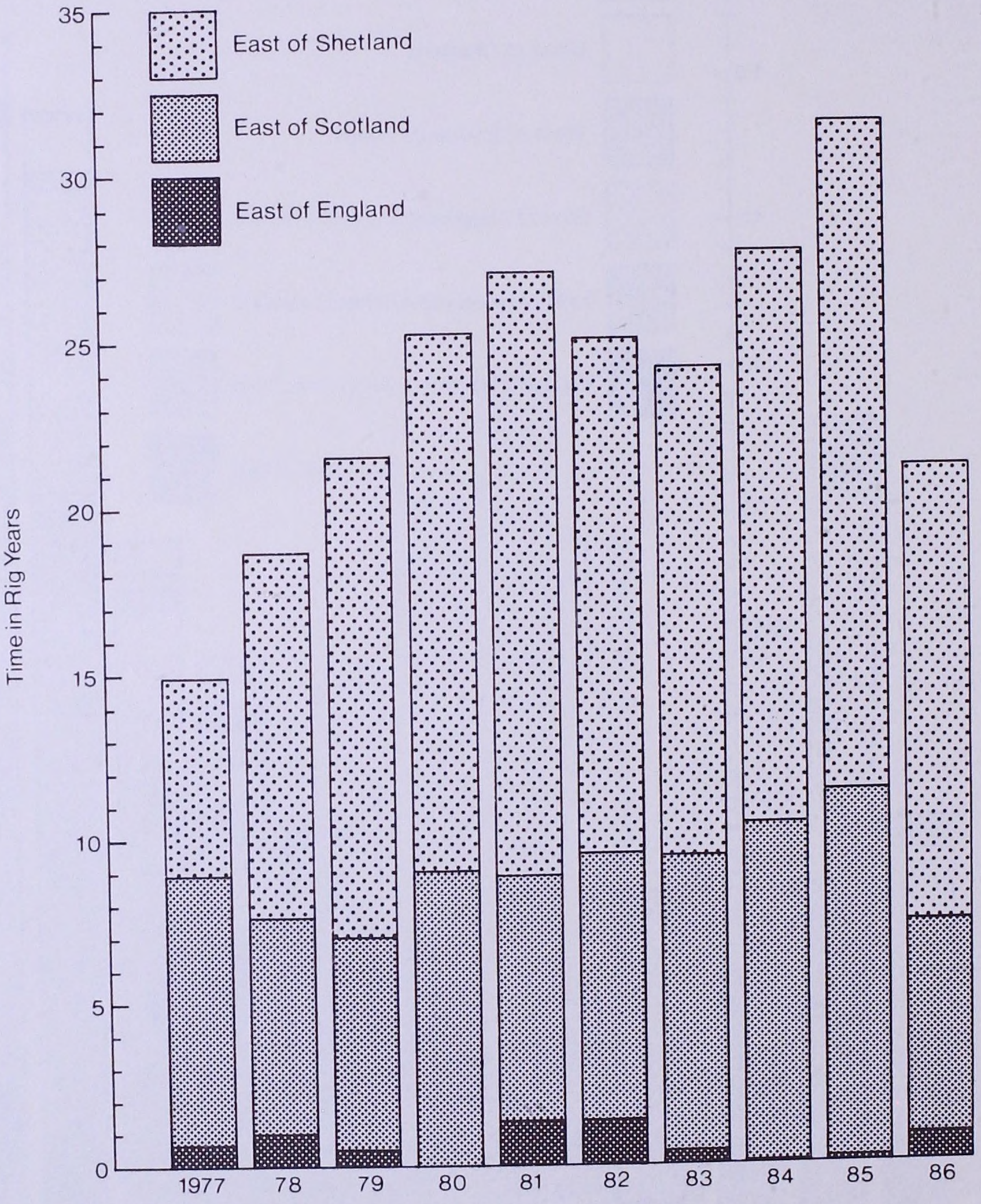
Offshore development wells drilled each year 1977—1986



Mobile rig activity
Rig time spent in UK Continental Shelf



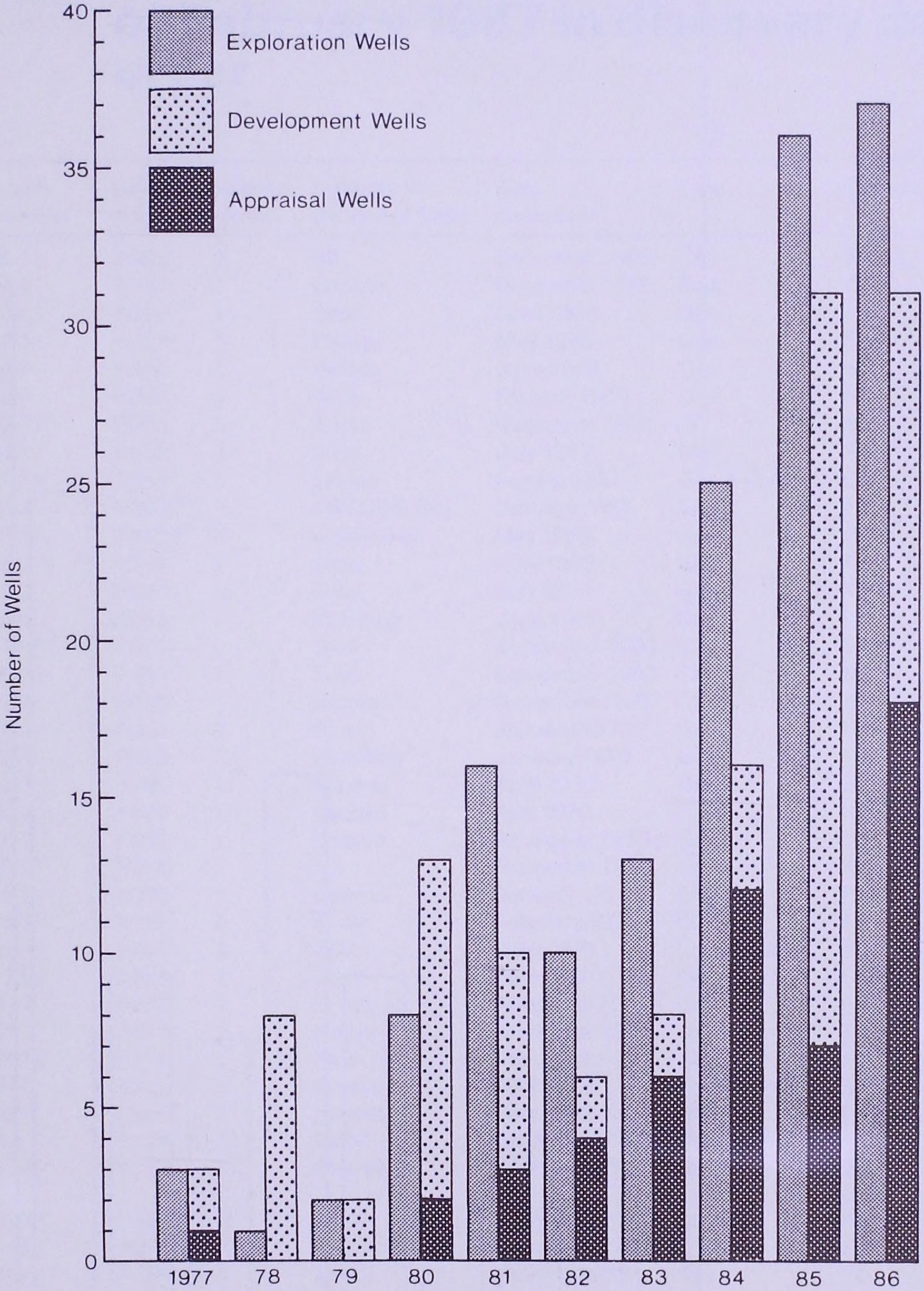
Fixed platform activity
Rig time spent in UK Continental Shelf



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

	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
East of England	0.7	1.0	0.5	—	1.4	1.4	0.4	0.01	0.1	0.8
East of Scotland	8.2	6.6	6.5	9.0	7.4	8.1	9.0	10.4	11.2	6.6
East of Shetland	6.0	11.0	14.5	16.2	18.2	15.5	14.7	17.2	20.2	13.8
Total all areas	14.9	18.6	21.5	25.2	27.0	25.0	24.1	27.6	31.5	21.2

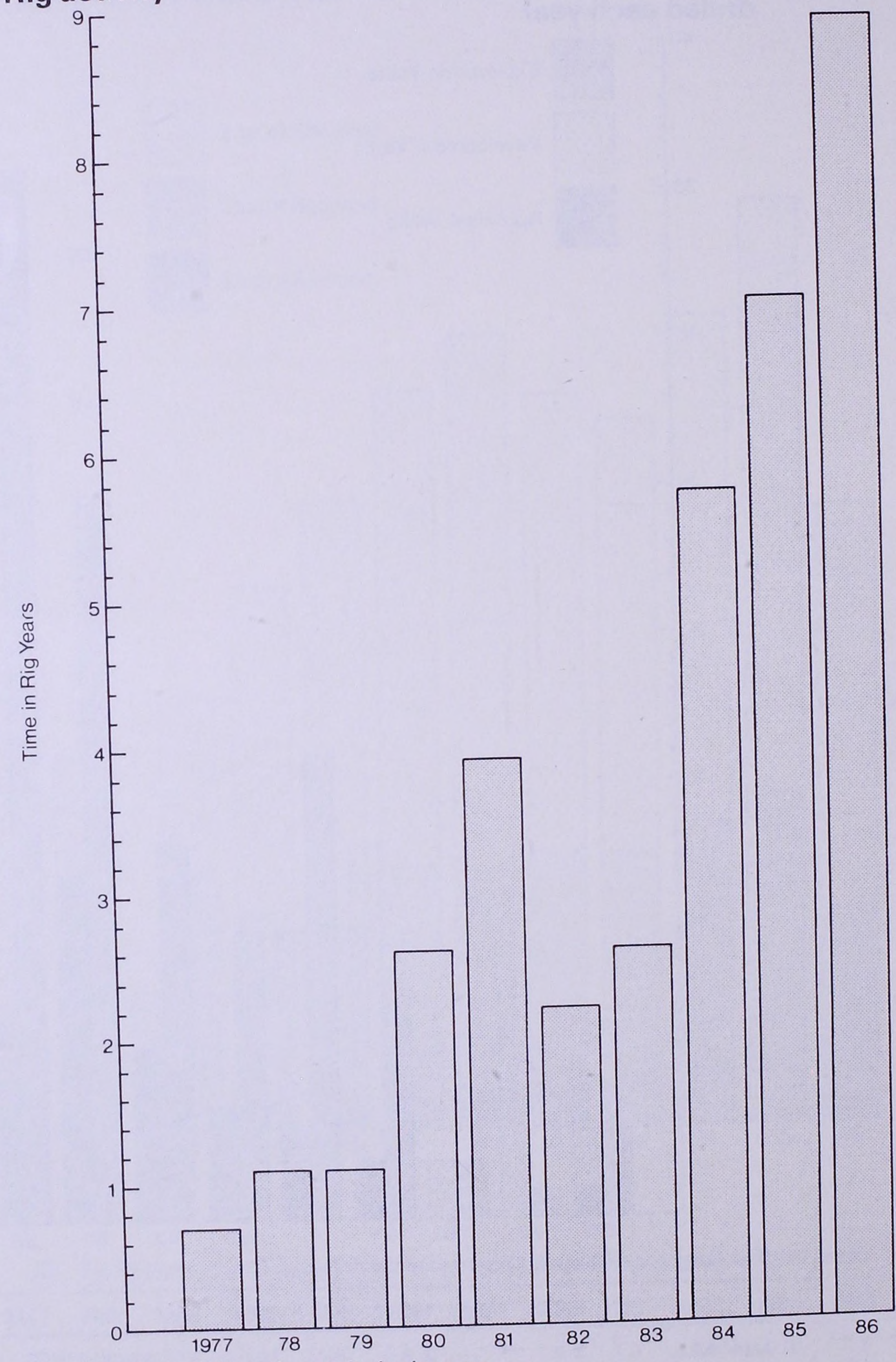
Onshore drilling
Number of exploration and appraisal/development wells drilled each year



(F) Onshore drilling: numbers of wells drilled

	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
Exploration	3	1	2	8	16	10	13	25	36	37
Appraisal	1	0	0	2	3	4	6	12	7	18
Development	2	8	2	11	7	2	2	4	24	13
Total	6	9	4	21	26	16	21	41	67	68

NB: The year in which a well is drilled is determined by its start date.



(G) Onshore drilling: rig activity in rig years

	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
Activity (rig years)	0.7	1.1	1.1	2.6	3.9	2.2	2.6	5.7	7	8.9

Appendix 3 Significant* offshore hydrocarbon discoveries announced by the end of February 1987 in discovery date order

Field[1] name	Block and well number	Licence number	Licence round	Operator at the end of 1986	Date discovered	Type	Category[2]	Area[3]
WEST SOLE	48/06-1	P.001	1	BP	December 1965	Gas	FIP	SNSB
VIKING	49/17-1	P.033	1	Conoco	December 1965	Gas	FIP	SNSB
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[5]	P.005	1	Britoil	November 1966	Oil	SD	SNSB
Scram	53/04-1	P.039	1	Arco	July 1967	Gas	SD	SNSB
	48/21-1	P.047	1	Lasmo	August 1967	Gas & Cond.	SD	SNSB
	44/23-1	P.003[4]	1	CSX Oil & Gas	January 1968	Gas	SD	SNSB
ROUGH	47/08-1	P.030[6]	1	British Gas	May 1968	Gas	FIP	SNSB
NORTH SEAN	49/25-1	P.054	2	Shell	April 1969	Gas	FIP	SNSB
YARE	49/28-3	P.037	1	Arco	May 1969	Gas	FIP	SNSB
GORDON	43/20-1	P.002	1	Hamilton	June 1969	Gas	FIP	SNSB
	41/24a-1[5]	P.034	1	Total	September 1969	Gas	SD	SNSB
	41/25a-1	P.039	1	Total	September 1969	Gas	SD	SNSB
Arbroath	22/18-1	P.020	1	Amoco	December 1969	Oil	SD	CNSB
SOUTH SEAN	49/25-2	P.054	2	Shell	January 1970	Gas	FIP	SNSB
FORBES	43/08-1	P.048	1	Hamilton	January 1970	Gas	FIP	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	FUD	SNSB
North Valiant	49/16-2	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
MONTROSE	22/18-2	P.020	1	Amoco	November 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
SOUTH CORMORANT	211/26-1	P.232	4	Shell	September 1972	Oil	FIP	ESB
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	Unocal	December 1973	Oil	FIP	ESB
THAMES	49/28-4	P.037	1	Arco	December 1973	Gas	FIP	SNSB

(Appendix 3 contd.)

Field[1] name	Block and well number	Licence number	Licence round	Operator at the end of 1986	Date discovered	Type	Category[2]	Area[3]
Osprey	211/23-3	P.296	4	Shell	February 1974	Oil	SD	ESB
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
NORTH CORMORANT	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
SOUTH MORECAMBE	110/02-1	P.153	4	Hydrocarbons GB	September 1974	Gas	FIP	ISB
	15/23-1Z	P.237	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	Unocal	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
PETRONELLA	14/20-1	P.324	4	Texaco	February 1975	Oil	FIP	MFB
	3/04-4	P.119	3	Texaco	March 1975	Oil	SD	ESB
NORTH WEST 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	FIP	ESB
TERN	210/25-1	P.296	4	Shell	May 1975	Oil	FUD	ESB
NORTH BRAE	16/07-1	P.108	3	Marathon	May 1975	Condensate	FUD	ESB
	21/02-1	P.244	4	Union Texas	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	FIP	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	FIP	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
NORTH ALWYN	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	Amerada	October 1975	Oil	FUD	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	Union Texas	December 1975	Condensate	SD	CNSB
	23/27-3	P.114	3	Ranger	March 1976	Oil	SD	CNSB
Central Brae	16/07-3	P.108	3	Marathon	March 1976	Oil	SD	ESB
AUDREY	49/11a-1	P.028	1	Phillips	March 1976	Gas	FUD	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	FIP	MFB
	9/19-2	P.103	3	Conoco	May 1976	Oil & Cond.	SD	ESB
EIDER	211/16-2	P.296	4	Shell	May 1976	Oil	FUD	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

(Appendix 3 contd.)

Field[1] name	Block and well number	Licence number	Licence round	Operator at the end of 1986	Date discovered	Type	Category[2]	Area[3]
	49/29-2	P.105	3	Mobil	June 1976	Gas	SD	SNSB
Toni/Thelma	16/17-1	P.225	4	AGIP	July 1976	Oil	SD	ESB
	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
	211/19a-6	P.104	3	Conoco	January 1977	Oil	SD	ESB
	16/22-2	P.240	4	Total	May 1977	Oil	SD	ESB
SOUTH BRAE	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.237	4	Texaco	August 1977	Oil	SD	MFB
	3/14a-4	P.090	2	Total	August 1977	Condensate	SD	ESB
	9/13-18	P.139	4	Mobil	October 1977	Oil	SD	ESB
	16/26-2	P.213	4	Gulf/Chevron	October 1977	Condensate	SD	ESB
	210/15-2	P.226	4	Phillips	October 1977	Oil	SD	ESB
East Gannet	22/21-3	P.013	1	Shell	April 1978	Oil & Gas	SD	CNSB
	14/18-1	P.263	5	Occidental	May 1978	Oil	SD	MFB
	2/10a-4	P.234	4	Chevron	May 1978	Oil	SD	ESB
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
	29/3a-2	P.012	1	Shell	January 1979	Gas & Cond.	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	AGIP	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	Unocal	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
North East 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
	3/04a-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
	21/23b-1	P.353	7	Shell	January 1982	Oil & Gas	SD	CNSB
	211/23a-7	P.258	4	Shell	February 1982	Oil	SD	ESB
	22/10a-2	P.066	2	Amoco	March 1982	Gas & Cond.	SD	CNSB
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	FIP	SNSB
	113/26-1	P.287	Sole	Hydrocarbons	August 1982	Gas	SD	ISB

Field[1] name	Block and well number	Licence number	Licence round	Operator at the end of 1986	Date discovered	Type	Category[2]	Area[3]
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	FUD	SNSB
	12/27-1	P.373	7	Premier	January 1983	Gas	SD	MFB
Clipper	48/19a-2A	P.008	1	Shell	February 1983	Gas	SD	SNSB
	47/09b-5A	P.302	6	British Gas	February 1983	Gas	SD	SNSB
Miller	16/07b-20Z	P.340	7	BP	March 1983	Oil	SD	ESB
	31/26-3	P.288	Sole	Amerada	March 1983	Oil	SD	CNSB
INNES	30/24-24	P.073	2	Hamilton	April 1983	Oil	FIP	CNSB
SOUTH RAVENSPURN	42/30-2	P.001	1	BP	April 1983	Gas	FUD	SNSB
CLEETON	42/29-2	P.001	1	BP	April 1983	Gas	FUD	SNSB
VULCAN	49/21-6	P.039	1	Conoco	April 1983	Gas	FUD	SNSB
Barque	48/13a-4	P.008	1	Shell	May 1983	Gas	SD	SNSB
Miller	16/08b-2Z	P.341	7	Conoco	May 1983	Oil	SD	ESB
	22/05b-3	P.356	7	Superior	May 1983	Oil & Gas	SD	CNSB
BURE	49/28-8	P.037	1	Arco	May 1983	Gas	FIP	SNSB
	16/21a-8	P.201	4	British Sun	June 1983	Oil	SD	MFB
	49/25a-5	P.054	2	Shell	June 1983	Gas	SD	SNSB
	29/9a-1	P.012	1	Shell	June 1983	Gas & Cond.	SD	CNSB
	9/08a-8	P.209	4	Hamilton	August 1983	Oil	SD	ESB
	16/18-1	P.312	6	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
	21/20a-2	P.185	4	Amoco	November 1983	Oil	SD	CNSB
	2/10a-6	P.234	4	Chevron	December 1983	Oil	SD	ESB
	29/08b-2	P.227	4	Unocal	December 1983	Oil	SD	CNSB
	15/22-4	P.185	4	Amoco	January 1984	Oil	SD	MFB
	16/13a-2Z	P.219	4	Britoil	January 1984	Condensate	SD	ESB
	53/04a-5	P.039	1	Arco	January 1984	Gas	SD	SNSB
Marnock	22/24a-2	P.092	3	BP	February 1984	Gas & Cond.	SD	CNSB
	22/02-2	P.354	7	Premier	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
ROB ROY	15/21a-11	P.218	4	Amerada	May 1984	Oil	FUD	MFB
	29/02a-2	P.224	4	Conoco	June 1984	Gas & Cond.	SD	CNSB
	42/15b-1	P.137	4	Ind Scot Energy	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
	44/28-1	P.453	8	Shell	November 1984	Gas	SD	SNSB
	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
	16/26-5	P.213	4	Gulf/Chevron	December 1984	Oil	SD	MFB
	44/23-4	P.452	8	CSX Oil & Gas	February 1985	Gas	SD	SNSB

(Appendix 3 contd.)

Field[1] name	Block and well number	Licence number	Licence round	Operator at the end of 1986	Date discovered	Type	Category[2]	Area[3]
	15/28b-4	P.339	7	Britoil	March 1985	Oil	SD	MFB
	29/8a-3	P.012	1	Shell	April 1985	Oil	SD	CNSB
	4/26-1A	P.229	4	Ranger	June 1985	Gas	SD	ESB
	9/13b-25	P.337	7	Mobil	June 1985	Oil & Gas	SD	ESB
	3/8b-10	P.329	7	BP	July 1985	Oil	SD	ESB
	16/23-4	P.103	3	Conoco	July 1985	Oil	SD	MFB
	44/22-3	P.451	8	Conoco	August 1985	Gas	SD	SNSB
	30/7a-4A	P.032	1	Phillips	August 1985	Oil, Gas, Cond.	SD	CNSB
	21/24-3	P.021	1	Texaco	August 1985	Oil & Gas	SD	CNSB
	29/9b-2	P.227	4	Premier	September 1985	Oil	SD	CNSB
South East Piper	15/17-13	P.250	4	Occidental	September 1985	Oil	SD	MFB
	21/18-6	P.351	7	Shell	September 1985	Oil	SD	CNSB
	30/18-3	P.073	2	Tenneco	October 1985	Oil & Gas	SD	CNSB
	16/12a-8	P.212	4	Occidental	October 1985	Oil & Gas	SD	MFB
	3/4a-9	P.119	3	Texaco	November 1985	Oil	SD	ESB
	3/4a-10	P.119	3	Texaco	November 1985	Oil, Gas, Cond.	SD	ESB
	16/13a-3	P.219	4	Britoil	November 1985	Oil	SD	MFB
	21/3a-4	P.118	3	Total	December 1985	Gas & Cond.	SD	CNSB
	9/13b-26	P.337	7	Mobil	December 1985	Oil	SD	ESB
	48/19b-7	P.128	4	Ranger	December 1985	Gas	SD	SNSB
	16/6a-2	P.205	4	Conoco	December 1985	Oil	SD	MFB
	30/1c-3	P.363	7	BP	December 1985	Gas & Cond.	SD	CNSB
	48/14-2	P.008	1	Shell	December 1985	Gas	SD	SNSB
	48/20a-3	P.008	1	Shell	December 1985	Gas	SD	SNSB
	48/15a-5	P.130	4	Conoco	February 1986	Gas	SD	SNSB
	49/19-4	P.008	1	Shell	March 1986	Gas	SD	SNSB
	13/30-3	P.310	6	Britoil	March 1986	Gas	SD	MFB
	48/17a-2	P.025	1	Mobil	April 1986	Gas	SD	SNSB
	3/30a-3	P.229	4	Ranger	April 1986	Gas	SD	ESB
	211/14-1	P.296	4	Shell	April 1986	Oil	SD	ESB
Ness	9/13b-28A	P.337	7	Mobil	May 1986	Oil	SD	ESB
	22/24b-7	P.358	7	Shell	May 1986	Oil & Gas	SD	CNSB
	15/18a-6	P.233	4	Shell	May 1986	Oil	SD	MFB
	206/1-2	P.393	7	Britoil	September 1986	Gas	SD	WSB
	29/5b-4	P.362	7	Ultramar	October 1986	Gas & Cond.	SD	CNSB
	22/2-5	P.354	7	Premier	October 1986	Oil	SD	MFB
	43/18-1	P.512	9	Total	November 1986	Gas	SD	SNSB
	21/28a-2	P.077	2	Mobil	December 1986	Oil	SD	CNSB

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

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

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

(3) ESB, East Shetland Basin; WSB, West Shetland Basin; MFB, Moray Firth Basin; CNSB, Central North Sea Basin; SNSB, Southern North Sea Basin; ISB, Irish Sea Basin; ECB, English Channel Basin.

(4) Licence relinquished.

(5) Block relinquished.

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

Appendix 4 Recently announced onshore oil and gas discoveries

Well Name	*Operator*	*Licence No.*	*County*	*Type*
1983				
Godley Bridge 1	Conoco	PL.203	Surrey	Gas
Horndean 1A	Carless	PL.211	Hants	Oil
Herriard 1	Carless	PL.116	Hants	Oil
Farleys Wood 4	BP	PL.215	Notts	Oil
Palmers Wood 1	Conoco	PL.182	Surrey	Oil
1984				
Nettleham 2	BP	PL.179	Lincs	Oil
Baxters Copse 1	Conoco	PL.204	W Sussex	Gas
Hemswell 1	BP	PL.179	Lincs	Oil
Cropwell Butler 2	BP	PL.218	Notts	Oil
Broughton 1	BP	PL.185	Humberside	Oil
Stainton 1	BP	PL.179	Lincs	Oil
Stockbridge 1	Amoco	PL.233	Hants	Oil
1985				
Milton of Balgonie 1	Burmah	PL.253	Fife	Oil
Kirby Misperton 1	Taylor Woodrow	PL.080	N Yorks	Gas
Whisby 1	BP	PL.199	Lincs	Oil
Scampton North 1	BP	PL.179	Lincs	Oil
Scampton 1	BP	PL.179	Lincs	Oil
Rempstone 1	BP	PL.220	Notts	Gas
1986				
Long Clawson 2	BP	PL.220	Leics	Oil
Kirklington 2	BP	PL.216	Notts	Oil
Storrington 1	Conoco	PL.205	W. Sussex	Oil and Gas
Crosby Warren 1	RTZ	EXL.009	Humberside	Oil
Kinoulton 1	BP	PL.218	Notts	Oil
Belvoir 1	BP	PL.219	Leics	Oil

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

Appendix 5 Appraisal drilling on significant discoveries

(A) Offshore

Field Name	Block and well number	Licence number	Operator	Type	Activity in 1986
	3/4-4	P.119	Texaco	Oil, Cond.	An appraisal well was drilled to delineate the Southern limits of this find.
West Ninian	3/7-2	P.203	Chevron	Oil	A successful appraisal well proved the extension of this find into Block 3/2. Development is being considered.
	3/8b-10	P.329	BP	Oil	A disappointing well was drilled, but development of this small area remains possible.
Bruce	9/8-1	P.209	Hamilton	Gas, Cond. and Oil	One appraisal well was drilled in Block 9/9a. Development options being considered.
	9/9b-2	P.276	BP		
	9/9a-6	P.090	Total		
	9/13a-18	P.139	Mobil	Oil	An appraisal well was drilled.
Ness	9/13b-28	P.337	Mobil	Oil	An appraisal well was started late in 1986. Development is under discussion.
	9/24b-1A	P.338	BP	Cond.	A disappointing well was drilled.
	14/20-6A	P.324	Texaco	Oil	An appraisal well was started late 1986.
South East Piper	15/17-13	P.220	Occidental	Oil, Cond.	A further appraisal well proved disappointing. Development is however being considered.
	16/12a-8	P.212	Occidental	Oil	Two appraisal wells were drilled.
	16/13a-3	P.219	Britoil	Oil	One successful appraisal well was drilled.
	16/26-5	P.213	Chevron	Oil	Two appraisal wells were drilled, one of which was sidetracked twice.
	22/10a-2	P.066	Amoco	Gas, Cond.	One appraisal well was drilled.
	23/26a-1	P.057	BP	Oil	One appraisal well was drilled.
	29/2a-9	P.224	Conoco	Gas, Cond.	One appraisal well was drilled.
	29/5a-1	P.188	Arco	Oil, Cond.	One appraisal well was drilled.
	30/1c-3	P.363	BP	Gas, Cond	One appraisal well was drilled.
North Ravenspurn	42/30-1	P.001	BP	Gas	Further appraisal drilling continued. A development programme is under consideration.
	43/26	P.380	Hamilton		

Field name	Block and well number	Licence number	Operator	Type	Activity in 1986
	44/21-2	P.450	BP	Gas	One appraisal well was drilled.
	44/23-4	P.452	CSX Oil and Gas	Gas	Two appraisal wells were drilled.
	48/11b-4 48/11a	P.460 P.037	Conoco Arco	Gas	Two appraisal wells were drilled.
	48/15a-5 48/19 48/20a	P.130 P.008 P.008	Conoco Shell Shell	Gas	Two appraisal wells were drilled.
	48/17a-2 48/17b 48/18a 48/18c	P.025 P.463 P.025 P.464	Mobil Mobil Mobil Arco	Gas	Further appraisal drilling continued on the field.
	49/4-1	P.468	BP	Gas	One appraisal well was drilled.
Audrey	49/11a-1 48/15a	P.028 P.130	Phillips Conoco	Gas	A development programme has been approved.
North Valiant	49/16-2 48/20a	P.033 P.008	Conoco Shell	Gas	A development programme is under consideration.
	49/25a	P.054	Shell	Gas	One appraisal well was drilled.
East Magnus	211/13-3	P.296	Shell	Oil	An appraisal well was started late in 1986.
	211/14-1	P.296	Shell	Oil	A successful appraisal well was drilled.

(B) Onshore

Discovery Well	Licence & County	Operator	Type	Activity in 1986
Godley Bridge 1	PL.203 Surrey	Conoco	Gas	Two appraisal wells were drilled (Alford and Godley Bridge 2z).
Kirby Misperton 1	PL.086 N. Yorks	Taylor Woodrow	Gas	Possible development with Malton under consideration.
Milton of Balgonie 1	PL.253 Fife	Premier	Oil	One appraisal well was drilled.
Palmers Wood 1	PL.182 Surrey	Conoco	Oil	Two appraisal wells were drilled. Palmers Wood 1, 2 and 5 on extended test.
Scampton North 1	PL.179 Lincs	BP	Oil	One appraisal well was drilled.
Stockbridge 1	PL.233 Hants	Amoco	Oil	Seven appraisal wells were drilled. (Stockbridge 2 to 8). Stockbridge 2z and 5 on extended test.
Whisby 1	PL.199 Lincs	BP	Oil	One appraisal well was drilled.

Note: Other wells have been on extended test during the year.

Appendix 6 Oil production[1]

	Total from 1975 to end 1980	1981	1982	1983	1984	1985	1986	Cumulative total from 1975 (million tonnes)
Offshore fields[5]								
Argyll	4.7	0.5	1.0	0.7	0.4	0.4	0.5	8.2
Auk	6.2	0.6	0.6	0.6	0.6	0.5	0.5	9.7
Balmoral	—	—	—	—	—	—	0.04	0.04
Beatrice	—	0.2	1.6	1.5	2.2	2.5	2.0	10.1
Beryl	16.1	4.7	4.4	3.8	4.3	4.9	4.6	42.8
South Brae	—	—	—	1.0	3.9	4.1	5.1	14.2
Brent	20.8	11.1	15.2	18.7	20.0	20.0	19.5	125.1
Buchan	—	0.9	1.4	1.6	1.1	0.9	1.1	7.0
Claymore	11.7	4.5	4.8	4.7	5.0	4.3	3.9	39.1
North Cormorant	—	—	1.3	2.1	4.4	5.0	5.0	17.9
South Cormorant	1.1	0.7	0.9	1.5	1.7	2.0	2.2	10.1
Deveron	—	—	—	0.1	0.1	0.3	0.3	0.8
Duncan	—	—	—	0.1	0.6	0.7	0.4	1.7
Dunlin	11.6	4.7	3.9	3.5	3.1	2.5	2.0	31.2
Forties	102.9	22.8	22.2	21.7	20.3	18.4	16.5	224.7
Fulmar	—	—	2.6	5.7	6.0	5.2	7.5	27.1
Heather	1.6	1.2	1.7	1.3	1.2	1.1	1.0	9.2
Highlander	—	—	—	—	—	1.0	1.3	2.3
Hutton	—	—	—	—	1.3	2.8	3.8	7.8
North West Hutton	—	—	—	1.9	2.4	2.2	2.3	8.9
Innes	—	—	—	—	—	0.2	0.2	0.4
Magnus	—	—	—	1.5	5.6	6.0	6.0	19.2
Maureen	—	—	—	0.8	3.8	3.8	3.6	12.0
Montrose	4.6	1.1	0.9	0.7	0.8	0.6	0.6	9.3
Murchison (UK)	0.4	3.1	4.4	4.5	2.9	3.1	2.8	21.2
Ninian	19.1	14.3	15.0	13.7	11.6	10.9	9.7	94.3
Petronella	—	—	—	—	—	—	0.03	0.03
Piper	44.5	9.8	9.8	9.6	8.9	9.0	8.4	99.9
Scapa	—	—	—	—	—	0.2	0.4	0.7
Statfjord (UK)	0.5	1.2	1.8	3.0	3.5	4.5	5.4	20.0
Tartan	—	0.7	0.6	1.1	1.2	1.2	1.0	5.8
Thistle	11.8	5.5	6.0	5.1	4.2	3.6	3.0	39.2

(Appendix 6 cont.)

	Total from 1975 to end 1980	1981	1982	1983	1984	1985	1986	Cumulative total from 1975 (million tonnes)
Total stabilised crude oil from offshore fields[2]	258.0	87.7	100.1	110.5	120.8	122.0	120.7	920.0
Stabilised crude oil from onshore fields[2]	0.7	0.2	0.2	0.3	0.3	0.4	0.5	2.6
Liquefied products from oil and gas fields								
Condensate[3]	2.5	0.4	0.5	0.6	0.6	0.7	0.7	6.0
Heavier natural gases[4]	3.1	1.2	2.4	3.5	4.1	4.4	5.1	23.8
Total production	264.3	89.5	103.2	114.9	125.9	127.5	127.0	952.4

(1) All figures are rounded to the nearest 100,000 tonnes except where start-up occurred late in the year. 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.

(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) Argyll, Auk, Beryl A, Brent, Claymore, Duncan, Dunlin, Deveron, Heather, Innes, Montrose, Murchison, Ninian, Piper, Scapa and Thistle have short term production consents. The other fields have development programme approval or long-term consents.

Appendix 7 Gross gas production

Million cubic metres

	Total to end 1980	1981	1982	1983	1984	1985	1986	Cumulative total to end 1986
West Sole	22,497	1,455	1,512	1,719	1,899	1,771	1,696	32,549
Leman	150,343	13,207	11,675	11,985	9,376	10,943	10,030	217,559
Hewett Area	66,665	5,048	4,108	3,851	3,631	3,412	3,337	90,052
Indefatigable	53,490	5,613	5,720	4,700	5,590	5,323	6,186	86,622
Victor	—	—	—	—	472	1,485	1,598	3,555
Viking Area	41,965	3,307	4,381	3,413	3,197	3,448	3,713	63,424
Rough[1]	3,988	99	101	27	55	93	7	4,370
Frigg[2]	15,088	6,790	6,087	6,063	6,167	6,240	5,720	52,155
Piper/Tartan Area[3]	1,195	569	667	848	796	786	777	5,638
FLAGS[4]	—	—	2,144	4,277	5,271	6,139	6,557	24,388
Fulmar	—	—	—	—	—	—	197	197
Other[5]	1,792	1,098	1,437	1,807	2,066	2,331	2,510	13,041
South Morecambe	—	—	—	—	—	91	605	696
Esmond	—	—	—	—	—	591	971	1,562
Forbes	—	—	—	—	—	107	305	412
Gordon	—	—	—	—	—	177	529	706
Thames	—	—	—	—	—	—	351	351
North and South Sean	—	—	—	—	—	—	201	201
Total Offshore	357,023	37,186	37,832	38,690	38,520	42,937	45,290	597,478
Total Onshore[6]	20	6	9	10	9	10	20	84
Total Production[7]	357,043	37,192	37,841	38,700	38,529	42,947	45,310	597,562
of which								
a) Net Production[8]	353,147	35,552	35,778	36,212	35,774	39,727	41,814	578,004
b) Own use	3,896	1,640	2,063	2,488	2,755	3,220	3,496	19,558

(1) Converted for use as an off-peak storage unit with effect from mid-1985. Production in 1985 and 1986 comprises gas originally in place and takes no account of gas injected or of subsequent production of gas previously injected.

(2) UK share only.

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

(4) Gas delivered to land via FLAGS from Brent, North and South Cormorant, North West Hutton, Ninian, Magnus, UK Murchison, Thistle and UK Statfjord.

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

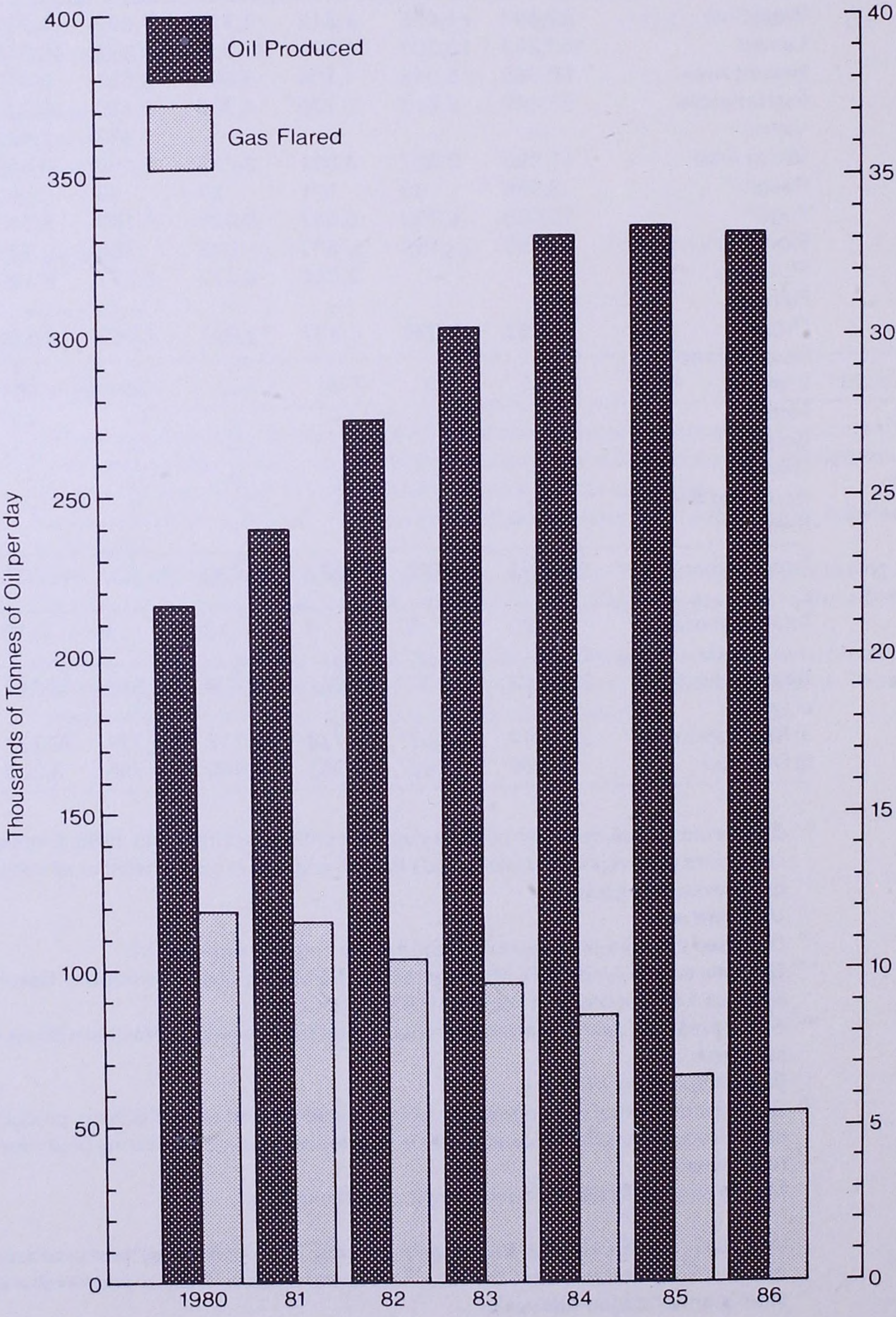
(6) Excluding colliery methane.

(7) Gross production of gas originally in place, including own use for drilling, production and pumping operations, but excluding gas flared, re-injected or used in re-injecting or producing previously re-injected gas.

(8) Mainly sales to British Gas and petrochemical industry.

West Sole, Leman, Hewett, Indefatigable, Viking, Rough and Frigg have production consents for 12 months; South Morecambe, Esmond, Forbes and Gordon, Thames and North and South Sean have been granted staged approvals.

Appendix 8 Oil produced and gas flared at producing oil fields



Appendix 9 Gas flaring at oil terminals and producing offshore oil fields

Field	Average gas flaring rate in 1986 in million cubic metres a day (figures for million cubic feet a day in brackets)	Remarks
Oil terminals		
Flotta	0.06 (2.0)	Flaring rate some 15 per cent above 1985 levels. NGL product disposal difficulties towards the year end had a major impact on flaring.
Sullom Voe	0.36 (12.8)	A substantial reduction in flaring compared with 1985 with only a marginal decrease in oil receipts.
Producing oil fields		
Argyll	0.03 (1.2)	Small isolated field — no alternative economic outlet for gas.
Auk	0.05 (1.7)	Small isolated field — no alternative economic outlet for gas.
Balmoral	0.01 (0.2)	Small isolated field — no alternative economic outlet for gas.
Beatrice	0.02 (0.8)	Small amounts flared offshore and at Nigg.
Beryl	0.42 (14.9)	High gas reinjection efficiency. Gas is reinjected into reservoir for later recovery.
South Brae	0.42 (14.9)	Gas is being reinjected for later use at North Brae.
Brent	0.40 (14.2)	Gas transported via FLAGS. NGLs injected into oil pipeline to Sullom Voe.
Buchan	0.16 (5.8)	Small isolated field — no alternative outlet for gas. Some NGLs transported via the Buchan-Forties pipeline commissioned in November 1986.
Claymore	0.01 (0.3)	Small amount flared — no surplus gas.
North Cormorant	0.02 (0.6)	Gas transported via Western Leg and FLAGS. NGLs injected into oil pipeline to Sullom Voe.
South Cormorant	0.16 (5.6)	Gas transported via Western Leg and FLAGS. NGLs injected into oil pipeline to Sullom Voe.
Deveron	0.00 (0.0)	All gas used as fuel on nearby Thistle platform.
Duncan	0.09 (3.3)	Small isolated field — no alternative economic outlet for gas.
Dunlin	0.04 (1.6)	NGLs injected into oil pipeline to Sullom Voe.

Field	Average gas flaring rate in 1986 in million cubic metres a day (figures for million cubic feet a day in brackets)	Remarks
Forties	0.99 (35.1)	NGLs injected into pipeline to Cruden Bay.
Fulmar	0.23 (8.3)	Gas and NGLs transported via Fulmar pipeline to St Fergus.
Heather	0.13 (4.5)	All dry gas not used is flared — no alternative outlet.
Highlander	0.00 (0.0)	Gas used in gas lift, or as fuel gas on nearby Tartan platform.
Hutton	0.09 (3.1)	All dry gas not used is flared — no alternative outlet.
North West Hutton	0.10 (3.4)	Gas transported via Western Leg and FLAGS. NGLs injected into oil pipeline to Sullom Voe.
Innes	0.23 (8.1)	Small isolated field — no alternative economic outlet for gas.
Magnus	0.09 (3.1)	Gas transported via Northern Leg and FLAGS. NGLs injected into crude and transported via Ninian System to Sullom Voe.
Maureen	0.71 (25.0)	Isolated field — no alternative economic outlet for gas.
Montrose	0.18 (6.3)	Isolated field — no alternative economic outlet for gas. Some NGLs transported via Montrose-Forties pipeline.
Murchison	0.07 (2.6)	Gas transported via Northern Leg and FLAGS. NGLs injected into oil pipeline to Sullom Voe.
Ninian	0.25 (8.7)	NGLs transported to Sullom Voe and gas via Western Leg and FLAGS.
Petronella	0.00 (0.0)	Gas transported through Piper/Claymore/Frigg system.
Piper	0.27 (9.7)	Gas transported via Frigg system to St Fergus.
Scapa	0.00 (0.0)	All gas used as fuel on nearby Claymore platform.
Statfjord	0.07 (2.4)	UK share of gas transported via Northern Leg and FLAGS.
Tartan	0.09 (3.0)	Gas transported through Piper/Claymore/Frigg system.
Thistle	0.12 (4.2)	Gas transported via Northern Leg and FLAGS. NGLs injected into oil pipeline to Sullom Voe.

Appendix 10 Oil production platforms

Field	Operator	Platform Contractor	Site	Platform type	Installation date
PLATFORMS INSTALLED					
North Alwyn (NAA)	Total	RGC Offshore	Methil	Steel	May 1985
North Alwyn (NAB)	Total	RGC Offshore	Methil	Steel	May 1986
Argyll/ Duncan/ Innes	Hamilton	Converted by Peterhead Engineering	Cromarty Firth	Converted Drilling Rig	Dec 1984
Auk	Shell	Redpath Dorman Long	Methil	Steel	July 1974
Balmoral	Sun Oil	Gotaverken Arendal AB	Gothenberg, Sweden	Floating production facility	June 1986
Beatrice A	Britoil	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	Shell	Norwegian Contractors	Stavanger, Norway	Concrete	August 1975
C	Shell	McAlpine/Sea Tank	Ardyne Point	Concrete	June 1978
D	Shell	Norwegian Contractors	Stavanger, Norway	Concrete	July 1976
Buchan	BP	Conversion by Lewis Offshore	Stornoway	Converted Drilling Rig	Sept 1980

(Appendix 10 contd.)

Field	Operator	Platform Contractor	Site	Platform type	Installation date
Claymore	Occidental	Union Industrielle et d'Enterprise	Cherbourg, France	Steel	July 1976
Clyde	Britoil	McDermott Scotland	Ardersier	Steel	July 1985
North Cormorant	Shell	Redpath de Groot Caledonian Union Industrielle et d'Enterprise	Methil Cherbourg, France	Steel	April 1981
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	BP	Laing Offshore	Teesside	Steel	June 1975
FC	BP	Highland Fabricators	Nigg Bay	Steel	August 1974
FD	BP	Highland Fabricators	Nigg Bay	Steel	June 1975
FE	BP	Highland Fabricators	Nigg Bay	Steel	July 1986
Fulmar (wellhead jacket platform)	Shell	Redpath de Groot Caledonian	Methil	Steel	July 1979
		Highland Fabricators	Nigg Bay	Steel	June 1980
Heather	Unocal	McDermott Scotland	Ardersier	Steel	May 1977
Hutton	Conoco	Highland Fabricators McDermott Scotland	Nigg Bay Ardersier	Tension leg platform	Sept 1984
North West Hutton	Amoco	McDermott Scotland	Ardersier	Steel	Sept 1981
Magnus	BP	Highland Fabricators	Nigg Bay	Steel	April 1982
Maureen	Phillips	Ayrshire Marine Constructors HDN Offshore Structures	Hunterston Loch Kishorn	Steel	June 1983
Montrose	Amoco	Union Industrielle et d'Enterprise	Le Havre, France	Steel	August 1975
Murchison	Conoco	McDermott Scotland	Ardersier	Steel	August 1979
Ninian	Chevron				
Central		Howard Doris	Loch Kishorn	Concrete	May 1978
North		Highland Fabricators	Nigg Bay	Steel	July 1978
South		Highland Fabricators	Nigg Bay	Steel	June 1977
Piper	Occidental	McDermott Scotland Union Industrielle et d'Enterprise	Ardersier Le Havre, France	Steel	June 1975

(Appendix 10 contd.)

Field	Operator	Platform Contractor	Site	Platform type	Installation date
Tartan	Texaco	Redpath de Groot Caledonian Union Industrielle et d'Enterprise	Methil Cherbourg. France	Steel	June 1979
Thistle	Britoil	Laing Offshore	Teesside	Steel	August 1976
PLATFORMS UNDER CONSTRUCTION AT END OF 1986					
Brae B	Marathon	McDermott Scotland	Ardersier	Steel	April 1987
Cyrus (SWOPS)	BP	Harland and Wolff	Belfast	Floating production facility	March 1988
Eider	Shell	Highland Fabricators	Nigg	Steel	June 1988
Tern	Shell	RGC Offshore	Nigg	Steel	June 1988

Appendix 11 Major offshore pipelines

Pipelines, from–to	Length (miles)	Diameter (inches)	Material conveyed	Operator	Year commissioned
Operating:					
West Sole–Easington	42	16	Natural Gas	BP	1967
Leman Bank–Bacton	35	30	Natural Gas	Shell/Esso	1968
Hewett–Bacton	20	30	Natural Gas	Phillips/Arpet	1969
Leman Bank–Bacton	38	30	Natural Gas	Amoco	1969
Leman Bank–Bacton	40	30	Natural Gas	Amoco/Shell/Esso	1970
Indefatigable–Leman Bank	25	30	Natural Gas	Amoco/Shell/Esso	1971
Viking–Theddlethorpe	86	28	Natural Gas	Conoco	1972
Hewett–Bacton	20	30	Natural Gas	Phillips/Arpet	1973
Leman Bank–Bacton	36	30	Natural Gas	Amoco/Shell/Esso	1973
Rough–Easington	18	16	Natural Gas	Amoco	1975
Ekofisk–Teesside	220	34	Crude Oil	Phillips	1975
Forties–Cruden Bay	111	32	Crude Oil	BP	1975
Piper–Flotta	124	30	Crude Oil	Occidental	1976
Frigg–St Fergus No. 1	220	32	Natural Gas	Total	1977
Claymore–Piper	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	Associated Gas	Shell	1980
Ninian–Western Leg	11	11	Associated 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	Associated Gas	Britoil	1982
Tartan–Piper	11	18	Associated Gas	Texaco	1983
North Cormorant–South Cormorant	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–South Cormorant	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
Victor–Viking	8	16	Natural Gas	Conoco	1984
South Morecambe–Westfield Point	23	36	Natural Gas	British Gas	1985
Rough–Easington	18	36	Natural Gas	British Gas	1985

(Appendix 11 contd.)

Pipelines, from–to	Length (miles)	Diameter (inches)	Material conveyed	Operator	Year commissioned
Esmond–Bacton	126	24	Natural Gas	Hamilton Bros	1985
Heimdal–Brae	24	8	Condensate	Elf	1985
Statfjord–NLGP	14	12	Associated Gas	BP	1985
Heather–Western Leg	4	12	Associated Gas	Unionoil	1986
Balmoral–Brae/Forties	9	14	Crude Oil	North Sea Sun	1986
Fulmar–St Fergus	65	30	Associated Gas	Shell	1986
Thames–Bacton	56	24	Natural Gas	Arco	1986
Buchan–Forties	34	12	Crude Oil	BP	1986
Sean–Bacton	66	30	Natural Gas	Shell	1986
Awaiting commissioning/under construction					
Clyde–Fulmar	8	16	Crude Oil	Britoil	
Clyde–Fulmar	8	16	Associated Gas	Britoil	
North Alwyn-Frigg	70	24	Natural Gas	Total	
North Alwyn-Ninian	9	12	Crude Oil	Total	

Appendix 12
Expenditure by operators and other production licensees upon exploration, development and operating activities

TOTAL EXPLORATION EXPENDITURE[1] £ million

	Q1	Q2	Q3	Q4	Year
1977	70	97	103	105	375
1978	65	66	61	69	261
1979	57	49	59	76	241
1980	67	88	109	115	379
1981	90	133	162	166	550
1982	186	218	215	256	875
1983	261	211	243	278	993
1984	231	338	379	447	1395
1985	366	351	370	363	1450
1986	308	253	246	212P	1019P

TOTAL OPERATING EXPENDITURE £ million

	Q1	Q2	Q3	Q4	Year
Oil fields					
1977	36	39	42	44	161
1978	47	57	67	91	262
1979	78	94	117	124	413
1980	122	157	142	169	591
1981	190	205	230	253	879
1982	243	264	288	350	1145
1983	274	308	326	406	1315
1984	341	379	393	424	1536
1985	457	476	464	521	1918
1986	439	467	433	391P	1730P
Gas fields[2]					
1977	9	10	12	16	47
1978	15	18	23	32	88
1979	21	22	23	27	93
1980	26	26	31	25	108
1981	24	30	36	35	125
1982	33	37	47	48	164
1983	43	41	55	41	180
1984	36	50	50	61	197
1985	75	87	80	88	330
1986	99	107	103	102P	412P

(Appendix 12 contd.)

DEVELOPMENT EXPENDITURE[3]

£ million

	Total	Platform structures	Modules and equipment	Offshore loading systems	Pipelines	Terminals	Development wells[4]	Other expenditure
Oil fields								
1977	1546	454	703	11	64	140	164	9
1978	1680	245	829	15	68	261	255	6
1979	1821	242	840	26	90	279	335	10
1980	2157	282	956	34	93	347	438	7
1981	2479	437	982	39	181	265	568	8
1982	2304	404	1093	27	108	102	565	6
1983	1768	375	778	2	61	14	535	5
1984	1806	550	595	4	104	15	535	5
1985 Q1	398	89	144	—	20	4	141	1
Q2	473	113	202	—	37	6	114	1
Q3	504	147	198	1	26	6	121	5
Q4	484	95	246	1	19	5	116	2
Year	1859	445	790	2	103	21	492	8
1986 Q1	424	135	152	—	20	5	110	2
Q2	476	113	206	2	32	4	116	3
Q3	438	137	203	2	24	4	64	3
Q4 P	371	68	192	5	19	6	77	4
Year P	1709	452	753	9	96	20	367	11
Gas fields[2]								
1977	344	52	65	—	178	27	23	—
1978	283	13	51	—	147	47	25	—
1979	191	3	78	—	41	52	18	—
1980	217	5	81	—	38	91	2	—
1981	280	32	54	—	43	137	13	—
1982	607	130	83	—	170	185	39	—
1983	1054	230	405	—	141	205	72	1
1984	1248	323	429	—	205	181	109	1
1985 Q1	224	66	85	—	1	38	33	—
Q2	238	82	65	—	16	33	42	—
Q3	243	28	92	—	26	45	53	—
Q4	234	45	100	—	24	36	30	—
Year	940	220	342	—	67	152	157	1
1986 Q1	122	36	47	—	7	15	17	1
Q2	162	20	64	—	24	26	25	2
Q3	172	43	56	—	9	26	38	—
Q4 P	173	53	35	—	21	24	39	—
Year P	628	152	202	—	61	91	119	3

P Indicates provisional figures.

(1) Exploration expenditure includes the cost of appraisal wells drilled prior to development approval.

(2) Expenditure on gas fields includes that on FLAGS and the other associated gas gathering pipelines and onshore related facilities.

(3) Adjustments of UK and Norwegian shares of some fields (eg Frigg, Murchison and Statfjord) result in a reimbursement of a proportion of previously incurred development expenditure. These settlements have been treated as sales or purchases of fixed assets in the balance of payments and in capital formation (Table 14) but have not been deducted from or added to the expenditure figures above.

(4) Development wells are production wells and appraisal wells drilled after development approval.

Appendix 13 Accident statistics

Year	Mobile drilling activity (rig years)	Fixed platform drilling activity (rig years)	Fixed platforms[1]	Estimated numbers employed on installations	Number of fatal accidents		Number of serious accidents	
					Installations	Vessels	Installations	Vessels
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[2]	1	3	42	3
1981	24.6	27.0	64	21,000[2]	4	2	54	5
1982	30.1	25.0	67	21,500[2]	11	2	37	2
1983	34.2	24.1	74	28,700[2]	7	2	41	6
1984	49.1	27.6	84	31,300[2]	12	1	35	6
1985	51.7	31.5	92	29,000[2]	7	1	85	18
1986	35.3	21.2	110	22,300[2]	3	0	72	29

(1) For the purposes of this Table, 'Fixed Platforms' refers to oil and gas platforms which are on location either drilling, producing or under construction.

(2) 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									
	77	78	79	80	81	82	83	84	85	86
Construction			5			3				
Drilling	2		1		3	3	3	1		
Production							3		3	
Maintenance	4				1	1		7	4	1
Diving	2	2	3					1		
Helicopters			1							
Boats	1	2		3	2	2	2	1	1	
Cranes	2			1			1			2
Domestic						1				
Structures[2]						3				
Unallocated[3]								3		
Total	11	4	10	4	6	13	9	13	8	3

	Serious accidents										Dangerous Occurrences						
	77	78	79	80	81	82	83	84	85	86	80	81	82	83	84	85	86
Construction	4	5	4	2	1	1	5				4	11		4	1	1	1
Drilling	20	10	16	15	24	13	10	6	26	15	25	23	40	25	19	36	25
Production	2	4	2	3	2	1	3	1	16	10	11	14	15	21	10	41	22
Maintenance	1	5	13	13	22	11	8	10	26	27	21	26	31	34	27	19	16
Diving	5	5	1	4	3	7	9	18[1]	19[1]	20[1]	2	7	8	7	7	18	12
Helicopters						1	1		1		3	1	1	1	4	1	1
Boats	5	7	3	3	5	2	5	6	3	10	19	22	23	28	26	23	15
Cranes	3	4	3	4	1	3	6	6	8	6	32	29	50	32	62	52	48
Domestic			1	1	1				1	6			6	3	2	2	4
Structures[2]								2					7	7	11	13	11
Unallocated[3]								10	3	7					19	2	12
Total	40	40	43	45	59	39	47	41	103	101	118	135	181	162	188	208	167

(1) These figures include decompression sickness type 2.
(2) Incidents in this category resulted from the failure of part of an installation or from damage to the structure owing to bad weather.
(3) Only the fatal accidents in this group have been reclassified under the other headings.

Appendix 14 Oil production forecasts

The Minister of State for Energy gave the following reply to a Parliamentary Question on 9 March 1987:

"The latest forecasts for United Kingdom petroleum production in the years 1987 to 1991 are as follows:

	Million tonnes
1987	115 – 130
1988	105 – 125
1989	95 – 120
1990	85 – 115
1991	70 – 105

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 uncertainties which influence the rate of oil production from both mature and recently developed fields.

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

	Million tonnes of NGLs
1981	1.5
1982	2.9
1983	4.1
1984	4.7
1985	5.1
1986	5.8 (provisional)

NGLs are expected to account for some 6 – 8 million tonnes annually of total petroleum production to 1991.

Total production in 1986 of stabilised crude and NGLs is estimated to have been 126.9 million tonnes[1]."

[1] This figure has subsequently been revised to 127.0 million tonnes.

Appendix 15 Map of the UK Continental Shelf as at 31 December 1986

The atlas on the following pages is the definitive map of the United Kingdom Continental Shelf.

Flat copies for display are available from HMSO at the addresses listed on the reverse of the title page. Price is £5.50 net, including cardboard roll and postage. ISBN 011 412827 8.

Printed for Her Majesty's Stationery Office by Linneys Colour Print, Mansfield, Notts.
4/87 Dd 239528 C50 52121

Appendix 15 Map of the UK Continental Shelf 31st December 1986

UK CONTINENTAL SHELF

As at 31st December 1986

Key to Plates

LEGEND

	OIL	GAS	GAS CONDENSATE
Terminal			
Pipeline			
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

N. Ireland

Offshore areas previously under licence

Town locations

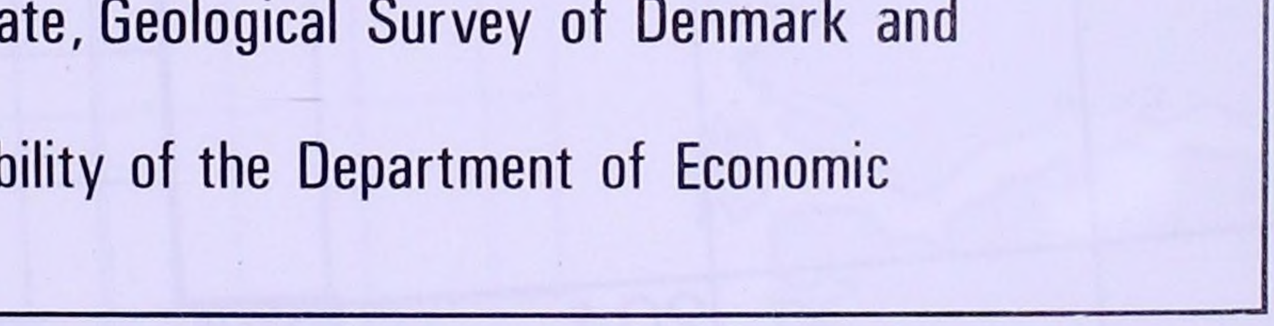
Additional field information in Norwegian, Danish and Dutch sectors courtesy of the Norwegian Petroleum Directorate, Geological Survey of Denmark and Royal Dutch Geological Survey.
Licences in N.Ireland are the responsibility of the Department of Economic Development, Belfast.

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

Lambert Conformal Conic projection

Scale 1:2,000,000 1cm : 20 kms



7°W 6° 5° 4° 3° 2° 1°

63° N

62°

61°

60°

Faeroe Islands

166 202 203 204 205 206 207 208 209 213 214 217 218

1 5 6 7

Shetland Islands

Sullom Voe

Lerwick

Clair

Gas Council

Shell Esso Total Gulf Elf Lasmo Amoco Britoil BP Mobil Texaco Marathon NSO Amerada Sovereign Arco

1° 2° 3° 4° 5° 6°E

6305 6306 6205 6206 6203 6204

9 220

Conoco Conoco Conoco Conoco

Sover-eign Sover-eign BP Total BP BP

10 211 33 34 35 36

Shell Esso Phillips BP

MAGNUS Shell BP Placid

THISTLE BP Shell Phillips Arco BP

MURCHISON Snorre

Don Shell DELTA Beta

DEVERON

EIDER Texaco Shell Total

DUNLIN Conoco Alpha

TERN INSO Osprey

STATFJORD GULLFAKS

CORMORANT N Amoco Shell Shell Conoco

CORMORANT S Occi-dental BP

BRENT

N. W. HUTTON Shell Amoco Con oco Shell

3 29 30 31 32

HEATHER Tri-centrol NSO Unocal Total Conoco Chev ron Texaco Total BP

HUTTON

Huldra

Veslefrikk

TROLL

NINIAN Total BP BP

N. ALWYN

Chevron Amoco Chevron BP Gas

Emerald Sover-eign

Britoil Total Alwyn Total

OSEBERG

Brage

Chevron Amoco Shell

Total

Sover-eign Amoco Shell Total Total

Phillips Chev ron Britoil Total Total

Ranger

BP Ranger ODIN

N. E. FRIGG

Lasmo Chevron

4 10 25 26 27

9 E. FRIGG

S. E. FRIGG

Occi-dental Conoco Amoco BP Chev ron

Conoco Hamilton Total

FRIGG

Bruce BP Total

Total Total

Conoco Total

HEIMDAL

Bergen

2

14° W
13°
12°
11°
10°
9°

158 159 160 161 162 163

59° N

148 149 150 151 152 153

58°

138 139 140 141 142 143

ROCKALL

57°

128 129 130 131 132 133

Britoil Britoil

BP BP

BP BP

56°

8° 7° 6° 5° 4° 3°W

2

164 165 202 203 5

BP Sover eign Arco

Esso BP

Esso

Occi- dental Shell

BP BP

BP BP

0

Kirkwall

12

Conoco BP BP Phillips Phillips

154 155 156 201 11

Flotta

noco Amoco Conoco Conoco

noco Conoco

Shell Britoil Arco Premier

BEATRICE

Burmah Tenneco

18

144

17

Nigg

Ardersier

Loch Kishorn

Inverness

134

125

Methil

Milton of Balgonie

Grangemouth

EDINBURGH

Glasgow

Dalmeny

3

7°W 6° 5° 4° 3° 2°

166 202 203 5 6 7

59° N

156 201 11 12 13 14

58°

17 18 19 20

57°

25 26 27

34 35

56°

Esso BP eign Arco

Esso

Occi-dental Shell

Fair Isle

Orkney Islands

Kirkwall

Flotta

Shell Shell

BP Shell Elf

Texaco Chevron

CLAYMORE

SCAPA

PETRONE

Amoco Texaco

Shell Britoil Arco Premier Occi-dental

BEATRICE

Burmah Tennec Kerr-McGee

Occi-dental

Arco BP Shell

Britoil Amoco

Ettrick NSO

Tennec

Mobil Mobil

Nigg

Ardersier

Loch Kishorn

Inverness

St. Fergus

Peterhead

Cruden Bay

Aberdeen

BP Tri-centrol

Cluff Tri-centrol

Methil

Milton of Balgonie

Grangemouth

Glasgow

Dalmeny

EDINBURGH

1° 2° 3° 4° 5°E

N.E. FRIGG
E. FRIGG
S.E. FRIGG
FRIGG
HEIMDAL
Balder
Bruce
Ness
BERYL
Crawford
NORTH BRAE
West Brae
Central Brae
Miller
SOUTH BRAE
LANDER
SLEIPNER
PIPER
Tiffany
TARTAN
Toni/Thelma
Stirling
BALMORAL
Rob Roy
Glamis
MAUREEN
CYRUS
Andrew
Drake
FORTIES
MONTROSE
Arbroath
Gannet
Marnock
Lomond
Cod
ULA
Joanne
Flyndre
ALBUSKJELL
N.W. TOR
TOR
S.E. TOR
EKOFISK
Tommeliten
ELDFISK
EDDA
VALHALL
FULMAR
CLYDE
AUK
INNES
ARGYLL
Hod
DUNCAN
ROAR
Stavanger
Norwegian
Danish
3
4
4.3
5.1
5.2
5.3
6.1
6.2
6.3

4

13°W 12° 11° 10° 9°

56° N

55°

54°

53°

8° 7° 6° 5° 4° 3°W

4

Milton of Balgonie

Grangemouth

EDINBURGH

Glasgow

Dalmeny

125

126

111

112

113

BELFAST

Barrow-in-Furness

Hydro carbons

Esso

TWE

110

MORECAMBE

Hydro carbons

Hydro carbons

Hydro carbons

Hydro carbons APE

Hydro carbons TWE

Conoco

Hydro carbons

Hydro carbons

108

109

DUBLIN

106

107

Burmah

Hydro carbons

Conoco

Arco

Britoil

5°W 4° 3° 2° 1°

56° N

55°

54°

53°

Methil
Milton of Balgonie
Grangemouth
Glasgow
Dalmeny
EDINBURGH
34 35
40 41
112
113
Teesside
Barrow-in-Furness
Kirby Misperton
Malton
Heysham
109 110
MORECAMBE
Hydro carbons
Esso
TWE
APE
Conoco
Crosby Warren
Hatfield Moors
Gainsborough
Beckingham
South Leverton
Bothamsall
Torksey
Scampton
Farleys Wood
Eakring
Kirklington
Egmanton
Kelham Hills
Whisby
Nettleham
Welton
Cropwell Butler
Kinoulton
Belvoir
Rempstone
Long Clawson
Corringham
Hemswell
Glentworth
Staint
Broughto
Brigg
107

1° 2° 3° 4° 5°E

5

Danish

German

Dutch

INNES

ARGYLL

DUNCAN

VALHALL

Hod

ROAR

TYRA

GORM

SKJOLD

DAN

F2-3

FORBES

ESMOND

GORDON

CLEETON

RAVENSPURN

WESTSOLE

Amethyst

AUDREY

VIKING

VICTOR

INDEFATIGABLE

Valiant N.

VALIANT S.

VAN-GUARD

VULCAN

N. SEAN

S. SEAN

LEMAN

THAMES

HEWETT

Bacton

Norwich

Great Yarmouth

Heddlethorpe

L4-A

L7-B

L7-C

L10-AE

K7

K8

K10

K13

K14

K15-FA

K15-FB

K17

HOORN

HELDER

HELM

P6

37 38 39 43 44 48 49 50 53 54

A B C D E F G J K L M P Q

45 5.1 5.2 5.3 6.1 6.2 6.3 7.2 7.3

6

13°W 12° 11° 10° 9°

52° N

51°

50°

49°

91

82 83

72 73

Amera

Chevron

8° 7° 6° 5° 4° W

6

Irish

KINSALE HEAD

102 103 104 105

92 93 94 95

84 85 86 87 88

74 75

Hydro/ carbons

Conoco

Arco

Burmah

Burmah

Conoco

Conoco

Britoil

Lochiel

Murphy

P

Arco

Murphy

Murphy

7

5°W 4° 3° 2° 1°

52° N

51°

50°

49°

Hydro carbons

104 105 95 96 97 98 99 87 88 89

CARDIFF

LONDO

Humbly Grove

Herriard

Stockbridge

Godley Bridge

Baxters Cose

Horndean

Storrington

Wytch Farm

Wareham

Kimmeridge

BP BP

Gas Council

Esso Esso

Occi-dental

Texaco

Unocal

Conoco

Hamilton

French

1° 2° 3° 4°E

Great Yarmouth

Amoco Arco

Amoco Total

O

R S

56 57

Rotterdam

58

00

BRUSSELS

NOTES

NOTES

NOTES

Development of the Oil and Gas Resources of the United Kingdom

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 1986. 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.

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