

THE POTENTIAL SOCIO-ECONOMIC IMPLICATIONS OF LICENSING THE SEA 5 AREA

A REPORT

for the
DEPARTMENT OF TRADE AND INDUSTRY
by
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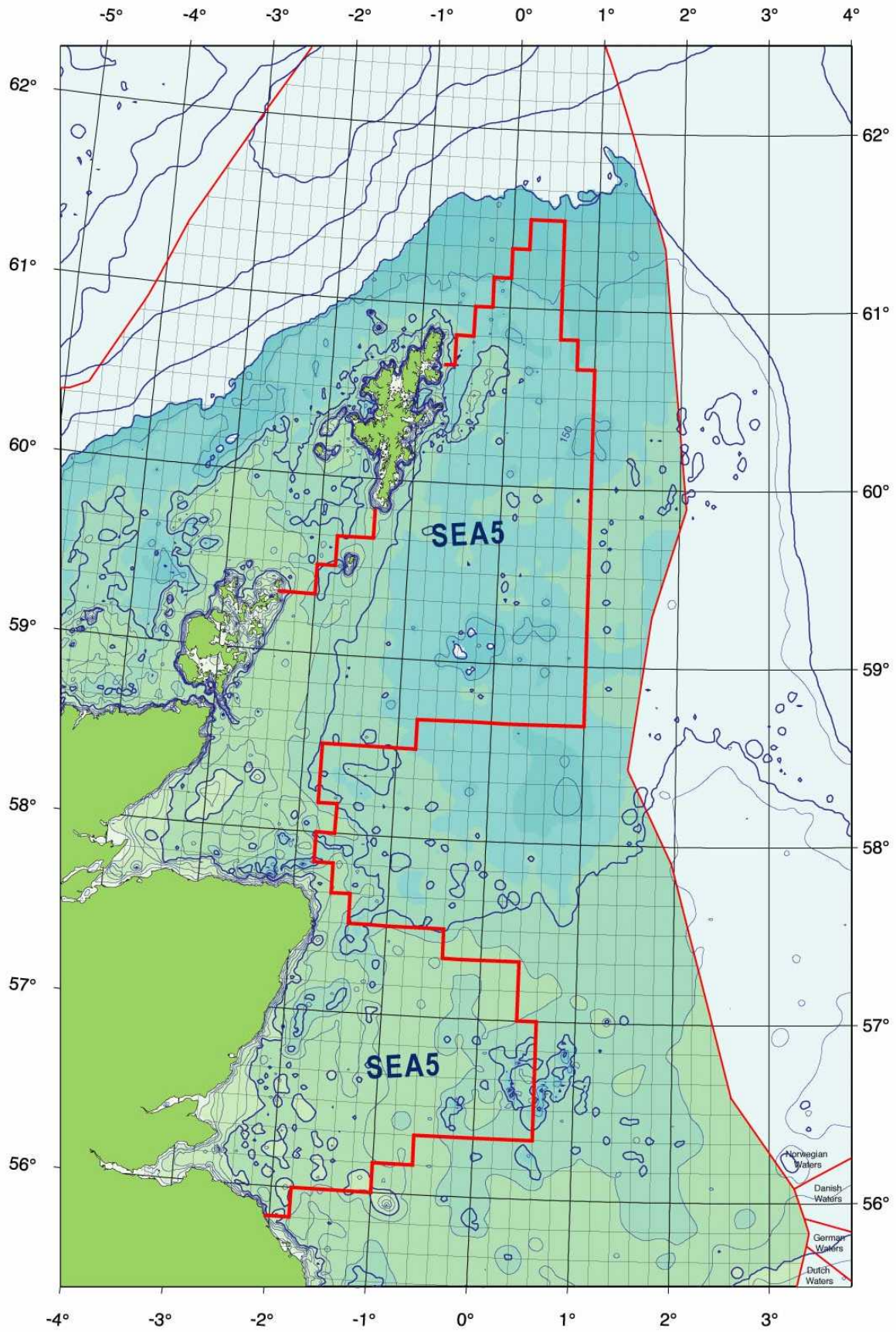
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1.0 INTRODUCTION

- 1.1 The UK Department of Trade and Industry (DTI) is conducting a Strategic Environmental Assessment (SEA) of licensing parts of the UK Continental Shelf (UKCS) for oil and gas exploration and production. This SEA 5 is the fifth in a series planned by the DTI, which will, in stages, cover the whole of the UKCS.
- 1.2 The SEA 5 area is shown on the map on the following page. It is the area between the SEA 2 and SEA 4 areas. It extends from north of the Shetland Islands down the whole east coast of Scotland to the border with England.
- 1.3 Mackay Consultants were asked by Geotek Ltd and Hartley Anderson Ltd, on behalf of the DTI, to assess the socio-economic implications of licensing the SEA 5 area. This report sets out the results of our work, in relation to
- oil and gas production, and reserves
 - capital, operating and decommissioning expenditure
 - employment
 - tax revenue
 - social impacts.
- 1.4 The Department of Trade and Industry provided scenarios of possible exploration and development activity in the area. They are set out in Section 2 of this report.
- 1.5 We converted these scenarios into optimistic and pessimistic scenarios, and then used them to produce forecasts of: oil and gas production (see Section 5); oil and gas reserves (Section 5); expenditure (Section 6); employment (Section 8); and tax revenues (Section 9). The implications for existing facilities in the area are discussed in Section 7 and the potential social impacts in Section 10.
- 1.6 We are very grateful for all the information and help provided in the course of our research. However, the opinions expressed in this report are those of Mackay Consultants, unless clearly indicated otherwise.



2.0 DTI SCENARIOS

2.1 The Department of Trade and Industry (DTI) provided us with the following scenarios of possible activity in the SEA 5 area.

Overview of prospectivity

2.2 The SEA 5 area includes components of 25 separate basinal, intrabasinal and platform structural elements, each with its own geological succession, which directly determines the hydrocarbon prospectivity of the area. These features are grouped into broad areas of prospectivity and summarised below.

2.3 The Unst Basin in the north of the SEA 5 area covers parts of Quadrants 209, 210, 1 and 2, and contains some minor potential for hydrocarbons. Where it lies close to the Shetland Islands, the potential reservoirs are probably too shallow to be prospective.

2.4 To the south of the Unst Basin lie the:

- East Shetland platform (covering parts of Quadrants 1, 2 7 and 8)
- The basins of the East and West Fair Isle (covering parts of Quadrants 5, 6 and 7)
- The Dutch Bank Basin (covering parts of Quadrants 7 and 8)
- The Fladen Ground Spur (covering part of Quadrant 8).

2.5 All these areas (with a few exceptions) are thought to be no more than marginally prospective as only a relatively thin cover of younger rocks lies on an old basement over most of this area. This is also the case very close to Orkney.

2.6 The potentially more prospective area lies immediately to the west of the Emerald field in Quadrant 2, and the narrow strip running south of this which borders the North Viking Graben on the very east of the SEA 5 area. The southerly portion of the Dutch Bank Basin shows greater prospectivity, as does the Fladen Ground Spur in the south east of Quadrant 8. Some of these areas are already licensed.

2.7 South of latitude 59°N in the Outer Moray Firth, the prospectivity increases. Although the area is characterised by dry holes from an earlier exploration phase, it is now considered that many of the wells were poorly located to find hydrocarbons.

2.8 There are areas of greater prospectivity in the Inner Moray Firth. The Sutherland and Caithness coast runs coincident with the “Great Glen Fault Zone” and seaward of this, prospectivity has been proven close to the coast in Block 11/24.

2.9 South along the Moray Firth coast of Ross and Cromarty, Nairnshire and Moray the potential reservoirs are shallow and not very prospective. However, there is some prospectivity in the top of Quadrant 17 in the “Great Glen Sub Basin”. Along the rest of the Moray, Banffshire and Aberdeenshire coasts, the prospectivity lies to the north of the “Banff Fault Zone”. Close to this coast, the potential reservoirs are shallow and prospectivity decreases.

- 2.10 Southwards, to the west of Buzzard field and then over the Peterhead Ridge and into the southern end of Quadrants 19, 25, 26 and 28 prospectivity decreases except in the Forth Approaches Basin, which covers south of Quadrant 19 and the north of Quadrants 25 and 26. Greater prospectivity is seen in the south of Quadrants 20 and 21 and Quadrants 27 and 28 with the exception of the Devils Hole Horst.

Estimates of potential activity

- 2.11 It should be noted that much of the SEA 5 area has limited potential for commercial oil and gas reserves and consequently uptake of the 382 blocks offered is expected to be less than 15%, with around 75% of these being Promote Licences and 25% Traditional Licences.
- 2.12 Both exploration and development activity levels and timing would depend on a range of factors including the number of blocks licensed, work programme commitments made by licensees, exploration success, economic and commercial factors and the Government approval of development plans. The DTI Licensing and Consents Unit have provided projections of the scale of potential exploration and production activity, which could follow licensing of the SEA 5 area. The projections are best estimates on the basis of current understanding and thus indicative.

Seismic surveys

- 2.13 In the north of the SEA 5 area, very few seismic surveys are anticipated with the exception of the Unst Basin and a fringe along the margins of the North Viking Graben where some 2D surveys are predicted. The majority of the anticipated 2D and 3D activity is expected in Quadrants 11 to 18, in line with the hydrocarbon prospectivity narrative above. South of this, in Quadrants 19 and 28 little activity is expected except along the fringes of the SEA 2 and SEA 5 areas where there may be some exploration.
- 2.14 The following seismic survey effort is envisaged:
- in the year of award – 2 x 2D seismic surveys
 - in the year following award – 4 x 2D seismic and 3 x 3D seismic surveys
 - in the year 2 years after award – 2 x 2D seismic and 3 x 3D seismic surveys
 - in the year 3 years after award – 2 x 3D seismic surveys
 - in the year 4 years after award – no seismic envisaged.

Exploration and appraisal wells

- 2.15 Expected exploration drilling activity follows the seismic acquisition and it is anticipated to show a similar spatial pattern. The following exploration drilling is envisaged:
- in the year of award – no exploration or appraisal wells
 - in the year following award – 3 exploration wells and 1 appraisal well
 - in the year 2 years after award – 3 exploration wells and 2 appraisal wells
 - in the year 3 years after award – 3 exploration wells and 2 appraisal wells
 - in the year 4 years after award – 3 exploration wells and 3 appraisal wells.

Developments

- 2.16 Depending on the success of the exploration and appraisal drilling, three new stand-alone developments are anticipated, with potentially one new pipeline to shore and the remaining developments tying into existing export infrastructure.

3.0 THE SOCIETY AND ECONOMY OF THE SEA 5 AREA

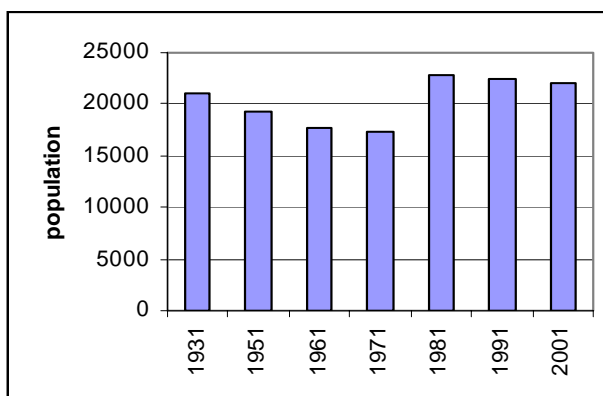
- 3.1 The SEA 5 area extends down the whole of the east coast of Scotland from Shetland Islands in the north to the border with England in the south. It is sensible therefore to disaggregate the area and we have done that into five distinct areas:
- (1) Shetland Islands;
 - (2) Orkney Islands
 - (3) the Moray Firth area;
 - (4) the Aberdeen area;
 - (5) the East Coast of Scotland south of Aberdeen
- 3.2 The main reason behind this fivefold division is the existing oil-related activity in these areas.
- 3.3 The oil and gas industry is very important to the societies and economies of **Shetland** and **Orkney**. The East Shetland Basin is one of the most prolific hydrocarbon basins on the UK Continental Shelf (UKCS). Oil from there is piped to the Sullom Voe terminal, which is the second largest employer in Shetland after the Shetland Islands Council. Gas is piped to the St Fergus terminal in North East Scotland.
- 3.4 The Flotta oil terminal is also an important part of the Orkney economy. It handles oil from various fields in the Outer Moray Firth which is part of the SEA 5 area.
- 3.5 There is relatively little oil-related activity in the **Inner Moray Firth** but there is a pipeline from the Beatrice field to a terminal at Nigg on the Cromarty Firth. The terminal has also handled oil from a few fields which do not have pipeline connections. There is other oil-related activity in the Highlands part of the Moray Firth, including a platform fabrication yard, two pipeline fabrication yards and facilities for the inspection, repair and maintenance (IRM) of mobile drilling rigs.
- 3.6 Further east in Aberdeenshire, Peterhead is an important oil supply base and the St Fergus gas terminal and the Cruden Bay oil terminal are nearby.
- 3.7 The fourth sub area identified is the **Aberdeen** area, which is the main centre for oil and gas-related activity in the UK. Thus the impacts there will be very different from those in the other sub-areas.
- 3.8 Finally, there is the area south of Aberdeen. The oil and gas industry is much less important in this area but there is significant activity in Montrose, Dundee, Burntisland, Leith and a few other locations. The Forth has two important terminals for exporting crude oil and LPG (liquid petroleum gases).

Shetland Islands

- 3.9 **Shetland** and Orkney used to be part of Norway and still display features more akin to Scandinavia than Scotland – such as the local dialects and the annual Up Helly-Aa festival in Shetland. Neither islands group was ever part of the Gaelic-speaking culture of Highland Scotland and the later Scottish influence is essentially a lowland one.

3.10 Shetland Islands Council’s annual “Shetland in Statistics” publication gives the following population statistics for the islands:

1931	21,131
1951	19,352
1961	17,812
1971	17,327
1981	22,766
1991	22,522
2001	21,960



3.11 The population fell substantially between 1931 and 1971. There was a large increase during the 1970s, however, mainly as a result of the advent of the North Sea oil industry, including the construction and operation of the Sullom Voe oil terminal (see next section). Since 1981 the decline appears to have resumed and indeed speeded up in recent years.

3.12 The statistics show a –560 or –2.5% decline in the decade 1991-2001. The continuing decline is of both economic and social concern.

3.13 The primary industries of fishing and agriculture have long been the mainstay of the islands’ economy and they are still very important. Since the 1970s the oil industry has become an integral part of the local economy.

3.14 “Shetland in Statistics, 2003” gives the following value estimates for the “key sectors” of the Shetland economy in 2001:

	<u>£ million</u>
oil production operations	116.1
combined fisheries output	223.9
agriculture	12.4
knitwear	2.5
tourism	12.8
<u>Shetland Islands Council</u>	<u>150.5</u>
total	518.1

3.15 The total of £518.1 million includes the contributions from other sectors of the economy, notably the service sector.

3.16 The figure for oil production operations (the Sullom Voe oil terminal) was unusually high in 2001 because of construction work underway then. The normal figure has recently been about £50 million per year.

3.17 “Shetland in Statistics” gives the following breakdown of employment in 2003:

primary	819
manufacturing	1,105
construction	928
<u>services</u>	<u>9,396</u>
total	12,248

These figures include the self-employed. Over 75% of the workforce is in the service sector and the Shetland Islands Council is the largest employer.

3.18 Oil-related activity at Sullom Voe and elsewhere in Shetland has declined in recent years, however. Further information on that decline is given in Section 4 of this report.

3.19 The statistics show that the fisheries sector, which includes fish catching, salmon farming and fish processing, is a very important part of the Shetland economy. Unfortunately, at the time of our research for this report in early 2004, it was going through a very difficult period.

3.20 The largest salmon farming group in the islands went into receivership in January and others had gone into liquidation. There was a large fall in farmed salmon prices worldwide and for some farms the sales price was below their operating costs.

3.21 The sea fishing industry has also had serious problems. Falling stocks, particularly of cod, forced the European commission to impose severe cuts in total allowable catches (TACs) and other restrictions on fishing effort. The fishing industry in Shetland – and elsewhere in the UK – has been badly hit by these measures and some local boats took advantage of a decommissioning programme introduced by the Scottish Executive.

3.22 Mackay Consultants produce a report annually which gives “Estimates of Local Economic Output (GDP)” for each of the 32 local authority areas in Scotland, including Shetland. The 2002 report estimates that Shetland’s GDP fell by –3.2% in real terms to £321.0 million. Our provisional estimates for 2003 show a further –1.8% decline.

3.23 These and other statistics confirm that the Shetland economy has gone through a difficult period recently and that seems likely to continue for the next few years.

3.24 Nevertheless, unemployment is at a very low level. The latest statistics from the Employment Department (for April 2004) show just 301 people unemployed in Shetland. That was just 2.2% of the local population, which was well below the Scottish average of 3.1%.

Orkney Islands

3.25 The population of Orkney is currently about 19,000. It fell by about –300 or –1.7% in the decade 1991-2001.

3.26 The “Orkney Economic Review, 2002”, produced by the Orkney Islands Council, gives the following percentage breakdown of value added (a measure of economic output) in Orkney in 1995:

	<u>% of total</u>
Flotta oil terminal	14.7
agriculture	14.5
construction	10.2
distribution	9.8
other private services	8.1
health and social work	6.0
education	5.5

3.27 There is no comparable data for Orkney since 1995 but Flotta and agriculture remain the two most important industries outwith the service sector.

3.28 The “Orkney Economic Review” gives the following breakdown of employment in 2002:

agriculture and fishing	700
manufacturing	500
construction	800
distribution, hotels and catering	2,100
transport and communications	900
banking, finance and insurance	400
<u>public admin, education and health</u>	<u>2,400</u>
Total	8,100

3.29 Note that these figures exclude the self-employed who probably account for about 25% of the workforce in Orkney. Most farmers, for example, are self-employed.

3.30 Activity and employment at the Flotta terminal has declined in recent years. Further information on that is given in Section 4 of this report.

3.31 Agriculture is much more important in Orkney than in Shetland. It went through a difficult period with the BSE crisis but farm incomes rose substantially in 2003 and the prospects for the next few years look quite good.

3.32 The main manufacturing industries in Orkney are food processing, whisky distilling and jewellery manufacture.

3.33 Unemployment is relatively low. The latest statistics from the Employment Department (for April 2004) show 236 people unemployed. That was 2.0% of the local population, which was the fifth lowest of the 32 local authority areas and well below the Scottish average of 3.1%.

3.34 One of the reasons for the relatively low unemployment, however, may be the declining population.

Moray Firth

- 3.35 We have defined the **Moray Firth** area to extend from Caithness in the north to Aberdeenshire in the east. It covers three local authority areas:
- Highland
 - Moray
 - Aberdeenshire.
- 3.36 The **Highlands** are the largest local authority area in Scotland. The SEA 5 area is bordered by the eastern coastline from Duncansby Head in Caithness, through Sutherland and Easter Ross to the east of Inverness.
- 3.37 The population of the Highlands increased by about 5,000 or +2.5% to 208,920 between 1991 and 2001. That compares with a -0.4% fall in Scotland as a whole.
- 3.38 We do not have statistics for individual areas but it is evident that most of the population growth took place in the Inverness area. The populations of the remoter areas, such as Caithness and Sutherland, declined by an estimated 1100 or -5.6% to approximately 18,400. That is a very high rate of decline which has continued since 2001.
- 3.39 Indeed, the latest mid-year estimates from the General Register Office (GRO) for Scotland suggest that the population of the Highlands is now declining, in contrast with the growth in the decade to 2001.
- 3.40 Caithness has one of the most varied economies in the Highlands and Islands. It includes the UKAEA nuclear complex at Dounreay and a relatively large manufacturing sector with a freezer factory, whisky distillery, engineering firms etc. Scrabster is now one of the busiest fishing ports in Scotland and also the terminal for the ferry service with Stromness in Orkney. There is some oil-related activity, as discussed in Section 4.
- 3.41 Sutherland is much more remote and sparsely populated. The east coast bordering on the SEA 5 area has a series of small towns such as Brora, Golspie and the popular tourist resort of Dornoch.
- 3.42 Easter Ross, which is part of the former Ross and Cromarty district, is much more industrialised and includes the Cromarty Firth which is the main centre for oil-related activity in the region (see details in Section 4). Agriculture continues to be important, notably on the Black Isle. The area is close to Inverness so many local residents commute to work there.
- 3.43 Inverness is the administrative capital of the Highlands and Islands and the main centre of economic activity. The population has grown substantially over the past decade with a high level of house building.
- 3.44 Virtually all employment is in the service sector, although the Inverness Medical company now employs over 1,000 people. The city is the headquarters for various public bodies, including the Highland Regional Council, Highlands and Islands Enterprise and the Crofters Commission. It also has a large retail sector which attracts customers from a wide area.

- 3.45 To the east of Inverness lies the small district of Nairn. The town itself is a popular tourist resort.
- 3.46 The next local authority area is Moray, whose population increased by approximately 3,000 or +3.6% over the 1991-2001 decade. The economy is a rural one with agriculture, forestry and fishing still important, although most employment – as elsewhere – is in the service sector. There are two large air bases at RAF Kinloss and RAF Lossiemouth.
- 3.47 Elgin is the main population and service centre. The coastal settlements include the fishing ports of Lossiemouth and Buckie.
- 3.48 Aberdeenshire occupies a large part of the North East and is one of the most important agricultural areas in Scotland. The area's population increased by approximately 11,000 or +5.1% over the 1991-2001 decade. That was one of the biggest increases in the country and contrasts markedly with the –0.4% fall in Scotland as a whole.
- 3.49 The oil and gas industry is very important in Aberdeenshire and is probably the main reason for the high rate of population growth in the 1990s. Most of that growth took place, however, in the “commuter belt” around the city of Aberdeen rather than on the Moray Firth coast. There has been much more house building there in recent years than in the city.
- 3.50 The coastal settlements on the Moray Firth include two of the largest fishing ports in Scotland - Peterhead and Fraserburgh. These towns have been badly affected by the decline in the fishing industry, which has had knock-on effects on fish processing, boatbuilding and other industries.
- 3.51 Details of the oil and gas-related activity are given in Section 4 but the facilities include the St Fergus gas terminal just north of Peterhead and the Cruden Bay oil terminal.

Aberdeen

- 3.52 The fourth sub-area we identified is that of the city of Aberdeen. The population actually fell by –1.0% over the 1991-2001 decade but the main reason for that was the high rate of growth in neighbouring Aberdeenshire where most of the new house building took place.
- 3.53 Aberdeen is the third largest city in Scotland and the main administrative and service centre for the North East. It has a diversified economy, although most of the employment is in the service sector, as elsewhere in the country.
- 3.54 Since the discovery of North Sea oil in the 1970s, the oil industry brought a lot of people to Aberdeen from overseas – notably the USA – and other parts of the UK. There is therefore a much more diverse population than in the rest of Scotland. It is also much younger than the Scottish average, partly because of the number of students attending the two universities of Aberdeen and Robert Gordon.
- 3.55 Information on the oil and gas industry is given in Section 4 of this report.
- 3.56 Other important industries in the city include fishing and food processing.

East Coast

- 3.57 The fifth sub-area is the rest of the East Coast of Scotland, south to the border with England. This comprises the local authority areas of
- Angus
 - Dundee City
 - Fife
 - Edinburgh City
 - East Lothian
 - Scottish Borders.
- 3.58 The population of [Angus](#) remained virtually unchanged at 108,370 in the decade to 2001. The coastal settlements include the towns of Montrose, Arbroath and Carnoustie.
- 3.59 The local economy is a mixed one, with a relatively large manufacturing sector. Food processing is important and is linked to the local agricultural production. Fishing and fish processing (eg the Arbroath smokie) used to be important in Arbroath but is now on a very small scale. Montrose has an oil supply base.
- 3.60 [Dundee's](#) population fell by about 10,000 or -6.5% to 145,460 in the decade to 2001. That was the fourth worst decline in Scotland.
- 3.61 The city has suffered from a substantial decline in the traditional manufacturing industries, such as jute and jam. There is some oil-related activity, as discussed in Section 4.
- 3.62 [Fife](#) lies between the Firth of Forth and the Firth of Tay. The kingdom's population increased by +0.7% to just under 350,000 over the 191-2001 decade.
- 3.63 Glenrothes is the administrative centre of Fife and Dunfermline the commercial centre. The coastal settlements include the university town of St Andrews and the attractive East Neuk villages such as Crail and Elie. There is a small fishing industry based on Pittenweem and the Scottish Fisheries Museum is located in Anstruther.
- 3.64 Further up the Firth of Forth there are traditional industrial towns such as Leven, Kirkcaldy and Burntisland. Close to the Forth Road and Rail Bridges is the naval dockyard of Rosyth, which also is the base for the Rosyth-Zeebrugge ferry service.
- 3.65 The economy is a varied one, although most employment is in the service sector. Important industries include paper manufacture, electronics, defence equipment and RAF Leuchars. There is some oil-related activity, as discussed in Section 4.
- 3.66 [Edinburgh](#) is the capital of Scotland. The city's population increased by +2.9% to just under 450,000 in the decade to 2001.

- 3.67 The economy is dominated by the service sector. Edinburgh is home to the Scottish Executive and the Scottish Parliament, as well as many other public bodies. It is the centre of the financial industry, with the headquarters of companies such as the Royal Bank of Scotland, the Bank of Scotland (now part of HBOS) and Standard Life. Edinburgh is also the most popular tourist destination in Scotland.
- 3.68 There is a little oil-related activity based on the port of Leith, as discussed in Section 4.
- 3.69 The local authority area to the east of the city is [East Lothian](#). The population increased by nearly 6,000 or +6.8% to 90,180 in the decade to 2001. That was the second largest increase (after West Lothian) of the 32 areas in Scotland.
- 3.70 The main reason for the high rate of growth is probably the proximity to Edinburgh. Many local residents commute to work in the city. The coastal settlements include North Berwick and Dunbar.
- 3.71 The local economy is still quite rural and agriculture continues to be important. There is no significant fishing industry.
- 3.72 The final local authority area is the [Scottish Borders](#), whose population increased by +3.0% to 106,950 in the decade to 2001. The only large settlement on the coast is Eyemouth.
- 3.73 The Borders have a rural economy, with agriculture continuing to be important. Other notable industries include textiles, electronics and tourism. There is a small fishing industry in Eyemouth.

4.0 EXISTING FACILITIES AND ACTIVITY IN THE AREA

- 4.1 The SEA 5 area comprises a large part of the undeveloped area of the UK sector of the Northern North Sea. There is only one producing field, Beatrice, in the area. However, to the immediate east of the SEA 5 boundary there are many producing oil and gas fields, including the prolific East Shetland and Outer Moray Firth basins.
- 4.2 The map shows many pipelines crossing the SEA 5 area. In the north there are the Brent and Ninian pipeline systems taking oil from the East Shetland fields to the Sullom Voe terminal in the Shetland Islands. There is also the FLAGS line which takes gas to the St Fergus terminal on the North East coast.
- 4.3 Further south there are the oil pipelines from
- Piper and other fields to the Flotta terminal in the Orkneys
 - Beatrice to the Nigg terminal in Easter Ross
 - Forties and other fields to the Cruden Bay terminal in the North East.
- 4.4 There are also six gas pipelines from fields in the Northern North Sea to the St Fergus gas terminal on the North East coast:
- FLAGS (1)
 - FLAGS (2)
 - Frigg (1)
 - Frigg (2)
 - SAGE (1)
 - SAGE (2)
- plus
- Miller pipeline which goes direct to the Boddam power station near Peterhead.
- 4.5 We shall discuss the existing facilities and activity for each of the five sub-areas identified in Section 3.

Shetland Islands

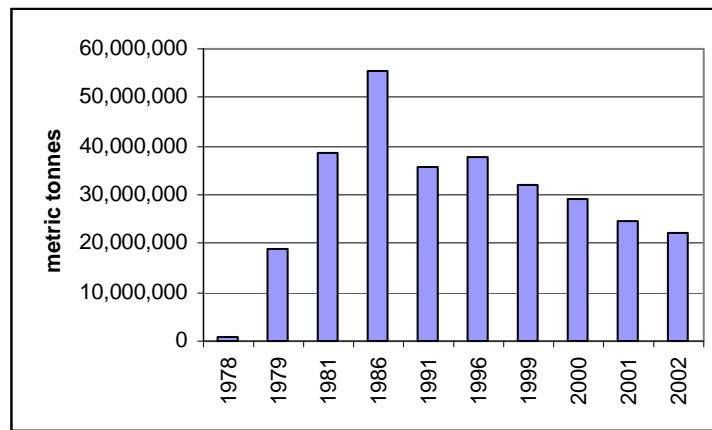
- 4.6 The SEA 5 area in this sub-area comprises part of quadrant 20 to the north of Shetland, most of quadrants 1 and 2 to the east, and parts of quadrants 6, 7 and 8 to the south of the islands. Immediately to the east of the SEA 5 area is the prolific East Shetland Basin where at the time of writing there were 29 fields producing oil and some associated gas. These fields include some of the “giants” and best-known fields on the UKCS such as Brent, Ninian and Magnus.
- 4.7 Brent (with estimated recoverable reserves of about 2 billion barrels or 270 million tonnes) began production in November 1976 and Ninian (1.2 billion barrels; 160 mt) began production in December 1978. Thus there has been oil production from the East Shetland Basin for over 27 years.
- 4.8 There are two oil pipelines to the Sullom Voe terminal in the Shetland Islands. The Brent pipeline system currently handles oil from 17 fields and the Ninian pipeline system oil from 12 fields. These two pipelines cross this part of the SEA 5 area.

- 4.9 Gas from the East Shetland Basin fields goes via the FLAGS (Far-north Liquids and Associated Gas) system to the St Fergus gas terminal in North East Scotland. Most of the length of this pipeline is also in the SEA 5 area, as shown on the map.
- 4.10 Shetland has had over 30 years' involvement with the UKCS oil and gas industry and there is a well-established range of existing infrastructure which any discoveries in the SEA 5 area could use.
- 4.11 The existing facilities include:
- the Sullom Voe oil terminal
 - Scatsta and Sumburgh airports
 - a supply base in Lerwick
 - other supporting facilities.
- 4.12 The Sullom Voe oil terminal was built in the 1970s to handle oil from the East Shetland Basin fields. First production from the Dunlin field was in November 1976, so the terminal has been in operation for over 27 years. It includes storage tanks, processing facilities and export jetties. Oil from the fields is stabilised, stored and loaded into tankers which go to UK refineries, the USA and other export markets.
- 4.13 The terminal is situated at Calback Ness on the shores of Sullom Voe on a site of approximately 400 hectares (1,000 acres). BP operate the terminal on behalf of the companies participating in the Brent and Ninian pipeline systems. It currently has a throughput design capacity of 1.2 million barrels of crude oil per day and reached a peak in 1984 with a total receipt of just over 439 million barrels of oil.
- 4.14 The throughput at Sullom Voe has declined substantially in recent years as a consequence of falling production from the fields in the East Shetland Basin. Table 4.1 below gives the historical statistics. Those for 2003 were not available at the time of writing.

Table 4.1
Sullom Voe terminal oil throughput
(metric tonnes)

	Brent system	Ninian system	Schiehallion	Total
1978	856,991	92,186	0	949,177
1979	10,367,579	8,555,865	0	18,923,444
1981	23,116,490	15,545,240	0	38,661,730
1986	38,692,099	16,875,047	0	55,567,146
1991	20,263,701	15,576,512	0	35,840,213
1996	23,332,990	14,368,498	0	37,701,488
1999	19,823,481	7,076,318	5,112,218	32,012,017
2000	15,820,037	7,503,953	7,003,895	29,327,785
2001	13,368,931	5,994,252	5,441,468	24,804,651
2002	11,479,375	5,048,451	5,793,604	22,321,430

Source: "Shetland in Statistics, 2003" (published by the Development Department of the Shetland Islands Council).



- 4.15 Peak throughput was in 1986 when over 55 million tonnes of oil were handled, averaging 1,146,647 barrels per day (bpd). The current throughput is about 450,000 bpd so there is substantial excess capacity.
- 4.16 The Schiehallion field, in the West of Shetland, came onstream in 1999 and has helped to slow down the rate of decline but not reversed it. There was a -15.4% decline in terminal throughput in 2001 and -10.0% in 2002.
- 4.17 The decline is expected to continue. Production from the East Shetland Basin could end between 2010 and 2015.
- 4.18 BP and partners are currently developing the Clair field to the West of Shetland. Oil from there will be piped to Sullom Voe. The start-up is scheduled for late 2004.
- 4.19 Sullom Voe would be delighted to handle oil from any new discoveries in the SEA 5 area. The implications of that are discussed in Section 7 of this report.
- 4.20 BP are currently undertaking changes at Sullom Voe to reduce costs and make the terminal more competitive. There are currently three oil processing trains but that will be reduced to one by the end of 2004.
- 4.21 The gas plant may be closed down in the foreseeable future. The liquid petroleum gases (LPG) are currently exported by tanker but in future will go to Magnus as part of the enhanced oil recovery (EOR) project there.
- 4.22 The utilisation of the storage tanks is about one third of the peak capacity. However, some of the tanks are now dedicated to Schiehallion oil which is not mixed with the other crudes. Schiehallion is a heavy oil and the tanks require heating. Clair oil will similarly have dedicated tanks.
- 4.23 Three of the four existing jetties are in operation and the other one has been “soft retired”. One jetty is currently dedicated to Schiehallion, handling about 250 vessels per year.

- 4.24 Current employment at the terminal averages about 390 (BP 240 plus 150 contractors), with some seasonal variations. That number will fall because BP are transferring most of the management and administration functions from Sullom Voe to Aberdeen. The closure of the gas plant would reduce employment further.
- 4.25 There is similar spare capacity among the tugs operated by Shetland Towage and the facilities provided by Shetland Islands Council. Shetland Towage employ about 60 people and SIC 60-70 at Sullom Voe.
- 4.26 Employment at Sullom Voe peaked at around 1,100 people in 1991. The current total is about 520.
- 4.27 Shetland has two airports at Sumburgh and Scatsta handling oil-related traffic. Sumburgh, which is owned and operated by Highlands and Islands Airports Ltd (HIAL), traditionally handled most of this traffic but in the late 1990s the oil companies transferred most of it to Scatsta, near Sullom Voe, because of dissatisfaction at the high costs of using Sumburgh. There is consequently substantial spare capacity at Sumburgh.
- 4.28 Some of the companies fly their platform and rig crews by fixed-wing planes between Aberdeen and Shetland, with helicopters operating from Shetland. Some fly helicopters direct from/to Aberdeen, bypassing Shetland. BP, for example, do that for the West of Shetland fields.
- 4.29 For many years Chevron used an airport on Unst to minimise the helicopter times but they stopped doing that a few years ago.
- 4.30 At one time there were six separate oil supply bases in Shetland but now there is only one at Greenhead, just outside Lerwick. It is also considerably underutilised at the present time.
- 4.31 The supply bases in Shetland suffered when the operators decided to supply the East of Shetland fields directly from Peterhead and Aberdeen, rather than using Shetland which involved doublehandling costs. Thus Shetland gets very little of the normal supply boat traffic, except during bad weather.
- 4.32 However, Shetland does attract some “heavy traffic” during the development period for new fields such as Clair. The Lerwick base, for example, handled the pipes for the gas pipeline from the West of Shetland fields to Magnus for the Clair pipeline.
- 4.33 Diving support vessels and standby ships also use Shetland for crew changes. Both Lerwick and Scalloway (on the west side) harbours benefit from this business.
- 4.34 Other oil-related businesses in Shetland include:
- SBS Logistics
 - Shetland Oil Tools, who handle drill cuttings
 - Malakoff and Moore, engineers.
- 4.35 There were many other oil-related businesses in the 1980s and 1990s but they have since closed down or left the islands. Nevertheless, there remains considerable oil industry expertise among the local labour force and the local business community.

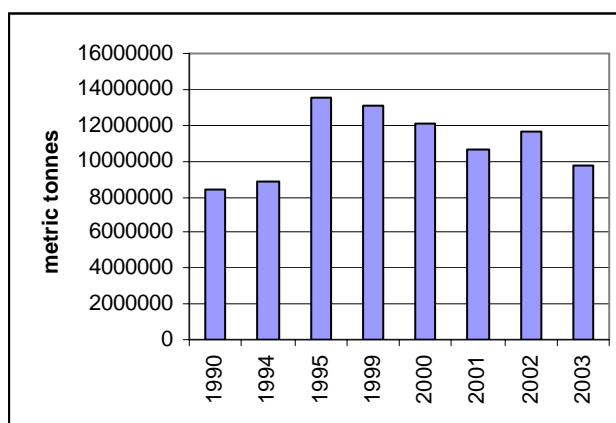
Orkney Islands

- 4.36 The SEA 5 area in this sub-area comprises parts of quadrants 5-8 and 12.15. Immediately to the east and south of the SEA 5 area there are producing fields. Oil from 16 of those fields, including Piper, is piped to the Flotta terminal in the Orkney Islands. This is the only significant oil-related facility there.
- 4.37 BP also use Flotta to handle oil from the Foinaven field, using shuttle tankers rather than a pipeline.
- 4.38 The terminal was originally built by Occidental and later operated by Elf. Talisman are now the operators.
- 4.39 Throughput at Flotta has also been declining as a consequence of falling production from the Moray Firth fields. Table 4.2 gives some historical statistics.

Table 4.2
Flotta terminal : oil throughput
(metric tonnes)

	North Sea crude	Foinaven	total
1990	8,336,225	0	8,336,225
1994	8,860,242	0	8,860,242
1995	13,529,630	0	13,529,630
1999	9,568,002	3,574,343	13,142,345
2000	8,378,324	3,738,239	12,116,563
2001	6,824,997	3,775,666	10,600,663
2002	6,383,882	5,282,829	11,666,711
2003	5,410,647	4,341,056	9,751,703

Sources: “Orkney Economic Review, 2002” (published by the Development Department, Orkney Islands Council) and the Flotta Terminal



- 4.40 Peak throughput was recorded in 1995. Since then there has been a substantial fall in oil from the North Sea fields but the oil from Foinaven reversed the trend in 2002 when there was a +10.8% increase in throughput. However, there was an overall fall of -16.4% in 2003.

- 4.41 The terminal's capacity is about 400,000 bpd. The Moray Firth fields currently use about 125,000 bpd of that and Foinaven about 100,000 bpd.
- 4.42 Talisman have mothballed a gas plant and a process plant but these could be recommissioned if required.
- 4.43 Flotta currently employs about 230 people, mainly contractors. Peak employment in the Occidental days was about 450.

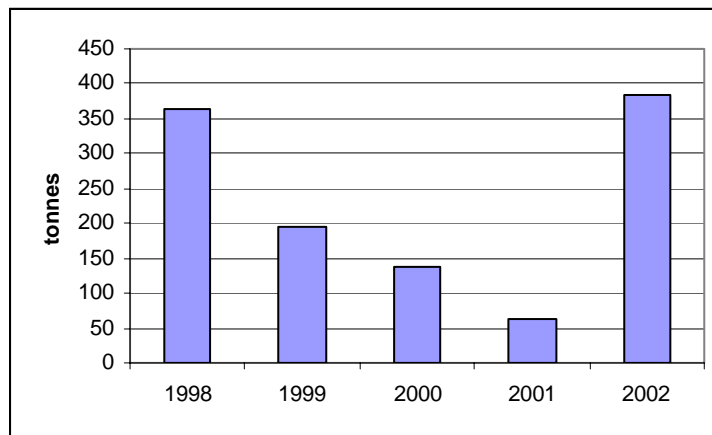
Moray Firth

- 4.44 The SEA 5 area in the Inner Moray Firth includes parts of quadrants 11-13 and 17-19.
- 4.45 The Beatrice oil field is located in block 11/30a. It came onstream in 1981. The oil is transported by a 67 km pipeline to a terminal at Nigg Bay on the Cromarty Firth in Easter Ross. The field was expected to cease production a few years ago but Talisman acquired it from BP in 1997 and have managed to extend its life. However, current production from Beatrice is less than 5,000 barrels per day (bpd).
- 4.46 Four other fields have also used the Nigg terminal: Blake (start-up 2001; operated by BG International), Captain (start-up 1997; ChevronTexaco), Gryphon (start-up 1993; Kerr-McGee) and Ross (start-up 1999; Talisman). These fields all use FPSOs (floating production, storage and offloading vessels) and shuttle tankers. However, they have not used the Nigg terminal recently and have used ship-to-ship transfers instead.
- 4.47 Table 4.3 and the accompanying figure give some historical statistics. Throughput fell substantially to 2001 but there was a very large increase in 2002. The reason for that was that the terminal began handling oil from the Captain field.

Table 4.3
Nigg terminal: oil throughput

	Tonnes	% change
1998	365	-
1999	194	-46.8
2000	137	-29.4
2001	62	-54.7
2002	385	+521.0

Source: Department of Trade and Industry



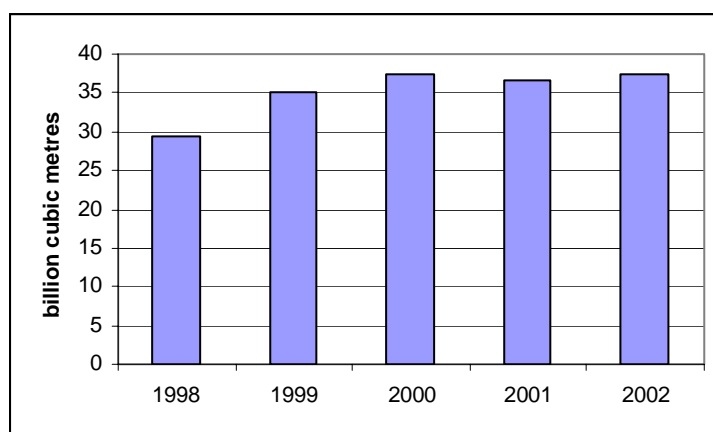
- 4.48 There are two storage tanks at the Nigg terminal but only one is currently being used for Beatrice. The other has a capacity of 700,000 barrels.
- 4.49 The Cromarty Firth is the main centre for oil-related activity in the Highlands. In addition to the Nigg oil terminal, other facilities include:
- a platform fabrication yard at Nigg, which is operated by Kellogg Brown and Root (KBR)
 - an oil rig inspection, repair and maintenance (IRM) facility at Invergordon
 - an oil supply base at Invergordon
 - a pipeline fabrication yard at Evanton.
- 4.50 The Nigg fabrication yard was set up in the 1970s and has built many of the steel platforms on the UKCS, including two of the Forties platforms. However, it has had very little work in recent years because of the downturn in demand for steel platforms. At peak the yard employed about 5,000 people.
- 4.51 The deep, sheltered water of the Cromarty Firth has helped make it the main centre in the UK for the IRM of mobile exploration rigs. A special dock was built for this work at Invergordon by the Cromarty Firth Port Authority. The firth is also used for “stacking” or “storing” rigs when they have no contracts and in January 2004 there were 16 rigs moored in the firth.
- 4.52 Coflexip have a pipeline manufacturing facility at Evanton on the Cromarty Firth.
- 4.53 There is another pipeline yard in the region at Wester near Wick in Caithness, which is operated by the Halliburton group. There used to be a third facility at Tain on the Dornoch Firth but that has not been used for a few years.
- 4.54 There was also another large fabrication yard at Ardersier on the Moray Firth, operated by McDermott. This built many platforms and other facilities for UKCS fields. However, McDermott closed the yard a few years ago and in January 2004 it was put up for sale.
- 4.55 Finally in the Highlands, supply boats and other oil-related vessels make occasional use of ports such as Scrabster and Wick, although most supply boat traffic is now concentrated in Aberdeen and Peterhead.

- 4.56 There are no oil-related facilities along the Moray and Aberdeenshire coastlines until the Peterhead area. The main facility there is the St Fergus gas terminal which is the largest in the UK. As mentioned earlier, this handles gas from most of the fields in the UK sector of the Northern North Sea and there are six separate pipelines to the terminal. There are four separate complexes at the terminal, which are operated by Shell, Total, ExxonMobil and Transco.
- 4.57 In 2002 the St Fergus terminal handled 37.3 billion cubic metres (bcm) of gas. That was 35.6% of the total handled by the gas terminals in the UK. Table 4.4 and the accompanying figure give the recent throughput statistics for the St Fergus terminal. Statistics for 2003 were not available at the time of writing.

Table 4.4
St Fergus: gas throughput

	bcm	% change
1998	29.5	-
1999	35.1	+19.0
2000	37.4	+6.6
2001	36.7	-1.9
2002	37.3	+1.6

Source: Department of Trade and Industry



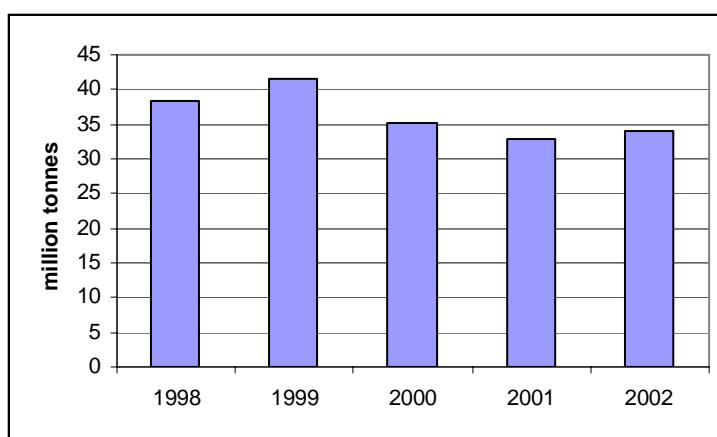
- 4.58 The amount of gas handled increased in three of the last four years shown. ExxonMobil are currently expanding their complex (Sage) at the terminal to enable it to handle gas from the Atlantic and Cromarty fields.
- 4.59 There is also a dedicated gas pipeline from the Miller field to the Boddam power station just south of Peterhead. It handled the following amounts of gas (in million cubic metres):
- | | |
|------|------|
| 1998 | 1254 |
| 1999 | 1109 |
| 2000 | 624 |
| 2001 | 256 |
| 2002 | 233 |

- 4.60 We understand that five of the six pipelines to St Fergus are currently operating at their peak capacity but that there is a little spare capacity in the Britannia line. However, the Miller pipeline to the Boddam power station is virtually empty.
- 4.61 South of Peterhead is the Cruden Bay oil terminal which handles oil from a large number of North Sea fields. The oil is piped from Cruden Bay to the Hound Point terminal on the Firth of Forth (see below), which is operated by BP.
- 4.62 In 2002 the Cruden Bay and Hound Point terminals handled 34.1 million tonnes of oil. That was 45.5% of the total of the UK terminals and about the same as Sullom Voe and Flotta combined.
- 4.63 Table 4.5 and the accompanying figure show the recent throughput statistics. There were substantial falls in 2000 and 2001 but a recovery in 2002.

Table 4.5
Cruden Bay/Hound Point: oil throughput

	mt	% change
1998	38.4	-
1999	41.6	+8.4
2000	35.2	-15.4
2001	32.8	-6.7
2002	34.1	+3.8

Source: Department of Trade and Industry



- 4.64 Peterhead is an important oil supply base, as well as being the number one fishing port in Scotland. ASCo operate a large supply base on the south shore of the bay, which is also occasionally used for rig IRM work. In the Peterhead area there is a large number of oil and gas-related businesses.
- 4.65 The Peterhead Bay Authority kindly provided us with traffic statistics for the port. The peak year for oil-related cargo was in 1998-99 when 1,429,000 tonnes were handled. That had fallen to 1,009,000 tonnes in 2002-03.

- 4.66 However, BP decided to transfer most of their supply boat traffic from the ASCo base in Peterhead to Aberdeen, with effect from November 2003. That will reduce the traffic substantially. The Authority's estimate for 2003-04 is 700,000 tonnes.
- 4.67 According to the Peterhead Bay Authority, there was probably about 15% spare capacity in the port in 1998-99 and that has since increased to about 60%. Thus Peterhead is another oil-related facility which would welcome any new traffic generated by SEA 5 activity.

Aberdeen

- 4.68 Aberdeen is now well-established as the main centre of the oil and gas industry in the UK and the city is often described as "Europe's oil capital". The industry came to Aberdeen in the early 1970s, initially on a very small scale, and in the 30 years since then has become a very important part of the local economy. There are now many oil-related businesses located in the city and the surrounding area.
- 4.69 The industry in the area comprises the operating companies, contractors and a large number of service companies. The operators include the "majors" such as BP and Shell and an increasing number of independents such as Apache, Dana and Venture.
- 4.70 Oil-related employment in the Aberdeen area is estimated at about 40,000, of which approximately 23,000 are onshore and 17,000 offshore.
- 4.71 A notable trend recently has been the reduced interest of the multinational majors in the North Sea, so that they can concentrate on what they regard as more prospective areas such as West Africa and the Russian Federation. BP, for example, sold their flagship Forties field in 2002 although they retain other North Sea interests. Most operators have reduced employment in the Aberdeen area over the last few years.
- 4.72 Some of the Aberdeen-based contractors and service companies have compensated for the downturn in North Sea business by building up substantial overseas businesses. The Wood Group and the Abbott Group are outstanding examples of that.
- 4.73 Aberdeen harbour accounts for a large proportion of oil-related maritime traffic in the Northern North Sea. The harbour includes eight separate oil supply bases in addition to common user quays.
- 4.74 The Aberdeen Harbour Board kindly provided us with traffic statistics. In 2003 4,343 oil-related vessels used the harbour, which was 58.2% of the total number of vessels. The oil-related cargo tonnage was 1,793,000 tonnes, which was 47.0% of the total tonnage.
- 4.75 As elsewhere, there has been a decline in oil-related traffic. For example, 4910 oil-related vessels used the port in 2001, 4698 in 2002 (-4.3%) and 4343 in 2003 (-7.6%). Thus Aberdeen also has spare capacity to handle any SEA 5-related activity.
- 4.76 Similarly, Aberdeen airport accounts for most of the oil-related air traffic in the UK, including helicopter flights to and from the platforms and rigs.

Rest of the East Coast

- 4.77 The SEA 5 area south of Aberdeen comprises quadrants 25 and 26, and parts of 27, 28, 33 and 34. There has been a little exploration activity in some of these quadrants, notably 26, but no commercial discoveries so far.
- 4.78 There are a few oil-related facilities south of Aberdeen. There used to be a small oil supply base at Montrose but only one oil-related vessel is now based in the port. There are a few other oil-related businesses in the town.
- 4.79 In the early days of North Sea activity Dundee rivalled Aberdeen as the main centre but as activity moved further and further north Dundee lost out, although there are still some oil-related facilities and businesses in the city. They include Prince Charles Wharf at the harbour, which is used by a few oil supply boats and for rig IRM work.
- 4.80 Further south in Fife there is a large fabrication yard at Methil, where many of the steel platforms on the UKCS were built. However, like the two yards on the Moray Firth this has had very little work recently.
- 4.81 A smaller fabrication yard at Burntisland has been more successful and at the time of our research was undertaking work for the Buzzard field development.
- 4.82 In the Firth of Forth the two main oil-related facilities are the
- Braefoot Terminal and the
 - Hound Point Terminal.
- 4.83 Braefoot is the marine export facility for the Mossmorran petrochemical complex in Fife, which is operated by Shell and Exxon Chemicals. The complex takes wet gas from the St Fergus terminal in Aberdeenshire and separates the liquid petroleum gases (LPG) such as butane and propane. The terminal handles up to two million tonnes of LPG a year.
- 4.84 The Hound Point terminal near the Forth Railway Bridge handles crude oil from the Forties and other fields in the North Sea. The oil first goes to the Cruden Bay terminal in Aberdeenshire and then by underground pipeline to Hound Point. The recent throughput statistics were given in Table 4.5 above.
- 4.85 In Leith there is a pipecoating yard at the harbour. We understand that will have to relocate elsewhere in the near future as a consequence of Fort Ports' redevelopment plans.
- 4.86 There are no oil-related facilities south of Edinburgh until the Teesside terminals in North East England.

5.0 IMPLICATIONS FOR OIL AND GAS PRODUCTION AND RESERVES

- 5.1 The scenarios provided by the DTI are set out in Section 2 of this report. To quote, “depending on the success of the exploration and appraisal drilling, three new stand-alone developments are anticipated, with potentially one new pipeline to shore and the remaining developments tying into existing export infrastructure”.
- 5.2 As mentioned earlier, we have converted the DTI scenarios into a “pessimistic” scenario and an “optimistic” one. It would obviously be possible to have a scenario in which there were no new developments but our pessimistic scenario is based on one.

Oil production

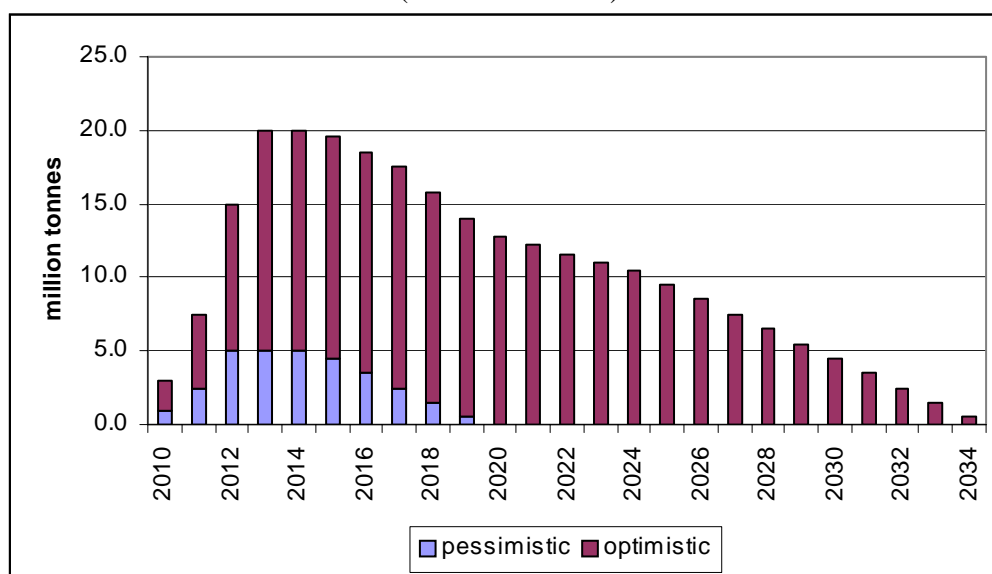
- 5.3 Table 5.1 sets out our forecasts of oil production for the two scenarios. Part (a) is in thousands of barrels per day and part (b) is in millions of tonnes per year.
- 5.4 Under the pessimistic scenario there is production for just ten years, reaching a peak of 100,000 bpd or 5.0 mt per year. The total oil production is 31.0 million tonnes or 232.5 million barrels (at 7.5 barrels = 1 tonne).
- 5.5 Under the optimistic scenario there is production for 25 years, reaching a peak of 300,000 bpd or 15.0 mt per year. The total oil production is 218.75 million tonnes or 1,640.6 million barrels. These figures are seven times higher than those for the pessimistic scenario.

Table 5.1
Oil production scenarios

	000 bpd		million tonnes	
	pessimistic	optimistic	pessimistic	optimistic
2010	20	40	1.0	2.0
2011	50	100	2.5	5.0
2012	100	150	5.0	10.0
2013	100	200	5.0	15.0
2014	100	250	5.0	15.0
2015	90	300	4.5	15.0
2016	70	300	3.5	15.0
2017	50	300	2.5	15.0
2018	30	285	1.5	14.25
2019	10	270	0.5	13.5
2020	-	255	-	12.75
2021	-	245	-	12.25
2022	-	230	-	11.5
2023	-	220	-	11.0
2024	-	210	-	10.5
2025	-	190	-	9.5
2026	-	170	-	8.5
2027	-	150	-	7.5
2028	-	130	-	6.5
2029	-	110	-	5.5
2030	-	90	-	4.5
2031	-	70	-	3.5
2032	-	50	-	2.5
2033	-	30	-	1.5
2034	-	10	-	0.5
2035	-	-	-	-

5.6 The forecasts are illustrated in Figure 5.1.

Figure 5.1
Oil production scenarios from SEA 5 fields
(million of tonnes)



Comparisons with total UKCS oil production

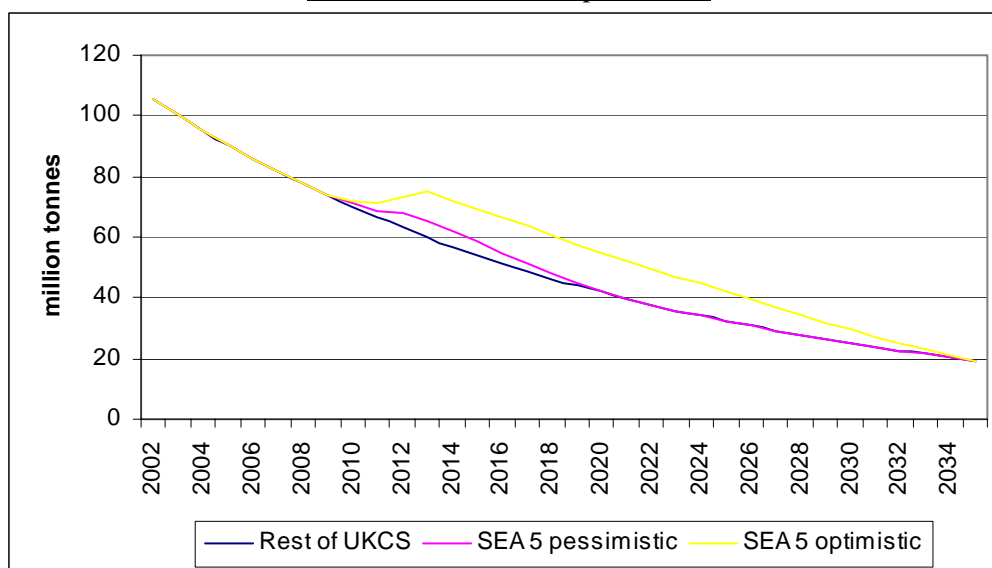
- 5.7 UKCS oil production in 2002 was 105.4 million tonnes (averaging just under 2 million barrels per day), according to the DTI. Statistics for 2003 were not available at the time of writing but output was lower than in the previous year.
- 5.8 UKCS oil production seems to have peaked in 1999 at 124.9 million tonnes. There seems general agreement that the future is one of slow decline.
- 5.9 It is very difficult to forecast the rate of decline, however. In Table 5.2 on the following page and Figure 5.2 we have made the simple assumption that there will be an annual average decline of -5.0% . In reality there will be fluctuations from year to year but for the purposes of this study we believe it is a reasonable assumption.
- 5.10 The Rest of UKCS column of Table 5.2 on the next page shows oil production declining slowly but steadily from 105.4 million tonnes (2.1 million bpd) in 2002 to 19.4 million tonnes (390,000 bpd) by 2035.
- 5.11 SEA 5 production is assumed to start in 2010 by which time the Rest of UKCS production would have fallen to 69.9 mt, down -35% on the 2002 level. Under the pessimistic scenario total production will continue to decline but SEA 5 production will slow down that decline. For example, 2014 production of 62.0 mt would be $+8.8\%$ higher than the Rest of UKCS total.
- 5.12 The optimistic SEA 5 scenario gives a significantly different picture, as illustrated in Figure 5.2. Production would actually increase in 2012 and 2013 before the decline resumed. For the six years 2010-15 production would be relatively stable at around 70 mt per year (1.4 million bpd).

- 5.13 In the peak year 2014 total production would be +26.3% higher than it would have been without SEA 5 oil. That percentage addition would decline over time, as indicated in the table and figure.

Table 5.2
Forecasts of UKCS oil production
(million tonnes)

	Rest of UKCS	SEA 5 pessimistic	Sub-total	SEA 5 optimistic	Totals
2002	105.4	-	105.4	-	105.4
2003	100.1	-	100.1	-	100.1
2004	95.1	-	95.1	-	95.1
2005	90.4	-	90.4	-	90.4
2006	85.8	-	85.8	-	85.8
2006	81.6	-	81.6	-	81.6
2008	77.5	-	77.5	-	77.5
2009	73.6	-	73.6	-	73.6
2010	69.9	1.0	70.9	2.0	71.9
2011	66.4	2.5	68.9	5.0	71.4
2012	63.1	5.0	68.1	10.0	73.1
2013	60.0	5.0	65.0	15.0	75.0
2014	57.0	5.0	62.0	15.0	72.0
2015	54.1	4.5	58.6	15.0	69.1
2016	51.4	3.5	54.9	15.0	66.4
2017	48.8	2.5	51.3	15.0	63.8
2018	46.4	1.5	47.9	14.25	60.65
2019	44.1	0.5	44.6	13.5	57.6
2020	41.9	-	41.9	12.75	54.65
2021	39.8	-	39.8	12.25	52.05
2022	37.8	-	37.8	11.5	49.3
2023	35.9	-	35.9	11.0	46.9
2024	34.1	-	34.1	10.5	44.6
2025	32.4	-	32.4	9.5	41.9
2026	30.8	-	30.8	8.5	39.3
2027	29.2	-	29.2	7.5	36.7
2028	27.8	-	27.8	6.5	34.3
2029	26.4	-	26.4	5.5	31.9
2030	25.1	-	25.1	4.5	29.6
2031	23.8	-	23.8	3.5	27.3
2032	22.6	-	22.6	2.5	25.1
2033	21.5	-	21.5	1.5	23.0
2034	20.4	-	20.4	0.5	20.9
2035	19.4	-	19.4	-	19.4

Figure 5.2
Forecasts of UKCS oil production



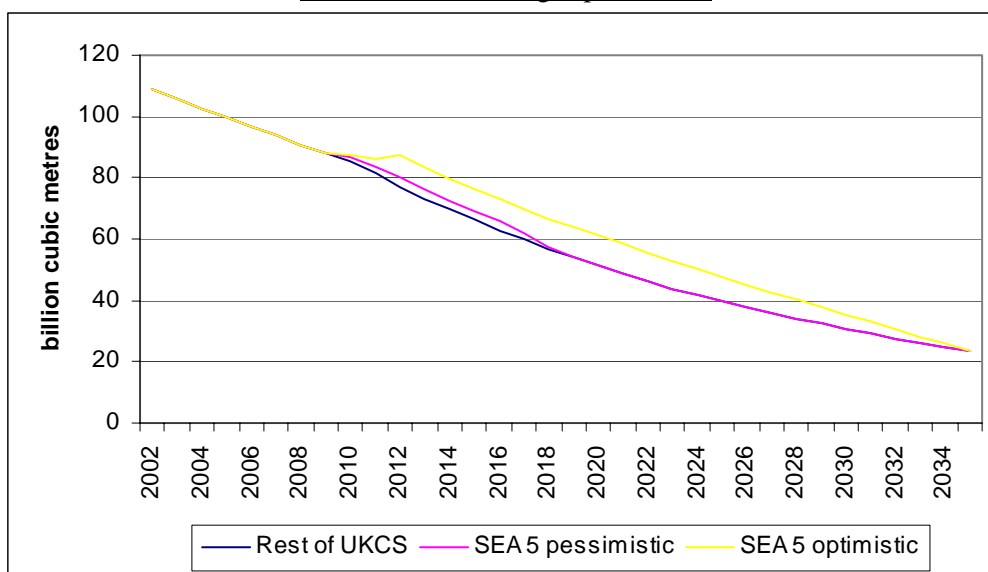
Gas production

- 5.14 Gas production from the SEA 5 area is more difficult to predict and analyse. It appears to be much more oil prone than gas, in marked contrast to the Southern North Sea. Generally, the further north you go on the UKCS the more likely you are to find oil than gas. There have been exceptions to this generalisation, of course, such as the giant Frigg gas field.
- 5.15 Nevertheless, associated gas has been found in most of the fields in the East Shetland Basin and elsewhere in the area. Six separate gas pipelines go to the St Fergus terminal which in 2002 handled 37.3 bcm of gas. That was 35.6% of the total handled by the gas terminals in the UK.
- 5.16 Given the existing gas pipeline infrastructure in the SEA 5 area it should be relatively easy to develop any new gas discoveries.
- 5.17 For the pessimistic scenario we have assumed a small level of gas production reaching a peak of 3.0 billion cubic metres (bcm). Gas fields usually produce for much longer than oil fields so we have assumed production for 25 years, ending in 2034.
- 5.18 For the optimistic scenario we have assumed a much higher peak of 10.0 bcm, with the same time profile. The two scenarios are set out in Table 5.3.
- 5.19 UKCS gas production was approximately 109.1 bcm in 2002, according to the DTI statistics. Production increased rapidly in the 1990s, reaching a peak of 114.7 bcm in 2000. It fell by –2.1% in 2001 and by –2.9% in 2002. The general expectation is that offshore gas output will also decline slowly in the future, as with offshore oil production.
- 5.20 In Table 5.3 we have assumed that the Rest of the UKCS gas output will decline at an annual average of –3.0% to 2010 and by –5.0% after that year. The annual figures are shown in the table and in Figure 5.3

Table 5.3
Forecasts of UKCS gas production
 (billion cubic metres)

	Rest of UKCS	SEA 5 pessimistic	Sub-total	SEA 5 optimistic	Totals
2002	109.1	-	109.1	-	109.1
2003	105.8	-	105.8	-	105.8
2004	102.7	-	102.7	-	102.7
2005	99.6	-	99.6	-	99.6
2006	96.6	-	96.6	-	96.6
2006	93.7	-	93.7	-	93.7
2008	90.9	-	90.9	-	90.9
2009	88.2	-	88.2	-	88.2
2010	85.5	1.0	86.5	2.0	87.5
2011	81.2	2.0	83.2	5.0	86.2
2012	77.2	3.0	80.2	10.0	87.2
2013	73.3	3.0	76.3	10.0	83.3
2014	69.6	3.0	72.6	10.0	79.6
2015	66.2	3.0	69.2	10.0	76.2
2016	62.9	3.0	65.9	10.0	72.9
2017	59.7	2.0	61.7	10.0	69.7
2018	56.7	1.0	57.7	10.0	66.7
2019	53.9	0.5	54.4	10.0	63.9
2020	51.2	-	51.2	10.0	61.2
2021	48.6	-	48.6	10.0	58.6
2022	46.2	-	46.2	9.5	55.7
2023	43.9	-	43.9	9.0	52.9
2024	41.7	-	41.7	8.5	50.2
2025	39.6	-	39.6	8.0	47.6
2026	37.6	-	37.6	7.5	45.1
2027	35.7	-	35.7	7.0	42.7
2028	34.0	-	34.0	6.5	40.5
2029	32.3	-	32.3	5.5	37.8
2030	30.7	-	30.7	4.5	35.2
2031	29.1	-	29.1	4.0	33.1
2032	27.7	-	27.7	3.0	30.7
2033	26.3	-	26.3	2.0	28.3
2034	25.0	-	25.0	1.0	26.0
2035	23.7	-	23.7	-	23.7

Figure 5.3
Forecasts of UKCS gas production



5.21 SEA 5 gas production would begin in 2010. Under the pessimistic scenario total UKCS output would continue to decline, so the impact of SEA 5 would be just to slow down the rate of decline. In 2012 the difference in output would be about 3.9% higher and in 2021 about 5.9% higher.

5.22 Under the optimistic scenario there could be a year or two when total UKCS gas production actually rose. Table 5.3 shows that occurring in 2012. However, the main impact of SEA 5 output would again be to slow down the overall rate of decline. In 2012 the difference in output would be about +13.0% higher and in 2021 about +20.6% higher.

Oil and gas reserves

5.23 Our reserve assumptions for the two scenarios are:

	<u>oil (mt)</u>	<u>gas (bcm)</u>
pessimistic	31.0	21.5
optimistic	227.75	183.0

5.24 The DTI’s Oil and Gas website gives various statistics on UKCS recoverable reserves. For oil they are (in million tonnes):

discovered	3,390-4,145
potential additional	90-490
undiscovered	270-1,770
total	3,750-6,405

5.25 It is the “undiscovered” reserves which are relevant in the present context. The range is inevitably wide but if we take the mid-point of 1,020 million tonnes, our optimistic assumption is 22.3% of that and our pessimistic assumption is 3.0% of that. In other words, the SEA 5 area could account for up to 22.3% of the UKCS oil reserves yet to be discovered.

5.26 The DTI's estimates of the UKCS recoverable gas reserves (in billion cubic metres) are:

discovered	2,355-3,055
potential additional	70-265
undiscovered	235-1,390
total	2,660-4,710

5.27 The mid-point of the "undiscovered" reserves range is approximately 815 bcm. Our optimistic assumption is 22.5% of that and our pessimistic assumption 2.6%. In other words, the SEA 5 area could account for up to 22.5% of the UKCS gas reserves yet to be discovered.

6.0 IMPLICATIONS FOR CAPITAL, OPERATING AND DECOMMISSIONING EXPENDITURE

Capital expenditure

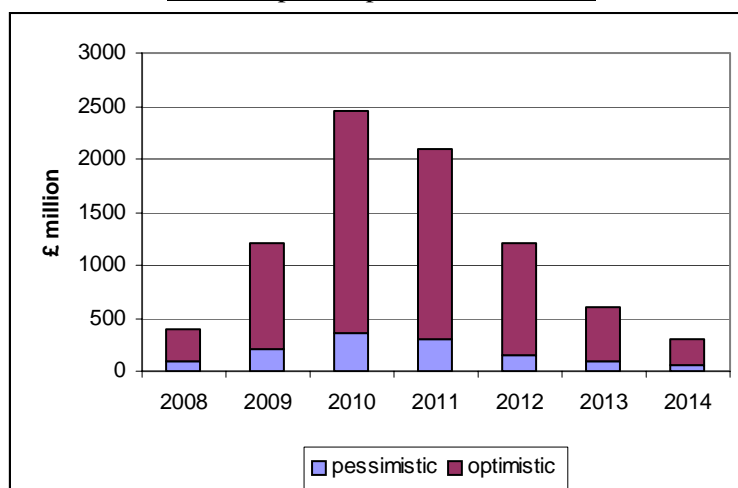
- 6.1 Table 6.1 sets out our estimates of the capital expenditure which will be required to develop the fields in the SEA 5 area, for both the optimistic and pessimistic scenarios.

Table 6.1
SEA 5 capital expenditure scenarios
(£ million)

	pessimistic	optimistic
2007	0	0
2008	100	300
2009	200	1,015
2010	350	2,100
2011	300	1,800
2012	150	1,050
2013	100	500
2014	50	250
2015	0	0
totals	1,350	7,015

- 6.2 For the pessimistic scenario we have assumed an average development cost of \$6 per barrel of oil or \$45 per tonne of oil or bcm of gas. The latter is equivalent to £25.70 at an exchange rate of £1 = \$1.75. For the optimistic scenario we have assumed an average development cost of \$4 per barrel, which is equivalent to £17.10 per tonne of oil or bcm of gas.
- 6.3 Total capital expenditure for the pessimistic scenario is £1,350 million and for the optimistic scenario £7,015 million. The time profiles are illustrated in Figure 6.1.

Figure 6.1
SEA 5 capital expenditure scenarios



- 6.4 It is difficult to predict future levels of capital expenditure on the UKCS. The DTI's Oil and Gas website gives the following historical estimates:

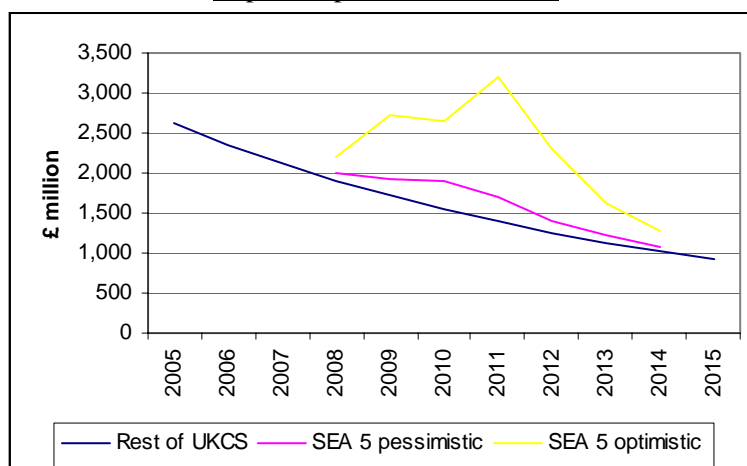
	<u>£ million</u>	<u>% change</u>
1998	4,996	-
1999	3,063	-38.7
2000	2,750	-10.2
2001	3,570	+36.4
2002	3,598	+0.8

- 6.5 There was a very large fall (-38.7%) in 1999, which was probably a consequence of the collapse in world oil prices at that time, and a further fall (-10.2%) in 2000. In the following year, however, there was a +36.4% increase to just under £3.6 billion and the 2002 level of expenditure was similar. Data for 2003 were not available at the time of writing.
- 6.6 The general trend in the future will almost certainly be downwards. The forecasts in Section 5 show both UKCS oil and gas production declining. Although new fields continue to be discovered and developed, they are generally much smaller than mature fields such as Brent, Forties and Ninian, and usually much cheaper to develop.
- 6.7 An important factor in that is the extensive existing infrastructure on the UKCS. New fields can often make use of that, eg as subsea completions to existing platforms and pipelines. That can substantially reduce capital expenditure although it may increase operating expenditure through the payment of tariffs.
- 6.8 We believe that a reasonable assumption is that capital expenditure on the Rest of the UKCS will fall at an annual average of -10% in the future. Table 6.2 and Figure 6.2 sets out forecasts on that basis.

Table 6.2
Capital expenditure forecasts
(£ million, constant 2003 values)

	Rest of UKCS	SEA 5 pessimistic	% of UKCS	SEA 5 optimistic	% of UKCS
2005	2,622	-	-	-	-
2006	2,361	-	-	-	-
2007	2,125	-	-	-	-
2008	1,912	100	5.2	300	15.7
2009	1,720	200	11.6	1,015	59.0
2010	1,549	350	22.6	2,100	135.6
2011	1,394	300	21.5	1,800	129.1
2012	1,255	150	12.0	1,050	83.7
2013	1,129	100	8.9	500	44.3
2014	1,016	50	4.9	250	24.6
2015	915	0	-	0	-

Figure 6.2
Capital expenditure forecasts



- 6.9 With the pessimistic scenario, the SEA 5 expenditure accounts for 22.6% of the Rest of the UKCS forecast in 2010 and 21.5% in 2011. Even the pessimistic scenario, therefore, would account for a substantial proportion of total capital expenditure during the seven year development period.
- 6.10 Expenditure under the optimistic scenario would actually exceed the Rest of the UKCS in 2011 and 2012. The £7,015 million total compares with £9,975 for the Rest of the UKCS during the 2008-14 period.
- 6.11 These estimates suggest that SEA 5 capital expenditure would be very important during a period when development activity on the rest of the UKCS was declining.
- 6.12 UK-based suppliers of FPSO and subsea equipment, installation contractors, supply boat and helicopter operators etc would all be very keen to win work for the SEA 5 fields, particularly if their other markets were declining and they had spare capacity.

Operating expenditure

- 6.13 Table 6.3 on the next page and Figure 6.3 give estimates of annual operating expenditure for the pessimistic and optimistic scenarios.
- 6.14 The DTI Oil and Gas website has a chart showing unit operating costs from 1976 to 2002 (in 2002 values). They rose fairly steadily from approximately £13 per tonne (£1.73 per barrel) in 1976 to a peak of £30 per tonne (£4.00 per barrel) in 1991. Since then there has been a fall and the average for the last few years has been approximately £22 per tonne (£2.93 per barrel).
- 6.15 For the pessimistic scenario we have assumed an average of £25 per tonne of oil or bcm of gas and for the optimistic scenario £20 per tonne. We have added the oil and gas production together for each year and then multiplied the totals by either £20 or £25. This is a simple approach but it should give sufficiently accurate estimates for the purposes of this report.

6.16 Table 6.3 also gives operating expenditure forecasts for the whole of the UKCS. Those are also difficult to make.

6.17 The DTI's estimates for the last few years are:

	<u>£ million</u>	<u>% change</u>
1998	4,190	-
1999	4,249	+1.4
2000	4,360	+2.6
2001	4,347	-0.3
2002	4,595	+5.7

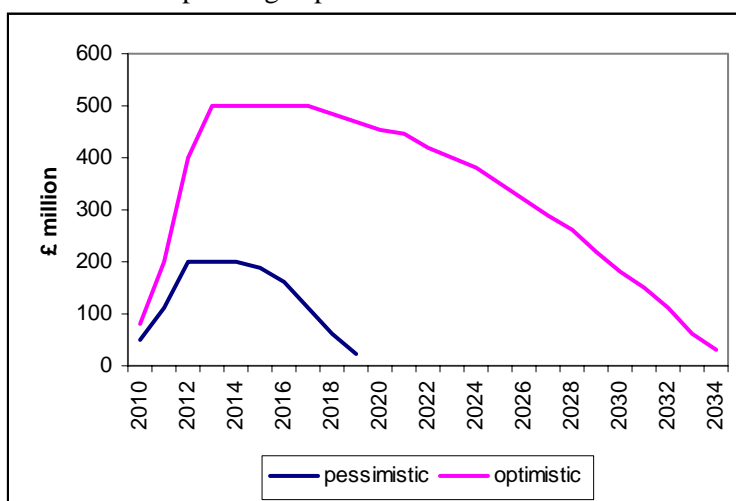
6.18 As mentioned earlier, UKCS oil production peaked in 1999. It declined by -8.1% in 2000, -7.2% in 2001 and -1.1% in 2002.

6.19 UKCS gas production peaked in 2000. It declined by -2.2% in 2001 and by -2.9% in 2002.

Table 6.3
Operating expenditure forecasts
(£ million, constant 2003 values)

	UKCS	SEA 5 pessimistic	% of UKCS	SEA 5 optimistic	% of UKCS
2009	3713	-	-	-	-
2010	3602	50	1.4	80	2.2
2011	3494	113	3.2	200	5.7
2012	3389	200	5.9	400	11.8
2013	3287	200	6.1	500	15.2
2014	3188	200	6.3	500	15.7
2015	3093	188	6.1	500	16.2
2016	3000	163	5.4	500	16.7
2017	2910	113	3.9	500	17.2
2018	2823	63	2.2	485	17.2
2019	2738	25	0.9	470	17.2
2020	2656	-	-	455	17.1
2021	2576	-	-	445	17.3
2022	2499	-	-	420	16.8
2023	2424	-	-	400	16.5
2024	2351	-	-	380	16.2
2025	2281	-	-	350	15.3
2026	2212	-	-	320	14.5
2027	2146	-	-	290	13.5
2028	2082	-	-	260	12.5
2029	2019	-	-	220	10.9
2030	1959	-	-	180	9.2
2031	1900	-	-	150	7.9
2032	1843	-	-	110	6.0
2033	1788	-	-	60	3.4
2034	1734	-	-	30	1.7
2035	1682	-	-	-	-

- 6.20 It might be expected, therefore, that UKCS operating expenditure would have fallen since 2000. There was a small -0.3% fall in 2001 but a surprising $+5.7\%$ increase in 2002.
- 6.21 It is difficult to explain the latter. However, more fields are still being brought onstream on the UKCS than being decommissioned, so the total number of fields in production has increased since 2000. Many of the new fields are relatively small and will have higher-than-average operating costs.
- 6.22 Nevertheless, we believe that operating expenditure must fall over time and in Table 6.3 we have assumed an annual fall of -3.0% from 2002 onwards.
- 6.23 The table shows that operating expenditure under the pessimistic scenario would reach a peak of 6.3% of the UKCS total in 2014.
- 6.24 Under the optimistic scenario it would reach a peak of 17.3% in 2021. The proportion would be relatively stable at over 15% for the thirteen years 2013-25. It would then fall in line with the forecast declines in SEA 5 oil and gas production.
- 6.25 Figure 6.3 illustrates the operating expenditure for the two scenarios.



Exploration expenditure

- 6.26 There will also be the initial exploration expenditure. The DTI scenarios show up to 20 exploration and appraisal wells. At an average cost of £10 million per well, 20 wells would therefore involve expenditure of about £200 million.

Decommissioning expenditure

- 6.27 Finally, there will be decommissioning expenditure at the ends of the productive lives of the various fields. An approximate “rule of thumb” is that this expenditure will be 10% of the original capital costs.

7.0 IMPLICATIONS FOR EXISTING FACILITIES

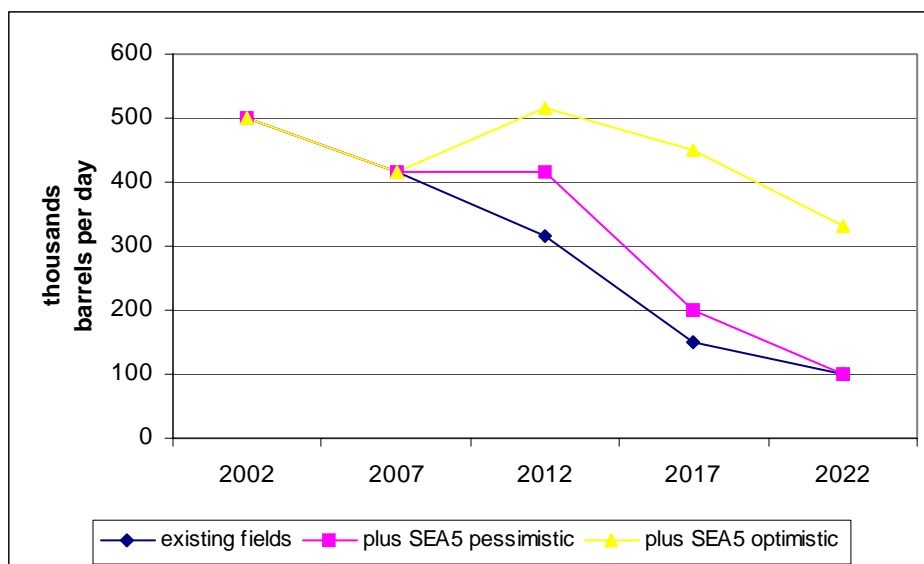
- 7.1 The main impacts would come from the development and operation of new fields in the SEA 5 area. The development or construction impacts would last for just a few years but the operational impacts could last for many years.
- 7.2 The SEA 5 area is very large, however, so the impacts on existing facilities will depend to a great extent on where any new fields are actually located. For example, there are four onshore oil terminals in the SEA 5 area at Sullom Voe, Flotta, Nigg and Cruden Bay/Hound Point. All would welcome new business from new fields but the use of a specific terminal would obviously depend on where new discoveries are made.
- 7.3 For example, if a field were found in the northern part of the SEA 5 area the oil would probably be landed at the Sullom Voe terminal in the Shetland Islands. Tanker loading would be the likely transport choice given the locations of the existing pipelines to Sullom Voe.
- 7.4 If a discovery were further south, the Flotta terminal in the Orkney Islands could be the preferred location. If it were in the Moray Firth, then the Nigg Bay terminal on the Cromarty Firth might be used.
- 7.5 If it were off the East Coast of Scotland there would be other options to take into account because Cruden Bay can only handle oil from pipelines and not from tankers. In this area, therefore, a link to one of the existing oil pipelines would be the likely transport choice.
- 7.6 Any new discoveries in the SEA 5 area are likely to use this existing infrastructure. Thus the socio-economic impacts will be **incremental** or **marginal**, to use the economics vocabulary, rather than the absolute impacts which would be expected from new discoveries in areas with no existing oil or gas infrastructure. We believe that it is very important to understand the incremental nature of any activity in the SEA 5 area.
- 7.7 As highlighted in Section 5, oil and gas production on the UKCS has declined in recent years and it seems to be widely accepted that both have passed their peaks. Similarly, there seems to be general agreement that both oil and gas production will continue to decline in the future, although there are different opinions about the rates of decline.
- 7.8 Consequently, throughput at all of the terminals has been declining. At some point in the future each of the terminals will become uneconomic because the operating costs will be too high. The Nigg terminal, for example, must be close to that situation.
- 7.9 Let us take the Sullom Voe terminal as the example. The throughput design capacity is 1.2 million barrels per day. The current throughput is about 500,000 bpd, which implies an utilisation rate of about 42%.
- 7.10 Table 7.1 sets out three throughput scenarios for the terminal. They are also illustrated in Figure 7.1.
- 7.11 The first scenario just includes the existing fields. It assumes that output/throughput from the East Shetland Basin fields will continue to decline at about –10% per year. This output could cease altogether by 2017.

7.12 The first scenario also includes output forecasts from the Schiehallion and Clair fields in the West of Shetland area. Overall, output from the existing fields is predicted to fall from about 500,000 bpd in 2002 to 315,000 bpd in 2012 and to 100,000 bpd in 2022.

Table 7.1
Forecasts of Sullom Voe oil throughput
 (thousands of barrels per day)

	2002	2007	2012	2017	2022
East Shetland	350	205	125	-	-
Schiehallion	150	150	90	50	-
Clair	-	60	100	100	100
sub-total	500	415	315	150	100
SEA 5 pessimistic	-	-	100	50	0
sub-total	500	415	415	200	100
SEA 5 optimistic	-	-	200	300	230
total	500	415	515	450	330

Figure 7.1
Forecasts of Sullom Voe oil throughput



7.13 We believe that this is a realistic scenario and consistent with the views of BP (their terminal operators) and partners. At some point in the future the terminal’s operating costs, as well as those of the Brent and Ninian pipeline systems, will rise to a level at which their operation would become unviable, and without new oil that seems likely to be before 2022.

7.14 Table 7.1 and Figure 7.1 also show our pessimistic SEA 5 scenario and the optimistic one. Under the pessimistic scenario throughput would be maintained at around 415,000 for a few years to 2012 but the impact would end in 2019. Under the optimistic scenario there would be an increase in throughput in the 2007-2012 period and it would still be relatively high in 2017.

- 7.15 We have just taken Sullom Voe as an example. Similar calculations could be made for the other terminals. They would likely show relatively greater beneficial impacts because their current throughputs are much smaller.
- 7.16 The impact of SEA 5 gas production should be much smaller than that of oil. There is only one gas terminal in Scotland at St Fergus, just north of Peterhead, and it is currently operating close to capacity, as indicated in Section 4. Thus the incremental impact there would be relatively small.
- 7.17 Although UKCS gas production is now declining, St Fergus is used to handle imported gas from Norway and that use is expected to increase in the future.
- 7.18 Because of the declines in UKCS oil and gas activity, most of the existing facilities in the SEA 5 area have spare capacity. Examples given in Section 4 include Sumburgh airport in Shetland, Peterhead harbour and Aberdeen harbour. All these facilities would welcome any additional business generated by SEA 5 activity.
- 7.19 That conclusion also applies to the development or construction phase of any SEA 5 activity. As mentioned in Section 4, there has been very little work over the last few years at the fabrication yards at Nigg and Ardersier in the Highlands and Methil in Fife. The fabrication industry would certainly welcome any new orders and that obviously applies also to a wide range of contractors and service companies.

[Implications for other industries](#)

- 7.20 Any new development will have impacts on other industries. The development will require inputs, both goods and services, from other businesses, so that their outputs will increase accordingly. If the development competes with existing businesses they may be adversely affected through loss of sales and lower outputs. There can also be external impacts such as pollution and noise.
- 7.21 Economists often distinguish between
- indirect effects and
 - induced effects.
- 7.22 The indirect or inter-industry effects arise from the purchases of goods and services (inputs) from other industries or businesses. The induced effects arise from the expenditure of people employed by the new development, which will increase trade for local shops etc.
- 7.23 A common way of calculating these effects is to apply **multipliers** to the direct impacts. These can be calculated by special survey work or by using appropriate multipliers from other studies. There have been many economic impact studies undertaken in Scotland, for both actual and proposed developments, so there is a large volume of data available.

Possible adverse impacts

- 7.24 It is possible that the development and operation of any SEA 5 fields will have adverse impacts on other industries, with fishing being the obvious example and tourism another one. Shetland was very badly affected by the Braer oil tanker disaster and local people are understandably concerned about possible oil spills at the Sullom Voe terminal or elsewhere.
- 7.25 The fishing industry has been covered in detail in other SEA 5 reports so we shall only make a few brief comments here. As mentioned earlier, the fishing sector – including fish catching, salmon farming and fish processing – is a very important part of the Shetland economy. It is also important in Caithness, with Scrabster having become one of the top four fishing ports in Scotland and in the North East. Peterhead is the biggest fishing port in the UK and Fraserburgh and Aberdeen also attract a large quantity of landings.
- 7.26 There is a wide variety of commercial fishing in the SEA 5 area. The main demersal (white) fishing is a mixed fishery targeting cod, haddock and whiting. This has been badly affected recently because of large declines in stocks and consequent large reductions in catch quotas set by the European Commission. There are also deeper water fisheries for species such as halibut, monkfish and saithe.
- 7.27 Pelagic fishing for herring and mackerel has become much more important recently and has helped to compensate for the decline in white fishing. That is particularly true in Shetland where there is a very large pelagic processing plant in Lerwick.
- 7.28 Shellfishing is also important in some of the SEA 5 area, with both mobile and static gear. The target species include nephrops, scallops, crab and lobster.
- 7.29 Fish farming is also very important economically. The Shetland Islands are one of the main centres for salmon farming in Scotland and there has been recent diversification into cod farming. Other farmed species in the SEA 5 area include mussels, oysters and scallops.
- 7.30 The main concern of local fishermen and fish farmers is the threat of oil spills, particularly in the light of the Braer disaster. Oil spills could occur at the fields – eg Foinaven and Schiehallion – at the Flotta and Sullom Voe terminals or somewhere in between. The fishermen and fish farmers appear to prefer pipeline transport to tanker loading.
- 7.31 It is important to remember that the Braer oil tanker had no connection with the local oil industry. Both the Sullom Voe and Flotta terminals, and the pipelines and tankers using them, have excellent records in relation to oil spills and pollution. Nevertheless, the fears of local fishermen and fish farmers are understandable.
- 7.32 There could also be other negative impacts from oil and gas operations. They include “loss of access” during seismic surveys, exploration drilling and production. However, given the forecast level of activity in the SEA 5 area, we do not believe this is a serious issue.
- 7.33 When we did the socio-economic impact study of the Clair field for BP, the local fishermen and fish farmers said that they wanted to be consulted about the proposed route of the pipeline from the field to the Sullom Voe terminal. That was also the case with the Magnus EOR gas pipeline. There would inevitably be disruption to fishing during pipelaying.

- 7.34 Any SEA 5 activity must take full account of these concerns, particularly in the light of the Braer disaster. However, the oil and fishing industries have worked well together over the past 25 years and there have been few problems. We believe that they can be kept to a minimum in the future.
- 7.35 Another industry which could be adversely affected by the oil industry is tourism, which is important in some parts of the SEA 5 area, notably the Highlands and Orkney. Oil spills could have negative impacts, as happened with the Braer disaster.
- 7.36 We do not believe that other economic activities in the area will be adversely affected by any SEA 5 developments.

8.0 IMPLICATIONS FOR EMPLOYMENT

- 8.1 The SEA 5 area will generate employment during the
- exploration
 - development
 - operational/production and
 - decommissioning
- phases. It is sensible to assess these impacts separately in the first instance and then aggregate them.
- 8.2 In economic impact studies it is common to distinguish between the
- direct
 - indirect and
 - induced
- impacts. We shall concentrate initially on the direct employment impacts and take account of the others later through the application of multipliers.

Exploration

- 8.3 The licensees will employ people for the duration of their licences, primarily through the operators. Initially their main task will be to assess the geology, decide on the seismic and other surveys and ultimately decide where to drill. The level of employment will obviously depend on the number of licences taken up and the number of firms involved.
- 8.4 We believe that a reasonable assumption is that there would be an average of about 100 employed in the first few years on SEA 5 work, before declining, as shown in Table 8.1. All the figures are in what could be called “job years”.
- 8.5 There would then be employment created by the seismic surveys and the exploration drilling. The pessimistic scenario involves four wells and the optimistic scenario eight wells. In Table 8.1 we have assumed that the eight wells will be drilled with two in each of the four years 2007-10. In the pessimistic scenario (Table 8.2) we have assumed one well in each of the four years.
- 8.6 On the assumption that the average exploration well will take two months and employ about 100 people, the optimistic scenario would generate an annual average of 40 jobs, and the pessimistic scenario 20 jobs. The jobs would only occur during the actual drilling periods, however. In Tables 8.1 and 8.2 we have added 10 and 5 respectively to take account of the seismic and other survey work.

Development

- 8.7 The development phase will involve the construction of the production facilities, pipelines and other equipment required. In Section 6 we estimated the capital expenditure of the pessimistic scenario as £1,350 million and that of the optimistic scenario as £7,015 million.
- 8.8 On the assumption that each £50,000 of capital or development expenditure creates one job (full-time equivalent) for one year, Tables 8.1 and 8.2 set out the development employment estimates. With the optimistic scenario there would be a total of 14,030 job years, with a peak of 4,200 in 2010. With the pessimistic scenario there would be 2,500 job years, with a peak of 700 in 2010.

Production

- 8.9 Our production/operating employment estimates are based on the actual experience of comparable existing fields. For the optimistic scenario the peak employment is 850 and for the pessimistic scenario 240.

Decommissioning

- 8.10 Finally, there is the employment which will be generated by the decommissioning work at the end of the lives of the various fields. This will be on a relatively small scale.

Employment estimates

- 8.11 The total employment, year by year, is shown in the tables and also in Figure 8.1. For the optimistic scenario the overall total is 31,830 person years, with a peak of 4,675 in 2010. For the pessimistic scenario the overall total is 5,460 person years, with a peak of 985 in 2010.

Figure 8.1
SEA 5 employment scenarios
(job years)

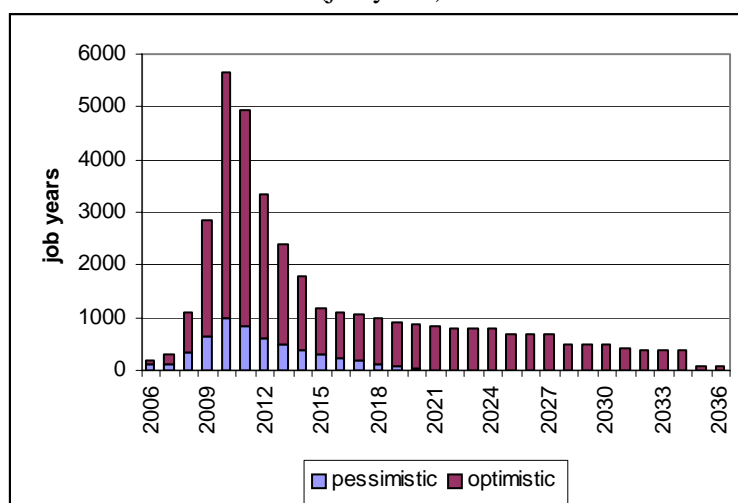


Table 8.1
SEA 5 employment: optimistic scenario

	Licence operations	Exploration	Development	Production	Decommissioning	Total
2006	100	-	-	-	-	100
2007	100	75	-	-	-	175
2008	100	75	600	-	-	775
2009	100	75	2030	-	-	2205
2010	100	75	4200	300	-	4675
2011	50	-	3600	450	-	4100
2012	50	-	2100	600	-	2750
2013	50	-	1000	850	-	1900
2014	50	-	500	850	-	1400
2015	50	-	-	850	-	900
2016	-	-	-	850	-	850
2017	-	-	-	850	-	850
2018	-	-	-	850	-	850
2019	-	-	-	850	-	850
2020	-	-	-	850	-	850
2021	-	-	-	850	-	850
2022	-	-	-	800	-	800
2023	-	-	-	800	-	800
2024	-	-	-	800	-	800
2025	-	-	-	700	-	700
2026	-	-	-	700	-	700
2027	-	-	-	700	-	700
2028	-	-	-	500	-	500
2029	-	-	-	500	-	500
2030	-	-	-	500	-	500
2031	-	-	-	400	-	400
2032	-	-	-	300	90	390
2033	-	-	-	300	90	390
2034	-	-	-	300	90	390
2035	-	-	-	-	90	90
2036	-	-	-	-	90	90
2037	-	-	-	-	-	-

Table 10.2
SEA 5 employment : pessimistic scenario

	Licence operations	Exploration	Development	Production	Decommissioning	Total
2006	100	-	-	-	-	100
2007	100	25	-	-	-	125
2008	100	25	200	-	-	325
2009	100	25	400	120	-	645
2010	100	25	700	160	-	985
2011	50	-	600	200	-	850
2012	50	-	300	240	-	590
2013	50	-	200	240	-	490
2014	50	-	100	240	-	390
2015	50	-	-	240	-	290
2016	-	-	-	240	-	240
2017	-	-	-	180	25	205
2018	-	-	-	100	25	125
2019	-	-	-	50	25	75
2020	-	-	-	-	25	25
2021	-	-	-	-	-	-

- 8.12 Regarding overall UKCS employment, the DTI Oil and Gas website states that “the Office for National Statistics (ONS) give figures for employment classified to the oil and gas extraction sector, which includes not only those engaged in extraction offshore and onshore but also certain classes of services peculiar to the industry. Many oil-related jobs such as construction workers are classified to other industries and are not included in ONS figures. Revised figures from ONS show employment rising from 29,300 in 1978 to peak at just over 40,000 in 1991, before falling sharply to below 28,000 in 1994 and 1995. Oil-related employment recovered to remain mainly within the range 30,000 and 32,000 from 1996 onwards”.
- 8.13 Further, “figures for offshore employment have been collected since 1967. The first annual surveys collected only numbers employed offshore on rigs and platforms and showed employment at just over 1,000 workers in 1967, rising steadily through the 1970s to 12,500 in 1978, before falling back in 1979. From 1980 onwards the survey included workers on pipe-laying vessels, crane barges, supply and standby vessels. The new survey showed offshore employment at 22,000 workers in 1980, rising to 31,300 in 1984, before slumping to near 22,000 in 1986. Offshore employment rose again to peak at 36,500 in 1990, after which there was a general downward trend with attempts to reduce costs”.
- 8.14 The latest survey shows offshore employment at 18,900 in February 2003, compared with 22,200 in August 2002.
- 8.15 The DTI website also states that “a study commissioned by UKOOA and summarised in the UKOOA Economic Report 2002 shows that some 265,000 jobs were supported by the offshore oil and gas industry in 2001. This total included some 104,000 jobs in the oil and gas industry and its direct suppliers, some 67,000 in the rest of the supply chain, and a further 94,000 jobs dependent on the spending of employment income by those in the 171,000 directly and indirectly supported jobs. Around 31% of these jobs were in Scotland and 26% in London and the South East, but oil-related jobs exist in almost every part of the country. This means that some 6% of the Scottish workforce are dependent on the oil and gas industry”.
- 8.16 Given the earlier forecasts of declining production and expenditure on the UKCS, it would be reasonable to expect employment also to decline in the future. In that context the employment created by SEA 5 activity will help to slow down the rate of decline.

[Multiplier employment](#)

- 8.17 As mentioned above, it is common in economic impact studies to distinguish between the
- direct
 - indirect and
 - induced
- impacts.
- 8.18 Indirect impacts arise from the oil and gas industry’s purchases of goods and services from other industries. Such expenditure creates employment in other industries.
- 8.19 Induced impacts arise from the expenditure of those people directly employed in the oil and gas industry. They spend their incomes in local shops and on local services, for example, and that creates additional employment.

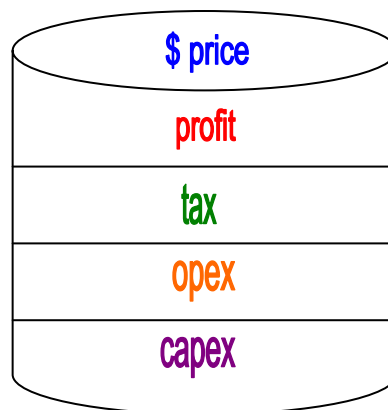
- 8.20 A common way of estimating the indirect and induced employment is to apply a multiplier to the direct employment. From other impact studies we have done, we would expect the multiplier for the oil and gas industry in Scotland to be in the range 1.75 to 2.0.
- 8.21 Thus if we take the peak production employment of 850 in the optimistic scenario, the indirect and induced employment is likely to be in the range 640-850, giving an overall total of 1,490-1,700. Similarly for the pessimistic scenario, the peak production employment of 240 is likely to create another 180-240 jobs, giving an overall total of 420-480.
- 8.22 The multipliers could also be applied to the licence operations and exploration employment, but not to the development phase employment. The latter employment is created by the purchase of goods and services by the oil and gas industry, so it is part of the multiplier impacts.
- 8.23 The UKOOA study mentioned above refers to 104,000 direct jobs and 265,000 total jobs, implying a multiplier of over 2.5. That seems very high to us. The UK multiplier will be higher than the equivalent Scottish multiplier. However, the study for UKOOA used a very unusual definition of direct employment and we believe that a multiplier of about 2.0 is appropriate in the present context.

9.0 IMPLICATIONS FOR TAX REVENUES

9.1 The implications for tax revenues are difficult to estimate because they will depend very much on the level of prices during the lifetimes of the various fields. They have fluctuated considerably in recent years and are likely to do so in the future.

9.2 The diagram below breaks down the price of a barrel of oil into its four key components, namely:

- capital expenditure
- operating expenditure
- tax payments
- profits.



9.3 It would be possible to model each of the SEA 5 fields separately but that would be complicated and we do not believe it is necessary. We believe that the following approach is acceptable for this part of the study.

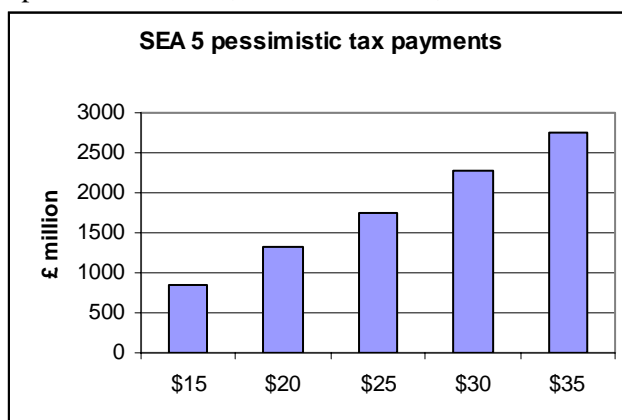
9.4 Let us assume that the capital and operating costs do not vary with the price of oil – in other words, they are constants. We estimate that the capital cost of the SEA 5 fields over their lifetimes will average \$3.10 per barrel (in 2003 values) and the operating cost \$2.90, giving a total of \$6.00 (approximately £4) per barrel of oil produced.

9.5 The UK corporate income tax rate is currently 40%, so the division of the “economic surplus” will be 40% for the Exchequer and 60% for the SEA 5 licensees.

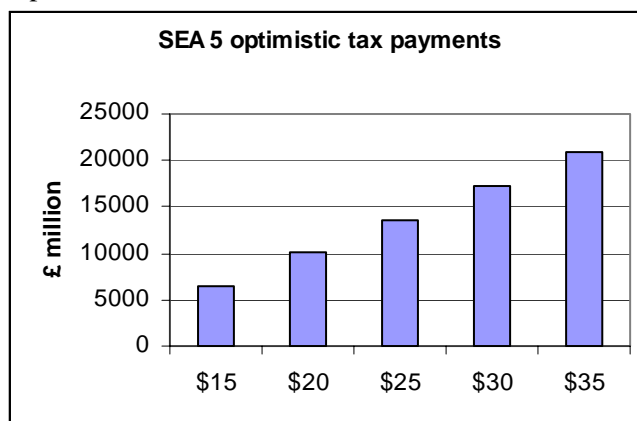
9.6 If the oil price averages \$10 per barrel there is then a \$4 “surplus” remaining to be divided between the companies and the government. At \$10 per barrel the division will be \$2.40 and \$1.60 respectively.

9.7 If the average oil price rises to \$15 per barrel, the surplus actually rises by \$5 because the costs remain the same; and similarly at \$20, \$25 and so on. We have assumed that the tax take will be \$1.60 per barrel at \$10, \$3.60 at \$15, \$5.60 at \$20, \$7.60 at \$25, \$9.60 at \$30 and \$11.60 at \$35 per barrel.

- 9.8 As set out in Section 5, the pessimistic scenario assumes oil production of 31.0 million tonnes and gas production of 21.5 billion cubic metres. The latter is equivalent to about 19.4 mt oil, using a conversion factor of 0.9. That gives an overall total of 50.4 mt oil equivalent or 378 million barrels.
- 9.9 The optimistic scenario assumes oil production of 218.75 mt and gas production of 183 bcm, giving a combined total of 383.4 mt oil equivalent or 2875.5 mb.
- 9.10 Oil is usually priced in US dollars so we need to convert the revenue into £. In the SEA 4 report in 2003 we used an exchange rate of £1 = \$1.50. At the time of writing (13th February 2004), however, the exchange rate is £1 = \$1.89. The US authorities have encouraged the fall of the dollar against most other currencies, including sterling.
- 9.11 We do not believe, however, that a rate of \$1.89 is the appropriate one to use for long term projections. We suggest that \$1.60 is more appropriate.
- 9.12 It is also necessary to make assumptions about oil prices. Over the last six years North Sea prices have fluctuated between \$9 and \$36 per barrel. They have been relatively high for the last few years and at the time of writing (February 2004) Brent crude was selling at about \$30 per barrel.
- 9.13 Given the volatility we have used a range of five prices from \$15 to \$35 per barrel in the following analysis.
- 9.14 Using the above assumptions, the pessimistic scenario would generate tax revenues of
- at \$15 price \$1,361 million = £851 million
 - at \$20 price \$2,117 million = £1,323 million
 - at \$25 price \$2,873 million = £1,739 million
 - at \$30 price \$3,629 million = £2,268 million
 - at \$35 price \$4,385 million = £2,741 million.



- 9.15 The optimistic scenario would generate tax payments of:
- at \$15 price \$10,352 million = £6,470 million
 - at \$20 price \$16,102 million = £10,064 million
 - at \$25 price \$21,854 million = £13,659 million
 - at \$30 price \$27,605 million = £17,253 million
 - at \$35 price \$33,356 million = £20,848 million.



- 9.16 These estimates are the undiscounted totals over the lifetimes of the SEA 5 fields.
- 9.17 They demonstrate the importance of the oil price. The key point to stress is that the tax take increases at a much higher rate than the rise in prices.
- 9.18 The actual level of prices over the lifetime of the SEA 5 fields will be “anybody’s guess” and will undoubtedly fluctuate from year to year. Of the five prices used above, the most realistic, on present evidence, is probably an average of \$25 per barrel. At that level the SEA 5 fields would generate tax revenues of approximately
- (a) pessimistic scenario £1,739 million
 - (b) optimistic scenario £13,659 million.

- 9.19 The \$:£ exchange rate will also be an important factor. Taking the above estimate for the optimistic scenario, changes in the actual average exchange rate would result in the following:

exchange rate	\$1.50	\$1.60	\$1.70	\$1.80	\$1.90	\$2.00
tax revenue	14,569	13,659	12,855	12,141	11,502	10,927

- 9.20 These estimates are undiscounted. If a discount rate of 10% were used, the net present value of the pessimistic scenario of £1,739 million would be approximately £950 million, with an average annual tax payment of £95 million over ten years. The NPV of the optimistic scenario would be approximately £4,500 million, with an average annual tax payment of £180 million over 25 years.
- 9.21 According to the DTI website, UK oil and gas production contributed £4,905 million in taxes and royalties in the 2002-3 financial year, compared with £5,261 million in 2001-2 and £4,453 million in 2000-1.

- 9.22 The tax revenues will almost certainly decline over the next few years, as a consequence of falling oil and gas production, although oil prices and the £:\$ exchange rate will be very important factors. If the revenues averaged £1,000 million per year when the SEA 5 fields are in production, then the optimistic scenario would account for 18.0% of that total and the pessimistic scenario 9.5%.

10.0 SOCIAL IMPLICATIONS

- 10.1 As with the economic impacts, the social impacts are likely to be incremental or marginal, rather than absolute. Much of the SEA 5 area has been involved with the oil and gas industry for over 25 years – notably the Aberdeen area, Peterhead, the Cromarty Firth, Orkney and Shetland. People living in these areas are accustomed to the industry so there are unlikely to be any significant new social impacts, either positive or negative.
- 10.2 The SEA 5 area is a very large area, encompassing the whole of the East Coast of Scotland plus the Northern Isles, so it is very difficult to generalise about the social impacts. They would be very different if a new development occurred in the Aberdeen area rather than the Shetland Islands, for example.
- 10.3 Given the history of the North Sea oil and gas industry in the area, we would not expect any significant problems of social integration. Many of the people working in the industry are “incomers”, eg at the Sullom Voe and Flotta terminals, who have settled in the local communities. The Aberdeen area, particularly the commuter belt in Aberdeenshire, has experienced a high level of oil-related immigration over the past 25 years.
- 10.4 An important factor is the ongoing population decline in some parts of the SEA 5 area, notably in Shetland and Orkney. The main social impacts there could be to slow down the rate of population decline and to help retain people in these areas. The creation of new jobs or the retention of existing jobs could help to do that.
- 10.5 Declining populations have negative implications for a wide range of social services such as education and health. Many of the settlements in the SEA 5 area are small so the declining populations may imply closures of schools, medical facilities and other services. Thus the SEA 5 developments could help to prevent or delay such closures.
- 10.6 This conclusion would not apply to the more populous areas, notably Aberdeen, of course. The relative magnitudes will be very important.
- 10.7 There were undoubtedly substantial social impacts generated by the North Sea oil and gas developments in the 1970s and early 1980s but we believe that any impacts generated by Sea 5 activity will be on a much smaller scale.

11.0 CONCLUSIONS

- 11.1 The purpose of this report has been to assess the potential socio-economic impacts of licensing the SEA 5 area. This has been done in relation to:
- oil and gas production, and reserves
 - capital, operating and decommissioning expenditure
 - employment
 - tax revenue.
- We have also assessed the implications for existing facilities.
- 11.2 The Department of Trade and Industry provided scenarios of possible activity in the area. We converted those into “pessimistic” and “optimistic” scenarios, which have been used in each of the sections.
- 11.3 The SEA 5 area is a very large area, encompassing the whole of the East Coast of Scotland plus the Northern Isles. That makes it very difficult to generalise about the impacts because they would be very different if they occurred in Shetland, for example, compared with Aberdeen.
- 11.4 Another important factor is that the North Sea oil and gas industry is now well established in many parts of the SEA 5 area. Areas such as Aberdeen, Peterhead, the Cromarty Firth, Orkney and Shetland have been involved with the industry for over 25 years.
- 11.5 A key point to stress therefore is that, to a very large extent, the socio-economic impacts of activity in the SEA 5 area will be
- **incremental**
- or **marginal** (in the economics jargon) rather than absolute. In other words, the impacts will be very different from those which would have occurred if there had been no existing or previous oil and gas-related activity in the area.
- 11.6 A second key point is that existing oil and gas activity in Scotland is declining, as a consequence of falling oil and gas production, and also falling expenditure on the UKCS. Thus the main impacts of SEA 5 activity will be to slow down the declines in the various variables.
- 11.7 The implications for oil and gas production and reserves were discussed in Section 5. The pessimistic scenario assumes that one SEA 5 field would produce 31.0 million tonnes of oil over ten years, with peak output of 100,000 barrels per day (bpd). The optimistic scenario assumes that three SEA 5 fields would produce 218.8 million tonnes of oil over 25 years, with peak output of 300,000 bpd.
- 11.8 In Section 5 we also gave forecasts of UKCS oil production, with the main assumption being an average annual decline of –5%. Under the pessimistic scenario production would continue to decline but would be slowed down. For example, in 2014 it would be +8.8% higher with SEA 5 production than it would otherwise have been.
- 11.9 The optimistic SEA 5 scenario gives a significantly different picture. Production would actually increase in 2012 and 2013 before the decline resumed. For the six years 2010-2015 production would be relatively stable at around 70 mt per year (1.4 million bpd).

- 11.10 For the pessimistic scenario we have assumed a small level of gas production, reaching a peak of 3.0 billion cubic metres (bcm). Gas fields usually produce for much longer than oil fields so we have assumed production for 25 years, ending in 2034. For the optimistic scenario we have assumed a much higher peak of 10.0 bcm, with the same time profile.
- 11.11 UKCS gas production is now declining. The forecasts in Section 5 show that continuing at an annual average of -3.0% to 2010 and by -5.0% after that year.
- 11.12 SEA 5 gas production would begin in 2010. Under the pessimistic scenario total UKCS output would continue to decline, so the impact of SEA 5 would be just to slow down the rate of decline. In 2012 the difference in output would be about 3.9% higher and in 2021 about 5.9% higher.
- 11.13 Under the optimistic scenario there could be a year or two when total UKCS gas production actually rose. Table 5.3 shows that occurring in 2012. However, the main impact of SEA 5 output would again be to slow down the overall rate of decline. In 2012 the difference in output would be about +13.0% higher and in 2021 about +20.6% higher.
- 11.14 Regarding reserves, our assumptions for the two scenarios are:
- | | <u>oil (mt)</u> | <u>gas (bcm)</u> |
|-------------|-----------------|------------------|
| pessimistic | 31.0 | 21.5 |
| optimistic | 227.75 | 183.0 |
- 11.15 The DTI's Oil and Gas website gives various statistics on UKCS recoverable reserves. For oil they are (in million tonnes):
- | | |
|----------------------|-------------|
| discovered | 3,390-4,145 |
| potential additional | 90-490 |
| undiscovered | 270-1,770 |
| total | 3,750-6,405 |
- 11.16 It is the "undiscovered" reserves which are relevant in the present context. The range is inevitably wide but if we take the mid-point of 1,020 million tonnes, our optimistic assumption is 22.3% of that and our pessimistic assumption is 3.0% of that. In other words, the SEA 5 area could account for up to 22.3% of the UKCS oil reserves yet to be discovered.
- 11.17 The DTI's estimates of the UKCS recoverable gas reserves (in billion cubic metres) are:
- | | |
|----------------------|-------------|
| discovered | 2,355-3,055 |
| potential additional | 70-265 |
| undiscovered | 235-1,390 |
| total | 2,660-4,710 |
- 11.18 The mid-point of the "undiscovered" reserves range is approximately 815 bcm. Our optimistic assumption is 22.5% of that and our pessimistic assumption 2.6%. In other words, the SEA 5 area could account for up to 22.5% of the UKCS gas reserves yet to be discovered.
- 11.19 In Section 6 we considered the implications for capital, operating and decommissioning expenditure. The pessimistic scenario involves capital expenditure of £1,350 million and the optimistic scenario £7,015 million.

- 11.20 Total UKCS expenditure is now declining. The forecasts in Section 6 assume an average annual decline of –10%.
- 11.21 With the pessimistic scenario, the SEA 5 expenditure accounts for 22.6% of the Rest of the UKCS forecast in 2010 and 21.5% in 2011. Even the pessimistic scenario, therefore, would account for a substantial proportion of total capital expenditure during the seven year development period.
- 11.22 Expenditure under the optimistic scenario would actually exceed the Rest of the UKCS in 2011 and 2012. The £7,015 million total compares with £9,975 million for the Rest of the UKCS during the 2008-14 period.
- 11.23 These estimates suggest that SEA 5 capital expenditure would be very important during a period when development activity on the rest of the UKCS was declining. UK-based suppliers of FPSO and subsea equipment, installation contractors, supply boat and helicopter operators etc would all be very keen to win work for the SEA 5 fields, particularly if their other markets were declining and they had spare capacity.
- 11.24 Similar calculations of operating expenditure are given in Section 6. Under the pessimistic scenario SEA 5 expenditure would reach a peak of 6.3% of the UKCS total in 2014.
- 11.25 Under the optimistic scenario it would reach a peak of 17.3% in 2021. The proportion would be relatively stable at over 15% for the thirteen years 2013-25. It would then fall in line with the forecast declines in SEA 5 oil and gas production.
- 11.26 In Section 7 we discussed the implications for existing facilities. The main impacts would come from the development and operation of new fields in the SEA 5 area. The development or construction impacts would last for just a few years but the operational impacts could last for many years.
- 11.27 The SEA 5 area is very large, however, so the impacts on existing facilities will depend to a great extent on where any new fields are actually located. For example, there are four onshore oil terminals in the SEA 5 area at Sullom Voe, Flotta, Nigg and Cruden Bay/Hound Point. All would welcome new business from new fields but the use of a specific terminal would obviously depend on where new discoveries are made.
- 11.28 Throughput at all of the terminals has been declining because of falling UKCS output and they all have spare capacity. Any SEA 5 production would improve their economics and probably extend the facility's productive life.
- 11.29 The impact of SEA 5 gas production should be much smaller than that of oil. There is only one gas terminal in Scotland at St Fergus, just north of Peterhead, and it is currently operating close to capacity, as indicated in Section 4. Thus the incremental impact there would be relatively small.
- 11.30 Although UKCS gas production is now declining, St Fergus is used to handle imported gas from Norway and that use is expected to increase in the future.

- 11.31 Because of the declines in UKCS oil and gas activity, most of the existing oil-related facilities in the SEA 5 area have spare capacity. Examples given in Section 4 include Sumburgh airport in Shetland, Peterhead harbour and Aberdeen harbour. All these facilities would welcome any additional business generated by SEA 5 activity.
- 11.32 In Section 7 there was a brief discussion of possible adverse impacts on other industries, with fishing being the obvious example and tourism another. The main concern of local fishermen and fish farmers is the threat of oil spills. There can also be disruption during pipelaying and “loss of access” attributable to platforms and other facilities.
- 11.33 The implications for employment were considered in Section 8. The pessimistic scenario is expected to create 5,460 person years of employment, with a peak of 985 in 2010. For the optimistic scenario the overall total is 31,830 person years, with a peak of 4,675 in 2010.
- 11.34 Section 9 considered the implications for tax revenues. They will depend to a large extent on the future levels of oil prices, which are extremely difficult to predict.
- 11.35 Different prices were used in the analysis. At US \$25 per barrel the pessimistic scenario is predicted to generate about £1,750 million in tax revenues and the optimistic scenario about £13,650 million.
- 11.36 The tax revenues will almost certainly decline over the next few years, as a consequence of falling oil and gas production, although oil prices and the £:\$ exchange rate will be very important factors. If the revenues averaged £1,000 million per year when the SEA 5 fields are in production, then the optimistic scenario would account for 18.0% of that total and the pessimistic scenario 9.5%.
- 11.37 Finally, we made a few comments on social implications in Section 10. The population of the SEA 5 area has declined in recent years and will probably continue to do so. Thus the main social impact of any SEA 5 developments could be to slow down the rate of population decline and help retain education, health and other social services in the area.

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