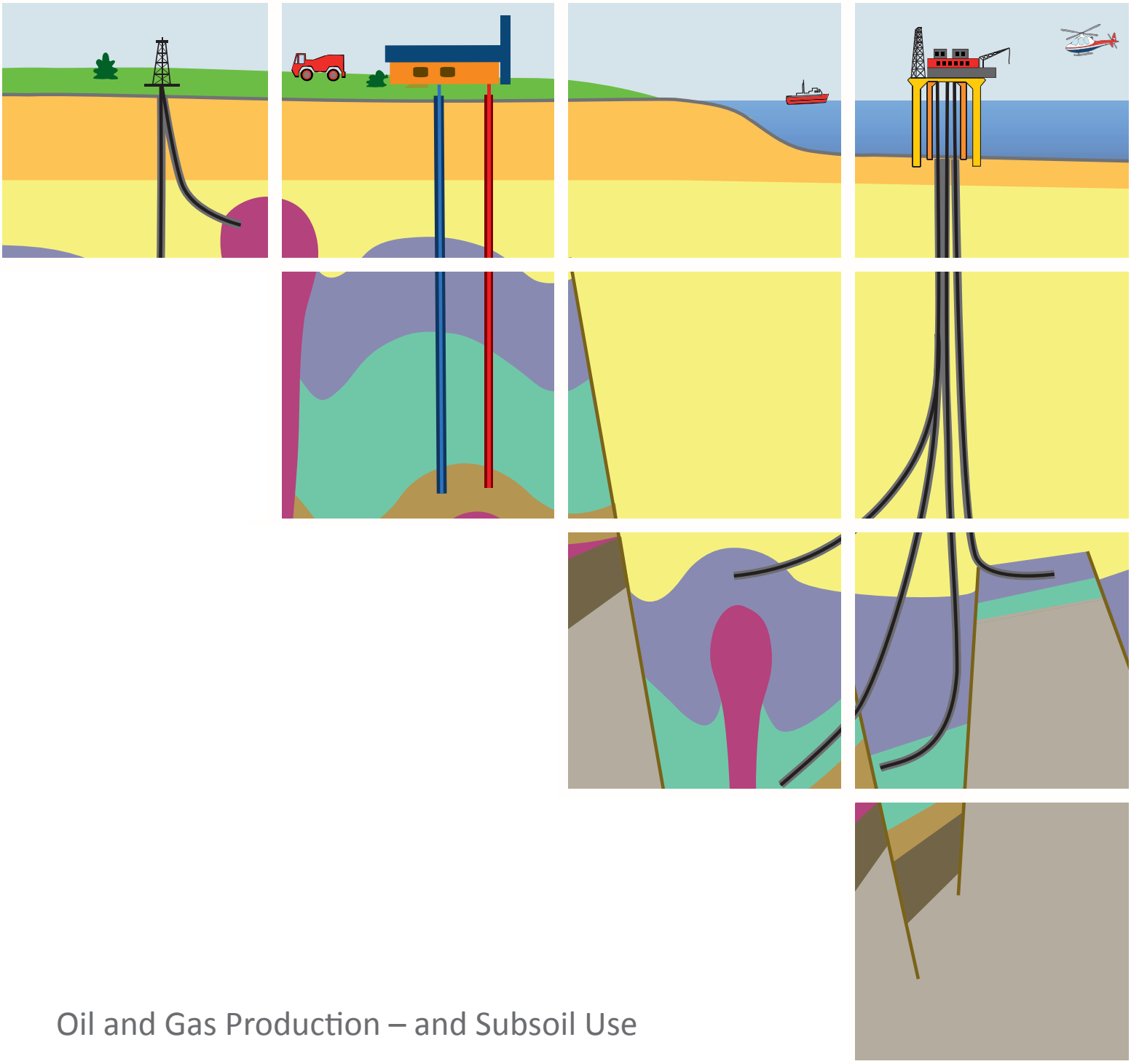

Oil and Gas Production – and Subsoil Use

OIL AND GAS PRODUCTION IN DENMARK 2011

DANISH ENERGY AGENCY

PREFACE

The publication of this year's report on Denmark's oil and gas production almost coincides with the 40th anniversary of the first Danish oil from the Dan Field, which began producing in July 1972. Since then, the search for new oil and gas fields has brought about a multitude of activities as well as major investments in the establishment of North Sea production facilities.

The two exploration wells drilled in the North Sea in 2011 made two new discoveries, including one in subsoil layers where no oil or gas had previously been found. This underpins the continued potential for making oil and gas discoveries in Denmark and could thus heighten the interest in new licences for oil and gas exploration and production. The Danish Energy Agency is preparing a new licensing round in the western part of the North Sea, with the aim of inviting applications for areas in 2013.

New production facilities are also established on an ongoing basis. Thus, a new plan for initiating oil and gas production from the Hejre Field was approved in 2011. This new field is expected to come on stream in 2015.

The action plan to strengthen measures for reducing energy consumption on the North Sea production installations has had beneficial effects. The volume of CO_2 emissions has fallen considerably, and the initiatives to reduce energy consumption will continue in the years to come.

Attention continues to be focused on ensuring high health and safety standards for the almost 3,000 people who have their workplace on offshore installations in the North Sea. Through inspections and dialogue with the companies, the Danish Energy Agency continuously strives to ensure that the health and safety level remains among the highest in the North Sea countries. Despite a slight increase in 2011, the accident frequency for the North Sea production installations has declined in the past decade, and the risk-reducing initiatives launched by operators are expected to maintain this downward trend. The offshore accident frequency is much lower than in many onshore industries.

Recovering geothermal heat from the Danish subsoil for district heating purposes holds potential that is gaining increasing interest. Today, two plants are producing geothermal heat, and a new plant is currently under construction. In 2011, three new licences to explore for and produce geothermal heat were issued, and several applications for licences are under consideration. The production of geothermal heat for district heating purposes may further aid Danish district heating production in its transition to greener technology.

The format of "Denmark's Oil and Gas Production" is currently undergoing change. After being published in a printed version since 1986, this year's report will be published solely at the Danish Energy Agency's website, www.ens.dk, and thus not be available in print.

Copenhagen, May 2012

Ib Larsen

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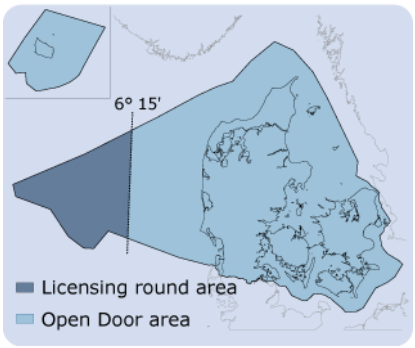
1 LICENCES AND EXPLORATION

Fig. 1.1 The Danish licence area



Exploration activity in Denmark remained high in 2011. Two onshore wells were drilled, and in the North Sea two wells were drilled in the Central Graben. Both of the wells drilled in the Central Graben encountered hydrocarbons. One discovery, Lille John, was made in Miocene strata, which is the first time that hydrocarbons have been found in strata from this epoch.

The Danish Government wishes to ensure that the oil and gas resources existing in the Danish subsoil are utilized optimally and has therefore started preparations for the 7th Licensing Round in the North Sea.

NEW NORTH SEA LICENSING ROUND IN 2013

In Denmark, the area west of 6° 15' eastern longitude is generally offered for licensing in licensing rounds (see figure 1.1 and box 1.1), while the rest of the Danish licensing area is offered for licensing according to the Open Door procedure (see figure 1.1 and box 1.2). The most recent licensing round, the 6th Round, was held in 2005-2006. Since then, there has been a high degree of exploration activity under the 14 licences issued in the Round. Some of the 6th Round licences have been relinquished, while discoveries are being evaluated or additional exploration activities being carried out in the remaining licence areas.

The DEA is preparing a new licensing round for the above-mentioned area, with the aim of initiating the 7th Danish Licensing Round in 2013. The Minister for Climate, Energy and Building will announce the timing and terms and conditions of the 7th Licensing Round, and the invitation will be published in the Official Journal of the European Union and the Danish Official Gazette.

As part of the preparations for a new licensing round, a strategic environmental assessment (SEA) will be performed of the licensing round area. The results of this SEA will be taken into account when drafting the terms and conditions for the 7th Round.

There are still many interesting exploration prospects in the Danish sector of the North Sea. Although the licensing round area must be considered mature, various exploration targets that have not been intensively explored still remain. In recent years, increased focus has been placed on sandstone of Late and Middle Jurassic age, and the Geological Survey of Denmark and Greenland (GEUS) has launched a major project to shed light on Jurassic exploration potential. However, younger parts of these strata may also contain interesting prospects. Several oil companies are currently evaluating discoveries in strata of Paleogene age just above the chalk and in even younger strata of Neogene age; see appendix E.

MINI LICENSING ROUND AT SIRI AND NINI

It is planned to invite applications for an area at the Siri and Nini Fields in the North Sea in a so-called mini licensing round, comprising a limited area only; see figure 1.2. The usual procedure for granting licences for areas west of 6° 15' eastern longitude is to hold actual licensing rounds; see box 1.1.

In 2011, the DEA received an uninvited application for a licence to explore for and produce hydrocarbons in the relevant area. Because of the expected useful life of the infrastructure surrounding this area, discovering and exploiting more accumulations in the area is a matter of urgency. Therefore, the Minister decided that the application should be considered. According to the provisions of the Subsoil Act,

the Minister must publish a notice inviting applications for the relevant area in the Danish Official Gazette and the Official Journal of the European Union. The Subsoil Act provides that applicants must be given a period of at least 90 days from the publication of the licensing terms and conditions.

Box 1.1

Facts about licensing in the Danish sector of the North Sea

The area in the Danish sector of the North Sea west of 6° 15' eastern longitude is offered for licensing after a public invitation of applications in a so-called licensing round. The terms and conditions of the licensing round are published in the Official Journal of the European Union and the Danish Official Gazette at least 90 days before the deadline for submitting applications. The letter inviting applications and information about terms and conditions and unlicensed areas, etc. can subsequently be found at the DEA's website, www.ens.dk.

In pursuance of section 5 of the Danish Subsoil Act, the Minister for Climate, Energy and Building issues the licences. Emphasis is placed on the following:

- that the applicants have the necessary expertise and financial resources;
- that society gains maximum insight into and benefit from the activities under the licence;
- the exploration activities that the applicants offer to carry out.

Moreover, the Minister may set up other relevant, objective and non-discriminatory selection criteria.

Before granting a licence, the Minister must submit the matter to the Climate, Energy and Building Committee of the Danish Parliament.

Exploration licences are granted for a term of up to six years. The individual licences include a work programme describing the exploration work that the licensee is obliged to carry out.

The most recent licensing round in Denmark, the 6th Round, was held in 2006. Thus, the licensing round planned for 2013 will be termed the 7th Round.

In cooperation with the Geological Survey of Denmark and Greenland (GEUS) and the Danish North Sea Found, the DEA has launched a website where all information about the 7th Round will be posted as soon as it becomes available. The address of the website is www.oilgasin.dk.

Fig. 1.2 Mini licensing round area

NEW LICENCES

On 27 January 2011, the Minister for Climate and Energy granted a new exclusive licence for hydrocarbon exploration and production to Altinex Oil Denmark A/S, which has a 47 per cent share, Elko Energy A/S, which has a 33 per cent share, and the Danish North Sea Fund, which has a 20 per cent share. The licence was granted on the basis of an application for a so-called neighbouring block submitted by the above-mentioned companies, which also hold the adjacent licence 2/05. The new licence covers an area of the North Sea west of licence 2/05; see figure 1.3.

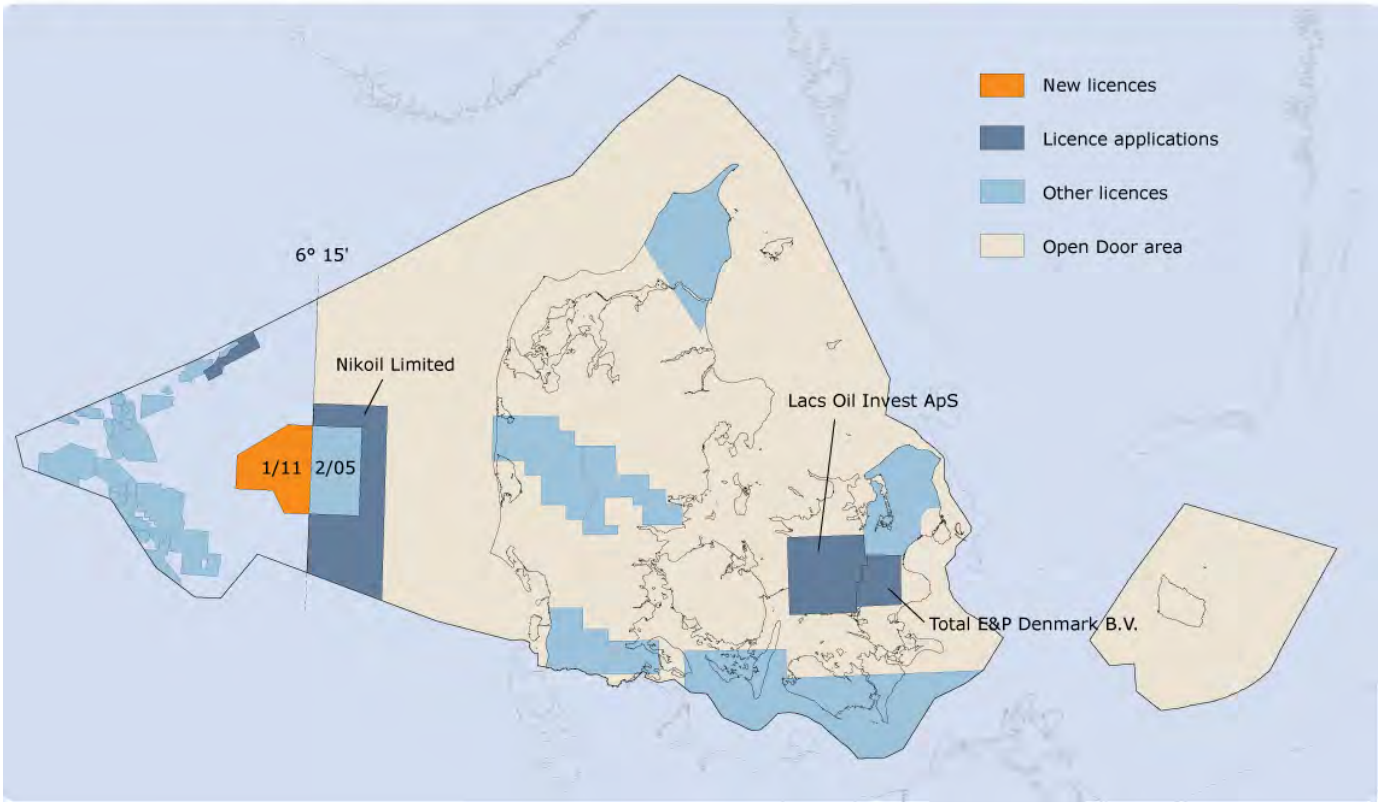
APPLICATIONS UNDER CONSIDERATION

In May 2011, Lacs Oil Invest ApS submitted an application for a licence to explore for and produce hydrocarbons in western Zealand in the Open Door area.

In March 2012, the DEA received another two Open Door applications. Nikoil Limited, a company incorporated in the UK, submitted an application for an area in the North Sea on 7 March 2012. On 8 March 2012, Total E&P Denmark B.V., a company incorporated in the Netherlands, applied for an area in southeastern Zealand.

Figure 1.3 shows the areas for which applications have been submitted.

Fig. 1.3 New licences and applications for licences



AMENDED LICENCES

All contemplated licence transfers and extensions and the associated conditions must be submitted to the DEA for approval.

The outline of licences on the DEA's website at www.ens.dk is continually updated and describes all amendments in the form of extended licence terms, the transfer of licence shares and relinquishments.

The maps of the licence areas in appendices F1 and F2 show the licences as at the end of March 2012.

Transferred licences

GMT Exploration Company reduced its share of Open Door licence 2/07 from 55 per cent to 40 per cent. Jordan Dansk Corporation took over the 15 per cent share with retroactive effect from 1 January 2010, thus increasing its licence share to 40 per cent.

With retroactive effect from 21 September 2010, GMT Exploration Company transferred its 40 per cent share to GMT Exploration Company Denmark ApS, which also took over the operatorship for the licence.

Effective 1 January 2010, Jordan Dansk Corporation transferred its 40 per cent share to JOG Corporation (25 per cent), Dunray, LLC (5 per cent), Armstrong Dansk, LLC (5 per cent) and Jimtown Ranch (5 per cent).

Effective 22 September 2011, GMT Exploration Company Denmark ApS transferred a 2.5 per cent share to JOG Corporation, thus reducing its share to 37.5 per cent.

On 10 March 2011, the DEA approved the transfer of operatorship from Elko Energy A/S to Altinex Oil Denmark A/S under Open Door licence 2/05. The transfer became effective on the date of approval.

Spyker Energy SAS has transferred its 16 per cent share of licence 12/06 in the Central Graben to Danoil Exploration A/S (8 per cent) and to Spyker Energy ApS (8 per cent). The transfer to Danoil became effective on 1 January 2011, while the transfer to Spyker Energy ApS became effective on 11 March 2011.

Altinex Oil Denmark A/S transferred its 6.56250 per cent share of licence 7/89, comprising the South Arne Field, to Hess Denmark ApS (+4.03697 per cent), DONG E&P A/S (+2.41430 per cent) and Danoil Exploration A/S (+0.11123 per cent) with effect from 1 January 2011.

Effective 1 October 2011, New World Operations ApS took over the operatorship for Open Door licences 1/09 and 2/09 from Danica Jutland ApS.

DONG E&P A/S took over Altinex Oil Denmark A/S' 20 per cent share of licence 6/95, comprising the Siri Field, with effect from 30 June 2011. As of the same date, DONG E&P A/S took over the company Siri (UK) Limited from Noreco, the parent company of Altinex. Siri (UK) Limited had a 30 per cent licence share, and following the above-mentioned acquisition, DONG E&P A/S now holds a 100 per cent share of licence 6/95.

Box 1.2

Open Door procedure

In 1997, an Open Door procedure was introduced for all unlicensed areas east of 6° 15' eastern longitude, i.e. the entire Danish onshore and offshore areas with the exception of the westernmost part of the North Sea. The Open Door area is shown in figure 1.1 and appendix G1. In the westernmost part of the North Sea, applications are invited in licensing rounds.

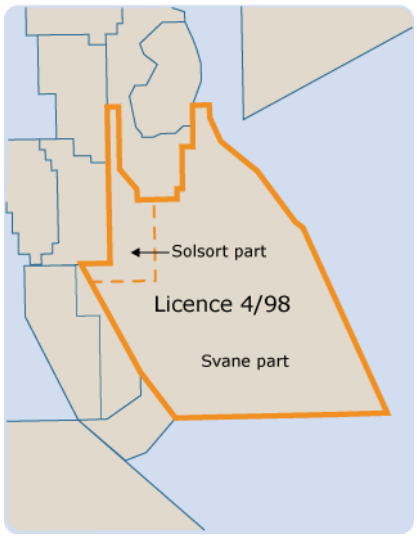
Oil companies can continually apply for licences in the Open Door area within an annual application period from 2 January through 30 September, based on the first-come, first-served policy.

To date, no commercial oil or gas discoveries have been made in the Open Door area. Open Door applications are therefore subject to more lenient work programme requirements than in the western part of the North Sea.

A map of the area and a letter inviting applications for Open Door areas are available at the DEA's website, www.ens.dk.

The Minister for Climate, Energy and Building issues the licences after submitting the matter to the Climate, Energy and Building Committee of the Danish Parliament.

Fig. 1.4 The division of licence 4/98



Extended licence terms

In 2011 and at the beginning of 2012, the DEA extended the terms of the licences shown in table 1.1 for the purpose of exploration. The licence terms were extended on the condition that the licensees undertake to carry out additional exploration in the relevant licence areas.

Table 1.1 Licences extended for the purpose of further exploration

Licence	Operator	Expiry
6/95	DONG E&P A/S	15-11-2013
9/95	Mærsk Olie og Gas A/S	22-05-2012
4/98 (the Svane part)	DONG E&P A/S	01-01-2013
4/98 (the Solsort part)	DONG E&P A/S	29-06-2013
1/05	PGNiG	05-10-2012
2/05	Altinex Oil Denmark A/S	27-01-2013
5/06	Wintershall Noordzee B.V.	22-08-2013
8/06	Mærsk Olie og Gas A/S	22-05-2014

The division of licence 4/98 mentioned in table 1.1 is illustrated in figure 1.4

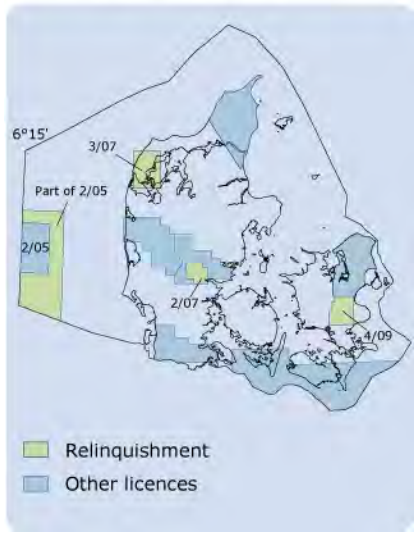
Terminated licences and area relinquishment

The licensee holding licence 2/05 in the Open Door area relinquished about two-thirds of the original licence area with effect from 27 January 2011.

Licence 3/07 in the Open Door area was relinquished on 12 February 2011. The licence, comprising an area in northwestern Jutland, was held by DONG E&P A/S (80 per cent) and the Danish North Sea Fund (20 per cent). Geochemical surveys in 2007 and 2008 showed traces of hydrocarbons, and the licensee performed a 2D seismic survey in 2009.

On 17 November 2011, licence 4/09 in southeastern Zealand was relinquished. The licence was held by Schuepbach Energy LLC (80 per cent) and the Danish North Sea Fund (20 per cent).

Fig. 1.5 Areas relinquished in the Open Door area in 2011



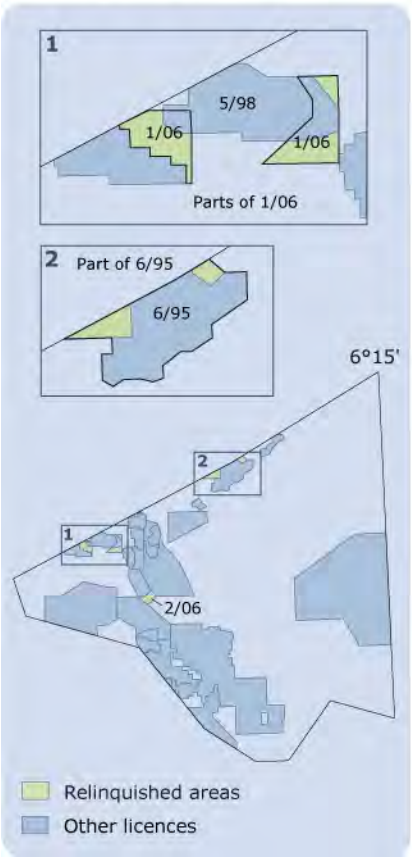
Licence 2/07, comprising an area in Jutland, was relinquished on 24 February 2012. The licence was held by GMT Exploration Company Denmark ApS (37.5 per cent), JOG Corporation (27.5 per cent), Armstrong Dansk, LLC (5 per cent), Dunray, LLC (5 per cent), Jimtown Ranch Corporation (5 per cent) and the Danish North Sea Fund (20 per cent). In 2011, the companies drilled the Løve-1 exploration well, described in more detail at the end of this chapter.

The changes in the Open Door area appear from figure 1.5.

The Hejre accumulation was declared commercial in 2010. In this connection, the field was delineated, and the DEA granted a 30-year extension for the purpose of production in the delineated area. The extension applied to part of licence 5/98 and two sub-areas of licence 1/06. The parts of licence 1/06 not comprised by the field delineation were relinquished on 22 May 2011.

In November 2011, the DEA extended licence 6/95 for the purpose of exploration; also see table 1.1. With effect from 15 November 2011, the licence expired for two sub-areas.

Fig. 1.6 Areas relinquished in the area west of 6°15' eastern longitude



Licence 2/06 was relinquished on 22 November 2011. The licence was held by Hess Denmark ApS (45 per cent), DONG E&P A/S (26.85375 per cent), Altinex Oil Denmark A/S (6.5625 per cent), Danoil Exploration A/S (1.58375 per cent) and the Danish North Sea Fund (20 per cent). The licence comprised an area extending south from the South Arne licence, 7/89.

The changes in the area west of 6° 15' eastern longitude are shown in figure 1.6.

Box 1.3

Access to subsoil data

Generally, data acquired under exclusive licences granted in pursuance of the Subsoil Act is protected by a five-year confidentiality clause. However, the confidentiality period is limited to two years for licence areas where the licence has expired or been relinquished.

Other oil companies thus have an opportunity to procure data for the exploration wells drilled and seismic surveys carried out in the relinquished areas. As a result, the companies are better able to map the subsoil and assess the future potential for oil exploration in the relinquished areas.

The Geological Survey of Denmark and Greenland (GEUS) is the commercial provider of all information about released well data, including seismic surveying data, etc. acquired in connection with exploration and production activities.

EXPLORATORY SURVEYS

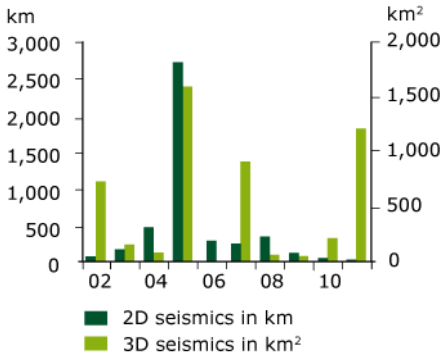
The level of activity for seismic surveys in 2011 is shown in figure 1.7. Figure 1.8 shows the localities of the exploratory surveys in the North Sea. The DEA's website contains an overview with supplementary information regarding the exploratory surveys mentioned below.

PGS Geophysical AS performed the 3D seismic survey MC3D-CGR-2011 in the Central Graben along the Danish-Norwegian border during the period April to May. The survey was an extension of a similar survey conducted mainly in the Norwegian area in 2010.

Danica Resources ApS collected soil samples in several areas on the islands of Lolland, Falster and Ærø during the period May to June 2011. Geochemical analyses have been performed on the samples, which will show whether there are indications of oil or gas accumulations in the subsoil.

Mærsk Olie og Gas A/S performed the CSEM (electromagnetic) survey DUC11-CSEM in July 2011. The survey covered an area of around 70 km^2 in the southern part of the Central Graben.

Fig. 1.7 Seismic data acquired during the period 2002-2011



During the period July – August, Hess Denmark ApS, as the operator for licence 7/89, performed the 3D seismic survey AHD11 across the northern part of the South Arne area with a view to performing a 4D seismic study.

Dansk Geotermi ApS performed a 2D seismic survey onshore in the vicinity of Aabenraa in August with the aim of identifying the opportunities for producing geothermal energy. Onshore seismic activities are shown in figure 2.3 in chapter 2, *Use of the subsoil.*

DONG E&P A/S performed the 3D seismic survey DN113DC01 during the period August to September 2011. The survey was conducted in the Central Graben and was particularly targeted at areas covered by licences 4/98 and 3/09.

WELLS

In 2011, two exploration wells were drilled in the Central Graben in addition to two onshore exploration wells; see figure 1.9 and figure 1.11. Hydrocarbon discoveries were made in both of the exploration wells in the Central Graben, Broder Tuck-2 and Lille John-1.

In the statistics in figure 1.10, the wells are placed in the year in which they were spudded.

An outline of all Danish exploration and appraisal wells is available at the DEA's website, www.ens.dk.

Exploration wells

Løve-1 (5509/6-1)

As operator for licence 2/07, GMT Exploration Company Denmark ApS drilled the exploration well Løve-1 between Give and Vejle in Jutland during the period May to June 2011.

Løve-1 was drilled as a vertical well and terminated in basement rock at a depth of 2,451 metres measured below ground level, corresponding to a depth of 2,365 metres measured below mean sea level.

The well intercepted Lower Triassic sandstones and Upper Permian limestone. Measurements were taken indicating that the chalk only contained traces of oil and gas. The well was subsequently plugged and abandoned. Following the evaluation of the results from the well, the licensee decided to relinquish the licence as described in the section *Terminated licences and area relinquishment*.

Fig. 1.8 Geophysical surveys west of 6°15' eastern longitude

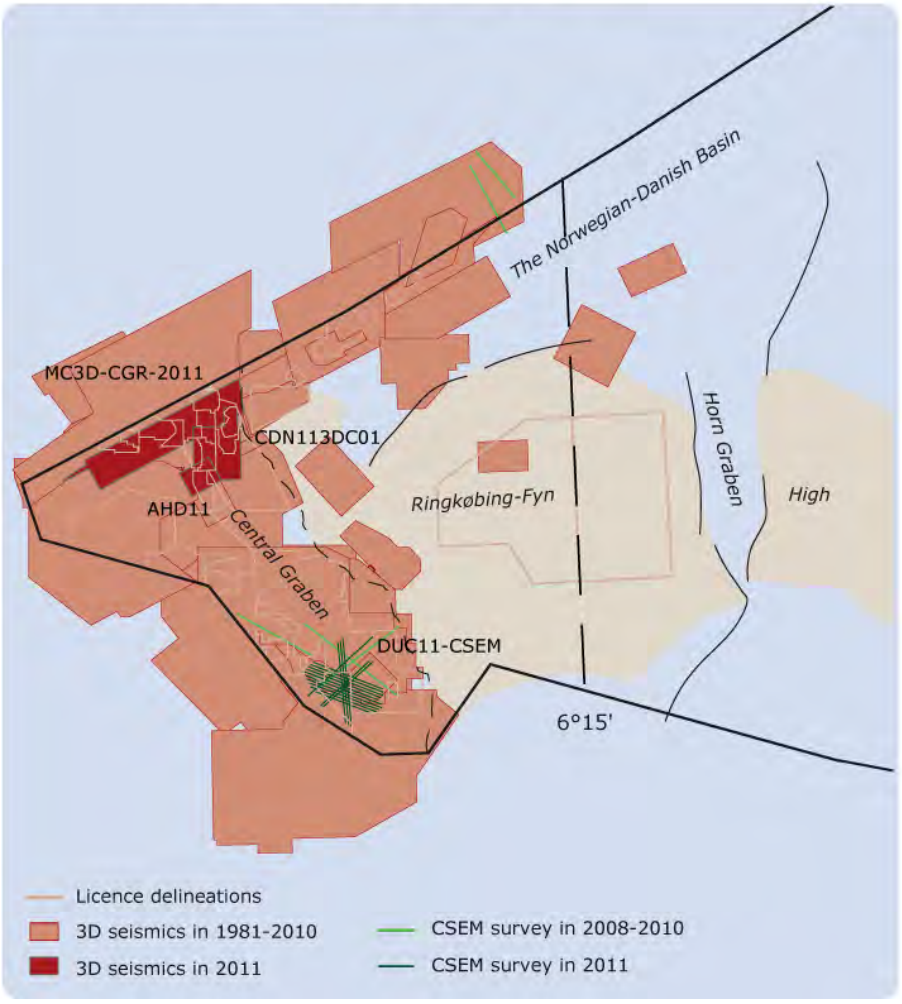
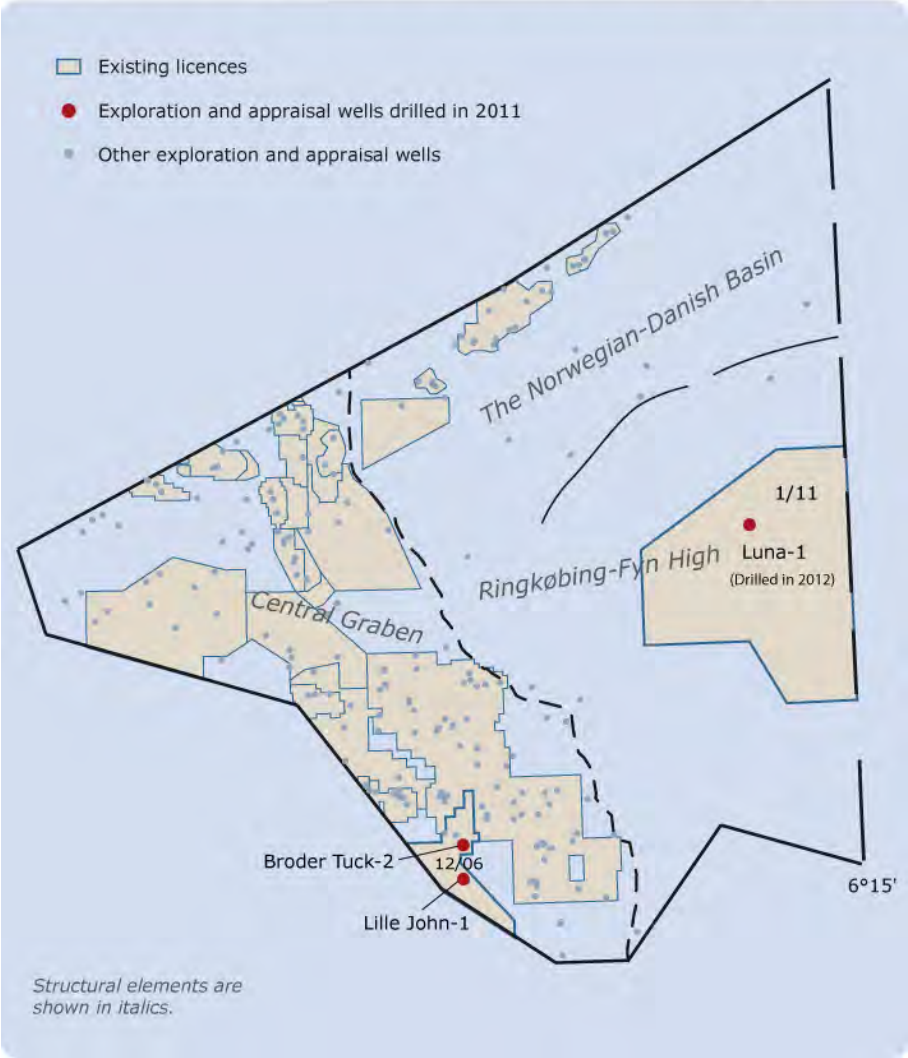


Fig. 1.9 Exploration and appraisal wells drilled in 2011 west of 6°15' eastern longitude



Broder Tuck-2/2A (5504/20-04)

As operator for licence 12/06, PA Resources UK Limited has drilled the exploration well Broder Tuck-2 in the southwesternmost part of the North Sea. The well was drilled during the period June to August 2011 and identified hydrocarbons (natural gas with condensate) in sandstones of Middle Jurassic age.

The drilling operation originally commenced with the drilling of Broder Tuck-1. However, this had to be abandoned due to technical problems, and Broder Tuck-2 was commenced a few metres from the first well.

Broder Tuck-2 was drilled as a vertical well and terminated in Triassic clay at a depth of 3,658 metres below mean sea level. A core was taken, fluid samples collected and extensive measurements performed. In order to further evaluate the extent and quality of the gas discovery, a sidetrack, Broder Tuck-2A, was drilled. Broder Tuck-2A also encountered Middle Jurassic sandstone containing hydrocarbons. This sidetrack terminated in Triassic rocks at a depth of 3,799 metres below mean sea level.

In 1975, well U-1X was drilled around 290 metres higher up in the same structure as Broder Tuck-2/2A. However, U-1X encountered only limited quantities of hydrocarbons.

Fig 1.10 Exploration and appraisal wells drilled from 2002-2011

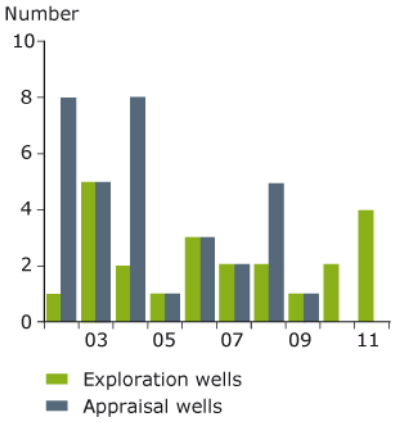
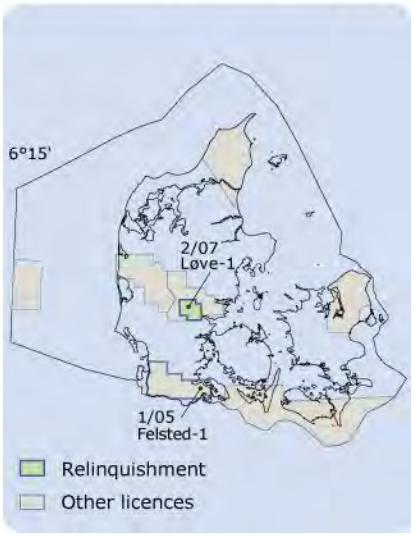


Fig. 1.11 Exploration wells drilled in 2011 east of 6°15' eastern longitude



The licensee will now assess the results from Broder Tuck-2/2A in more detail and draw up a plan for additional work to determine whether the gas discovery can be exploited commercially.

Lille John-1/1A/1B (5504/20-05)

As operator for licence 12/06, PA Resources UK Limited drilled the exploration well Lille John-1 in the southwesternmost part of the North Sea during the period September to November 2011. The well encountered oil in sandstones of Miocene age and minor indications of hydrocarbons in deeper sections.

The Miocene strata are a relatively unexplored exploration target in the Danish area, and the exciting discovery in Lille John-1 may prove to be the first exploitation of hydrocarbons from a reservoir of Miocene age in Denmark.

Lille John-1 was drilled as an almost vertical well. Sidewall cores, fluid samples and extensive measurements were taken. In connection with drilling Lille John-1 in the Lower Paleocene, the operator had to re-drill a section of the well on two ccasions, resulting in the sidetracks Lille John-1A and Lille John-1B. Lille John-1B drilled through tight rock showing minor indications of hydrocarbons and terminated in Zechstein salt at a vertical depth of 1,307 metres below mean sea level.

The licensee will now assess the results from Lille John-1 in more detail and draw up a plan for the additional work to determine whether the oil discovery can be exploited commercially.

Felsted-1 (5409/3-1)

As operator for licence 1/05, Polskie Górnictwo Naftowe i Gazownictwo SA (PGNiG) drilled the exploration well Felsted-1 southeast of Aabenraa in Jutland during the period December 2011 to January 2012. The well encountered nitrogen and small quantities of natural gas.

Felsted-1 was drilled as a deviated well and terminated in conglomerates of Rotliegendes age at a depth of 2,514 metres measured below ground, corresponding to a vertical depth of 2,412 metres measured below mean sea level. The well encountered Zechstein carbonates. Core drilling was carried out and fluid samples and extensive measurements were taken. Samples primarily containing nitrogen and small quantities of natural gas were taken in the carbonates.

Luna-1 (5605/32-1)

As operator for licence 1/11 as well as licence 2/05, Altinex Oil Denmark A/S drilled the exploration well Luna-1. No hydrocarbons were encountered in the well. The drilling commenced in February and was concluded in March 2012. The well will be included in the statistics for 2012 owing to the fact that drilling commenced in 2012.

Luna-1 was drilled on the Ringkøbing-Fyn High in the western part of the North Sea around 60 km from the Central Graben.

Luna-1 was drilled as a vertical well and terminated in volcanic conglomerates presumed to be of Rotliegendes age at a depth of 2,073 metres below mean sea level. A core and sidewall cores were collected and extensive measurements performed.

The licensee will now carry out a more detailed analysis and assessment of the results in order to assess the geological potential of the area.

2 USE OF THE SUBSOIL

The use of the Danish subsoil is regulated by the Act on the Use of the Danish Subsoil, usually referred to as the Subsoil Act. This chapter describes use of the subsoil for purposes other than oil and gas production. In Denmark, the subsoil is also used to produce salt, explore for and produce geothermal heat and store natural gas. Moreover, the possibilities of storing CO_2 in the subsoil are being investigated. The Subsoil Act was amended in spring 2011, one aim being to implement the EC Directive on the geological storage of carbon dioxide.

GEOTHERMAL HEAT PRODUCTION

There are substantial quantities of heat in the Danish subsoil. This geothermal heat can be recovered from the saltwater that is present in porous sandstones and which can be found in much of Denmark's subsoil. Geothermal heat from the subsoil can be utilized for the production of district heating.

There are currently two plants producing geothermal heat for district heating purposes. The Thisted plant has been producing heat since 1984, and a plant at Amager since 2005. A new plant is being established at Sønderborg, where two wells were drilled in 2010 for the purpose of producing geothermal energy. The new Sønderborg plant is expected to be commissioned in autumn 2012. Figure 2.1 shows geothermal licences at end 2011.

Fig. 2.1 Geothermal licences and applications at the beginning of 2012

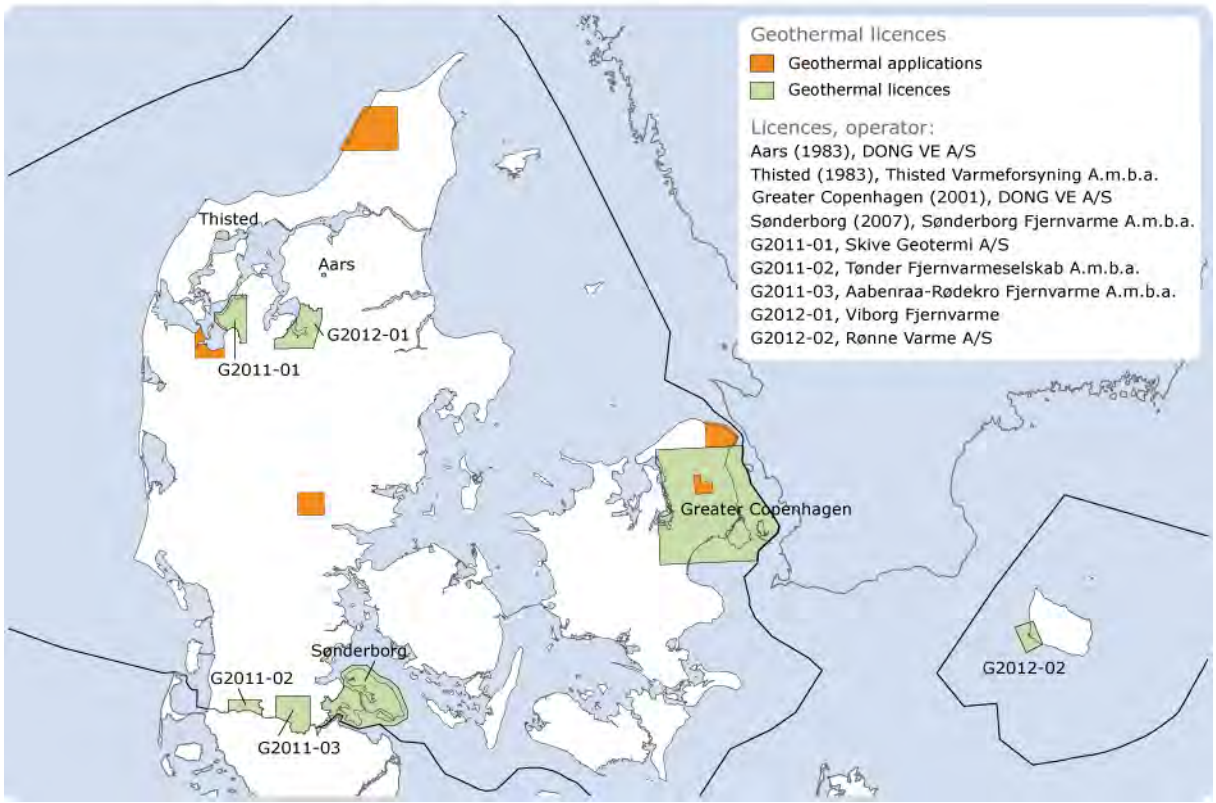


Fig. 2.2 Production of geothermal energy, 2002-2011

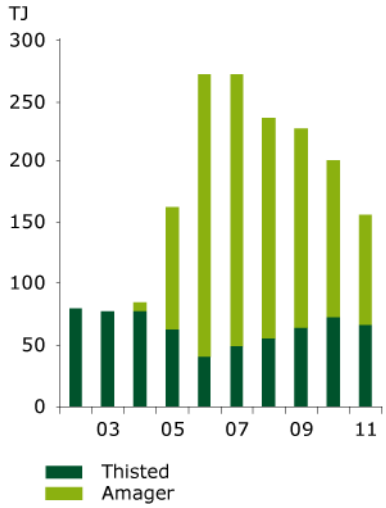


Figure 2.2 shows the production of geothermal energy during the past ten years. In total, 166 TJ of geothermal energy was produced for district heating purposes during 2011, which corresponds to the heat consumption of about 2,500 households. This is about 22 per cent less than in 2010, a decline caused by lower production from the Amager plant on account of technical issues.

To give all interested parties an opportunity to apply for a licence to explore for and produce geothermal energy, an open invitation for new applications to explore for and produce geothermal energy for district heating production was issued in autumn 2010. Applications for new licences can be submitted twice a year, the deadlines being 1 February and 1 September. On 1 October 2010, the DEA presented the procedure for submitting such applications. In this connection, standard terms for licences to explore for and produce geothermal energy for district heating production were also presented. The application procedure (in Danish) appears from the DEA's website, www.ens.dk. In December 2011, the application procedure and model licence underwent a minor update, also available at the DEA's website.

Pursuant to section 35 of the Subsoil Act, a licensee is liable to pay damages for any loss, damage or injury caused by the activities carried on under the licence, even if caused accidentally. Licences to explore for and produce geothermal energy stipulate that the licensee's liability pursuant to the Subsoil Act must be covered by insurance. The insurance must provide reasonable cover, in light of the risks involved in the performance of the activity. Moreover, the licensee must comply with any rules concerning insurance that may be issued by the DEA. In autumn 2011, the DEA clarified its insurance requirements for the performance of activities under licences to explore for and produce geothermal energy. For further details, please see the DEA's website.

NEW LICENCES AND APPLICATIONS

In 2011, three new licences were issued to explore for and extract geothermal energy, covering areas near Skive and Tønder as well as an area south of Aabenraa. A further two licences for areas near Viborg and Rønne were issued in January 2012. The areas covered by the new licences are shown in figure 2.1.

By the application deadline on 1 February 2012, the DEA had received a total of five applications for licences to explore for and produce geothermal energy for district heating purposes. The applications cover areas around Hjørring, Struer, Givskud, Elsinore and Farum, as shown in figure 2.1. The DEA considers the applications. Before the Minister for Climate, Energy and Building can issue the new licences, the matter must be submitted to the Climate, Energy and Building Committee of the Danish Parliament.

Aabenraa-Rødekro Fjernvarme A.m.b.a. carried out a seismic survey in August 2011 to identify the possibilities of producing geothermal energy. Vibroseismic equipment was used to acquire a total of about 12.5 km of 2D seismic lines. The location of these lines is shown in figure 2.3.

The DEA's website, www.ens.dk, contains further details about the eight existing licences and the five applications under consideration, including information about the companies holding shares in the individual licences.

STORAGE OF CO_2

The potential for reducing atmospheric CO_2 emissions is a topical issue in many contexts. One possibility is to capture and then store CO_2 from major point sources such as power stations and major industrial plants. This technology is often referred to as 'CCS', which stands for 'Carbon Capture and Storage'.

CO_2 must be stored at locations with suitable geological conditions. Before such locations can be designated, a number of detailed investigations and analyses must be made to evaluate the appropriateness of the subsoil for CO_2 storage. There are a number of similarities between the technology for storing CO_2 and for storing natural gas in the subsoil.

Another possibility is to inject the CO_2 into the oil fields of the North Sea, which has the benefit of enabling more oil to be produced from the fields. Thus, the injection of CO_2 in an oil field can release more oil from the rocks, oil that would not otherwise be recoverable with today's production technology. This method has not yet been introduced in the North Sea oil fields, but investigations are being carried out to determine the viability of such a project in the years to come.

In connection with the Danish Parliament's consideration of the Bill to amend the Subsoil Act for the purpose of implementing the CCS Directive (see below), the Energy Policy Committee of the Danish Parliament reviewed the Bill in spring 2011. Among other things, the Committee's report states that the Government will strive to introduce CO_2 injection and storage in North Sea oil fields with a view to enhancing oil production, provided that this can be done in a safe and environmentally sound manner. Moreover, it appears from the Energy Policy Committee's report that other countries are working on projects to demonstrate the capture, transport and storage of CO_2 at major power stations and industrial plants. From now until 2015, the countries concerned are expected to make and implement decisions to establish a number of full-scale demonstration plants, and thus to compile useful experience from such projects in the subsequent years. The Government will wait until the experience from such projects is available before deciding whether to endorse CO_2 storage in Danish onshore areas. The Danish Parliament must discuss and make a decision-in-principle on onshore CO_2 storage before it can be introduced. The same applies to offshore CO_2 storage if the aim of such storage is not tied to improving oil recovery from Danish oil fields. These matters can be addressed when more experience with this technology becomes available, at the earliest in the years leading up to 2020.

Fig. 2.3 Geophysical surveys onshore in 2011

In March 2010, Vattenfall submitted an application for a licence to use the subsoil for storing CO_2 in the Vedsted structure northwest of Aalborg. Vattenfall's application was rejected in October 2011. The decision to reject the application was based mainly on the Government's wish to await experience from foreign CCS projects before deciding whether to endorse onshore CO_2 storage in Denmark.

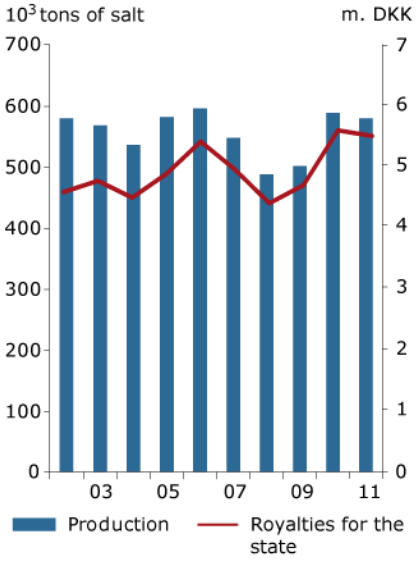
AMENDMENT OF THE SUBSOIL ACT

In April 2009, the EU adopted a Directive on the geological storage of carbon dioxide, the so-called CCS Directive. In May 2011, the Danish Parliament adopted a Bill to amend the Subsoil Act, thus implementing large parts of the CCS Directive. The more technical aspects of the Directive have been implemented in Executive Order No. 859 of 14 July 2011 on the Geological Storage of CO_2, etc. The amendments to the Subsoil Act do not involve any decision on the use of CO_2 storage in Denmark. The amendments include provisions on a legal framework for CO_2 storage should it be decided to introduce this technology in Denmark.

In addition to implementing the CCS Directive, the amendments to the Subsoil Act also introduced changes to other provisions of the Act.

The amended Act has introduced a right to refrain from processing uninvited new applications for licences to explore for and produce one or more raw materials. This makes it possible to prioritize the use of the subsoil for various purposes. The amended Act also includes special provisions on the exploration for and production of geothermal energy, including on the procedure for submitting applications for new licences. Moreover, the amended Act has revised the provision entitling the

Fig. 2.4 Salt production and state revenue from royalties, 2002-2011



Minister for Climate, Energy and Building to stipulate coordinated production and utilization of installations for producing, processing and transporting oil and gas. The aim is to ensure the optimum utilization of the infrastructure with a view to extending the useful life of existing oil and gas fields and production from new marginal fields. The revised, complete provisions of the Subsoil Act appear from Consolidated Act No. 960 of 13 September 2011, available at the DEA's website, www.ens.dk. More detailed rules about coordination (third-party access) are laid down in Executive Order No. 1132 of 5 December 2011.

GAS STORAGE

There are currently two gas storage facilities in Denmark. One facility is located at Stenlille on Zealand and is owned by DONG Storage A/S, while the other is situated at Lille Torup in northern Jutland and is owned by Energinet.dk Gaslager A/S.

More information about the Stenlille and Lille Torup gas storage facilities is available in the DEA's report "Denmark's Oil and Gas Production – and Subsoil Use, 2009".

In June 2011, the application from Dansk Gaslager ApS for establishing and operating a natural gas storage facility at Tønder was rejected. The main reason for the rejection was that Denmark has no current need to extend its gas storage capacity.

SALT EXTRACTION

In Denmark, salt is extracted at one location only, at Hvornum about 8 km southwest of Hobro, where the company Akzo Nobel Salt A/S produces salt from a salt diapir. The company has an exclusive licence for the production of salt from the Danish subsoil. The salt is used for consumption and for use as industrial salt and road salt.

The production of salt totals about 500,000 to 600,000 tons per year, and the Danish state receives about DKK 5 million a year in royalties. Figure 2.4 shows the past ten years' production of salt and the Danish state's revenue in the form of royalties.

3 PRODUCTION AND DEVELOPMENT

Denmark's oil and gas production has been in progress for almost 40 years, and oil companies continue to show interest in securing future production from the fields. This was again apparent in 2011, when the DEA approved five plans for the further development of existing fields and the development of an entirely new field, the Hejre Field. Additionally, there have been comprehensive maintenance activities offshore in order to optimize production from existing fields, and new wells have also been drilled.

Fig. 3.1 Location of production facilities in the Danish North Sea 2011

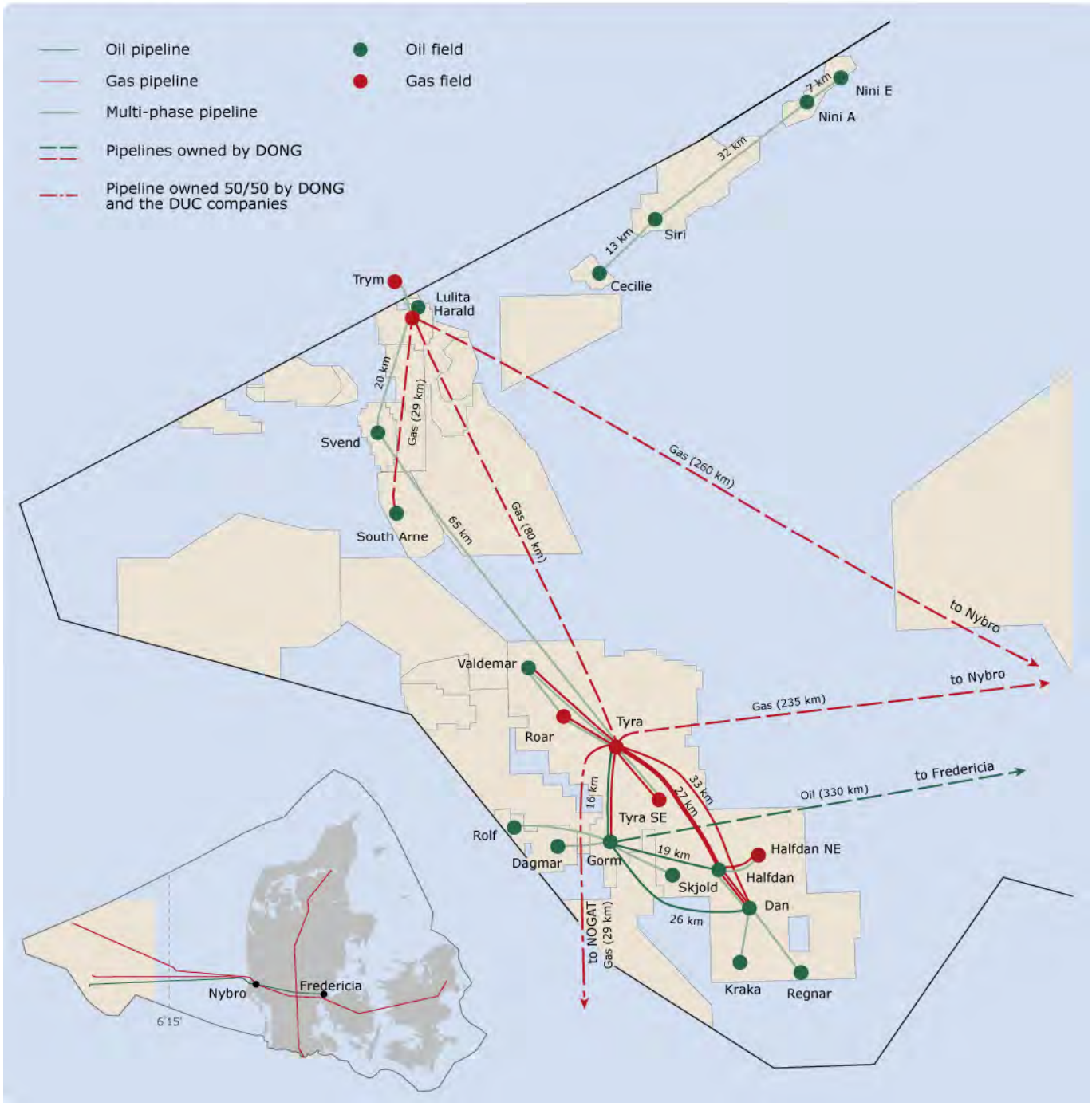
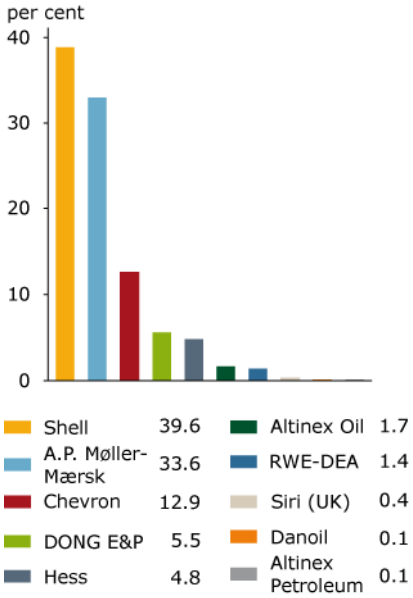


Fig. 3.2 Breakdown of oil production by company



In 2011, production was suspended in some fields due to safety or environmental issues. Such shutdowns may become more frequent in future in step with the increasing age and obsolescence of platforms and pipelines. Summer shutdowns have been planned in recent years on several platforms in order to undertake overhauls and maintenance of wells and offshore installations in order to prevent unplanned shutdowns.

A description of all producing fields can be found in the overview "Denmark's producing fields, 2011" at the DEA website, www.ens.dk. The overview contains information about development and investment activities, historical production and remaining reserves. There is also a brief description for each field of the geological conditions, production strategy and the installations, in addition to a field map showing the existing development and injection wells.

PRODUCTION IN 2011

All producing fields in Denmark are located offshore in the North Sea and appear from figure 3.1, which also shows the key pipelines. In total there are 19 producing fields of varying size, and three operators are responsible for production from these fields: DONG E&P A/S, Hess Denmark ApS and Mærsk Olie og Gas A/S.

A total of ten companies participate in production from Danish fields. Figure 3.2 shows the individual companies' shares of oil production. Dansk Undergrunds Consortium (DUC), consisting of Shell, A.P. Møller - Mærsk and Chevron, has the largest share, accounting for 86 per cent of oil production and 97 per cent of gas exports.

In 2011, production in the Danish part of the North Sea derived from a total of 278 active production wells, of which 199 were oil wells and 79 were gas wells. In addition, 109 active water-injection wells and 6 gas-injection wells contributed to production.

Appendix A shows figures for the production of oil and gas from the individual fields. Gas production is broken down into sales gas, injection gas, fuel gas and flared gas. Moreover, appendix A contains figures for the production and injection of water as well as for CO_2 emissions.

Production figures for each year are available at the DEA's website, www.ens.dk. These statistics date back to 1972, when production started in Denmark.

Oil production

Oil production in 2011 totalled 12.8 million m^3, a 9.8 per cent decline compared to 2010. Production from the Danish sector of the North Sea is therefore continuing to show a decline as expected. The main reason for this trend is that over the past many years, the majority of fields have already produced the bulk of the anticipated recoverable oil. In addition, these ageing fields require increasing maintenance of wells, pipelines and platforms. This maintenance work frequently involves production losses or delays as the wells, and possibly also entire platforms, need to be shut down while the work is taking place. The development in oil and gas production during the past 25 years appears from figure 3.3.

The development of existing and new fields can help counteract the decline in production. In addition, the implementation of both known and new technology can aid in optimizing production from existing fields.

Gas production

The offshore production of natural gas totalled 6.5 billion Nm^3 in 2011, of which 5.6 billion Nm^3 of gas was exported ashore as sales gas, a 21 per cent decline compared to 2010.

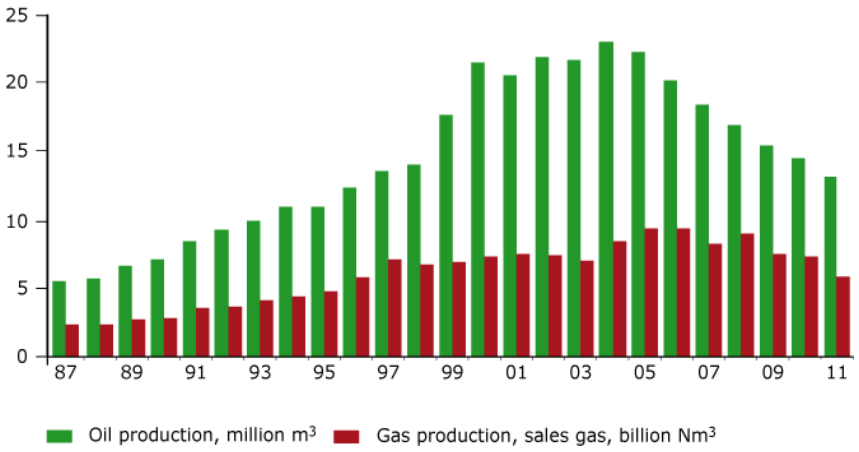
The remainder of the gas produced was either reinjected into selected fields to improve recovery or used as fuel on the platforms. A small volume of unutilized gas is flared for technical and safety reasons. The volumes of gas consumed as fuel and flared are described in chapter 5, *Environment and climate*. Appendix A gives an outline of historical developments since 1972.

Water production and water injection

Water is produced as a by-product in connection with the production of oil and gas. The water can originate from natural water zones in the subsoil and from the water injection that is carried out in order to enhance oil production. The water content of total liquid production for the Danish sector of the North Sea is increasing, and reached 74 per cent in 2011. A considerable amount of energy is required to handle the large volumes of produced water, which for some of the older fields is as high as 90 per cent. Water production in 2011 totalled 35.6 million Nm^3, which represents a 4 per cent decline compared with 2010. Water injection increased by 3 per cent in 2011 compared with 2010.

Water production has fallen since 2008, primarily as a result of declining oil and gas production. The water content of total liquid production is increasing for most fields (see above). Operators are therefore attempting to stem this rise by shutting down production from zones with high levels of water production.

Fig. 3.3 Production of oil and sales gas 1987-2011



DEVELOPMENT ACTIVITY IN 2011

Six new production wells and one new water-injection well were drilled and completed in Danish fields in 2011. The level of development drilling in 2011 was therefore slightly higher than in 2010. Based on previously approved development plans, this level is expected to increase further in 2012.

The wells drilled and additional development activities represented total investments of DKK 4.3 billion, which is at the same level as for 2010.

Approved development plans and ongoing activities

The Dan Field

A new plan for the further development of the Dan Field was approved on 27 May 2011. The plan comprises the drilling of up to eight new wells from existing installations and subsequent production from these wells. Six new wells have been planned, in addition to the possible redrilling of a further two wells if it proves impossible to repair them.

The costs associated with the wells are estimated to total about DKK 150 million per well. The development is expected to increase production from the Dan Field by about 2.7 million m^3 of oil during the lives of the wells.

During 2011, work proceeded on the drilling of two new production wells, MFF-36 and MFF-40, in the Dan Field, and this work is expected to be completed in 2012. These two wells form part of the development plans approved in both July 2010 and May 2011.

A comprehensive maintenance and repair programme for existing wells and installations was carried out in the Dan Field in 2011. As part of this work two, wells were permanently closed.

The Gorm Field

A new plan for the further development of the Gorm Field was approved on 4 October 2011. This plan comprises drilling and subsequent production from six new oil production wells, several of which will reuse parts of existing wells no longer contributing to production. The new wells are spread across the field between the existing wells.

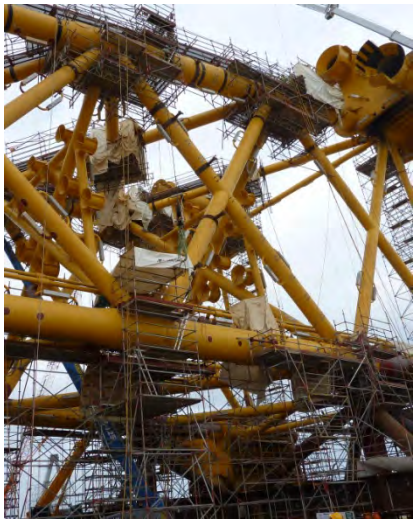
The costs of the overall development plan are estimated to total about DKK 740 million. The field development is estimated to enhance recovery from the Gorm Field by about 0.95 million m^3 of oil during the life of the wells. Work on the development project is expected to commence in the third quarter of 2012.

A comprehensive maintenance and repair programme for existing installations was carried out in the Gorm Field in 2011.

The Halfdan Field

A plan for the further development of the Halfdan Field was approved on 11 March 2011. This plan comprises the drilling of up to four new oil production wells from existing installations and subsequent production from these wells. Initially, one well will be drilled from Halfdan DA, and depending on the results, the potential for drilling a further three wells from the same platform will be assessed.

The costs of the first well are estimated to total about DKK 256 million. Production from the well is estimated to amount to about 0.23 million m^3 of oil and about 0.19 billion Nm^3 of gas during the life of the well. The development project was initiated in March 2011.



The first well in the above-mentioned development plan, HDA-9ML, was spudded in 2011 and completed in 2012. The well is a combined appraisal and production well. One appraisal section was drilled initially, but subsequently plugged and abandoned prior to the drilling of the actual production section.

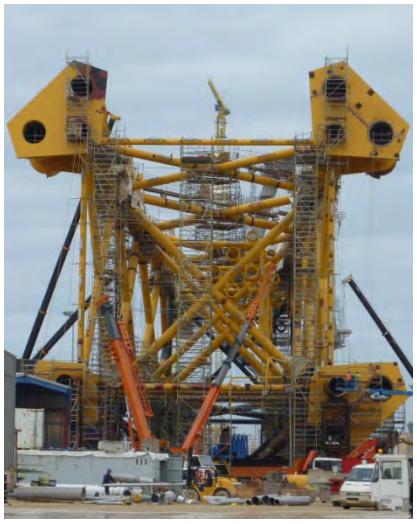
The Halfdan Field's new processing platform, Halfdan BD, was commissioned in 2011 and received its first oil for processing in March 2011.

The Harald Field

The Harald Field itself was not developed in 2011, but the Norwegian Trym Field was hooked up to the Harald Field installation in 2011 via a pipeline. Trym came on stream in February 2011, and the production is exported ashore via the Harald Field.

The Hejre Field

A plan for the development of an entirely new field (Hejre) was approved on 6 October 2011. This field is located at the northern end of the Danish part of the Cen-



tral Graben. Hydrocarbons have been identified at depths of around 5 km, and the difficult geological conditions at this depth require equipment for handling both high pressures and high temperatures (HPHT equipment). To date, oil and gas have been produced from depths of around 1.5 – 3.5 km in Denmark.

The plan envisages the establishment of a new offshore installation with production to take place from at least five new wells. The new offshore installation comprises a combined accommodation, wellhead and processing platform. The installation's processing capacity is estimated at 7,200 m^3 of fluid and 2 million Nm^3 of gas per day, and the accommodation facilities are expected to accommodate a maximum of 70 persons. As part of the field development, pipelaying will also be carried out in connection with hooking up the platform to the existing infrastructure.

The costs of the field development are expected to total about DKK 12 billion, and production from the wells is estimated to total about 16 million m^3 of oil and about 10 billion Nm^3 of gas during the term of the project. The field development is expected to start in 2014, with production startup scheduled for 2015.

It is anticipated that the hydrocarbons produced from the field will be of a composition which requires an extension to the oil terminal in Fredericia. DONG Oil Pipe A/S anticipates investing about DKK 2 billion in the extension of the terminal facilities.

The Kraka Field

The Kraka Field was developed in 2011 with well A-11, which was drilled with the partial reuse of the abandoned well A-4. The work carried out forms part of a development plan for the Kraka Field approved by the DEA in 2006.

The Nini Field

The Nini Field was developed in 2011 with well NB-4, which is used for water injection. This well forms part of the plan for Nini East which was approved in January 2008.

The Rolf Field

The Rolf Field has been shut down since March 2011 due to a leak in the pipeline between the Rolf Field and the Gorm Field. Work is under way to find a solution.

The Siri Field

In 2009, problems were observed in a subsea structure that supports the well caisson forming part of the Siri installation. A temporary support structure to secure the caisson was established in January 2010, and work on establishing a permanent structure was started in 2011. This permanent solution is expected to be ready by summer 2013.

Pending completion of the permanent structure, the operator has been forced to shut down the entire Siri installation during periods with anticipated wave heights of over six metres for safety reasons. These shutdowns have also included the Nini and Cecilie Fields, which are both satellite developments to Siri.

The South Arne Field

In the South Arne Field, work is proceeding on the second stage of the third development phase for the field, which was approved in 2010. The plan provides for the establishment of and subsequent production from two new platforms with a total of 11 new wells. The plan is described in more detail in last year's report on Denmark's oil and gas production.

Maintenance programmes have been carried out for existing wells and upgrades have been performed on existing equipment as part of the current development work. A flare gas recovery plant has been installed, which is expected to become operational in 2012.

The Svend Field

The Svend Field was shut down during the period between November 2010 and the end of March 2011 in connection with the repair of corroded installations.

The Tyra Field

Two separate plans were approved in 2011 for the further development of the Tyra Field.

The year's first development plan for the Tyra Field was approved on 11 March. The plan comprises the drilling of up to two new oil production wells from existing installations and subsequent production from these wells. Initially, one well will be drilled from Tyra West, and depending on the results of this well, the potential for drilling a further well in the southern flank of the Tyra Field will be assessed. The costs of the first well are estimated to total about DKK 326 million. Production from the well is estimated to amount to about 0.68 million m^3 of oil and about 0.31 billion Nm^3 of gas during the life of the project. Work on the development project commenced in the first quarter of 2012.

The year's second development plan for the Tyra Field was approved on 23 December 2011. This plan comprises the drilling of up to four new gas production wells, all from existing installations, and subsequent production from these wells. The results from the first well will be crucial in determining whether there is a basis for drilling a further three wells. The costs of the first well are estimated to total about DKK 190 million, and the drilling of the first well under the development plan is expected to enhance recovery from the Tyra Field by about 0.05 million m^3 of oil and about 0.37 billion Nm^3 of gas during the life of the well. Work on the development project is expected to commence in the second quarter of 2013.

Valdemar

As part of a development plan for the field approved in 2009, two new production wells, VBA-6C and VBA-9, were drilled in the Valdemar Field in 2011.

The exploration and appraisal wells drilled in 2011 are described in more detail in chapter 1, *Licences and exploration*. Information about approved development plans and new plans under consideration is also available at the DEA's website, www.ens.dk.

4 HEALTH AND SAFETY

Health and safety on fixed and mobile offshore units in the Danish continental shelf area are regulated by the Danish Offshore Safety Act and regulations issued under the Act. The Offshore Safety Act with associated regulations can be found at the DEA's website.

The Offshore Safety Act is based on the premise that the companies should set high health and safety standards and reduce risks as much as reasonably practicable. Moreover, the Offshore Safety Act presupposes that the companies have a health and safety management system enabling them to control their own risks and ensure compliance with statutory rules and regulations.

Together with the Danish Maritime Authority, the DEA supervises the companies' risk control, including compliance with rules and regulations. The DEA also cooperates with various national authorities as well as national and international organizations, including the Offshore Safety Council, the Danish Environmental Protection Agency, the North Sea Offshore Authorities Forum (NSOAF) and the International Regulators' Forum, about continuous improvements to health and safety conditions on the offshore installations.

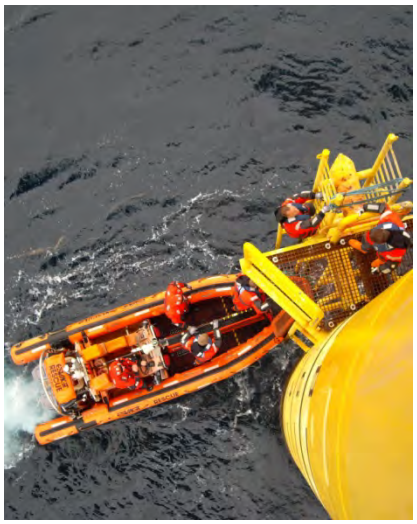
High health and safety standards are vital to the almost 3,000 people who have their workplace on offshore installations in the Danish continental shelf area.

The European Commission has presented a proposal to regulate offshore oil and gas activities for the purpose of preventing major accidents and limiting the consequences of oil pollution of the marine environment in the EU; see box 4.1. The proposal is the Commission's response to the "Deepwater Horizon" disaster in the Gulf of Mexico, as a result of which 11 people died, the drilling rig sank and more than 4 million barrels (800,000 m^3) of oil flowed into the sea.

SUPERVISION OF HEALTH AND SAFETY ON THE NORTH SEA INSTALLATIONS

Working on offshore installations in the Danish continental shelf area should be safe. Through inspections and dialogue with the companies, the DEA continuously strives to ensure that the health and safety level in the Danish offshore sector remains among the highest in the North Sea countries, see box 4.2.

The three main types of supervision are immediate inspections, project supervision and operations supervision.



Immediate inspections

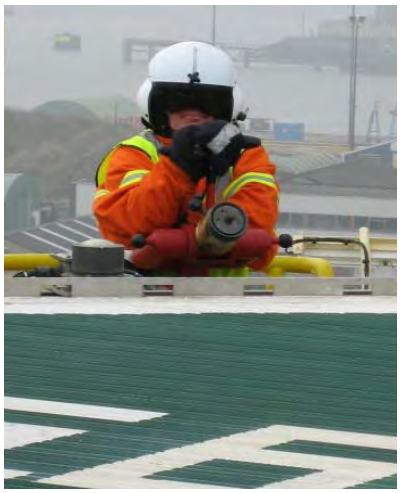
Immediate inspections are carried out in connection with work-related accidents and major near-miss occurrences. In the event of immediate inspections, the DEA will assist in clarifying the sequence of events in cases where the police are involved, while the DEA will be solely responsible for this clarification if the police are not involved.

Project supervision

Project supervision consists of supervising new facilities and major modifications to existing offshore installations.

Operations supervision

The majority of inspections concern operations and comprise announced regular inspections, unannounced inspections and the supervision of special topics.



Regular inspections

Usually, the DEA carries out annual inspections of the operating conditions on all manned fixed installations and mobile units. Among other things, the annual inspection covers three standard inspection items: a review of work-related accidents, hydrocarbon gas releases and the maintenance of safety-critical equipment.

Unannounced inspections

Unannounced inspections are carried out if announcing the inspection would compromise its purpose, e.g. when checking compliance with the regulations regarding rest periods, accommodation facilities and emergency procedures for the increased manning of installations, painting projects, etc. Moreover, unannounced inspections are carried out if unlawful circumstances are reported, or if otherwise warranted by employee health and safety considerations. Between three and five unannounced inspections are performed annually.

An unannounced inspection differs from the annual inspection of operations in the sense that the programme normally only focuses on two or three relevant issues.

Box 4.1

The Macondo disaster in the Gulf of Mexico

In April 2010, an explosion occurred on the Deepwater Horizon mobile drilling rig, which was carrying out drilling operations in BP's Macondo Field. Eleven people died, the drilling rig sank and over a period of three months more than 4 million barrels (800,000 m^3) of oil flowed into the Gulf of Mexico.

In response to the accident, the European Commission initiated an analysis to assess whether a similar accident could occur in the EU's territorial waters.

The European Commission found that the legislative framework for the exploration and exploitation of oil and gas in the EU did not provide the most effective preparedness to prevent and contain accidents in all the EU Member States. Morever, it was not clear where the responsibility lay for the clean-up and remediation of damage following a major oil spill.

The European Commission therefore presented a proposal to regulate offshore oil and gas activities in the form of a Regulation, whose purpose is to prevent major accidents and limit the consequences of oil pollution of the marine environment.

The Regulation was negotiated under the Danish Presidency of the Council of the European Union during the first half of 2012, and the negotiations will continue under the Cypriot Presidency during the second half of 2012.

The majority of the Member States are against a Regulation that is directly applicable and want a Directive instead, so that existing national legislation can be retained insofar as possible.

The legislation is expected to be adopted during 2013/2014. If the proposal is adopted in its current form, it will entail major changes for the authorities. The provisions of the Offshore Safety Act aimed at preventing the risk of major accidents will be regulated by the Regulation, while other health and safety risks will remain under national legislation. The proposal furthermore establishes that the Member State authorities regulating safety and the offshore environment as part of their duties must be independent of any conflicts of interest in relation to the authorities that are responsible for economic development, including the awarding of licences and the collection of taxes, duties and charges.

The proposal is not expected to have a major impact on the legal requirements imposed on the industry in relation to the Offshore Safety Act. However, the requirements for the assessment of major accident risks (Major Hazards) are expected to be revised. The proposal also contains requirements concerning public sector participation in approval procedures.

Box 4.2

The DEA's inspection of offshore installations

Following the Danish Parliament's adoption in 2005 of the Offshore Safety Act, which took effect on 1 July 2006, the delegation of responsibility for the area changed from the more prescriptive rules of the Offshore Installations Act to the more function-oriented rules of the Offshore Safety Act. Therefore, it is now the companies themselves which determine and carry out the activities and which also have a clearly defined responsibility for ensuring that this takes place correctly and appropriately in terms of health and safety. The Offshore Safety Act has been formulated as a set of function-specific rules, i.e. rules describing the goal that is to be achieved rather than specifically how the goal is to be achieved. Individual companies must therefore determine the framework for their activities, and in this way ensure that the purpose of the Act is fulfilled.

This means that guidelines and procedures may impose different and more demanding requirements on companies, and correspondingly give greater levels of freedom and more room for manoeuvring, so long as this is appropriate in terms of health and safety.

The overall goals for the companies' own guidelines and procedures are to fulfil the purpose of the legislation, viz. to promote a high level of health and safety on offshore installations that reflects technical and social developments within society, and to establish a framework that enables the oil companies to independently manage health and safety issues offshore.

The DEA therefore expects companies to:

- follow the intentions of the Act by establishing goals for health and safety supplemented by acceptance criteria, which must not be exceeded;
- establish and implement an effective management system for the management of health and safety on offshore installations;
- maintain and develop a safety culture that can promote the long-term prevention of both occupational accidents and diseases and damage to equipment and installations, e.g. through increased training and competencies;
- propose solutions that give due consideration to risk and the working environment through the use of risk assessments as a decision-making tool and the involvement of the workforce;
- implement risk reductions in due consideration of both probability and consequences, and balance the reductions against the verifiable input of resources;
- provide detailed and location-specific evacuation analyses and test the preparedness to manage the consequences of accidents and hazardous situations through drills;
- collaborate with the authorities in an open, respectful and responsible dialogue.

In practice, the DEA conducts its supervision through inspections at both the companies' administrative offices and offshore installations. A significant element of this procedure involves gaining an impression of the safety culture at the location. The DEA continues to check specific conditions such as signage, state of maintenance and the workplace organization during tours of the offshore installations. An inspection report is prepared after each inspection and sent to the company, which must make the report available to employees on the offshore installation.

The tools used by the DEA in connection with observations during on-site inspections are:

- verbally addressing minor issues on site that call for improvement;
- handing out a list on site that specifies the issues requiring major improvement and any deviations from applicable legislation, collectively referred to as observations;
- warning on site that an enforcement notice will be issued in the case of serious deviations from applicable legislation;
- issuing an immediate enforcement notice on site in the case of circumstances posing an immediate risk of a serious accident;
- subsequently issuing a written request to bring non-conforming circumstances into line with applicable legislation;
- subsequently issuing a written enforcement notice giving a deadline to bring serious non-conforming circumstances into line with applicable legislation. The next stage is to hand the matter over to the police with a view to criminal prosecution in the event of non-compliance with an enforcement notice.

Box 4.3

Supervision of musculoskeletal disorders

The DEA's most recent supervision of special topics focused on the prevention of musculoskeletal disorders, both in 2010 and 2011.

Musculoskeletal disorders are covered under "Other risks" in sections 14, 16 and 19 of Executive Order No. 729 of 3 July 2009 on Health and Safety Management on Offshore Installations, etc. and Executive Order No. 395 of 15 January 2008 on Manual Handling of Loads on Offshore Installations, etc.

The risk assessment of tasks on offshore installations must include an assessment of the ergonomic working environment. Among other things, the risk assessment must encompass work postures, the minimization of manual handling, daily lifting loads and the number of kilograms per individual lift, the frequency and duration of lifting, organization of the workplace and weather conditions (cold and draughts).

The DEA began its supervision by reviewing the aspects of the companies' management systems relating to the ergonomic working environment in order to determine how the prevention of musculoskeletal disorders has been incorporated. This was followed up by supervision aimed at the ergonomic working environment on all manned offshore installations in the course of 2011, and concluded with an inspection of the onshore administrative offices to make inquiries into the description contained in the management system.

The DEA established that all operating companies addressed the subject of ergonomic working environment in their management systems. It was the DEA's impression that the focus on ergonomic working environment in connection with inspections of the companies' onshore administrative offices and offshore installations promoted greater awareness and understanding of the issue, among both the companies' employees and the management on the installations.

During the offshore inspections, the DEA established that certain ergonomic conditions could be improved, including work postures, working heights and reaching distances. Additionally, ergonomically correct storage in relation to weight and usage had not always been adequately assessed on the installations.

The DEA also established that there was an understanding that carrying heavy loads and heavy lifting could lead to musculoskeletal disorders. However, there was a tendency for the injurious effects from awkward pushing, pulling, twisting and repeated manual handling to be underestimated. This underestimation was reflected in the fact that personnel did not always make adequate use of technical equipment such as cranes, trolleys, and hand trucks, etc. Despite this, it was generally accepted by both management and colleagues to object to heavy lifting and instead review the execution of lifting tasks, including any requirement for the use of cranes (for heavy lifting operations).

The DEA found that health and safety campaigns focusing on the prevention of musculoskeletal disorders that were coordinated with medics resulted in a more uniform understanding of and approach to the issue.

The DEA concluded that the design phase should include a more detailed assessment of future ergonomic conditions as well as a risk assessment of these conditions.

Box 4.4

Reporting work-related accidents

Work-related accidents resulting in incapacity to work for one or more days beyond the injury date must be reported.

Employers are obliged to report accidents, but all other parties are entitled to file reports.

"An injured person who is unable to fully perform his or her ordinary duties" is considered to be unfit for work

Table 4.1 Reported accidents broken down by cause of accident

Cause of accident	Fixed	Mobile
Falling/tripping	7	0
Use of work equipment	3	1
Falling objects	1	0
Electrical accidents	1	0
Handling goods	1	0
Crane/lifting operations	2	0
Other	1	0
Total	**16**	**1**

Supervision of special topics

The supervision of special topics consists of inspections in which one specific topic is considered. Since 2007, the DEA has been focusing on:

- Work-related accidents (2007)
- Noise (2008)
- Psychological working environment (2009 – 2010)
- Musculoskeletal disorders (2010 – 2011); see box 4.3

INSPECTIONS IN 2011

In 2011, the DEA carried out 24 offshore inspections, distributed on 16 inspections of manned production installations, one inspection of an unmanned production installation and seven inspections of mobile units, i.e. drilling rigs and accommodation units.

Three inspections were carried out unannounced at Tyre East, Dan F and Dan B, respectively. The inspections did not result in the identification of any highly safety-critical conditions.

Three immediate inspections were made to follow up on work-related accidents at Gorm, Dan and South Arne.

In addition, the DEA made six inspections of the onshore bases of operators and operating companies.

Finally, the DEA carried out eight inspections of mobile units at shipyards in the Netherlands and the UK before granting them a permit to operate in the Danish area.

An outline of all inspections in 2011 is available at the DEA's website, www.ens.dk

WORK-RELATED INJURIES

An industrial injury covers two different concepts - work-related accidents and occupational diseases (previously work-related diseases). Work-related accidents on offshore installations must be reported to the DEA; see box 4.4. Doctors are under a duty to report occupational diseases to the DEA, the Danish Working Environment Authority and the National Board of Industrial Injuries.

Work-related accidents

The DEA registers and processes all reported work-related accidents on Danish offshore installations and evaluates the follow-up procedures taken by the companies. At the DEA's first inspection after an accident, the work-related accident is addressed at a meeting with the safety organization on the installation. This procedure applies to all work-related accidents. In case of serious accidents, the DEA carries out an immediate inspection on the relevant installation in cooperation with the police.

The general aim of the DEA's follow-up on work-related accidents is to ensure that the companies and their safety organizations take concerted action to reinforce preventive measures on offshore installations.

In 2011, the DEA registered a total of 17 reports concerning work-related accidents, 16 on fixed offshore installations, including mobile accommodation units, and one on other mobile offshore units; see figure 4.1. The accidents are broken down by category in table 4.1 and figure 4.2.

Fig. 4.1 Number of work-related accidents on offshore installations, 2004-2011

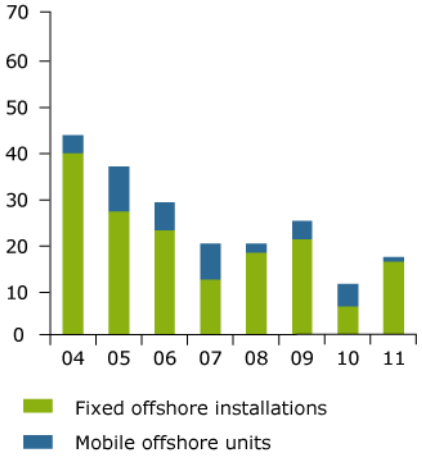


Fig. 4.2 No. of work-related accidents on offshore installations, 2006-2011, shown by cause of accident

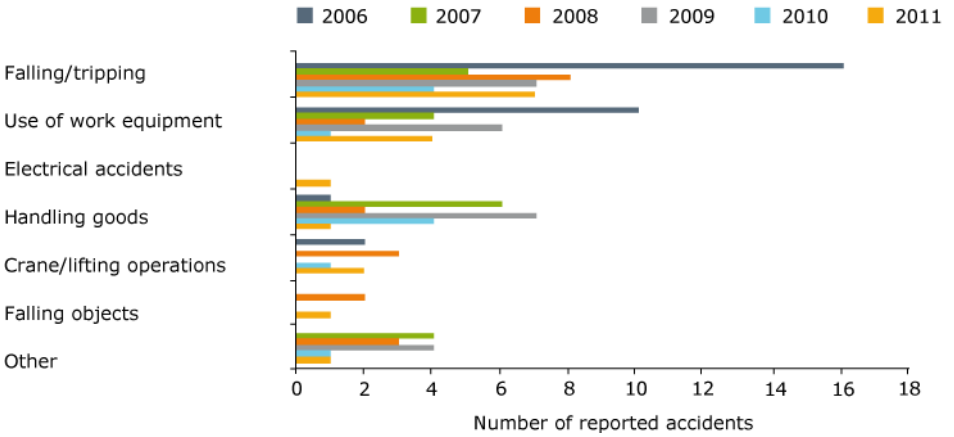


Table 4.2 indicates the actual periods of absence from work, broken down on fixed and mobile offshore units.

Accident frequency

Every year, the DEA calculates the overall accident frequency, which is the number of accidents reported per million working hours.

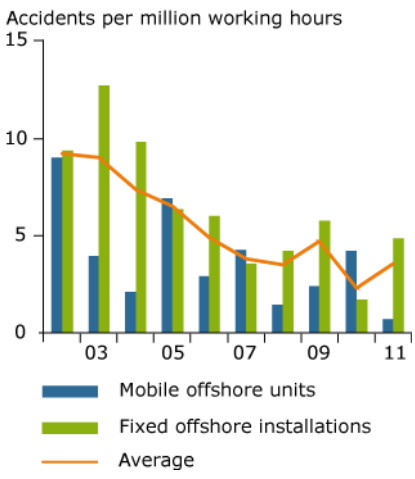
The overall accident frequencies for fixed offshore installations and mobile offshore units in recent years are shown in figure 4.3. As appears from the figure, the accident frequency for fixed and mobile units combined was 3.5 in 2011. This is an increase compared to 2010, when the overall accident frequency came to 2.3.

For mobile offshore units alone, one work-related accident was recorded in 2011, and the number of working hours totalled 1.5 million. Thus, the accident frequency for mobile offshore units fell from 4.2 in 2010 to 0.7 in 2011.

The number of work-related accidents on fixed offshore installations and mobile accommodation units, which is calculated on a combined basis, totalled 16 in 2011. The operating companies have stated that the number of working hours in 2011 totalled 3.3 million on these offshore installations. The accident frequency for fixed offshore installations is thus 4.8 for 2011, an increase on 2010 when the accident frequency came to 1.7.

Because of the relatively low number of accidents on offshore installations, merely a few accidents may change the picture from year to year. Thus, the trend over a number of years, and not the development from one year to another, provides the overall picture of the accident frequency.

Fig. 4.3 Offshore accident frequency



Box 4.5

Fall accident on the Dan installation

On 3 January 2011, an employee stepped onto an aluminium stairway after having cleaned a turbine enclosure. The employee slipped on the second step of the stairway and broke his fall by using his hand. The employee was immediately flown to Esbjerg Hospital, where it was established that he had fractured his wrist.

The DEA followed up on the accident at a subsequent inspection of the installation, and was able to establish that an anti-slip coating had been applied to the treads of several stairways in addition to the one where the accident occurred and that handrails had been fitted.

The DEA therefore considers the matter closed.

Tabel 4.2 Actual absence due to reported work-related accidents in 2011

Duration	Fixed	Mobile
1-3 days	0	0
4-14 days	1	0
2-5 weeks	2	0
More than 5 weeks	9	0
Undisclosed	4	1
Total	**16**	**1**

Box 4.6

Lifting accident on the Gorm installation

The accident occurred in connection with the lifting of a power supply unit (weight approx. 1,200 kg) on the Gorm C platform's production deck on 26 January 2011. A crane was to be used to move the unit from an area (module) on the platform to an unloading area. The gate in the module had a lip around 10 cm high at floor level, over which the power supply unit had to be lifted before it could be placed in the unloading area. The crane lifting had to be carried out as a blind oblique lift. Thus, the crane hook was unable to get a vertical hold on the load, and instead had to pull it at an oblique angle through the opening. The crane operator did not have a clear view of the unit. There were three people involved in the lifting operation, and they all had radio contact with each other during the lifting.

During the lifting operation, the injured person was located between the power supply unit and the railings in the unloading area, while the second rigger was located inside the module. As the unit was being lifted over the lip of the module, it swung outwards and the leg of the injured person got caught between the unit and the railings.

The injured person was immediately flown by helicopter to hospital onshore for further examination, where it was established that he had a fractured ankle and shin bone.

The DEA investigated the scene of the accident together with the South Jutland Police in an immediate inspection. The DEA was able to establish that no risk assessment had been carried out for the lifting operation before the lifting commenced, which is contrary to the provisions of the Offshore Safety Act. The use of hoists or lines for directional control had also not been considered.

The operating company (Mærsk Olie og Gas A/S) has subsequently implemented various measures, including the preparation of a clearer description of the various lifting types and the associated precautionary measures. Moreover, the operating company has ensured that the personnel involved in the lift must reach a joint agreement regarding the safe positioning of riggers before performing a lifting operation. The DEA has subsequently referred the matter to the police.

Box 4.7

Electrical accident on the South Arne installation

On 14 December 2011, an employee on the South Arne installation was working on the main switch of a battery emergency power pack. A short circuit occurred during the work caused by a hand-held measuring instrument that the employee was using. An arc formed, which resulted in first-degree burns to the employee's face and second-degree burns to the employee's hands. The employee received treatment from the medic, and was subsequently flown to Esbjerg Hospital for further treatment.

The DEA investigated the scene of the accident together with the Danish Safety Technology Authority and the South Jutland Police in an immediate inspection. The DEA ascertained that the company had deviated from its own management system during the performance of the task by not suspending the work permit during the work when the employee had established that the performance of the task had to be altered. Furthermore, the DEA established that the measuring equipment being used for the measurements was not appropriate for the task in question, which is contrary to the provisions of the Offshore Safety Act.

The operating company (Hess Denmark) has subsequently planned various measures, including a review of the relevant procedures and an investigation of the potential for improvements to the measuring and isolation of electrical installations in connection with electrical work

Onshore accident frequency

The DEA has compared the accident frequency on Danish offshore installations with the onshore accident frequency, as shown in table 4.3.

Table 4.3 Accident frequencies in Danish offshore and onshore industries

	Frequency		
	Accidents per million manhours		
Industry	**2009**	**2010**	**2011**
Offshore installations *	4.6	2.3	3.5
Total onshore industries	9.5	10.5	
Of which:			
- Completion of construction projects	16.0	17.0	
- Energy and raw materials	7.8	8.7	
- Installation/repair of machinery and equipment	9.4	9.3	
- Chemical and medical industries	8.7	8.1	

**) Overall accident frequency for fixed offshore installations and mobile offshore units*

Box 4.8

Work-related accidents calculated by the Danish Working Environment Authority

The Danish Working Environment Authority calculates the incidence of work-related accidents for onshore industries in Denmark on the basis of the number of accidents reported proportionate to the entire workforce, i.e. the number of employees. The Danish Working Environment Authority uses register-based labour force statistics from Statistics Denmark ("RAS statistics"), which are workforce statistics indicating the number of persons who had their main job in the relevant industries in November of the year preceding the year of calculation. The annual statistics compiled by the Danish Working Environment Authority indicate the incidence per 10,000 employees. Thus, for all onshore industries, the incidence was 165 reports per 10,000 employees in 2010.

This incidence is not directly comparable with the calculation of offshore accidents relative to the number of hours worked (for example, per 1 million working hours). Converting the number of employees to the number of working hours would only result in an approximation, as it is assumed that one employee corresponds to one full-time equivalent (FTE). The figures for onshore companies are converted on the assumptions that the total number of working days is 222 days per year and that each working day averages 7.12 working hours, a full-time equivalent of 1,580 hours.

A total of 44,382 work-related accidents were reported for onshore companies in 2010. With a workforce of 2,684,992 employees (approx. 4.24 billion working hours) in 2010, the accident frequency in 2010 for all onshore industries can be calculated at 10.5 reports per 1 million working hours. The calculation is based on the assumptions described in box 4.6. The Danish Working Environment Authority has not yet calculated the number of work-related accidents and the number of employees for 2011.

In 2009, the Danish Working Environment Authority changed the number of activity codes. Previously, the classification comprised 49 onshore activity codes, which have now been reduced to 36 different activity codes. This means that the figures for individual industries from 2009 and onwards are not comparable to the figures shown by industry for previous years. Therefore, the table only shows the accident

Box 4.9

Reporting near-miss occurrences

Near-miss occurrences are defined as occurrences that could have directly led to an accident involving personal injury or damage to the offshore installation. The occurrences to be reported to the DEA are specified in the Guidelines on Reporting Accidents, available at the DEA's website, www.ens.dk.

frequency by industry from 2009. The DEA has calculated the accident frequencies for selected onshore industries and combined accident frequencies for on- and offshore industries for 2009 and 2010. The results of these calculations are shown in table 4.3.

Occupational diseases

An occupational disease (previously a "work-related disease") is defined as an illness or a disease that is due to long-term exposure to work-related factors or the conditions under which the work is performed on the offshore installation.

As from 1 July 2008, doctors have been obliged to report all diagnosed or suspected occupational diseases to the DEA. In addition, doctors must still report occupational diseases to the Danish Working Environment Authority and the National Board of Industrial Injuries.

To ensure that the DEA has received all reports of suspected occupational diseases attributable to work on an offshore installation, the DEA awaits data from the Danish Working Environment Authority. The Danish Working Environment Authority has completed its work regarding occupational diseases for 2010, but has not yet published statistics for 2011.

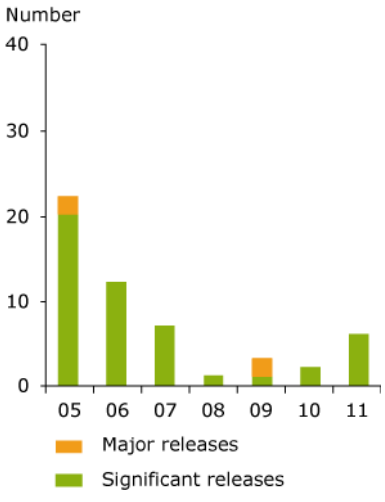
For 2010, the DEA received 20 reports on suspected occupational diseases from the Danish Working Environment Authority, based on a doctor's assessment that the relevant occupational disease was primarily contracted due to work on an offshore installation. The diseases reported for 2010 are distributed on five hearing injuries, 13 musculoskeletal disorders, including one vibration injury, one case of asthma and one central nervous system disease due to exposure to vapours or liquids.

NEAR-MISS OCCURRENCES

Major near-miss occurrences must be reported to the DEA; see box 4.9. In 2011, the DEA received a total of 20 reports on near-miss occurrences. By comparison, 11 near-miss occurrences were reported in 2010, a significantly lower figure than in previous years.

Hydrocarbon gas releases are also defined as near-miss occurrences; see the section "Hydrocarbon gas" releases below.

Fig. 4.4 Accidental hydrocarbon gas releases, 2005-2011



HYDROCARBON GAS RELEASES

The operating companies are obliged to report all major releases and significant releases of hydrocarbons to the DEA immediately.

Major releases are releases of more than 300 kg or with a release rate of more than 1 kg/sec. for more than five minutes.

Significant releases are releases of 1-300 kg or with a release rate of 0.1-1 kg/sec. with a duration of two to five minutes.

There were no major releases in 2011, but six significant releases were reported. Three releases had a release rate estimated at 0.001 to 0.14 kg/sec., with an unknown duration. The three other releases had release rates ranging from 0.03 to 1.0 kg/sec., equal to a release of 3 – 150 kg.

Since the DEA targeted its focus at accidental hydrocarbon gas releases, the total number of releases dropped from 36 in 2004 to two releases in 2010, increasing to six releases in 2011; see figure 4.4.

Box 4.10

The Authorities' Emergency Response Committee

The Emergency Response Committee consists of a chairman and four members representing the Danish Energy Agency, Defence Command Denmark, the Ministry of Justice, the Danish Environmental Protection Agency and the Danish Maritime Authority, all appointed by the Minister for Climate, Energy and Building.

The Emergency Response Committee is convened when major accidents occur on an offshore installation, pipelines or vessels accommodating employees from an adjoining offshore installation, or in case of imminent danger of such accidents. The members of the Emergency Response Committee also monitor the measures taken by the operating company responsible for the offshore installation, pipeline or vessel in case of a major accident.

The members of the Emergency Response Committee must also assist the authorities in gaining complete insight into the course of a major accident and the measures taken by the operating company to counter the accident. Moreover, the Emergency Response Committee is charged with advising and informing a ministerial committee composed of Government officials representing the Minister for Climate, Energy and Building, the Minister of Justice, the Minister of Defence and the Minister for the Environment, and the Committee is also responsible for coordinating any direct intervention from authorities abroad.

The Emergency Response Committee must hold regular drills to test its emergency procedures. The most recent drill was held in September 2011.

APPROVALS AND PERMITS GRANTED IN 2011

The supervision of health and safety on fixed and mobile offshore units in the Danish continental shelf area involves granting approvals and permits for design, commissioning and modifications.

Approvals and permits under the Offshore Safety Act

The overall design of a production installation must be approved according to section 27 of the Offshore Safety Act prior to detailed project design and construction.

Before production can commence, the installation must have an operating permit in accordance with section 28 of the Offshore Safety Act. Similarly, a mobile offshore unit, such as a drilling rig, must have an operating permit prior to use in Danish territory.

In the case of significant modifications to existing installations that impact the risk of major accidents, the operating company must apply for a permit for modifications under section 29 of the Offshore Safety Act.

Before an offshore installation is decommissioned, the licensee must apply for a permit in accordance with section 31 of the Offshore Safety Act. No applications were submitted in 2011.

In 2011, the DEA granted the following approvals and permits for fixed installations and mobile units as well as a pipeline in the Danish sector of the North Sea:

The South Arne Field

Permits have been issued for the modification of the existing South Arne processing plant as a result of the forthcoming development of the South Arne Field with

two new platforms and a pipeline connecting them. One of the new platforms is an unmanned wellhead platform about 2.5 km north of the existing South Arne installation. The other platform is a wellhead platform located east of the South Arne installation, to which it will be connected by a bridge.

Furthermore, permits have been granted to increase the level of manning on the South Arne platform and to increase occupancy of the cabins in connection with the preparatory work on the development project up until 9 April 2012.

The Siri Field

Permits have been granted to establish guyed support of the Siri Field platform and to establish an independent support structure for the well caisson in order to relieve the tank console supporting the caisson. Several permits have been granted to increase the level of manning on the installation for a longer period of time in connection with the performance of the preparatory work.

The Halfdan Field

A permit has been granted for the commissioning of the Halfdan Phase 4 development. Additionally, a permit has been granted for a number of mobile units to operate at the installations .

The Dan Field

A permit has been granted for replacement of the flare stack and for a number of mobile units to operate at the Dan Field installations, including for the Atlantic Labrador flotel.

The Gorm Field (including the Skjold Field)

A permit has been issued to perform modifications to the Gorm and Skjold Field installations.

The Tyra Field

A permit has been granted for the modification of the Tyra Field installations. Furthermore, a permit has been granted for a number of mobile units to operate at the installations, including for Safe Esbjerg to be used for extra accommodation at Tyra East.

Mobile units

ENSCO 70, ENSCO 71, ENSCO 72, Energy Endeavour, GSF Monarch and Safe Esbjerg were granted new operating permits in 2011. Permits were also issued for modifications to ENSCO 71, ENSCO 72, Energy Endeavour and Safe Esbjerg in connection with operations around fixed offshore installations.

Safe Esbjerg, Mærsk Resolute, Mærsk Reacher and ENSCO 70 all left the Danish continental shelf area in 2011.

5 ENVIRONMENT AND CLIMATE

IMPACT ON THE SURROUNDINGS

Like all other activities, offshore hydrocarbon exploration, production and final decommissioning of obsolete installations has an impact on the environment. In order to permit these activities to take place, it is therefore an important prerequisite that impacts are managed and controlled in such a way that the consequences are acceptable.

The various activities affect the environment with varying levels of intensity over very different timescales. Seismic surveys and the laying of pipelines are examples of activities of a relatively short duration over a large area, while drilling and the establishment or removal of installations – although of fairly short duration – have a more intensive effect on a limited locality. However, hydrocarbon production involves a more constant local impact over a very long period of time, and is associated with air and ship transport via the infrastructure required for such production.

Impacts on the environment come from discharges and any marine spills, atmospheric emissions, changes in the subsoil from which the hydrocarbons are extracted, in addition to the physical presence of installations and infrastructure in the seabed, water column and air space.

With regard to climatic and environmental impacts, the DEA is the administrative body for atmospheric emissions of CO_2 from the combustion and flaring of natural gas and diesel oil, the effects of activities on conditions in established international nature protection areas and the permissible impact of projects on the environment and the monitoring of this impact.

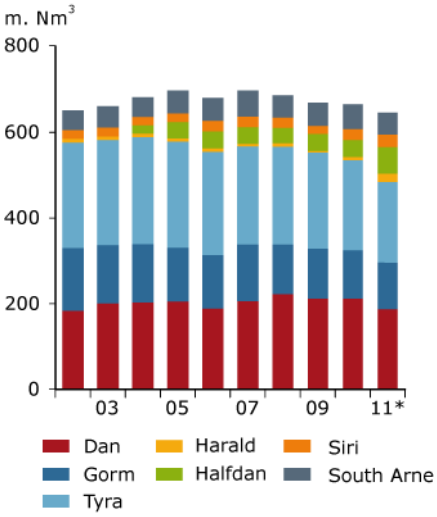
Discharges and any marine spills continue to be administered by the Ministry of the Environment, partly on the basis of regulations issued under the auspices of the international cooperation under the OSPAR Convention. The Oslo-Paris Convention concerns the protection of the marine environment, and covers the North-East Atlantic. The contracting parties consist of 15 countries, including Denmark.

ENERGY EFFICIENCY OFFSHORE

The energy policy agreement of 21 February 2008 made between the Government and the parties to the political accord set out goals for the development of Danish energy consumption during the period 2008-2011. One of the general goals in this energy agreement is to reduce gross Danish energy consumption by 2 per cent in 2011 and 4 per cent in 2020 relative to the level in 2006. As a follow-up to this agreement, the DEA, supported by the Danish operators, prepared the report entitled "Increased energy efficiency in oil and gas production - review and proposals" from December 2008. Based on this report, the Minister for Climate and Energy and the Danish operators agreed in April 2009 to launch an action plan to reinforce the measures for reducing energy consumption offshore. The action plan was supplemented by an addendum in February 2010.

This action plan contained a series of initiatives aimed at improving energy efficiency, which are collectively expected to result in a 3 per cent reduction of energy consumption during the period 2006-2011, compared with the previously expected increase of 1.5 per cent. These initiatives were expected to result in total savings of around 4.5 per cent relative to 2006, about one quarter of which would come from a reduction in gas flaring as a result of operational changes.

Fig. 5.1 Fuel consumption (gas)



*As from 2006, the figures have been based on verified CO_2 emission data from reports filed under the Act on CO_2 Allowances

The spokesmen behind the political accord were informed about the action plan status in May 2010, and in December 2011 the "Summary of the results from implementing the plan to improve the energy efficiency of North Sea oil and gas production 2009-2011" was submitted to the spokesmen.

The following appeared from this summary: "The most recent forecast of energy consumption from oil and production in the North Sea in 2011 shows that gas used as fuel and gas flared is expected to total 739 million Nm^3 in 2011. As the corresponding figure for gas consumption and flaring was 882 million Nm^3 in 2006, this corresponds to a reduction of almost 16 per cent. It should be noted that the processing of Norwegian production (Trym) started at the Harald platform at the beginning of 2011, and that one of the Halfdan platforms has been extended. This results in increased consumption and flaring of gas. The action plan envisaged that the initiatives to be commenced by 1 April 2009 and fully implemented by 1 October 2009 would lead to a 4.5 per cent reduction of energy consumption in 2011 relative to the level in 2006. Thus, the forecast for 2011 shows a greater reduction of energy consumption and flaring than expected."

The content of the action plan implemented appears from box 5.1.

In December 2011, the Minister for Climate, Energy and Building asked the DEA to discuss an action plan to follow up on the current plan together with Danish Operators. In April 2012, the Minister for Climate, Energy and Building and Danish Operators agreed on a new action plan for 2012-2014.

EMISSIONS TO THE ATMOSPHERE

Emissions to the atmosphere consist of such gases as CO_2 (carbon dioxide) and NO_X (nitrogen oxide).

The combustion and flaring of natural gas and diesel oil produce CO_2 emissions to the atmosphere. Producing and transporting oil and gas require substantial amounts of energy. Furthermore, a certain volume of gas has to be flared for safety or plant-related reasons. Gas is flared on all offshore platforms with processing facilities, and for safety reasons gas flaring is necessary if the installations must be emptied of gas quickly.

The volume emitted by the individual installation or field depends on the scale of production as well as plant-related and natural conditions.

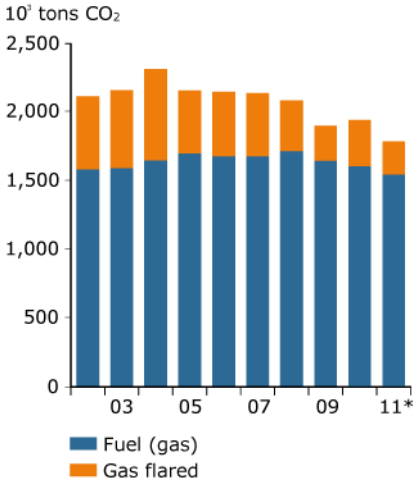
The Danish Subsoil Act regulates the volumes of gas flared, while CO_2 emissions (including from flaring) are regulated by the Danish Act on CO_2 Allowances.

Consumption of fuel

Fuel gas accounted for almost 89 per cent of total gas consumption offshore in 2011. The remaining 11 per cent was flared. The development in the use of gas as fuel on Danish production installations appears from figure 5.1. The general increase until 2007 is attributable to rising oil and gas production and ageing fields. The main reason for the sharp drop from 2008 is energy-efficiency measures taken by the operators.

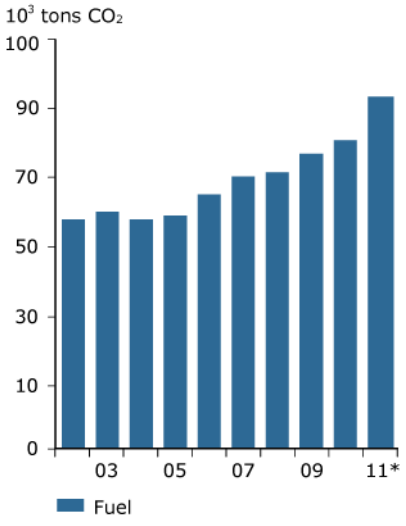
In recent years, the steadily ageing fields have particularly impacted fuel consumption. Natural conditions in the Danish fields mean that energy consumption per produced ton oil equivalent (t.o.e.) increases the longer a field has carried on production. This is because the water content of production increases over the life of a field, and oil and gas production therefore accounts for a relatively lower share of total production. Assuming unchanged production conditions, this increases the need for injecting lift gas, and possibly water, to maintain pressure in the reservoir. Both processes are energy-intensive.

Fig. 5.2 CO_2 emissions from production facilities in the North Sea



*As from 2006, the figures have been based on verified CO_2 emission data from reports filed under the Act on CO_2 Allowances and have included CO_2 emissions from diesel combustion

Fig. 5.3 CO_2 emissions from consumption of fuel per m. t.o.e.



*As from 2006, the figures have been based on verified CO_2 emission data from reports filed under the Act on CO_2 Allowances and have included CO_2 emissions from diesel combustion

Box 5.1

Action plan to improve the energy efficiency of North Sea oil and gas production 2009-2011

One of the central elements in the action plan for 2009-2011 was the operators' commitment to introducing energy management, based on the principles laid down in the energy management standard. This means that the focus on energy efficiency has been maintained and strengthened, both in daily operations and in the planning of new projects. Thus, the operators have integrated energy efficiency into their policies and set goals for energy-efficiency initiatives in their energy management systems. For example, the operators have implemented the following specific initiatives:

- transition to more energy-efficient operation of generators, pumps and compressors;
- reduction of energy consumption for lighting;
- better monitoring of wells, which reduces water production and the consumption of lift gas;
- better monitoring of equipment.

In the action plan, the operators have undertaken to continue the optimization of operations with the aim of reducing the flaring of gas. Activities carried out in order to reduce the amount of flaring include:

- revised control and modification of selected process systems at both the Dan and the Gorm installations, enabling the recovery of gas flared;
- a systematic overhaul and repair of valves that have previously leaked gas to the flare system;
- a reduction in the number of process equipment stoppages and a consequent reduction in blow–downs to the flare systems through better maintenance and an even stronger focus on stable operating conditions.

The action plan also incorporated a work schedule for making further analyses. These analyses have now been carried out, and the results were presented at the beginning of May 2010, along with a status report on the implementation of the action plan. In December 2011, the "Summary of the results from implementing the plan to improve the energy efficiency of North Sea oil and gas production 2009-2011" was completed. The action plan, status report and summary of the results are available at www.ens.dk.

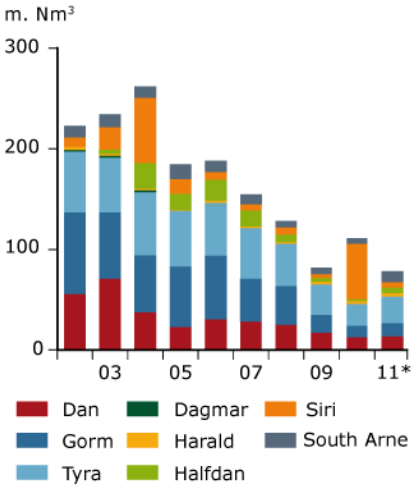
Flare gas recovery

A portion of the flared gas can be recovered by means of installing and using gas recovery systems. Such systems exist on the platforms in Norway and on the Siri platform in the Danish sector of the North Sea. During normal operating conditions, the gas fed into the flare system is accumulated and compressed and then returned to the processing facilities on the platform.

Mærsk Olie og Gas A/S has analyzed the possibilities of installing flare gas recovery systems on the company's platforms and has concluded that it is not financially viable to do so on any of its platforms. Instead, the company will continue to focus on further optimizing the process to reduce flaring, e.g. by improving the sealing of valves for flare systems. For one thing, the company intends to look at the possibility of recapturing gases removed by degassers.

Hess Denmark ApS has analyzed the possibilities of establishing a flare gas recovery system at South Arne and has decided to commission such a system in accordance with the action plan, viz. in mid-2012. The flare gas recovery system was installed in November 2011, and is expected to come into operation in mid-2012.

Fig. 5.4 Gas flaring



*As from 2006, the figures have been based on verified CO_2 emission data from reports filed under the Act on CO_2 Allowances

The development in the emission of CO_2 from the North Sea production facilities since 2002 appears from figure 5.2. This figure shows that CO_2 emissions totalled about 1.74 million tons in 2011, the lowest level in the past ten years.

It appears from figure 5.3 that CO_2 emissions due to fuel consumption have increased relative to the size of hydrocarbon production over the past decade. The reason for this increase is that oil and gas production has dropped more sharply than fuel consumption, which means that CO_2 emissions due to fuel consumption have increased relative to the size of production.

Gas flaring

The flaring of gas declined substantially from 2006 to 2011 in all fields with the exception of the Harald Field where flaring increased marginally due to the commissioning of Trym, as well as the Siri and South Arne Fields where flaring remained unchanged. This development is attributable to more stable operating conditions on the installations, changes in operations and focus on energy efficiency. As appears from figure 5.4, which shows the volumes of gas flared, flaring varies considerably from one year to another. The large fluctuation in 2004 is partially due to the tie-in of new fields and the commissioning of new facilities. In 2011, gas flaring totalled 81 million Nm^3.

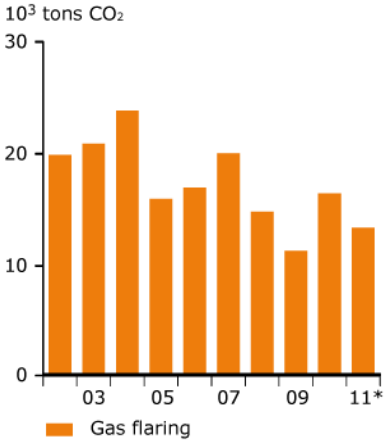
The volume of gas flared depends in part on the design and layout of the individual installation, but not on the volumes of gas or oil produced.

In 2011, CO_2 emissions from flaring came to 0.23 million tons of CO_2 out of total CO_2 emissions from the offshore sector of 1.74 million tons, i.e. 13 per cent of total emissions. All CO_2 emissions are comprised by the CO_2 allowance scheme.

Emissions from flaring declined steadily from 2004 to 2009, increased again in 2010 and then dropped in 2011 to the lowest level since 1998.

The production of hydrocarbons has declined during the past decade, and thus the volume of gas flared per t.o.e. produced increased until 2007; see figure 5.5. From 2008 to 2011, the volume of gas flared per t.o.e. produced fell to just under 14.0 ktons of CO_2 per million t.o.e., which means that the reduction in flaring was so substantial that it more than offset the fall in hydrocarbon production.

Fig. 5.5 CO_2 emissions from gas flaring per m. t.o.e.



*As from 2006, the figures have been based on verified CO_2 emission data from reports filed under the Act on CO_2 Allowances and have included CO_2 emissions from diesel combustion

Regulation of NO_X emissions

In November 2011, the Minister for Taxation introduced Bill L 32 to amend the Act on the Taxation of Nitrogen Oxides, the Act on Energy Tax on Mineral Oil Products, etc. and the Act on the Taxation of Natural Gas and Town Gas. The Bill formed part of the agreement concerning the 2012 Budget between the Government and the Danish Red-Green Alliance.

The Act (No. 1385 of 28 December 2011) entered into force on 1 January 2012, with the exception of certain sections for which the Minister for Taxation will determine the commencement date. The Act is available (in Danish) at: www.retsinformation.dk

The Act will help ensure that Denmark fulfils the obligations set out in Directive 2001/81/EC of the European Parliament and of the Council of 23 October 2001 on national emission ceilings for certain atmospheric pollutants (the NEC Directive), and also extends to the offshore sector.

The Act involves that the tax on air pollution caused by NO_X will increase from DKK 5 to DKK 25 per kg of NO_X. In addition to the tax rise itself, more NO_X-discharging energy installations in the North Sea will also be subject to the tax. The tax increase for the NO_X-discharging energy installations in the North Sea will enter into force on 1 July 2012.

OIL/GAS ACTIVITIES AND PROTECTION OF NATURE

When submitting an application for a project, e.g. an exploration well, a development project or a seismic survey, the applicant must include all necessary information about the project and its impact on international areas of conservation, including Natura 2000 sites. On this basis, the DEA will decide whether an impact assessment is required.

Projects assumed to impact an international conservation area significantly will only be permitted or approved if the impact assessment shows that the project will have no adverse effects on the conservation area in view of the conservation objectives for the site in question. The DEA will decide whether the application for approval of the project is to include an impact assessment.

The DEA may attach special terms and conditions to a permit or an approval for the purpose of protecting the environment, nature or cultural heritage. Such terms and conditions may place restrictions on the project; for example, time limits may be imposed for noise-generating activities in some areas to ensure that whales, including porpoises, are not disturbed during periods when the relevant species is particularly sensitive to disturbances, e.g. during the mating and breeding season.

Whales and dolphins belong to the species that require strict protection in accordance with Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora (the Habitats Directive). These species must not be disturbed in their natural habitats, in particular during the most sensitive periods, so as to avoid harmful effects on the species or population. Therefore, permission or approval of a project will not be granted if the project would result in such disturbance of protected species. Project applications must include sufficient information for the DEA to assess whether the activity might cause disturbance of any protected species.

One of the standard conditions included in approvals or permits is that companies must use what is known as a “soft start procedure” when carrying out noise-generating activity, e.g. seismic surveys or pile driving in the seabed. The soft start procedure is based on slowly increasing the sound level from the sound source up to the operational level. If marine mammals are observed at a distance of less than 200 metres from the sound source, the soft start procedure must be postponed. The soft start procedure must be carried out in accordance with a set of best practice guidelines prepared by the National Environmental Research Institute (“NERI”).

The conditions that are imposed in connection with the permission or approval of marine activities are partly based on the latest data and information concerning the presence and behaviour of the marine mammals that live in the Danish offshore area. The DEA continually reassesses and updates the conditions as new knowledge about the subject is acquired in order to ensure compliance with the requirements of the Habitats Directive concerning the strict protection of, e.g., whales and dolphins.

In 2011, the Danish Nature Agency and Mærsk Olie og Gas A/S entered into a framework agreement on a surveillance and monitoring programme to assess the density and behaviour of marine mammals in light of the noise impact from offshore-related activities in the western part of the Danish sector of the North Sea. Thus, the parties reached agreement on the main content of the programme. The results are to be presented in a report in 2014.

The Marine Strategy Framework Directive

The Marine Strategy Framework Directive, Directive 2008/56/EC establishing a framework for community action in the field of marine environmental policy, sets out a common approach for the Member States with the objective of maintaining or achieving good environmental status in the marine environment by the year

2020 at the latest. The Marine Strategy Framework Directive requires each Member State to prepare and implement marine strategies for its marine waters. As part of these strategies, the Member States must prepare basic analyses which describe the status and impacts on the marine waters, set goals concerning natural and environmental status and associated indicators, and establish programmes of measures and monitoring to maintain or achieve good environmental status for the marine areas.

The aim of the marine strategies is to protect, conserve and prevent deterioration of the marine environment and, insofar as possible, restore marine ecosystems in areas where negative impacts have already occurred. A further aim is to reduce and prevent pollution of the marine environment and its harmful effects. An ecosystem-based approach to the management of human activity is used to ensure that the combined pressure from these activities will be kept within levels that are compatible with the achievement of good environmental status, and also to ensure that marine ecosystems will retain the ability to cope with the human-induced changes to which they are exposed.

The Danish Nature Agency has initiated a series of activities as part of its preparation of basic analyses of Danish marine waters, descriptions of good environmental status and proposals for environmental targets, which must all be available by 15 July 2012. The DEA is following the work in a group of authority representatives which was set up in this connection.

ENVIRONMENTAL IMPACT ASSESSMENTS (EIAs)

Regulation

On 25 June 2011, a revised Executive Order on EIA entered into force, Executive Order No. 684 of 23 June 2011 on EIA, impact assessments concerning international nature conservation areas and the protection of certain species in connection with offshore projects for hydrocarbon exploration and production, storage in the subsoil, pipelines etc.

The Executive Order on EIA was revised to follow up on the implementation of Directive 2009/31/EC on the geological storage of carbon dioxide (the CCS Directive), which was implemented by Act No. 541 of 30 May 2011 to amend the Act on the Use of the Danish Subsoil.

The revised Executive Order on EIA lays down rules concerning EIAs for offshore projects on the geological storage of CO_2 (carbon dioxide) and pipelines for the transport of CO_2. Thus, the Executive Order implements the provisions of the CCS Directive that amended Directive 85/337/EEC on the assessment of the effects of certain public and private projects on the environment (the EIA Directive). Furthermore, rules were laid down concerning impact assessments regarding international nature conservation areas and the protection of certain species in connection with offshore projects on the geological storage of CO_2 and pipelines for the transport of CO_2.

Finally, the rules concerning species protection included a direct reference to the list of animal species requiring strict protection in Annex IV to the Habitats Directive, Council Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora. The list of species in Annex 4 of the Executive Order on EIA was instead changed to an indicative annex.

During 2012, the Executive Order on EIA will be amended so that the requirement for a screening procedure to determine the need for an EIA in connection with deep drilling is also extended to drilling operations associated with hydrocarbon exploration and production. This amendment is based on an interpretation from

the European Commission of screening requirements for deep drilling in the EIA Directive.

EIA for Mærsk's fields

Mærsk Olie og Gas A/S has prepared an EIA report for all its current and planned activities for oil and gas production in the North Sea. The EIA report was the subject of a public consultation procedure at the end of 2010. Following the consultation, Mærsk Olie og Gas A/S revised the EIA report, Assessment of the environmental impact of further oil and gas activities, July 2011.

In connection with the consultation process, the Danish Nature Agency submitted comments concerning the noise impact of offshore activities on marine mammals and requested Mærsk Olie og Gas A/S to provide more details about the noise issue in relation to the activities described in the EIA. In connection with the approval process, the Danish Nature Agency and Mærsk Olie og Gas A/S entered into an agreement about a measuring and monitoring programme to determine the presence and behaviour of marine mammals in the area in light of the noise effects from offshore-related activities.

EIA for the Hejre Field

On 4 November 2010, the DEA received an application from DONG E&P A/S for approval of the development of the Hejre Field in the North Sea. The environmental impact assessment for the project in question can be found in the EIA report Environmental impact assessment (EIA) for the Hejre Field – development and production, 2011, which was subjected to public consultation between 13 May and 8 July 2011.

The DEA has subsequently processed the application and approved the development of the Hejre Field. This approval covers the establishment of an installation for processing, accommodation and production from up to six wells. The approval also covers the establishment of two new pipelines for the transport of gas and unstabilized oil, respectively.

The other North Sea countries were asked to express their opinion as to whether the Danish section of the pipeline could impact on the environment in their respective areas. This procedure was followed in accordance with the provisions of the Espoo Convention on consultations between the affected countries to prevent, reduce and control significant adverse transboundary environmental impact. The comments made in the responses to the consultation on the environmental impact assessment were incorporated as conditions in the approval of the development project.

Box 5.2

Espoo consultation process

The Espoo (EIA) Convention (the Convention of 25 February 1991 on Environmental Impact Assessment in a Transboundary Context), is a UN Convention, ratified by Denmark and a large number of other countries, that is aimed at preventing the adverse environmental impact of proposed activities across borders. In this connection, it is a requirement for the EIAs to be made at an early stage of planning.

Consequently, the Espoo Convention contains provisions on environmental impact assessment (EIA), public participation and consultations between the affected countries to prevent, reduce and control significant adverse transboundary environmental impact.

In an Espoo consultation process, the public in the areas likely to be affected by a proposed project is given an opportunity to participate in the environmental impact assessment of the project, including in the areas affected in other countries.

6 RESOURCES

The DEA makes an assessment of Danish oil and gas resources annually.

The DEA uses a classification system for hydrocarbons to assess Denmark's oil and gas resources. The assessment of resources is used as a basis for preparing oil and gas production forecasts, which can be used, among other things, to provide an estimate of future state revenue. The aim of the classification system is to determine resources in a systematic way. A description of the classification system is available at the DEA's website, www.ens.dk.

ASSESSMENT OF RESOURCES IN 2012

The quantities produced and the Danish resources assessed according to the DEA's classification system appear from table 6.1. Two figures are indicated for gas: net gas, which consists of future production less gas reinjected; and sales gas, which is future production less gas reinjected, gas used as fuel and gas flared. The DEA uses the quantity of sales gas to assess resources, whereas previous resources assessments were based on the quantity of net gas. The quantity of net gas is shown in the table to enable a comparison with the DEA's previous assessments.

Table 6.1 Production and resources calculated at 1 January 2012

	Oil (m. m^3)	**Net gas** (bn. Nm^3)	**Sales gas** (bn. Nm^3)
Production	374	170	152
Reserves	128	55	43
Contingent resources	53	40	37
Technological resources	100		15
Prospective resources	45		30

A more detailed assessment of production, reserves and contingent resources appears from appendix C.

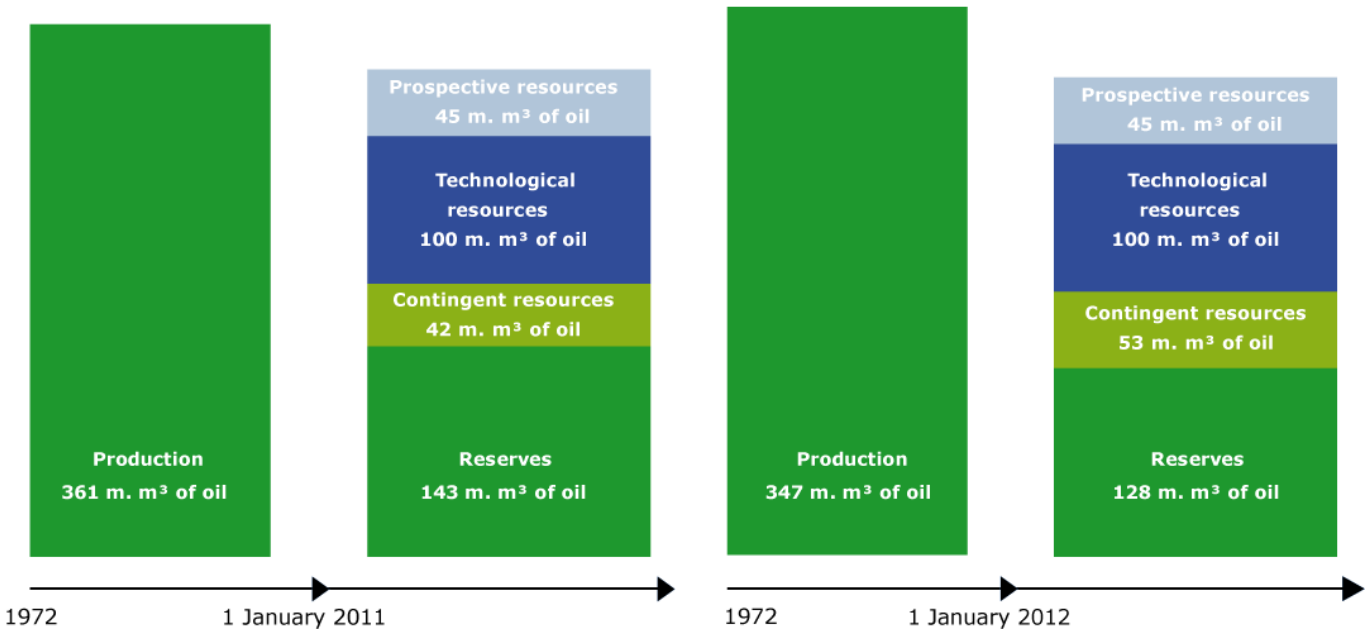
Production in 2011 consisted of 12.8 million m^3 of oil and 6.3 billion Nm^3 of net gas or 5.6 billion Nm^3 of sales gas.

Figure 6.1 shows a comparison between last year's oil resources and the current assessment. The sum total of reserves and contingent resources of 185 million m^3 of oil in 2011 should be compared with the sum total of reserves and contingent resources of 181 million m^3 in 2012. Oil production totalled 12.8 million m^3 in 2011 and the estimate of future recovery has been adjusted upwards by 9 million m^3, which results in a difference of 4 million m^3 of oil between the two assessments. The upward adjustment of future recovery is due mainly to new development opportunities.

The estimate of enhanced oil recovery due to new technology, called technological resources, is unchanged compared to last year's assessment.

Prospective oil resources have been assessed at 45 million m^3, and this assessment is unchanged compared to last year's assessment.

Fig. 6.1 Produced oil and oil resources



For the purpose of assessing net gas, the sum total of reserves and contingent resources of 95 billion Nm^3 in 2012 should be compared with the sum total of reserves and contingent resources of 101 billion Nm^3 in 2011. Gas production in 2011 totalled 6.3 billion Nm^3, and the estimate of total future recovery has not been changed, which means that the difference between the two assessments amounts to the production in 2011.

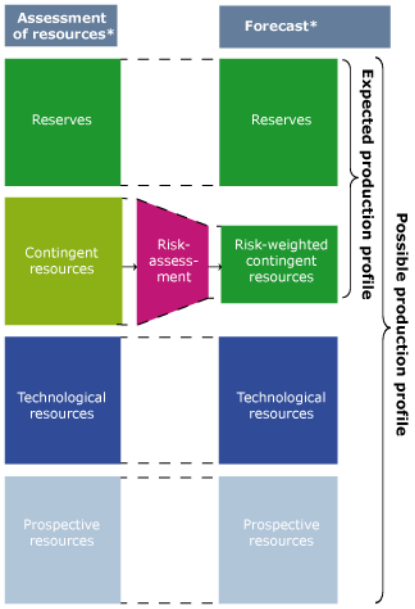
In estimating the consumption of gas as fuel and gas flared, it has been assumed that the majority of the processing facilities, for example the Tyra facilities, are expected to produce during most of the forecast period. The total consumption of gas as fuel and gas flared for the reserves and contingent resources classes is estimated at 16 billion Nm^3 of gas.

The estimate of gas recoverable by means of new technology is 15 billion Nm^3 and is unchanged compared to last year's assessment.

Prospective gas resources have been assessed at 30 billion Nm^3, and this assessment is unchanged compared to last year's assessment.

The resources assessment forms the basis for the DEA's preparation of oil and gas production forecasts.

Fig. 6.2 Correlation between the DEA´s assessment of resources and production forecast



* The assessment of resources and the forecast are shown with the colour code for oil.

PRODUCTION FORECASTS, SPRING 2012

The DEA prepares both short- and long-term forecasts for expected Danish oil and gas production.

The basis for the DEA's forecasts is an expected production profile, and in principle it is equally probable that the forecast turns out to be too optimistic or too pessimistic.

The production forecasts are based on the assessed resources. As far as contingent resources are concerned, the resources assessment is adjusted by making a risk assessment, i.e. estimating the probability that the development projects comprised by the resources assessment will be implemented; see figure 6.2.

For oil, the risk assessment means that the difference between contingent resources and risk-weighted contingent resources is around 30 million m^3 of oil. Of this about 10 million m^3 of oil is attributable to resources in discoveries not comprised by an exploration licence, while the balance consists of a reduction resulting from the probability weighting of the development projects.

For gas, the risk assessment means that the difference between contingent resources and risk-weighted contingent resources ranges around 20 billion m^3 of gas. Of this amount, about 10 billion Nm^3 of gas consists of resources in discoveries not comprised by an exploration licence, while the balance is a reduction resulting from the probability weighting of the development projects.

The DEA's forecasts of oil and gas production and of the investments and operating costs associated with production are used, among other things, for calculating expected state revenue from oil and gas production.

In addition, the DEA uses the oil and gas production forecasts together with its consumption forecasts to determine whether Denmark is a net importer or exporter of oil and gas. Denmark is a net exporter of energy when energy production exceeds energy consumption, calculated on the basis of energy statistics.

To illustrate the potential for prolonging Denmark's period as a net exporter of oil and gas due to the use of new technology and new discoveries resulting from exploration activity, a forecast of total resources has been made. The forecast based on total resources is termed the possible production profile.

The expected production profile forms the basis for the DEA's preparation of its five-year forecast.

Five-year production forecast

The DEA prepares five-year forecasts of oil and gas production to be used by the Danish Ministry of Finance for its forecasts of state revenue. The DEA publishes the five-year forecast in its report "Denmark's Oil and Gas Production and Subsoil Use". Moreover, the forecast is revised every autumn.

Oil

For 2012, oil production is expected to total 11.8 million m^3, equal to about 203,000 barrels of oil per day; see table 6.2. This is a reduction of 8 per cent relative to 2011, when oil production totalled 12.8 million m^3. Compared to last year's estimate for 2012, this is a writeup of 2 per cent.

For the period from 2012 to 2015, oil production is expected to decline or remain constant, after which it is expected to increase in 2016. Only minor adjustments have been made relative to last year's forecast, and the total estimate for the forecast period is largely unchanged relative to last year. A more detailed forecast is available at the DEA's website, www.ens.dk.

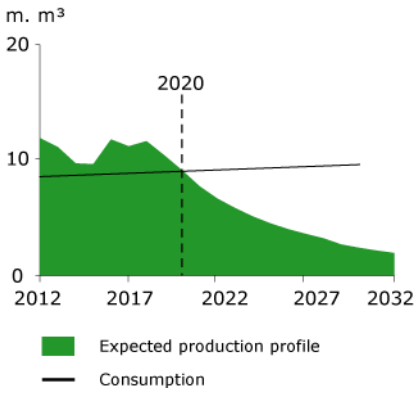
Table 6.2 Expected production profile for oil and sales gas

	2012	2013	2014	2015	2016
Oil, m. m^3	11.8	11.0	9.6	9.6	11.7
Sales gas, bn. Nm^3	4.3	3.5	3.7	3.4	5.0

Sales gas

Sales gas production is estimated at 4.3 billion Nm^3 for 2012; see table 6.2. This is a reduction of 23 per cent relative to 2011, when production totalled 5.6 billion Nm^3. Compared to last year's estimate for 2012, the estimate for production is unchanged.

Fig. 6.3 Expected production profile, oil



On average, the production forecast for the period from 2013 to 2016 has been written down by 12 per cent relative to last year's forecast due to postponed production startup of the Adda and Elly Fields and postponement of a further development of the Tyra Field.

Net exports/net imports for the next 20 years

Every year, the DEA prepares a 20-year forecast for the production of oil and sales gas, based on the expected production profile.

A forecast covering 20 years is most reliable in the first part of the period. The methods used in making the forecast imply that production will decline after a short number of years. The reason is that all commercial development projects are implemented as quickly as possible. Therefore no development projects have been planned for the latter part of the forecast period, even though it must be assumed that development projects will also be undertaken during that period if the oil companies consider such projects to be commercial.

The expected production profile for oil shows a generally declining trend; see figure 6.3. However, production is expected to increase in 2016 due to the development of new fields and the further development of some existing fields. Just over ten years from now, production is expected to constitute approx. 50 per cent of production in 2012.

Figure 6.3 shows the consumption forecast from "The DEA's baseline scenario, April 2011". The baseline scenario is a scenario in which it is assumed that no measures will be taken other than those already decided with a parliamentary majority. Therefore, the baseline scenario is not a forecast of future energy consumption, but a description of the development that could be expected during the period until 2030 based on a number of assumptions regarding technological developments, prices, economic trends, etc., assuming that no new initiatives or measures are taken.

Based on these production and consumption assumptions, Denmark is expected to be a net exporter of oil up to and including 2020. However, it should be noted that the amount of production in 2014 and 2015 is not expected to differ significantly from consumption.

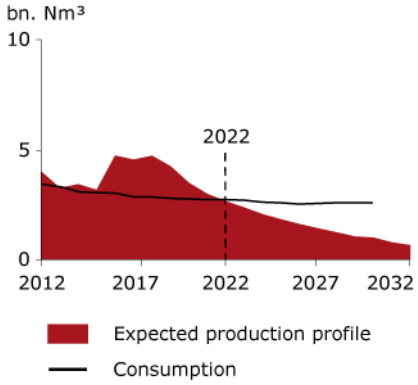
As opposed to oil, which is most frequently sold as individual tanker loads from the North Sea at the prevailing market price, the production of sales gas is subject to the condition that sales contracts have been concluded. Such contracts may either be long-term contracts or spot contracts for very short-term delivery of gas.

Since the start of gas sales in 1984, gas produced under A.P. Møller - Mærsk's Sole Concession has been supplied primarily under long-term gas sales contracts concluded between the DUC companies and DONG Naturgas A/S. The present gas sales contracts do not stipulate a fixed total volume, but rather an annual volume that will be supplied for as long as DUC considers it technically and financially feasible to carry on production.

In 1997, a contract was concluded between the Hess Denmark ApS group and DONG Naturgas A/S for the sale of gas from the South Arne Field, and, in 1998, a contract was concluded with DONG Naturgas A/S for the sale of the DONG group's share of gas produced from the Lulita Field.

In addition, the forecast includes the gas production resulting from contracts for the export of gas through the pipeline from Tyra West via the NOGAT pipeline to the Netherlands.

Fig. 6.4 Expected production profile, sales gas



All the above-mentioned contributions have been included in the production forecast for sales gas. The forecast based on the expected production profile for sales gas is shown in figure 6.4. The forecast shows a generally declining trend, as is the case for oil. However, production is expected to increase in 2016 due to the development of new fields and the further development of some existing fields. The forecast indicates the quantities expected to be technically recoverable. However, as mentioned above, the actual production depends on the sales based on existing and future gas sales contracts.

According to international regulations, the consumption of fuel associated with production must be included in the calculation of energy consumption, but here this fuel consumption has been deducted to allow a comparison with production. Denmark is anticipated to be a net exporter of sales gas up to and including 2022 based on the expected production profile; see figure 6.4. However, it should be noted that the amount of production for the period 2013 to 2015 is not expected to differ significantly from consumption.

However, technological developments and any new discoveries made as part of the ongoing exploration activity are expected to contribute with additional production and thus prolong Denmark's period as a net exporter of oil and sales gas.

Net exports/net imports based on total resources

A forecast based on total resources can be divided into the following contributions:

Expected production profile, technological resources and prospective resources.

It should be emphasized that estimates of the technological resources and prospective resources are subject to great uncertainty.

The DEA's estimate of technological oil resources is based on a five percentage point increase of the average recovery factor for Danish fields and discoveries. The average recovery factor is the ratio of ultimate recovery to total oil originally in place.

Based on the reserves assessment and risk-weighted contingent resources, the average expected recovery factor for oil is 26 per cent.

The assumption that the average recovery factor for oil can be increased by five percentage points is based on an evaluation of historical developments. Thus, the average recovery factor increased by nine percentage points during the period from 1990 to 2000. There has been no significant increase in the recovery factor since 2000. However, it is very difficult to predict which new technologies will contribute to production in future and to estimate the amounts contributed by such technologies.

Most of the five per cent contribution from technological developments is expected to derive from new techniques used for injecting CO_2 into the large producing fields where recovery is based on water injection, while the remaining minor contributions will derive from other technological initiatives. It has been assumed that CO_2 injection will contribute to production from the period 2020-25. The remaining contributions to increased production from other initiatives are assumed to be spread over the forecast period as from 2018.

An analysis - instigated by Mærsk Olie og Gas A/S, the Danish North Sea Fund and the DEA - was performed by the well-known University of Texas in Austin, which demonstrates that the best way to substantially increase oil production from the largest Danish fields is to inject CO_2 into the fields. The analysis is available at the DEA's website, www.ens.dk.

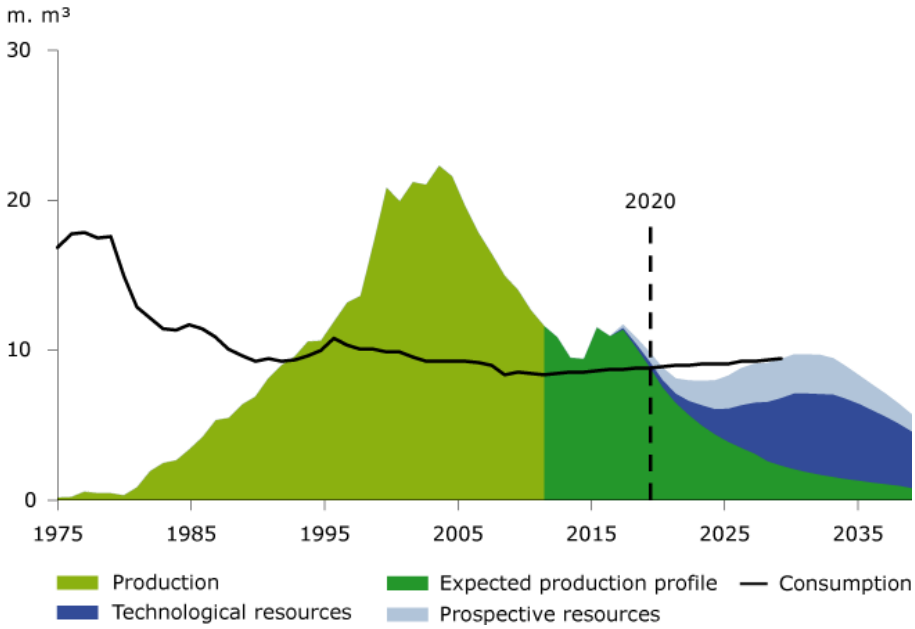
The recovery factor for the large producing fields with water injection is expected to be 35 per cent. The total oil originally in place in these fields accounts for more than half the total oil originally in place in the Danish subsoil. Therefore, the assessment of technological oil resources is subject to a nine percentage point increase of the average recovery factor for these fields. When including the estimated technological resources, an average recovery factor of 44 per cent is expected for the large oil fields.

Any new recovery methods must be implemented while the fields are still producing, as the introduction of new technology will usually not be financially viable once a field has been decommissioned. This means that a limited period is available for the development and introduction of new technology.

The DEA's estimate of prospective resources is based on the exploration prospects known today in which exploration drilling is expected to take place. Moreover, the estimate includes assessments of the additional prospects expected to be demonstrated later in the forecast period.

The oil production forecast is divided into the three above-mentioned contributions, the expected production profile, technological resources and prospective resources, which are shown in figure 6.5 along with the consumption forecast from "The DEA's baseline scenario, April 2011".

Fig 6.5 Production and possible production profile, oil



It appears from the figure that Denmark is anticipated to be a net exporter of oil for nine years up to and including 2020, based on the expected production profile. The period in which Denmark will be a net exporter can be assessed fairly reliably for the expected production profile, as the production deriving from this contribution is known with a great degree of certainty and is expected to decline substantially, while consumption is expected to remain fairly constant.

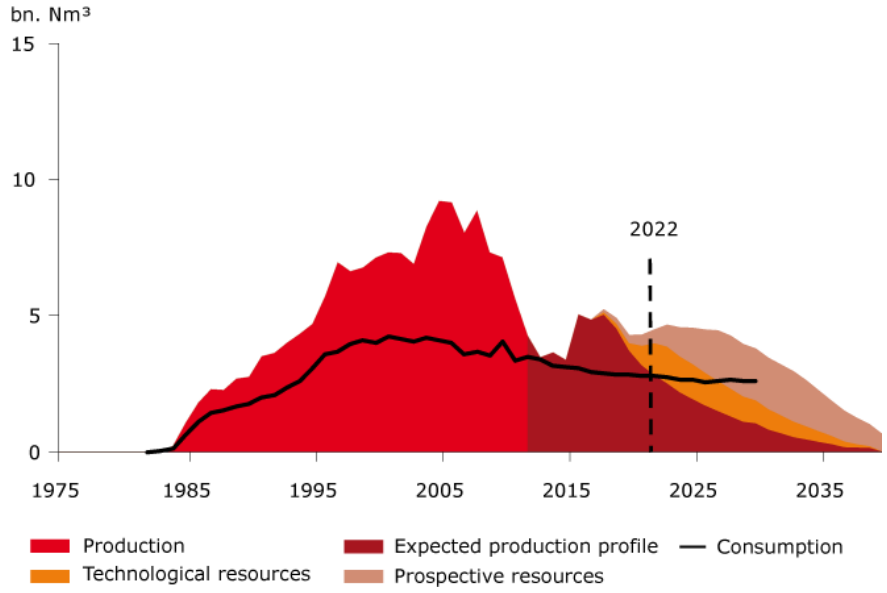
The oil production forecast that includes technological resources and prospective resources varies somewhat from 2015 to around 2035, after which estimated production is expected to decline. If technological and prospective resources are included, they will contribute substantially to reducing Denmark's net oil imports from around 2025 to around 2035.

Figure 6.6 shows the sales gas production forecast, divided into the expected production profile, technological resources and prospective resources. The figure also shows the consumption forecast from "The DEA's baseline scenario, April 2011". It appears from the figure that Denmark is anticipated to be a net exporter of sales gas for 11 years up to and including 2022, based on the expected production profile.

For sales gas, the DEA anticipates no significant contribution from technological resources for producing fields because current technology has already generated a much higher recovery factor than for oil. However, a contribution reflecting the potential for developing new well technology has been included.

When including technological resources and prospective resources, the DEA estimates that Denmark will be a net exporter of gas for just over 20 years reckoned from 2012.

Fig 6.6 Production and possible production profile, sales gas



7 ECONOMY

Oil and gas production from the North Sea has an impact on the Danish economy, and thus on the balance of trade and balance of payments, through the Danish state's tax revenue and the profits generated by the players in the oil and gas sector, and not least, it provides jobs for numerous people.

Denmark has been self-sufficient in energy since 1997 due to the production of hydrocarbons mainly, but also because of energy savings and the utilization of renewable energy. Thus, Denmark is the only EU country that is a net exporter of energy.

VALUE OF OIL AND GAS PRODUCTION

Three factors influence the value of oil and gas production: the volume of production, the international crude oil price and the dollar exchange rate.

The average quotation for a barrel of Brent crude oil was USD 111.4 in 2011 against USD 79.5 in 2010, an increase of about 40 per cent.

Figure 7.1 illustrates the oil price trend in 2011. The year was characterized by a fairly stable oil price of about USD 110 per barrel. It appears from figure 7.1 that the EUR/USD rate remained relatively constant throughout 2011. Figure 7.2 shows the oil price development in USD from 1972 to 2011.

The average dollar exchange rate in 2011 was DKK 5.4 per USD. This is a decrease of almost 4 per cent compared to 2010 when the average dollar exchange rate was DKK 5.6 per USD.

The slightly decreasing dollar exchange rate and the markedly higher oil price in USD relative to the average price in 2010 caused the oil price in DKK to rise by almost 35 per cent from 2010 to 2011. The average price for a barrel of Brent crude oil increased to DKK 595.8 in 2011 from DKK 446.7 in 2010.

According to preliminary estimates for 2011, oil production accounts for about DKK 48.3 billion and gas production for about DKK 9.9 billion of the total production value.

Fig 7.1 Oil prices, 2011, USD and EUR

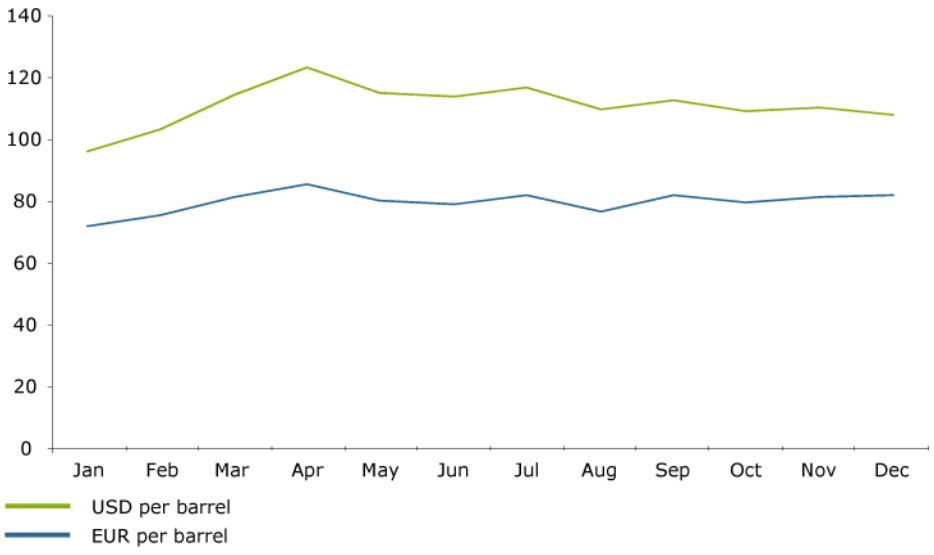
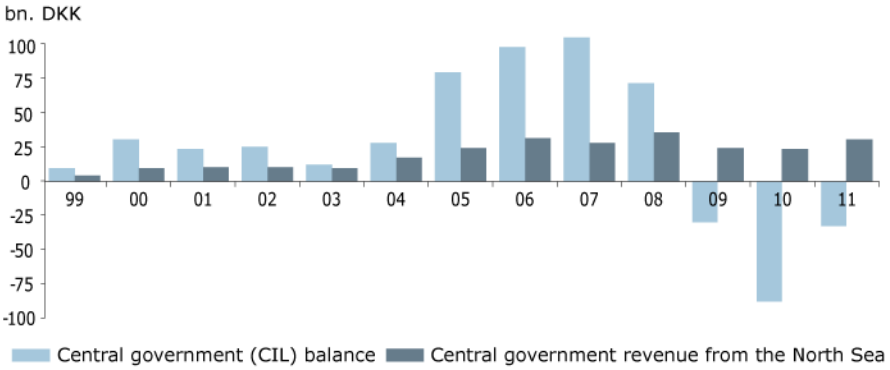


Fig. 7.6 Central government (CIL) balance and central government revenue from the North Sea



Note: The CIL balance (central government balance on the current investment and lending account) is the difference between total central government revenue and total central government expenditure

The total estimated value of Danish oil and gas production in 2011 is DKK 58.2 billion, an increase of about 15 per cent on the year before. The production value rose because the higher oil price more than offset the decline in production.

The breakdown of oil production in 2011 on the ten producing companies in Denmark appears from figure 3.2 in chapter 3, *Production and development*.

The DEA prepares forecasts of the future development of production based on the reserves assessment; see chapter 6, *Resources*.

Appendix C contains a detailed outline of financial key figures from 1972 to 2011.

Table 7.1 Impact of oil/gas activities on the balance of payments, DKK billion, 2011 prices, price scenario 120 USD/bbl

	2012	2013	2014	2015	2016
Socio-economic production value	57	54	48	48	61
Import content	6	6	7	8	6
Balance of goods and services	51	48	41	40	55
Transfer of interest and dividends	11	11	9	8	12
Balance of payments current account	41	37	32	32	43
Balance of payments current account, price scenario 80 USD/bbl.	28	25	21	21	30
Balance of payments current account, price scenario 160 USD/bbl.	54	49	43	43	56

IMPACT OF PRODUCTION ON THE DANISH ECONOMY

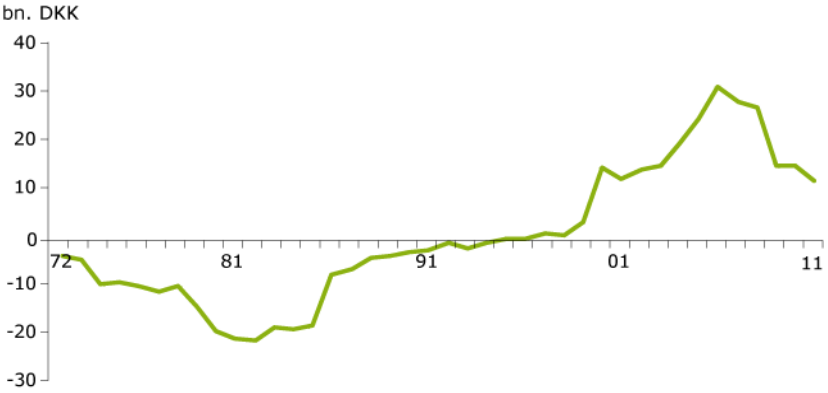
Oil and gas production contributes to Denmark being a net exporter of energy. This export has a favourable impact on both the balance of trade and the balance of payments current account.

The balance of trade for oil and natural gas

Figure 7.3 shows the trend in Denmark's external trade in oil and natural gas. Since 1995, Denmark has had a surplus on the balance of trade for oil and gas.

The surplus amounted to DKK 12.3 billion in 2011, a decline of about 20 per cent compared to the year before.

Fig 7.3 Balance of trade for oil and natural gas 1972-2011, norminal prices



Impact on the balance of payments

The DEA prepares an estimate of the impact of oil and gas activities on the balance of payments current account for the next five years on the basis of its own forecasts for production, investments, operating and transportation costs. The underlying calculations are based on a number of assumptions about import content, interest expenses and the oil companies' profits from the hydrocarbon activities.

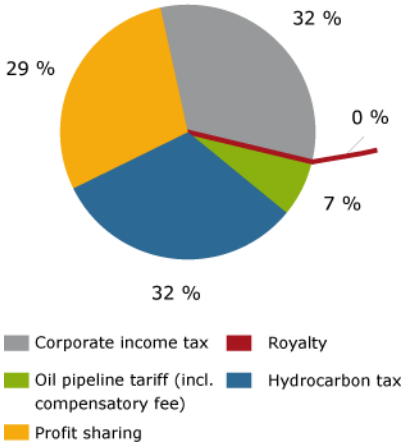
This year, the DEA's five-year forecast has been prepared for three different oil price scenarios. The three scenarios are based on an oil price of USD 80, 120 and 160 per barrel and a dollar exchange rate of about DKK 5.5 per USD. An oil price of USD 120 per barrel reflects the IEA's long-term oil price forecast in the "New policies scenario" (2010 prices).

The purpose of preparing three scenarios is to illustrate the sensitivity of balance-of-payments effects to fluctuations in the oil price. Thus, the only variable in the three scenarios is the oil price. The calculations include no dynamic or derived effects.

Table 7.1 shows the individual items used in calculating the impact of oil and gas activities on the balance of payments in the USD 120 oil price scenario. The lower part of the table also shows the calculated impact on the balance of payments current account when using the price scenarios of USD 80 and USD 160 per barrel.

Assuming that the oil price is USD 120 per barrel, the oil and gas activities will have an estimated DKK 32-43 billion impact on the balance of payments current account per year during the period 2012-2016. Moreover, it appears that a higher oil price intensifies the impact, and vice versa.

Fig 7.4 State revenue in 2011



State revenue

The Danish state derives proceeds from North Sea oil and gas production via direct revenue from various taxes and fees: corporate income tax, hydrocarbon tax, royalty, the oil pipeline tariff, compensatory fee and profit sharing. The sources of revenue are described in more detail at the DEA's website, www.ens.dk, and in appendix D.

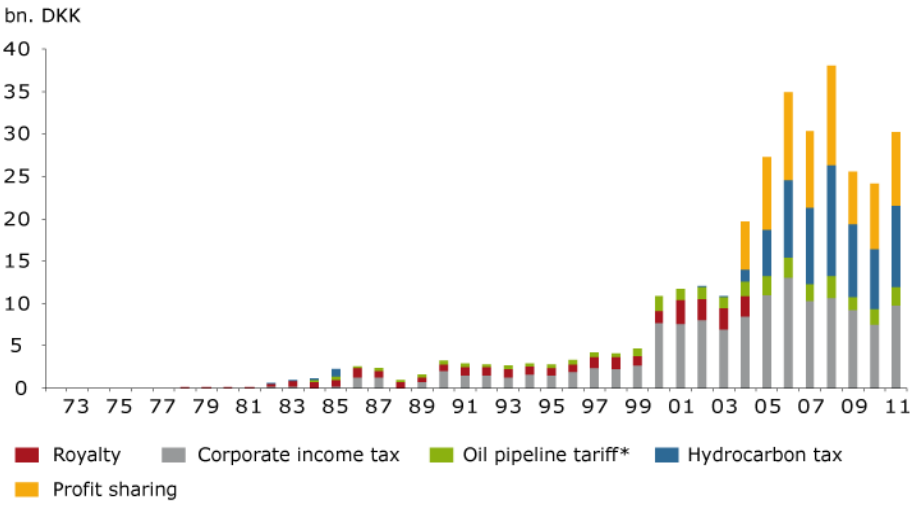
In addition to the direct revenue from taxes and fees, the Danish state receives indirect revenue from the North Sea by virtue of its shareholding in DONG Energy, generated by the subsidiary DONG E&P A/S, which participates in oil and gas activities. In the long term, the state will also receive revenue through the Danish North Sea Fund.

A more detailed explanation of the state's revenue base in the form of taxes and fees from oil and gas production is available at the DEA's website, www.ens.dk.

With a share of about 32 per cent each, profit sharing and corporate income tax are the main sources of state revenue. Figure 7.4 shows the breakdown of state tax revenue in 2011.

State revenue from hydrocarbon production in the North Sea aggregated DKK 325 billion in 2011 prices in the period 1963-2011. The cumulative production value was DKK 831 billion during the same period, while the aggregate value of the licensees' expenses for exploration, field developments and operations was about DKK 292 billion (2011 prices). Figure 7.5 shows the development in state revenue from 1972 to 2011.

Fig 7.5 Development in total state revenue from oil and gas production 1972-2011, 2011 prices



** Incl. compensatory fee*
Note: Accrual according to the Finance Act (year of payment)

The development in 2011 was characterized by a fall in production and an increase in the oil price. Total revenue is estimated at DKK 30.6 billion for 2011, an increase of almost 30 per cent from 2010. Table 7.2 shows total state revenue for the past five years, broken down on the individual taxes and fees.

State revenue has grown substantially since 2003 on account of the higher oil price level. Another reason for this growth is that the Danish Government concluded an agreement with A.P. Møller - Mærsk, the so-called North Sea Agreement, in 2003. The agreement involved a restructuring of tax allowances, which resulted in steeper progressive tax rates. Information about Dansk Undergrunds Consortium's pre-tax profits can be found at www.ens.dk. As in previous years, this information will also be submitted to the Climate, Energy and Building Committee of the Danish Parliament.

Table 7.2 State revenue over the past five years, DKK million, nominal prices

	2007	2008	2009	2010	2011**
Hydrocarbon tax	8,245	12,405	8,250	6,943	9,732
Corporate income tax	9,475	10,092	8,876	7,374	9,852
Royalty	2	2	0	0	1
Oil pipeline tariff*	1,815	2,511	1,431	1,824	2,201
Profit sharing	8,348	11,145	6,027	7,594	8,819
Total	27,885	36,155	24,584	23,735	30,605

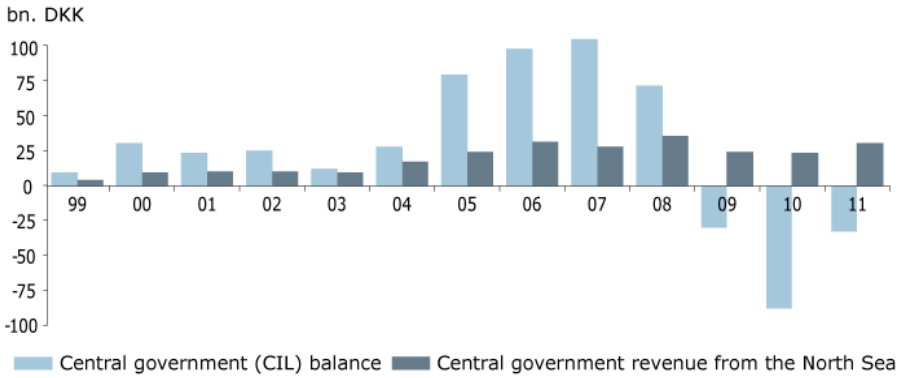
** Incl. 5 per cent. compensatory fee*
*** Estimate*
Note: Accrual according to the Finance Act (year of payment)

The state's share of oil company profits is estimated at 62 per cent for 2011, calculated by year of payment. The marginal income tax is about 71 per cent according to the new rules, including profit sharing, and about 29 per cent according to the old rules, excluding hydrocarbon tax. The rules regarding the hydrocarbon allowance mean that companies taxed according to the old rules do not pay hydrocarbon tax in practice. Licences awarded before 2004 are taxed according to the old rules.

At the turn of the year 2011/2012, the Government decided to initiate an overhaul of the terms and conditions for oil and gas production in the North Sea. In this connection, the terms and conditions of licences covered by the North Sea Agreement from 2003, existing licences not covered by the North Sea Agreement and future licences will be reviewed. The overhaul is subject to the premise that the Government abides by the agreement concluded between the Danish state and A. P. Møller-Mærsk.

Figure 7.6 shows the proportion of revenue from the oil and gas activities to the central government balance on the current investment and lending account. As appears from the figure, state revenue from the Danish part of the North Sea contributed to reducing the central government deficit in 2011.

Fig. 7.6 Central government (CIL) balance and central government revenue from the north sea



Note: The CIL balance (central government balance on the current investment and lending account) is the difference between total central government revenue and total central government expenditure

For the next five years, the Ministry of Taxation estimates that the state's total revenue will range from DKK 22 to DKK 30 billion per year from 2012 to 2016, based on the USD 120 oil price scenario. Table 7.3 shows the development in expected state revenue for the three different oil price scenarios of USD 80, 120 and 160 per barrel. It also appears from the table that the state's share of profits increases when the oil companies generate increasing earnings due to higher oil prices, for example. The revenue from the Danish North Sea Fund is included as

from 2012 at the same time as revenue from profit sharing is phased out. This is because the Danish state, via the Danish North Sea Fund, will join DUC with a 20 per cent share as of 9 July 2012.

Future estimates of corporate income tax and hydrocarbon tax payments are subject to uncertainty with respect to oil prices, production volumes and the dollar exchange rate. In addition, uncertainty attaches to the calculations because they are based on various stylized assumptions, some of which concern the companies' finance costs.

Table 7.3 Expected state revenue from oil and gas production, DKK billion, nominal prices*

			2012	2013	2014	2015	2016
Corporate income tax base before taxes, fees and profit sharing	160	USD/bbl	68,8	62,0	56,1	52,9	71,6
	120	USD/bbl	48,1	43,1	38,8	35,7	49,7
	80	USD/bbl	27,5	24,2	21,4	18,6	27,8
Corporate income tax	160	USD/bbl	14,9	15,3	13,9	13,1	17,5
	120	USD/bbl	10,4	10,7	9,6	8,9	12,1
	80	USD/bbl	5,8	6,0	5,3	4,7	6,8
Hydrocarbon tax	160	USD/bbl	18,1	19,3	18,6	16,7	19,6
	120	USD/bbl	12,3	13,3	12,2	11,1	13,5
	80	USD/bbl	6,6	7,2	6,6	5,7	7,4
Profit sharing	160	USD/bbl	7,4	0,0	0,0	0,0	0,0
Danish North Sea Fund post-tax profits **	160	USD/bbl	1,3	3,9	3,3	2,5	3,5
	120	USD/bbl	5,3	0,0	0,0	0,0	0,0
	120	USD/bbl	0,7	2,7	2,2	1,5	2,3
	80	USD/bbl	3,2	0,0	0,0	0,0	0,0
	80	USD/bbl	0,0	1,6	1,2	0,5	1,2
Royalty	160	USD/bbl	0,0	0,0	0,0	0,0	0,0
	120	USD/bbl	0,0	0,0	0,0	0,0	0,0
	80	USD/bbl	0,0	0,0	0,0	0,0	0,0
Oil pipeline tariff ***	160	USD/bbl	1,7	0,6	0,6	0,6	1,1
	120	USD/bbl	1,3	0,5	0,4	0,5	0,8
	80	USD/bbl	0,9	0,3	0,3	0,3	0,5
Total	160	USD/bbl	43,4	39,2	36,4	33,0	41,7
	120	USD/bbl	30,0	27,2	24,4	22,0	28,8
	80	USD/bbl	16,6	15,1	13,3	11,2	15,9
The state's share (pct.)	160	USD/bbl	63,1	63,2	64,8	62,4	58,2
	120	USD/bbl	62,3	63,0	63,1	61,5	57,9
	80	USD/bbl	60,4	62,5	62,3	60,4	57,2

** Assumed annual inflation rate of 1.8 per cent*
*** On 9 July, the Danish North Sea Fund will join DUC with a 20 per cent share. The Danish North Sea Fund is liable to pay tax, for which reason the revenue from state participation appears under different headings, including in corporate income tax and hydrocarbon tax revenue. The Danish North Sea Fund's post tax profits accrue to the state. However, it should be noted that the Fund must first repay loans raised with the Danish central bank and finance its continuous investments before delivering any profits to the state.*
**** Incl. 5 per cent. compensatory fee*
Source: Ministry of taxation
Note 1: Based on the DEA's five-year forecast
Note 2: Accrual according to the National Accounts (income year)

Fig. 7.7 All licensees´ total cost 1963-2011, DKK billion, 2011 prices

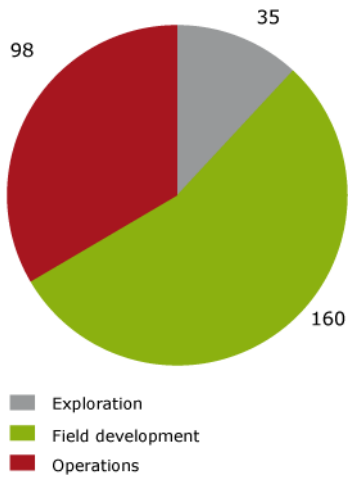
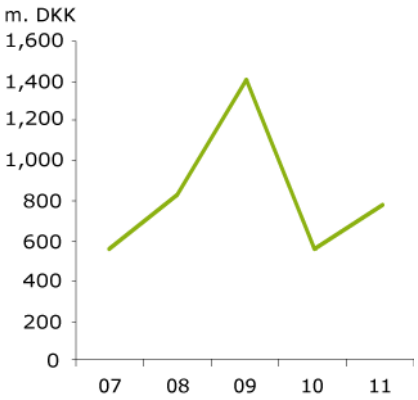


Fig. 7.8 Exploration costs 2007-2011, nominal prices



Investments and costs

In the same way that oil prices impact on state revenue from production in the North Sea, the licensees' initiatives play a vital role for both the current and future activity level and thus for potential revenue.

Figure 7.7 shows the breakdown of the licensees' costs during the period from 1963 to 2011. Development costs and investments account for more than half the licensees' total costs. The costs of exploration, field developments and operations (including administration and transportation) account for 12, 55 and 33 per cent, respectively, of total costs.

Exploration costs

Figure 7.8 illustrates the development in exploration costs from 2007 to 2011.

The preliminary figures for 2011 show that exploration costs increased about 40 per cent from 2010 to 2011, the reason being that more deep exploration wells were drilled in 2011. For 2011, total exploration costs are preliminarily estimated at slightly less than DKK 0.75 billion.

In 2012-2015, investments in exploration are expected to total about DKK 4.9 billion. The activities will include further exploration both onshore and in the Danish part of the North Sea.

Investments in field developments

The most cost-intensive activity for the licensees is the development of new and existing fields. Investments in field developments are estimated to total about DKK 4.3 billion in 2011, the same level as in 2010. The investment level in 2011 is below the past decade's average annual investments of about DKK 5.5 billion. Figure 7.9 illustrates investments in field developments over the period 2007-2011. A table showing the investments by field is available at the DEA's website.

Table 7.4 shows the DEA's estimate of investments in development activity for the period from 2012 to 2016. The estimate is based on the following resource categories: ongoing recovery and approved for development, justified for development and risk-weighted contingent resources; see chapter 6, *Resources*. For the next five years, investments in field developments are estimated to total DKK 44 billion. It should be noted that investments in 2014 and 2015 are expected to exceed DKK 10 billion, which indicates a high estimated level of development activity.

The investments in the category ongoing recovery and approved for development are shown broken down by field at the DEA's website.

Fig. 7.9 Investments in field developments 2007-2011, nominal prices

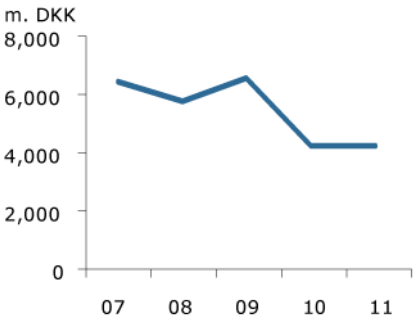
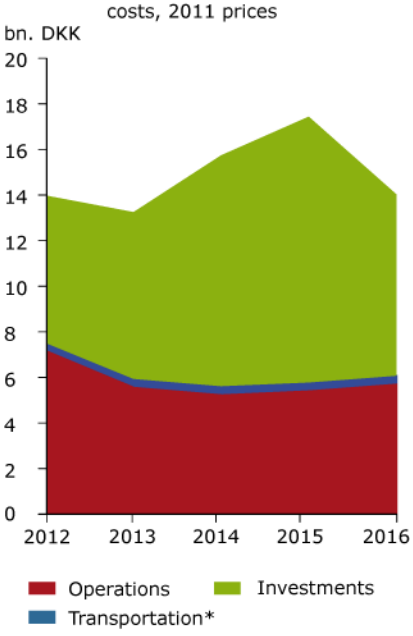


Table 7.4 Estimated investments in development projects, 2012-2016, DKK billion, 2011 prices

	2012	2013	2014	2015	2016
Ongoing and approved	6,459	6,547	5,746	3,814	250
Justified for development	22	162	-	-	-
Risk-weighted contingent resources	-	623	4,405	7,867	7,725
Expected, total	6,481	7,332	10,151	11,680	7,976

Fig. 7.10 Investments in fields and operating and oil transportation costs, 2011 prices



**Excl. pipeline tariff/compensatory fee*

Operating, administration and transportation costs

For 2011, the DEA has calculated operating, administration and transportation costs at DKK 6.1 billion, an increase of about 11 per cent compared to the year before.

Figure 7.10 illustrates the DEA's estimate of developments in investments and operating and transportation costs for the period 2012-2016.

Due to the maturity of the Danish sector, the DEA has reviewed the estimate of future operating costs, which has resulted in an upward adjustment of the cost level.

APPENDIX A: AMOUNTS PRODUCES AND INJECTED

Production and sales — **OIL** — *thousand cubic metres*

	1972-2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	Total
Dan	57,222	6,326	5,929	6,139	5,712	5,021	4,650	4,241	3,549	2,979	2,474	104,242
Gorm	42,330	2,887	2,838	2,469	1,978	1,897	1,639	1,053	924	923	713	59,653
Skjold	32,398	1,659	1,532	1,443	1,310	1,214	1,015	989	918	835	778	44,092
Tyra	19,390	801	918	723	773	845	764	551	415	856	744	26,781
Rolf	3,678	51	104	107	79	89	103	78	76	60	1	4,427
Kraka	3,675	157	139	199	211	222	176	112	37	67	170	5,165
Dagmar	990	6	7	2	0	-	-	0	-	-	-	1,005
Regnar	847	18	19	19	16	11	0	-	-	-	-	930
Valdemar	1,282	353	435	491	423	470	881	1,268	1,410	909	817	8,739
Roar	1,936	175	121	98	94	51	35	28	30	24	16	2,607
Svend	4,320	457	280	326	324	296	299	278	195	190	145	7,110
Harald	5,763	578	425	314	237	176	139	114	65	70	95	7,976
Lulita	612	24	20	19	35	68	55	47	24	36	36	976
Halfdan	4,307	3,718	4,352	4,946	6,200	6,085	5,785	5,326	5,465	5,119	4,905	56,209
Siri	5,472	1,487	925	693	703	595	508	598	326	286	161	11,754
South Arne	5,345	2,313	2,383	2,257	2,371	1,869	1,245	1,139	1,164	1,066	1,004	22,157
Tyra SE	-	493	343	580	614	446	377	429	374	225	165	4,045
Cecilie	-	-	166	310	183	116	88	66	38	33	39	1,038
Nini	-	-	391	1,477	624	377	323	355	159	544	569	4,820
Total	**189,567**	**21,505**	**21,327**	**22,612**	**21,886**	**19,847**	**18,084**	**16,672**	**15,169**	**14,223**	**12,834**	**373,726**

Production — **GAS** — *million normal cubic metres*

	1972-2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	Total
Dan	17,367	945	786	764	651	561	456	467	364	360	327	23,050
Gorm	13,597	480	339	216	218	207	175	119	109	99	67	15,624
Skjold	2,812	123	92	77	93	77	69	60	58	87	69	3,617
Tyra	57,952	3,948	3,994	4,120	3,745	3,792	3,916	3,130	2,007	1,664	1,320	89,588
Rolf	155	2	4	5	3	4	4	3	3	3	0	186
Kraka	1,168	52	25	23	24	28	28	36	8	12	46	1,450
Dagmar	151	1	3	2	0	-	-	0	-	-	-	158
Regnar	56	1	2	2	1	1	0	-	-	-	-	63
Valdemar	559	109	151	218	208	208	355	593	510	791	579	4,282
Roar	9,111	1,052	915	894	860	489	367	417	398	213	171	14,888
Svend	508	61	43	38	34	28	28	24	16	27	24	831
Harald	11,995	2,019	1,563	1,232	1,091	927	781	690	400	592	573	21,864
Lulita	438	6	5	5	13	38	33	30	15	18	20	619
Halfdan	736	759	1,142	1,449	2,582	2,948	2,675	3,104	3,401	2,886	2,343	24,025
Siri	515	157	110	64	112	55	47	63	44	67	48	1,280
South Arne	1,654	681	544	461	485	366	234	225	271	248	238	5,408
Tyra SE	-	447	452	1,233	1,337	1,108	848	889	939	911	626	8,791
Cecilie	-	-	14	22	13	8	6	4	2	2	3	74
Nini	-	-	29	109	46	28	24	26	12	76	57	407
Total	**118,772**	**10,844**	**10,213**	**10,934**	**11,517**	**10,873**	**10,046**	**9,879**	**8,559**	**8,057**	**6,511**	**216,205**

Fuel *

GAS

million normal cubic metres

	1972-2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	Total
Dan	1,409	182	198	201	205	209	222	225	207	206	179	3,443
Gorm	1,863	146	135	137	124	124	132	117	116	111	107	3,112
Tyra	2,351	245	242	249	247	241	228	233	219	208	188	4,651
Dagmar	21	-	-	-	-	-	-	-	-	-	-	21
Harald	56	9	8	8	7	8	7	7	4	8	16	139
Siri	52	21	20	19	20	24	25	25	19	27	28	279
South Arne	69	45	49	45	52	53	55	51	52	55	49	574
Halfdan	-	-	-	20	39	39	39	39	39	37	62	315
Total	**5,820**	**648**	**652**	**679**	**694**	**698**	**708**	**697**	**656**	**652**	**629**	**12,534**

** As from 2006, the figures have been based on verified CO_2 emission data from reports filed under the Act on CO_2 Allowances*

Flaring *

	1972-2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	Total
Dan	1,778	55	71	37	23	29	27	25	16	12	13	2,086
Gorm	1,382	81	66	57	61	61	48	41	19	12	14	1,842
Tyra	805	61	54	63	55	51	43	43	32	23	28	1,258
Dagmar	128	1	3	2	0	-	-	0	-	-	-	135
Harald	126	3	1	1	1	2	2	2	2	3	3	147
Siri	97	9	23	65	15	6	7	7	4	58	6	296
South Arne	164	11	12	11	14	11	11	7	7	6	11	264
Halfdan	-	-	4	25	16	20	17	8	4	2	6	101
Total	**4,480**	**222**	**234**	**262**	**184**	**180**	**154**	**132**	**85**	**116**	**81**	**6,129**

** As from 2006, the figures have been based on verified CO_2 emission data from reports filed under the Act on CO_2 Allowances*

Injection

	1972-2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	Total
Gorm	8,137	14	6	4	3	0	-	-	-	-	-	8,164
Tyra	26,163	2,535	2,312	1,612	1,285	761	1,094	119	451	89	94	36,514
Siri	367	127	109	111	135	61	45	61	35	59	73	1,182
Total	**34,666**	**2,676**	**2,428**	**1,727**	**1,423**	**821**	**1,139**	**180**	**486**	**148**	**167**	**45,860**

Sales *

	1984-2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	Total
Dan	16,141	1,521	1,679	1,681	1,804	1,862	1,653	1,293	947	1,200	1,017	30,800
Gorm	5,181	364	228	99	126	103	66	23	33	64	12	6,298
Tyra	38,811	2,776	2,948	4,580	4,598	4,574	4,143	4,652	3,163	3,283	2,410	75,938
Harald	12,250	2,013	1,558	1,228	1,096	954	804	710	408	598	577	22,196
South Arne	1,421	625	483	406	419	302	168	167	212	199	180	4,582
Halfdan	0	0	4	274	1,172	1,370	1,215	2,020	2,560	1,801	1,439	11,850
Total	**73,804**	**7,299**	**6,900**	**8,267**	**9,215**	**9,164**	**8,049**	**8,865**	**7,324**	**7,144**	**5,635**	**151,666**

** The names refer to processing centres*

Emissions

CO_2 EMISSIONS *)

thousand tons

	1972-2001	2002	2003	2004	2005	2006 **	2007	2008	2009	2010	2011	Total
Fuel	13,414	1,577	1,591	1,642	1,694	1,675	1,690	1,670	1,572	1,559	1,510	29593
Flaring	10,551	535	564	664	457	470	449	354	241	331	230	14846
Total	**22,965**	**2,112**	**2,154**	**2,306**	**2,151**	**2,144**	**2,139**	**2,025**	**1,813**	**1,890**	**1,740**	**43,440**

**) CO_2 emissions have been calculated on the basis of parameters specific to the individual year and the individual installation*
CO_2 emissions from the use of diesel oil were not included from 1972 through 2005

***) As from 2006, the figures have been based on verified CO_2 emission data from reports filed under the Act on CO_2 allowances and have included CO_2 emissions from diesel combustion*

Production

WATER

thousand cubic metres

	1972-2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	Total
Dan	27,143	6,348	7,183	8,053	9,527	10,936	12,152	13,946	12,889	12,111	11,059	131,346
Gorm	26,132	4,017	4,420	5,173	5,252	4,822	4,708	3,976	4,737	4,904	4,654	72,794
Skjold	24,700	3,007	3,525	3,688	4,270	4,328	3,885	3,636	3,855	3,895	3,861	62,650
Tyra	19,909	2,261	3,039	2,977	3,482	3,150	2,725	3,103	2,677	1,980	1,811	47,114
Rolf	4,109	168	270	308	290	316	383	349	381	281	8	6,861
Kraka	2,652	306	208	426	320	297	359	436	183	166	358	5,712
Dagmar	3,285	160	375	90	3	-	-	13	-	-	-	3,927
Regnar	2,487	257	316	396	352	255	1	-	-	-	-	4,064
Valdemar	444	272	310	325	792	937	854	925	812	1,207	1,026	7,902
Roar	1,159	301	476	653	662	498	560	586	624	275	200	5,994
Svend	3,230	1,051	1,330	1,031	1,309	1,205	1,200	1,022	804	664	585	13,431
Harald	157	78	43	15	12	12	18	21	11	37	113	518
Lulita	43	14	14	15	38	92	96	91	49	65	73	588
Halfdan	787	367	612	2,099	2,825	3,460	4,086	4,766	4,814	5,519	6,149	35,483
Siri	4,941	3,041	2,891	1,641	1,683	2,032	2,528	2,686	1,778	2,868	2,593	28,680
South Arne	185	370	857	1,127	1,790	1,830	1,861	2,174	2,285	2,068	1,883	16,430
Tyra Se	-	250	596	466	437	377	669	602	716	568	485	5,166
Cecilie	-	-	25	331	637	651	576	456	266	317	452	3,710
Nini	-	-	0	63	730	822	619	660	522	195	330	3,942
Total	**121,360**	**22,268**	**26,490**	**28,875**	**34,410**	**36,019**	**37,280**	**39,448**	**37,402**	**37,121**	**35,640**	**456,311**

Injection

	1972-2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	Total
Dan	91,849	16,123	18,063	20,042	20,281	21,520	20,230	19,275	16,712	15,148	14,508	273,753
Gorm	67,424	8,167	7,066	7,551	7,251	6,544	6,678	5,251	4,777	4,408	5,459	130,576
Skjold	61,204	6,411	6,115	5,607	6,045	5,711	6,098	4,989	5,285	4,155	4,374	115,995
Halfdan	715	2,532	5,162	5,759	9,710	11,026	12,107	12,727	11,485	11,945	12,277	95,446
Siri	9,515	4,517	3,383	1,683	1,350	1,973	3,499	2,695	1,692	2,692	3,201	36,198
South Arne	2,049	4,397	5,332	4,949	5,608	5,362	4,296	4,279	3,872	3,427	3,240	46,811
Nini	-	-	81	918	502	912	413	883	501	1,558	1,365	7,132
Cecilie	-	-	-	93	198	30	91	42	97	47	221	819
Total	**232,756**	**42,148**	**45,201**	**46,603**	**50,945**	**53,077**	**53,412**	**50,141**	**44,420**	**43,379**	**44,646**	**706,730**

Water injection includes the injection of produced water and seawater. Most of the water produced in the Gorm, Skjold, Dagmar and Siri Fields is reinjected

APPENDIX B: PRODUCTION, RESERVES AND CONTINGENT RESOURCES AT 1 JANUARY 2012

OIL, m. m^3	Produced	Resources Exp.
		Reserves
Ongoing recovery and approved for development		
Cecilie	1.0	0.2
Dagmar	1.0	0.0
Dan	104.2	20.7
Gorm	59.7	5.4
Halfdan	56.2	44.4
Harald	8.0	0.4
Hejre	-	16.2
Kraka	5.2	0.8
Lulita	1.0	0.2
Nini	4.8	1.9
Regnar	0.9	0.0
Roar	2.6	0.1
Rolf	4.4	0.0
Siri	11.8	1.8
Skjold	44.1	5.4
Svend	7.1	0.6
South Arne	22.2	13.7
Tyra **	30.8	8.4
Valdemar	8.7	7.7
Justified for development	-	0
Subtotal	**374**	**128**
		Contingent resources
Development pending	-	*26*
Development unclarified	-	*15*
Development not viable	-	*11*
Subtotal		**53**
Total	**374**	**181**
January 2011	361	185

GAS, bn. Nm^3	Net Produced*	Resources Net gas * Exp.	Resources Sales gas * Exp.
		Reserves	
Ongoing recovery and approved for development			
Cecilie	0.1	-	-
Dagmar	0.2	0.0	0
Dan	23.1	2.8	0
Gorm	7.5	0.6	0
Halfdan	24.0	8.0	7
Harald	21.9	3.0	3
Hejre	-	10.0	9
Kraka	1.5	0.1	0
Lulita	0.6	0.1	0
Nini	0.4	-	-
Regnar	0.1	0.0	0
Roar	14.9	0.3	0
Rolf	0.2	0.0	0
Siri	0.1	-	-
Skjold	3.6	0.5	0
Svend	0.8	0.1	0
South Arne	5.4	2.8	2
Tyra **	61.9	18.4	14
Valdemar	4.3	5.2	5
Justified for development	-	3	3
Subtotal	**170**	**55**	**43**
		Contingent resources	
Development pending	-	*18*	*16*
Development unclarified	-	*12*	*11*
Development not viable	-	*10*	*9*
Subtotal		**40**	**37**
Total	**170**	**95**	**79**
January 2011	164	101	84

*) *Net production: historical production less injection*
Net gas: future production less injection
Sales gas: future production less injection and less fuel gas and flaring

**) *Tyra Southeast included*

APPENDIX C: FINANCIAL KEY FIGURES

	Investments in field dev. DKK million [1)]	Field operating costs DKK million [2)]	Exploration costs DKK million	Crude oil price USD/bbl [3)]	Exchange rate DKK/USD	Inflation per cent [4)]	Net foreign currency value DKK billion [5)]	State revenue DKK millon
1972	105	21	30	3.0	7.0	6.7	-3.2	0
1973	9	23	28	4.6	6.1	9.3	-4.0	1
1974	38	44	83	11.6	6.1	15.3	-9.2	1
1975	139	47	76	12.3	5.8	9.6	-8.5	2
1976	372	53	118	12.9	6.1	9.0	-9.5	4
1977	64	61	114	14.0	6.0	11.1	-10.4	5
1978	71	83	176	14.1	5.5	10.0	-9.5	21
1979	387	120	55	20.4	5.3	9.6	-13.7	19
1980	956	83	78	37.5	5.6	12.3	-18.6	29
1981	1,651	197	201	37.4	7.1	11.7	-20.1	36
1982	3,884	407	257	34.0	8.4	10.1	-20.6	231
1983	3,554	431	566	30.5	9.1	6.9	-17.8	401
1984	1,598	1,099	1,211	28.2	10.4	6.3	-18.3	564
1985	1,943	1,275	1,373	27.2	10.6	4.7	-17.6	1,192
1986	1,651	1,217	747	14.9	8.1	3.7	-7.3	1,399
1987	930	1,167	664	18.3	6.8	4.0	-5.9	1,328
1988	928	1,210	424	14.8	6.7	4.5	-3.7	568
1989	1,162	1,409	366	18.2	7.3	4.8	-3.2	1,024
1990	1,769	1,450	592	23.6	6.2	2.6	-2.7	2,089
1991	2,302	1,670	985	20.0	6.4	2.4	-1.9	1,889
1992	2,335	1,560	983	19.3	6.0	2.1	-0.4	1,911
1993	3,307	1,816	442	16.8	6.5	1.2	-1.7	1,811
1994	3,084	1,907	151	15.6	6.4	2.0	-0.5	2,053
1995	4,164	1,707	272	17.0	5.6	2.1	0.3	1,980
1996	4,260	1,915	470	21.1	5.8	2.1	0.4	2,465
1997	3,760	1,946	515	18.9	6.6	2.2	1.4	3,171
1998	5,381	1,797	406	12.8	6.7	1.8	0.9	3,125
1999	3,531	1,910	656	17.9	7.0	2.5	3.5	3,630
2000	3,113	2,577	672	28.5	8.1	2.9	14.9	8,695
2001	4,025	2,557	973	24.4	8.3	2.4	12.6	9,634
2002	5,475	2,802	1,036	24.9	7.9	2.4	14.5	10,138
2003	7,386	3,380	789	28.8	6.6	2.1	15.3	9,331
2004	5,104	3,174	340	38.2	6.0	1.2	19.7	17,092
2005	3,951	4,005	578	54.4	6.0	1.8	24.8	24,163
2006	5,007	5,182	600	65.1	5.9	1.9	31.5	31,499
2007	6,524	4,129	547	72.5	5.4	1.7	28.3	27,885
2008	5,879	5,402	820	97.2	5.1	3.4	27.1	36,155
2009	6,686	5,284	1,413	61.6	5.4	1.3	15.0	24,584
2010	4,330	5,471	547	79.5	5.6	2.3	15.3	23,735
2011*	4,314	6,083	767	111.4	5.4	2.8	12.3	30,605

Nominal prices

1) Investments include the NOGAT pipeline

2) Incl. transportation costs

3) Brent crude oil

4 Consumer prices, source: Statistics Denmark

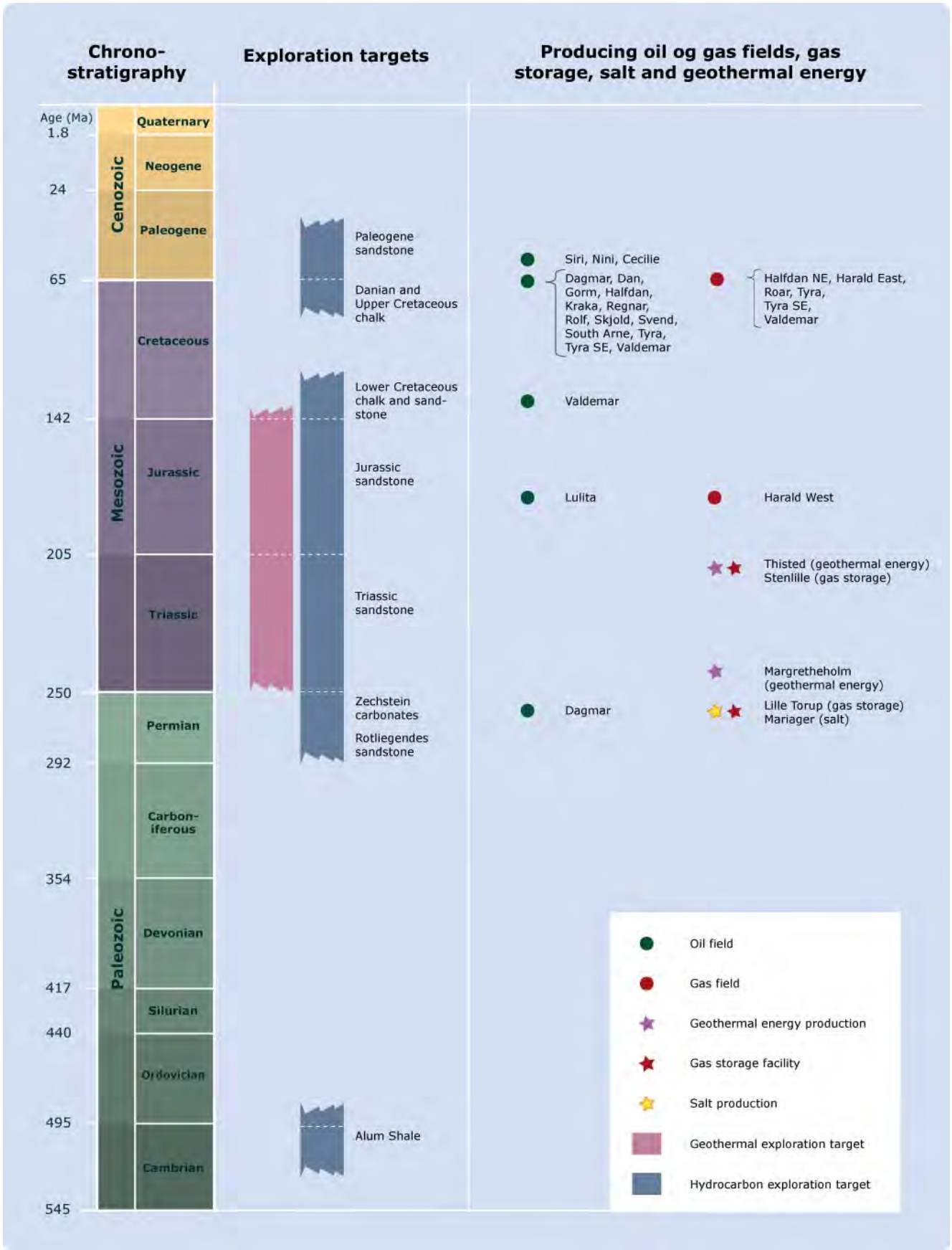
5) Surplus on the balance of trade for oil products and natural gas, source: external trade statistic, Statistics Denmark

**) Estimate*

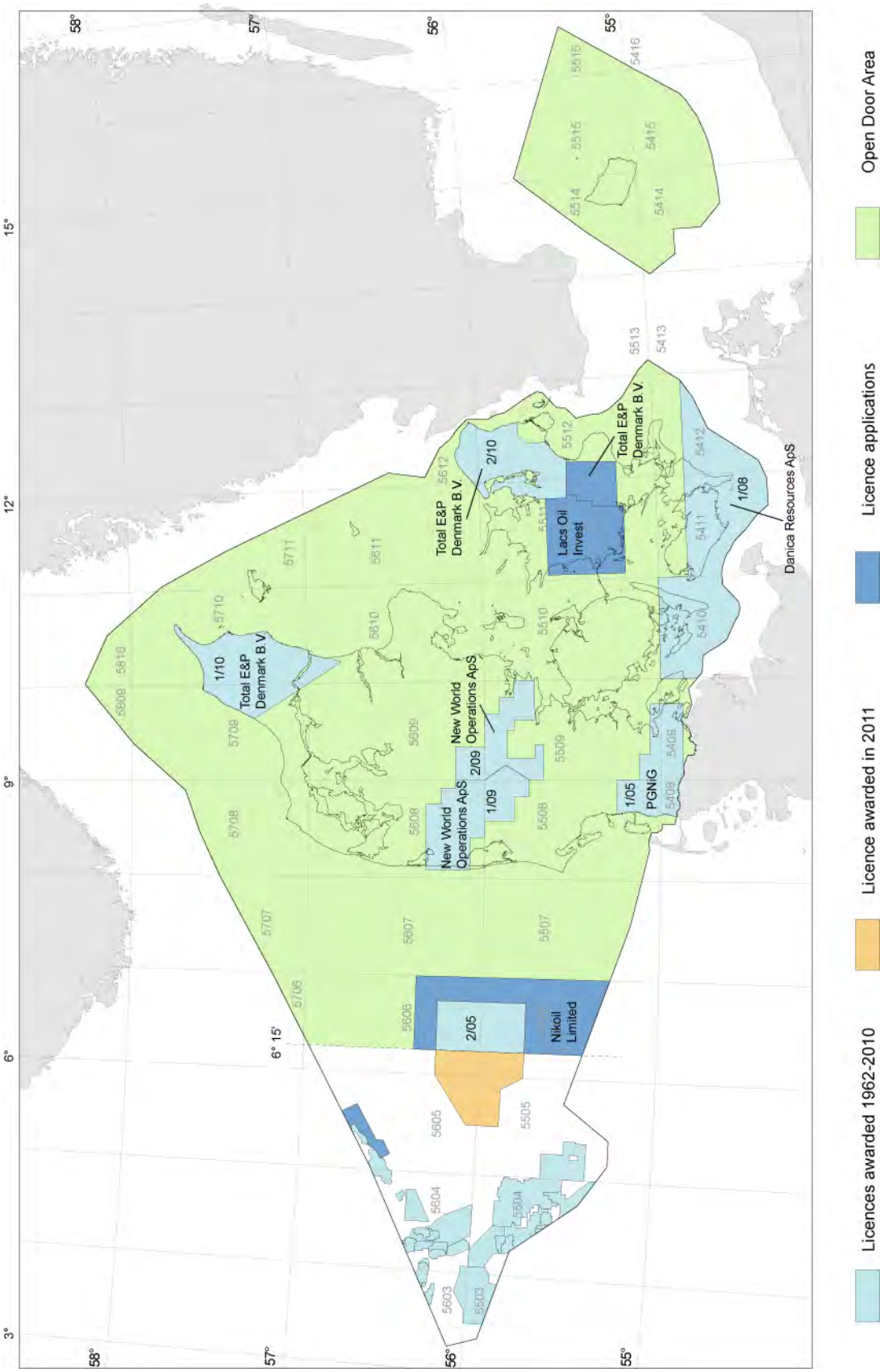
APPENDIX D: EXISTING FINANCIAL CONDITIONS

	Sole Concession at 1 Jan. 2004	Licences granted before 1 Jan. 2004	Licences granted after 1 Jan. 2004
Corporate income tax	25 per cent Deductible from the hydrocarbon tax base.	25 per cent Deductible from the hydrocarbon tax base.	25 per cent Deductible from the hydrocarbon tax base.
Hydrocarbon tax	52 per cent Allowance of 5 per cent over 6 years (a total of 30 per cent) for investments. Transitional rules for investments and unutilized field losses made before 1 January 2004.	70 per cent Allowance of 25 per cent over 10 years (a total of 250 per cent) for investments.	52 per cent Allowance of 5 per cent for 6 years (a total of 30 per cent) for investments.
Royalty	No	2nd Round licences pay royalty as follows: 1,000 bbl/day — Rate 0 - 5 — 2 per cent 5 - 20 — 8 per cent 20 - — 16 per cent Deductible from the corp. income tax and hydrocarbon tax bases.	No
Oil pipeline tariff/ compensatory fee	5 per cent until 8 July 2012, after which no tariff/fee is payable. The oil pipeline tariff/compensatory fee can be offset against hydrocarbon tax, but not against the corporate tax and hydrocarbon tax bases.	5 per cent The oil pipeline tariff/compensatory fee is deductible from the royalty base and the corporate income tax and hydrocarbon tax bases.	5 per cent until 8 July 2012, after which no tariff/fee is payable. The oil pipeline tariff/compensatory fee can be offset against hydrocarbon tax, but not against the corporate tax and hydrocarbon tax bases
State participation	20 per cent from 9 July 2012	20 per cent 1st, 2nd and 3rd Rounds: State participation with carried interest in the exploratory phase. A paying interest, depending on the size of production, in the development and production phases. 4th and 5th Rounds and Open Door procedure: fully paying interest.	20 per cent
Profit sharing	From 1 January 2004 to 8 July 2012 20 per cent is payable on the taxable profit before tax and before net interest expenses.	No	No

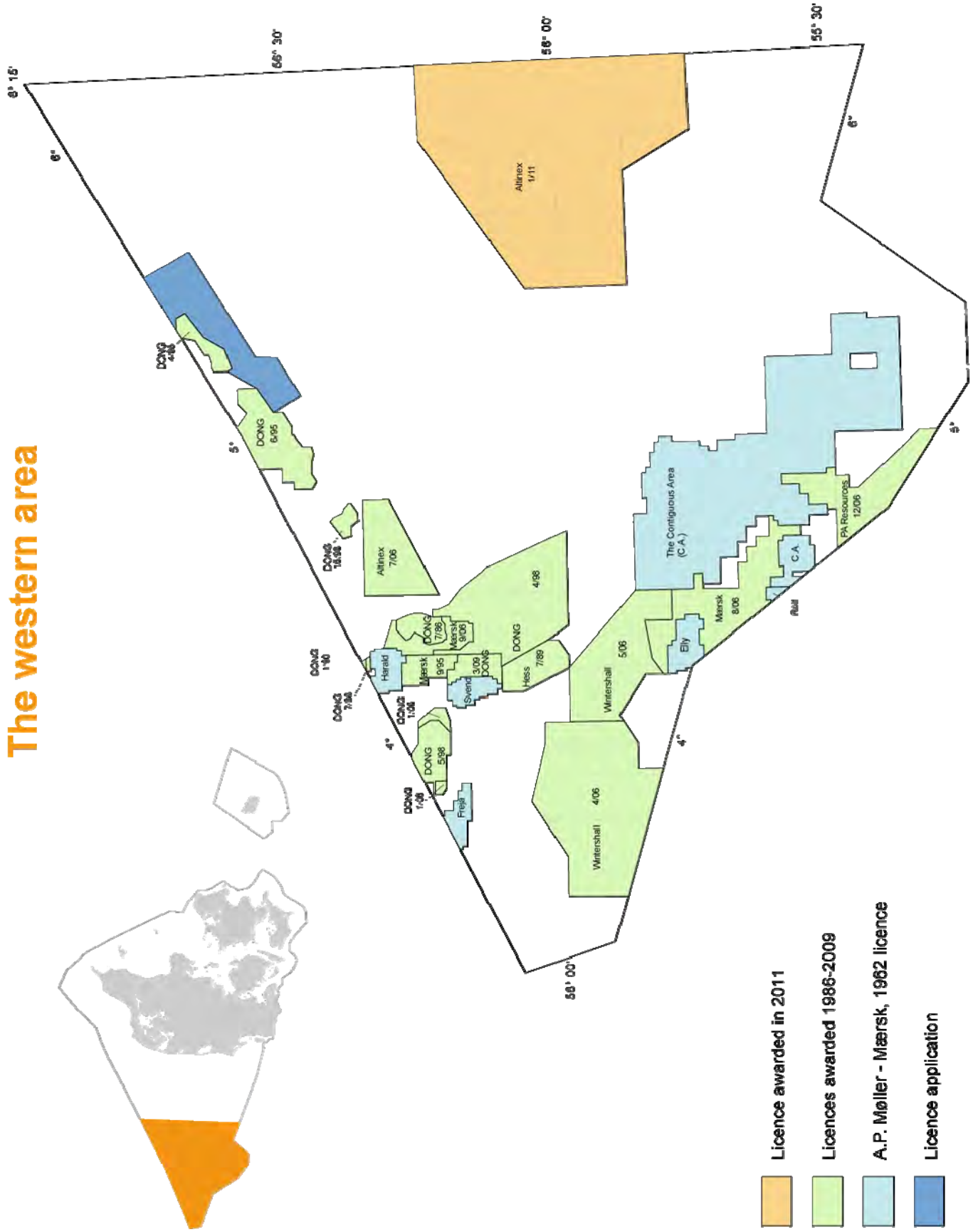
APPENDIX E: GEOLOGICAL TIME SCALE



APPENDIX F1: DANISH LICENCE AREA, MARCH 2012



APPENDIX F2: DANISH LICENCE AREA, MARCH 2012



CONVERSION FACTORS

Reference pressure and temperature for the units mentioned:

		TEMP.	PRESSURE
Crude oil	m^3 (st)	15°C	101.325 kPa
	stb	60°C	14.73 psia[ii]
Natural gas	m^3	15°C	101.325 kPa
	Nm^3	0°C	101.325 kPa
	scf	60°C	14.73 psia*

ii) The reference pressure used in Denmark and in US Federal Leases and in few states in the USA is 14.73 psia

In the oil industry, two different systems of units are frequently used: SI units (metric units) and the so-called oil field units, which were originally introduced in the USA. The SI units are based on international definitions, whereas the use of oil field units may vary from one country to another, being defined by tradition.

The abbreviations used for oil field units are those recommended by the SPE (Society of Petroleum Engineers).

Quantities of oil and natural gas may be indicated by volume or energy content. As gas, and, to some extent, oil are compressible, the volume of a specific amount varies according to pressure and temperature. Therefore, measurements of volume are only unambiguous if the pressure and temperature are indicated.

The composition, and thus the calorific value, of crude oil and natural gas vary from field to field and with time. Therefore, the conversion factors for ton (t) and gigajoule (GJ) are dependent on time. The lower calorific value is indicated.

The SI prefixes m (milli), k (kilo), M (mega), G (giga), T (tera) and P (peta) stand for 10^{-3}, 10^3, 10^6, 10^9, 10^{12} and 10^{15}, respectively.

A special prefix is used for oil field units: M (roman numeral 1,000). Thus, the abbreviated form of one million stock tank barrels is 1 MMstb, and the abbreviation used for one billion standard cubic feet is 1 MMMscf or 1 Bscf.

Abbreviations:

kPa	*kilopascal. Unit of pressure. 100 kPa = 1 bar.*
psia	*pound per square inch absolute.*
m^3(st)	*standard cubic metre. Unit of measurement used for natural gas and crude oil in a reference state: 15°C and 101.325 kPa in this report.*
Nm^3	*Normal cubic metre. Unit of measurement used for natural gas in the reference state 0°C and 101.325 kPa.*
scf	*standard cubic foot/feet. Unit of measurement used for natural gas I a reference state: 15°C and 101.325 kPa in this report.*
stb	*stock tank barrel; barrel in a reference state of 15°C and 101.325 kPa. Used for oil.*
bbl	*blue barrel. In the early days of the oil industry when oil was traded in physical barrels, different barrel sizes soon emerged. To avoid confusion, Standard Oil painted their standard-volumen barrels blue.*
kg · mol	*kilogram-mol. The mass of a substance whose mass in kilograms is equal to the molecular mass of the substance.*
γ	*gamma; relative density.*
Btu	*British Thermal Unit. Other thermal units are J (=Joule) and cal (=calorie).*
t.o.e.	*ton oil equivalent. This unit is internationally defined as: 1 t.o.e.=10 Gcal.*
in	*inch; British unit of length. 1 inch =2.54 cm.*
ft	*foot/feet; British unit of length. 1foot = 12 in = 0.3048 m.*

	FROM	TO	MULTIPLY BY
Crude oil	m^3 (st)	stb	6.293
	m^3 (st)	GJ	36.55[i]
	m^3 (st)	t	0.85[i]
Natural gas	Nm^3	scf	37.2396
	Nm^3	GJ	0.03946[i]
	Nm^3	t.o.e.	$942.49 \cdot 10^{-6}$ [i]
	Nm^3	kg · mol	0.0446158
	m^3 (st)	scf	35.3014
	m^3 (st)	GJ	0.03741[i]
	m^3 (st)	kg · mol	0.0422932
Units of Volume	m^3	bbl	6,28981
	m^3	ft^3	35.31467
	US gallon	in^3	231*
	bbl	US gallon	42*
Energi	t.o.e.	GJ	41.868*
	GJ	Btu	947,817
	cal	J	4.1868*
Density	**FROM**	**TO**	**CONVERSION**
	°API	kg/m^3	141,364.33/(°API+131.5)
	°API	γ	141.5/(°API+131.5)

**) Exact value.*
i) Average value for Danish fields for 2011

The Danish Energy Agency, DEA, was established in 1976 and is placed under the Ministry of Climate, Energy and Building. The DEA works nationally and internationally with tasks related to energy supply and consumption and CO_2-reducing measures. Thus, the DEA is responsible for the entire chain of tasks related to energy production and supply, transport and consumption, including improved energy efficiency and energy savings, as well as national CO_2 targets and initiatives to reduce the emission of greenhouse gases.

In addition, the DEA performs analyses and assessments of climate, energy and building developments at national and international level, and safeguards Danish interests in international cooperation on climate, energy and building issues.

The DEA advises the Minister on climate, energy and building matters and administers Danish legislation in these areas.

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In 1966, the first discovery of oil and natural gas was made in Denmark. Since 1986, the Danish Energy Agency has published its annual report "Denmark's Oil and Gas Production".

As in previous years, this report describes exploration and development activities in the Danish area as well as production. Moreover, the report describes the use of the Danish subsoil for purposes other than oil and gas production, including the exploitation of geothermal energy and the potential for Carbon Capture and Storage (CCS). The report also contains a review of the health and safety aspects of oil and gas production activities, the environment and climate.

In addition, the report contains an assessment of Danish oil and gas reserves and a chapter on the impact of hydrocarbon production on the Danish economy.

The report can be obtained from the DEA's website: www.ens.dk

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