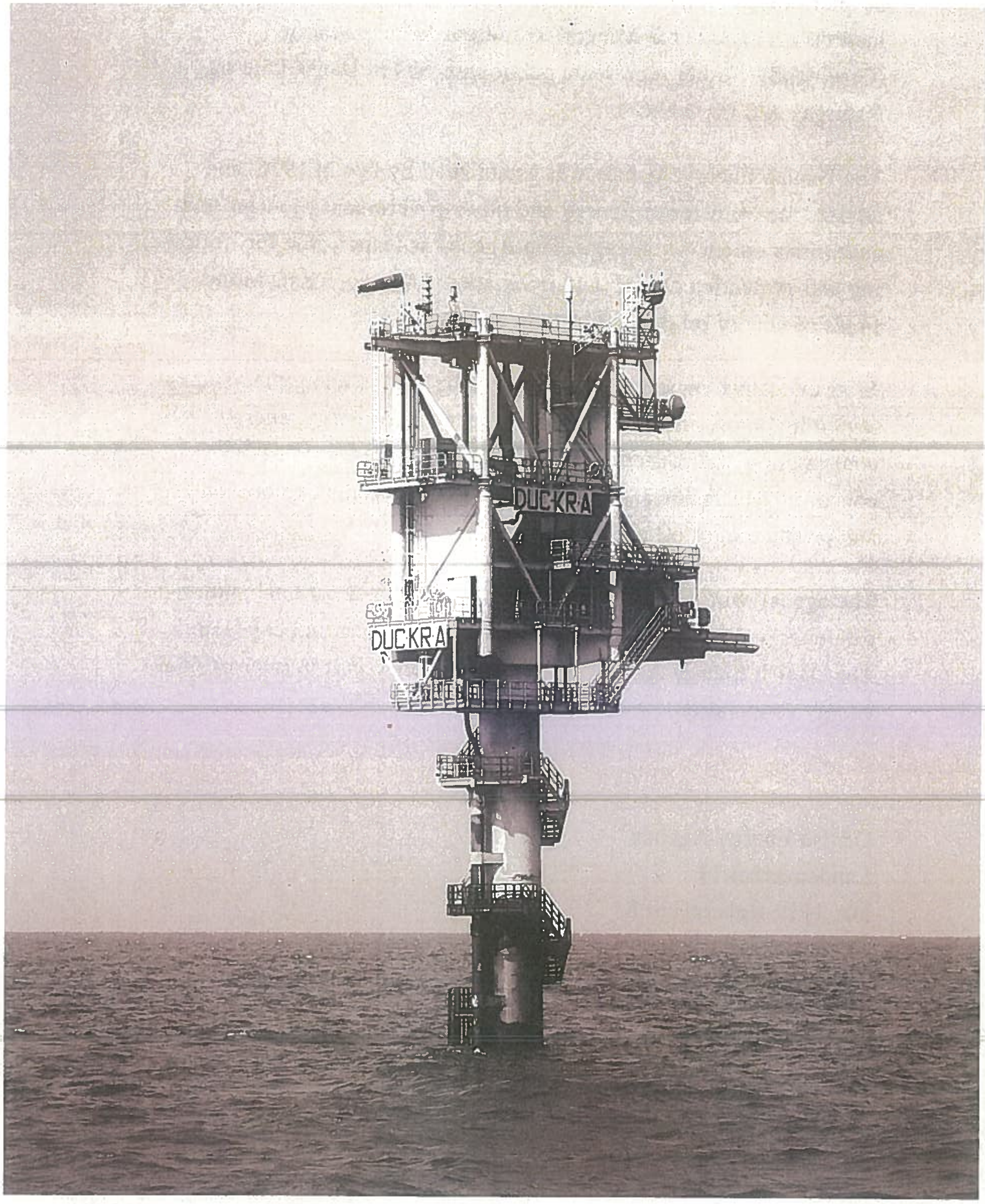
MINISTRY OF ENERGY
Danish Energy Agency



Oil and Gas Production in Denmark 1993

The Danish Energy Agency is an institution operating under the auspices of the Ministry of Energy. The Ministry, whose affiliated institutions include the Mineral Resources Administration (Greenland), further represents public interests in Dansk Olie og Naturgas A/S (D.O.N.G.).

The Danish Energy Agency was established by law in 1976, and advises the Minister of Energy and other government agencies and authorities on energy matters. The Agency is responsible for following and evaluating Danish and international developments in the fields of energy production, supply and research.

In its executive capacity, the Agency administers energy legislation regarding power and heating supply, renewable energy, energy consumption and conservation, carbon dioxide taxes and energy conservation subsidies, emergency measures and the exploration and production of oil and natural gas.

The agency works closely with local, regional and national authorities, energy distribution companies, licence holders and consumers. The Danish Energy Agency also takes an active part in international energy cooperation.

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Conversion Factors

Conversion Factors

1 m³ Crude Oil = 0.858 tonne ≈ 36.7 GJ

1 m³ Motor Gasoline = 0.75 tonne ≈ 32.9 GJ

1 m³ Middle Distillate = 0.84 tonne ≈ 35.9 GJ

1 m³ Heavy Fuel Oil = 0.98 tonne ≈ 39.6 GJ

1 barrel = 0.159 m³

1 t.o.e = 41.868 GJ

1,000 Nm³ Natural Gas = 37,239 scf ≈ 39.0 GJ

1 Nm³ Natural Gas = 1.057 Sm³

1 tonne Steam Coal ≈ 25.7 GJ

1 tonne Coal (other) ≈ 26.5 GJ

Nm³ (normal cubic metre), at 0°C, 101.325 kPa

Sm³ (standard cubic metre), at 15°C, 101.325 kPa

scf (standard cubic foot), at 15.6°C, 101.56 kPa

Foreword

The favourable development in the production of Danish oil and natural gas continued in 1993.

The number of producing fields increased by two to nine, when the Regnar and Valdemar Fields were brought on stream. The investment level in the North Sea showed an upward trend, and most of the producing fields are being further developed.

Oil and natural gas production continued to increase. This increase, combined with an almost unchanged consumption of hydrocarbons in 1993, resulted in Denmark becoming a net exporter of oil as well as natural gas. This position is expected to be further consolidated in the years to come.

Seen as a whole, the Danish production of energy - including renewable energy - covered 71% of overall consumption, as compared to 67% the year before.

In the next few years, the production of oil is expected to reach about 10 million m^3 per year. As a result of this production level, coupled with the expected increase in natural gas production and exports, Danish energy imports and exports are expected to balance from 1997 according to the Danish Energy Agency's forecasts.

Exploration activity was moderate compared to the record level in 1992, and no new discoveries were made. However, there continues to be considerable interest in carrying out exploration activities in Denmark.

The status of exploration is dealt with in a separate section of the report. It appears that by Danish standards, there is still considerable exploration potential in the Central Graben and adjacent areas.

Copenhagen, May 1994

Ib Larsen

Ib Larsen

Director

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1. Organization

As of February 1994, the Danish Energy Agency was composed of 11 divisions. Oil and gas exploration and production are administered by divisions 3 and 4 and - to some extent - division 6. The delegation of responsibilities between the oil and gas divisions is described in more detail below.

At the turn of the year 1993/94, the Agency employed the equivalent of 168 full-time employees, 34 of whom are involved in the administration of oil and gas activities.

Oil and gas activities are administered by the following divisions:

The Third Division. Exploration and Production - Oil and Gas

Prospect analysis and evaluation. Supervision of drilling activities (reservoir considerations). Supervision of exploratory work commitments. Matters concerning licensing. Reservoir engineering and geological evaluations. Evaluation of commercial viability and development plans. Supervision of oil and gas production. Assessments of oil and gas reserves and production forecasts.

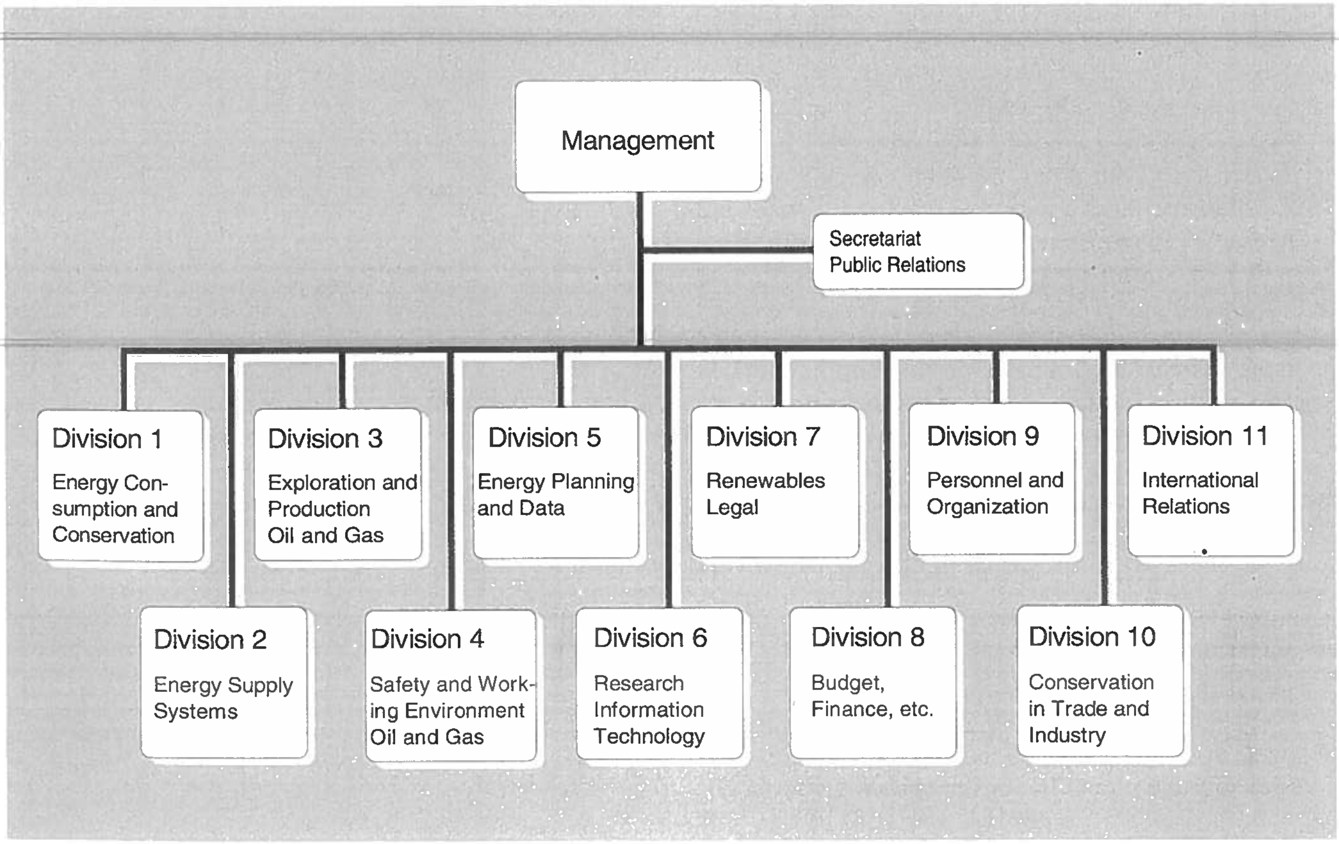
The Fourth Division. Health, Safety and Environment - Oil and Gas

Health, safety and environment on offshore installations, safety supervision of drilling operations, approving manning tables and supervising Dansk Naturgas A/S' transmission systems. Drawing up regulations in this connection. Membership of the Action Committee and the Coordination Committee.

The Sixth Division. Research and Information Technology

This division is in charge of informatics as well as matters relating to training and research in the oil and gas sector.

Fig. 1.1 Organization of the Danish Energy Agency

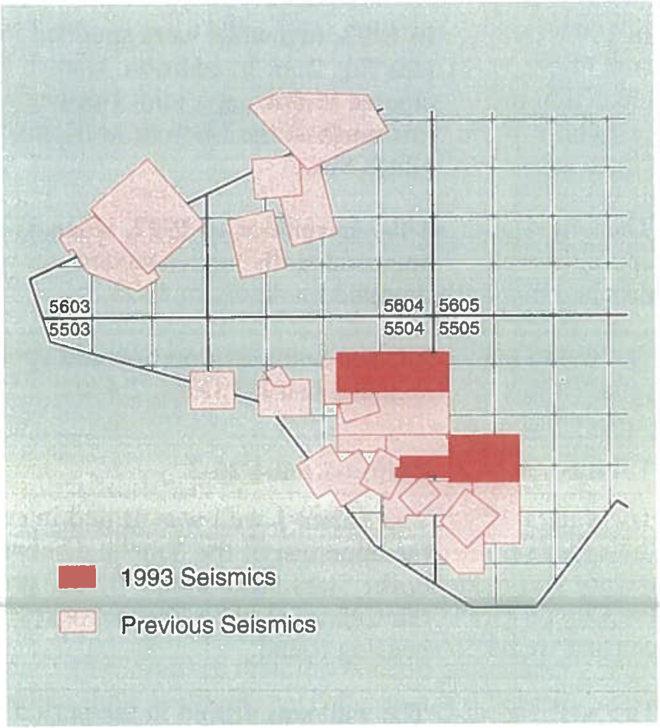


2. Exploration

In 1993, oil was encountered in the Rita-1 well, which was spudded in 1992. Otherwise, exploration activity remained at a low level throughout 1993. Thus, only two wells were spudded in the Danish area, which figure must be viewed in relation to 11 wells in 1992. One of the reasons for this decrease in activity is that only one exploration licence (Løgumkloster) has been awarded since 1990.

An outline of the companies that held licences for exploration and production in Danish territory at end-1993 is shown in Appendix A. The map of licensed areas at the back of the report shows the geographic coverage of licences awarded at end-1993.

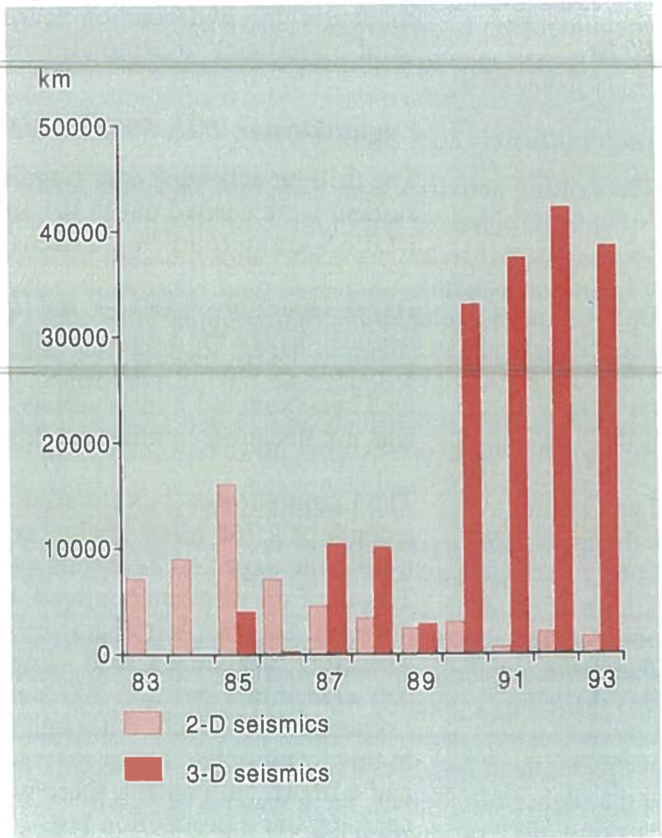
Fig. 2.2 3D Seismics in the Central Graben



Exploratory Surveys

In total, 40,100 km of seismic surveying data were aquired in 1993, chiefly in three-dimensional (3D) surveys, which accounted for 38,500 km. As appears from Fig. 2.1, the high level of activity of recent years continued in 1993. The majority of seismic surveys were carried out with a view to recovery; only a few of them formed part of exploration activities.

Fig. 2.1 Annual Seismic Surveying Activities



Seismic surveying activity in 1993 focused on the Central Graben, where DUC continued the extensive 3D surveys in the so-called Contiguous Area.

Outside the Central Graben, the seismic surveys made in 1993 consisted of foreign surveys extending into Danish territory, viz. in the Skagerrak at the Norwegian-Danish border and in the Baltic Sea at the German-Danish border. Appendix C contains an outline of seismic surveys performed in 1993.

Since 3D surveys were initiated in Danish territory in 1985, detailed three-dimensional seismic data have been aquired for large sections of the Central Graben (Fig. 2.2). These data contribute significantly to understanding producing fields and to assessing the potential for making new discoveries. In the southern part of the Central Graben, DUC has performed surveys in nearly all of the Contiguous Area.

The fields in the northern part of the Central Graben, i.e. the Svend, Harald and Gert Fields, have also been subjected to 3D surveys. Further, the Amoco, Statoil and Mærsk groups have employed 3D surveys in connection with exploring for oil in this part of the Central Graben.

Drilling Activities

In 1993, two wells were spudded in the Danish area (see Fig. 2.3). In addition, Danish licensees participated in drilling a joint Norwegian-Danish well just north of the Norwegian-Danish border in the North Sea.

Thus, in relation to 1992, when 11 exploration and appraisal wells were spudded, the activity level dropped markedly in 1993.

The following exploration and appraisal wells were spudded in 1993 (Figs. 2.4 and 2.5):

Tabita-1 5604/26-3

The Tabita-1 well was drilled in connection with the appraisal of the Amalie discovery. This discovery was made by the Statoil group in 1991 under the Central Graben licence awarded in the second licensing round.

The well was drilled in the period from September to December 1993, with Statoil as the operator. Tabita-1 terminated in layers of late Jurassic age at a depth of 4,312 metres below sea level. The results were disappointing, and there was no basis for carrying out a production test. The Tabita well data will now be used in the Statoil group's further appraisal of the Amalie discovery.

Fig. 2.3 Exploration and Appraisal Wells

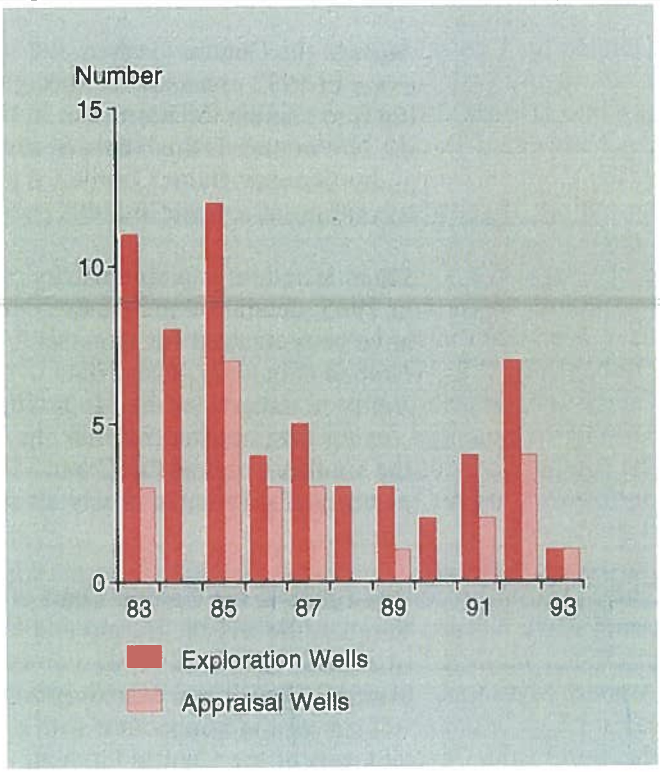
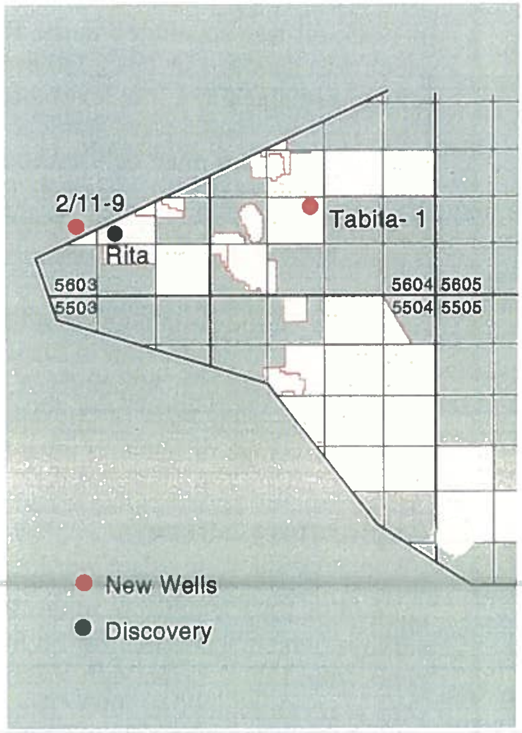


Fig. 2.4 Exploration and Appraisal Wells coveries in the Central Graben



Although Tabita was a disappointment, tl encounter thin hydrocarbon-bearing layer be of importance to exploration in the adj

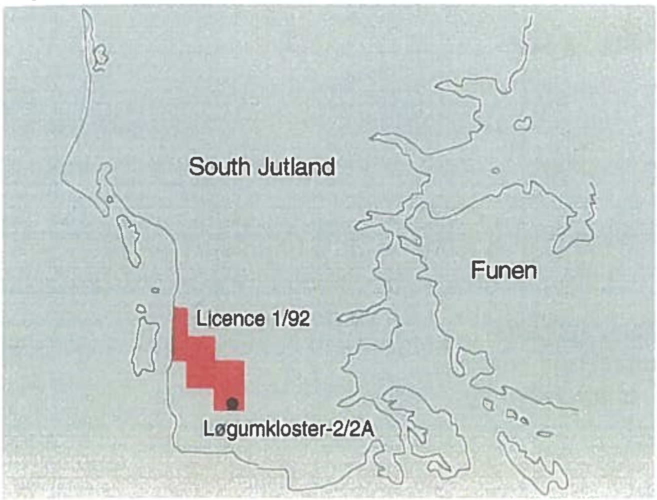
Løgumkloster-2/2A 5508/32-3/3A

The drilling activities near Løguml ster Jutland were carried out in the area awar DOPAS group following a licensing roun

Dansk Operatørselskab i-s, the operator u licence, drilled the Løgumkloster-2 well km south of the old Løgumkloster-1 well DUC encountered hydrocarbons in that w was not declared commercial, however.

The Løgumkloster-2 exploration well ter a depth of 2,768 metres below sea level a trating the expected Zechstein carbonate Traces of oil were encountered, but the l not have the reservoir characteristics anti Therefore, a sidetrack well - Løgumklost was drilled to a position 500 metres clos Løgumkloster-1 well. Although the carb at this location had better reservoir chara and a higher oil content, there was no ba carrying out a production test.

Fig. 2.5 The Løgumkloster Well



South Hod-1 (2/11-9)

The partners in the Amoco group participated in drilling a joint Norwegian-Danish exploration well under licence 2/89, at a location just north of the Norwegian-Danish border in the North Sea. Amoco, which also acts as operator on the Norwegian side of the border, conducted the South Hod-1 drilling operations through its Norwegian affiliate.

The well was drilled in a border-straddling structure between Norway and Denmark in order to explore for hydrocarbons in pre-Jurassic layers. South Hod-1 terminated in layers of early Carboniferous age at a depth of 4,361 metres below sea level. Only small amounts of hydrocarbons were found, and no production test was carried out.

Appraisal Activities

In May 1993, DUC submitted a declaration of commerciality for the Alma discovery in the Contiguous Area. The Alma-1 well encountered hydrocarbons in 1990. Following the implementation of an appraisal programme, which included a 3D seismic survey and the drilling of the Alma-2 appraisal well, it was confirmed that the accumulation is commercially exploitable. In May 1994, DUC is to submit plans for the proposed development of the field.

In connection with the appraisal of the Amalie discovery under licence 7/86, the Statoil group drilled the Tabita-1 well (see the details given above). The location of the well was chosen on the basis of a 3D seismic survey performed in 1992.

The Skjold Flank and Lulita discoveries are also comprised by approved appraisal programmes. The Skjold Flank discovery was made in 1991 by DUC near the Skjold Field. The Lulita discovery, made in 1992, extends into DUC's areas as well as those of the Statoil group at the Norwegian-Danish border. More detailed investigations will establish whether production can be initiated in these areas.

Extended Licence Terms

In 1993, the term of the Statoil group's licence 7/86 was extended for the northernmost licence area, where part of the Lulita discovery is situated. The extension was granted with a view to the ongoing appraisal of the discovery.

Relinquishments

In 1993, three licences were relinquished, viz. licences 2/84, 4/89 and 5/89.

The Amoco group's licence 2/84 expired in February 1993. Before that, the Amoco group had drilled three wells, Ravn-1, Ravn-2 and Falk-1, within the area comprised by the licence, besides carrying out 3D seismic surveys. A discovery of oil was made in the Ravn-1 well in 1986, but a subsequent appraisal of the discovery did not confirm its commerciality. With the expiry of licence 2/84, all areas awarded in the first licensing round have been relinquished.

In December 1993, the Amoco group's licence 4/89 expired. This licence comprised an area near the Baltic island Bornholm and was one of the four licences obtained by the Amoco group in the third licensing round.

Finally, the BEB group's licence 5/89, comprising an area close to the German-Danish border in the North Sea, expired in April 1993.

Seismic surveys were carried out, but no wells were drilled under the two licences last mentioned.

Released Well Data

Generally, data collected under the Danish Subsoil Act are protected by a five-year confidentiality clause.

However, the confidentiality period is limited to two years for licences which expire or are relinquished.

In 1993, data regarding the following exploration and appraisal wells were released:

Exploration

Offshore:

Gulnare-1	5604/26-1	Statoil
Elly-2	5504/06-2	Mærsk Olie og Gas
Eg-1	5503/04-2	Agip

Onshore:

Stenlille-4	5511/15-4	Danop
Stenlille-5	5511/15-5	Danop
Stenlille-6	5511/15-6	Danop

All information about released well data, and seismic surveying data, etc. aquired in connection with exploration and production activities, is provided by the Geological Survey of Denmark.

3. Exploration Potential

Today, after more than 150 exploration wells have been drilled in Denmark, the possibilities for making new oil and gas discoveries are still good, particularly in the Central Graben and the adjacent areas.

A key factor is the rapid technological development that has taken place in recent years in exploration and production in the oil industry. Particularly important in this respect is the refinement of seismic techniques, which has led to improved mapping of the subsoil.

Using refined 3D investigation methods and more advanced data processing techniques, it is now possible to evaluate even deeper lying sediments more accurately, and thus to gain a better understanding of the hydrocarbon potential. At the same time, improved, more economical recovery techniques, such as horizontal production wells and cheaper platforms, have made offshore exploration for relatively small reserves more attractive than previously.

Exploration models

Oil companies base their exploration for oil and gas on geological exploration models (also referred to as *plays*). A model contains a set of geological conditions, all of which are necessary prerequisites to the formation of gas or oil deposits.

The most important condition is the presence of layers that are favourable to the generation of hydrocarbons (source rock), and of reservoir layers in which the hydrocarbons formed can accumulate.

The Danish area can be divided into a number of smaller sub-areas, each with its own geological history. Usually, a model is related to a particular sub-area, while more generalized plays may be defined for a larger area.

As a rule, several models apply to the same area, each relating to a different geological layer. Present exploration activities are carried to a depth of 5-6 km.

Initially, all models are theoretical. They are confirmed or invalidated by drilling. Sometimes, a model may be verified by a single well drilled at the right place.

Fig. 3.1 Exploration Possibilities in Cretaceous

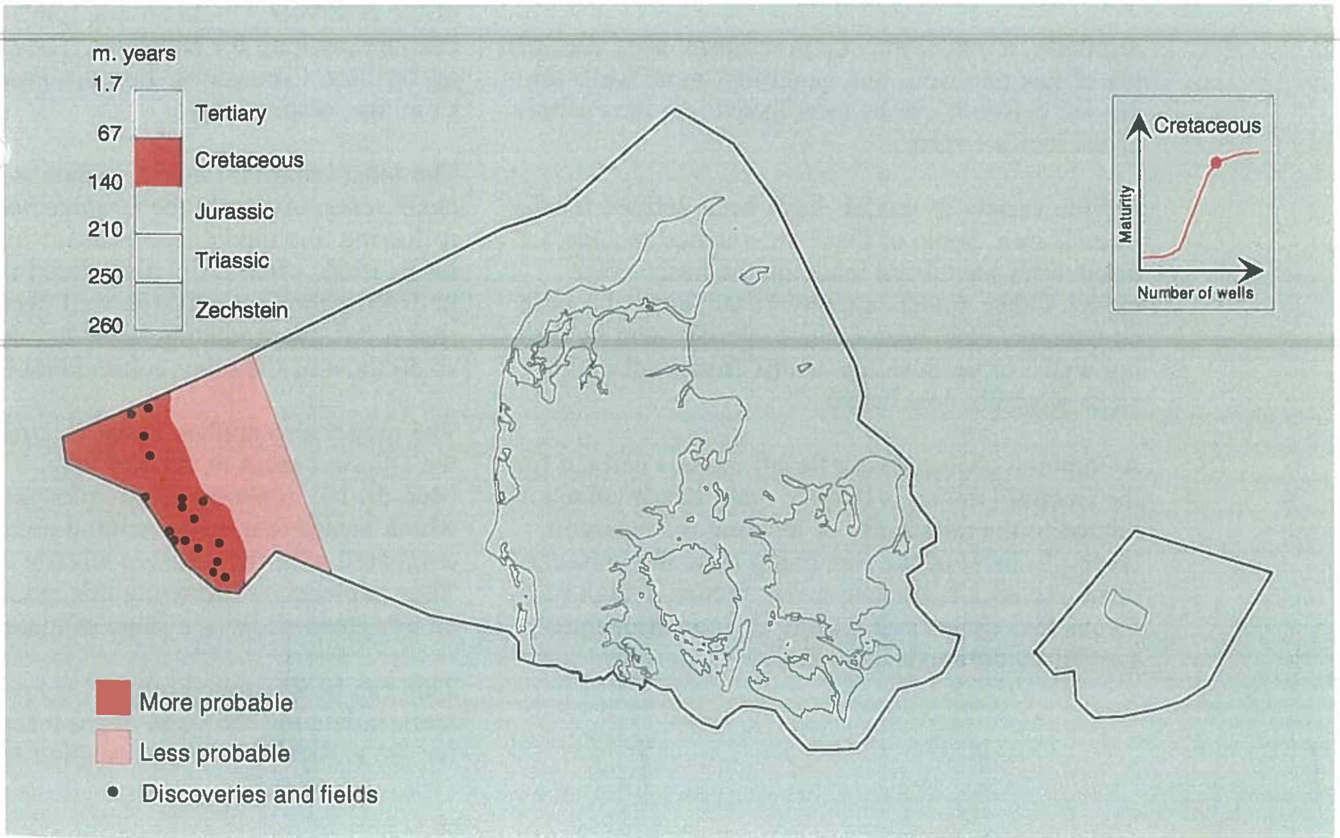
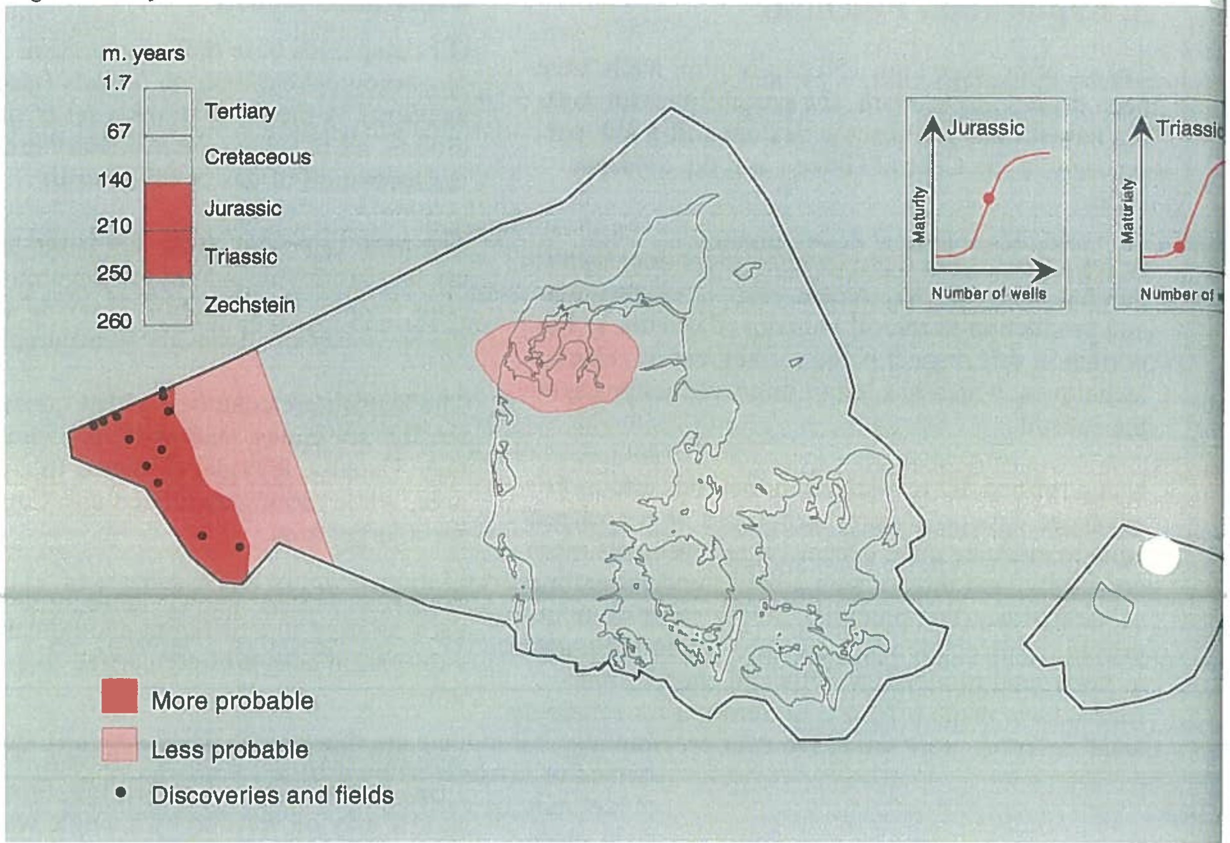


Fig. 3.2 Exploration Possibilities in Jurassic/Triassic



Usually, however, several wells have to be drilled before the model is verified, i.e. before hydrocarbons are found in a specific geological setting.

Similarly, a model may be invalidated after the drilling of just one well, but, generally, more wells are needed before it can be established that the chances of success are zero.

A wide variety of models have been defined for the Danish area. Some of these are verified models, i.e. discoveries have been made on the basis of the model. Other models are unverified, either because no attempts have been made to verify them by drilling wells, or because the results from exploration wells were not conclusive.

A common characteristic for all models defined for the Central Graben is that the main risk involved is related to the possibility of locating the reservoir layers. In most of the remaining area, the presence of source rock is the major risk factor. A high risk means that chances of finding the conditions prescribed by the model are small.

Confirmed models

All the models can be grouped according to of the reservoir. On this basis, four verified can be drawn up for Denmark. They relate of Tertiary, Cretaceous, Jurassic/Triassic an stein age, respectively.

The most important model to date is associa chalk reservoirs from the *Cretaceous*. Explo following this model led to results already a set in 1966, when DUC discovered the Kral in drilling the first offshore well ever on Da ritory. All the producing fields belong to th as do most of the other commercial fields.

The model also applies to the Central Grabe the adjacent areas to the east (Fig. 3.1). We been drilled in almost all the prospects of th which means that the remaining potential is compared with the reserves already discove Thus exploration following this model has r an advanced stage or a stage of maturity.

This can be illustrated by an S-shaped curv mark indicating the stage of exploration ma for the particular model in relation to the nu wells drilled, with due regard to whether the model is geologically simple or complicated.

The model that ranges second in importance in terms of number of discoveries is *Jurassic* sandstone. Exploration based on this model has led to a number of discoveries, four of which have been declared commercial, namely Harald Vest, Gert, Elly and Alma. Also the more recent discoveries, i.e. Ravn, Amalie, Rita and Lulita, belong to the Jurassic exploration model. Like the first model, it is primarily associated with the Central Graben, but the possibility exists that it also applies outside the Central Graben, primarily in an area surrounding the western part of the Liim Fiord (Fig. 3.2).

Although Jurassic sand was the main target for the exploration activities in connection with the licensing rounds for the Central Graben, the potential for additional discoveries in the Central Graben has not been exhausted.

The model for Triassic sand in the Central Graben has many features in common with the Jurassic model. The results of recent exploration activities confirm the Triassic model and hold further promises for these deposits.

Thus, the Bertel field, discovered by the Norsk Hydro group in 1992, is probably an example of this model.

In Jutland, a number of (dry) wells have been drilled in the area shown in Fig. 3.2. according to the Jurassic as well as the Triassic models. However, new research into the geological history of the area shows that hydrocarbon potential may still exist in the area, although any discoveries will probably be on a small scale.

With regard to the two other models, exploration has resulted in discoveries, though not large enough to be commercially attractive.These discoveries were made in Tertiary sandstone and Zechstein carbonates. These models involve a higher geological risk than the two above-mentioned models.

Sandstone of *Tertiary* age offers a possibility for exploration in the Central Graben and the adjacent areas to the east, an area almost identical to the one covered by the Cretaceous model (Fig. 3.3).

Here are only few examples of targeted exploration of Danish Tertiary sandstone formations, while the model has been widely used in the Norwegian and British shelf areas.

Fig. 3.3 Exploration Possibilities in Tertiary

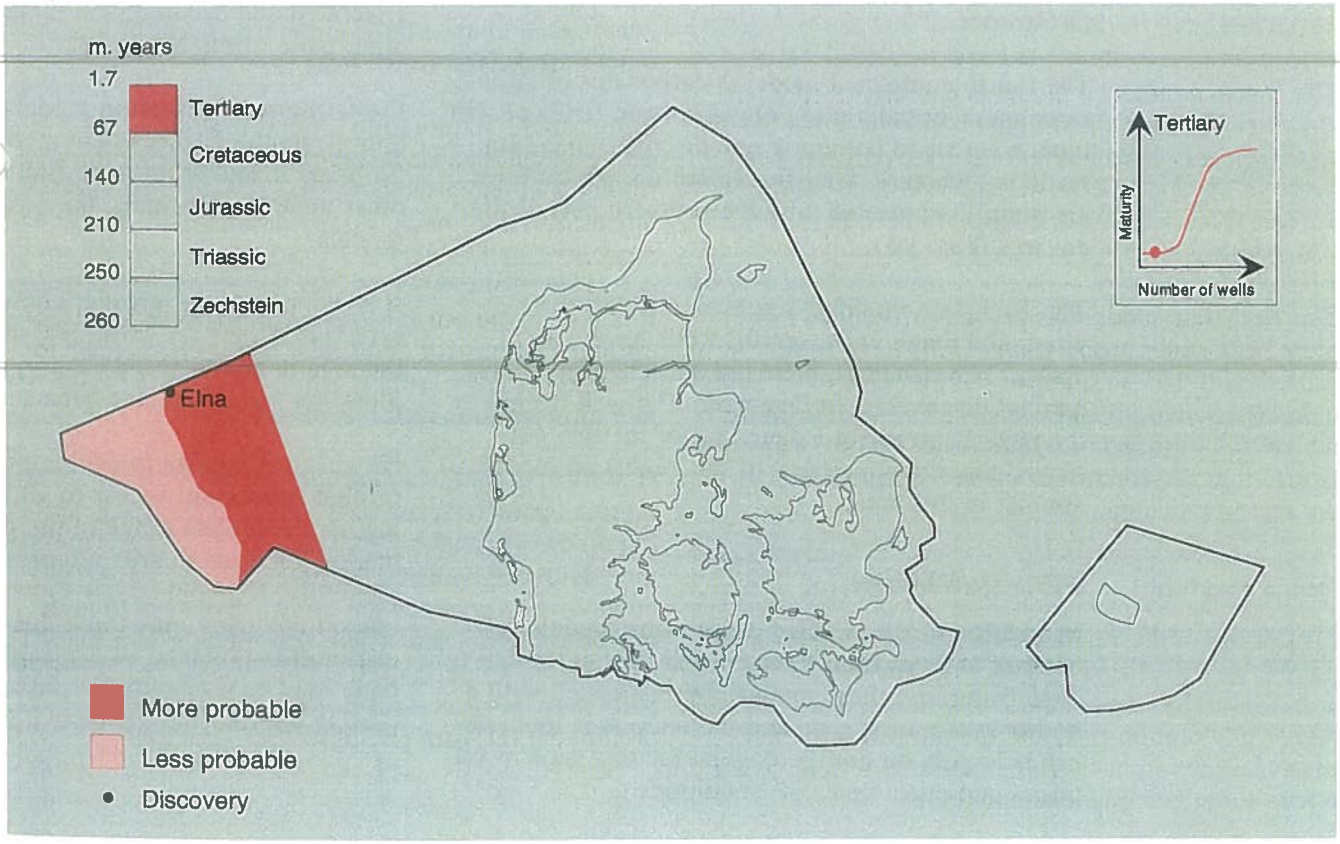
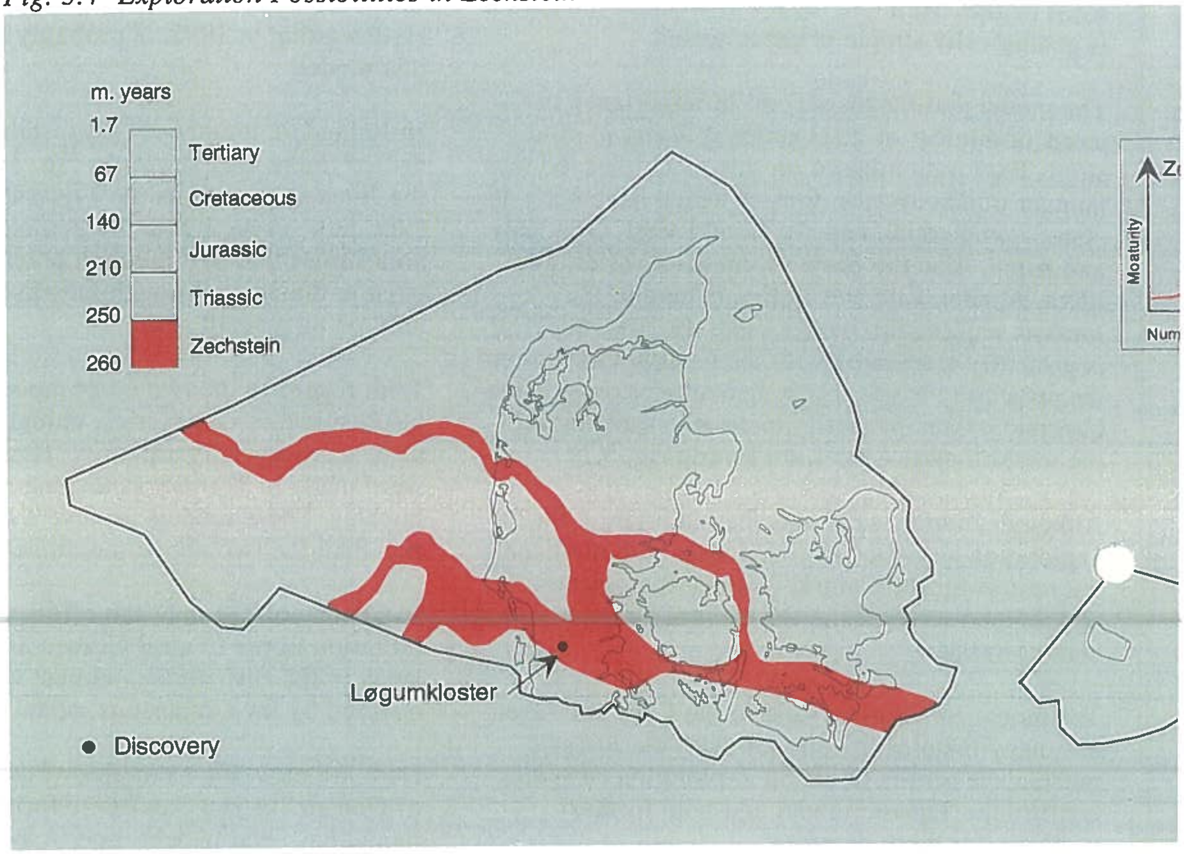


Fig. 3.4 Exploration Possibilities in Zechstein



In Denmark, one discovery has been made in Tertiary sandstone, namely the Elna deposit, and it is estimated that these layers still have a potential for new discoveries.

The fourth confirmed model is carbonates of *Zechstein* age. Germany and Poland operate fields of this type, whereas to date only one discovery has been made in Denmark. Danish exploration possibilities are mainly associated with the southern part of the country (Fig. 3.4).

The Zechstein model has proved difficult to explore, and many unsuccessful wells have been drilled. Nevertheless, there are still chances of commercial discoveries in Denmark. The well drilled by the DOPAS group at Løgumkloster in 1993 confirmed that the conditions of the Zechstein model are met in this area.

Other possibilities

In addition to the verified exploration models, a number of unverified models exist for the Danish area. Naturally, these models are associated with a higher exploration risk, and the interest in them depends largely on non-geological factors, such as oil prices and other financial conditions.

It is possible that deeper layers in the C
ben than those explored so far contain h
bons, and also that hydrocarbons may h
generated and accumulated in deep, loc
other parts of the North Sea.

Furthermore, exploration models other
above-mentioned Zechstein mode' can
for areas in and around the Balti. Sea.
other unverified models, they would be
models.

It is clear from our present knowledge
est expectations for additional discover
the area in and near the Central Graber
ploration activities have been successfu

However, it applies to exploration acti
ral that apart from access to all availab
ing up a complete range of the possible
models for a given area requires a larg
creativity. Experience has shown that e
one oil company may think that it has
exploration potential of a specific area
pany may be successful in the same ar
preting the relevant geological informa

4. Production

In 1993, Danish oil and gas production took place in nine fields, Dan, Gorm, Skjold, Rolf, Tyra, Kraka, Dagmar, Regnar and Valdemar. The two last fields were brought on stream towards the end of the year. Dansk Undergrunds Consortium, DUC, is in charge of recovery from all these fields. The operator is Mærsk Olie og Gas AS.

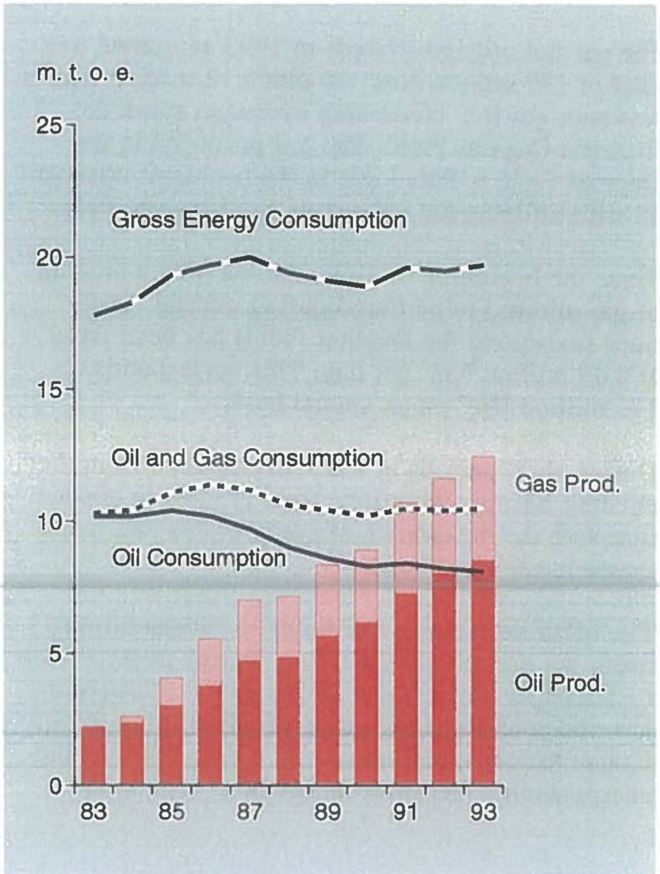
All the producing fields are situated in the Contiguous Area in the southern region of the Central Graben.

Oil and Gas Production

Total oil and condensate production in 1993 amounted to 9.73 million m^3, equal to 8.34 million tonnes, 7% increase as compared to 1992.

Gas production amounted to 6.35 billion Nm^3 (normal cubic metres), an increase of 2% in relation to 1992. Of this amount, 3.85 billion Nm^3 was extracted from the Tyra Field, while the balance was associated gas produced in conjunction with oil in the other fields. Of the gas produced, 4.00 billion Nm^3 (63%) was supplied to Dansk Naturgas A/S, while 1.87 billion Nm^3 (30%) was reinjected into the Gorm and Tyra Fields. The rest of the gas produced was consumed or flared on the platforms.

Fig. 4.1 Consumption and Production of Oil and Natural Gas



The production of oil and gas in 1993, including the amount consumed on the platforms, totalled 12.5 million t.o.e. (tonnes oil equivalent), which is 8% more than in 1992.

Domestic energy consumption in 1993 totalled 19.7 million t.o.e., while the consumption of oil products and natural gas amounted to 10.5 million t.o.e. Thus, in 1993, the degree of self-sufficiency for hydrocarbon products (oil and gas) was 119% against 112% in 1992.

At the same time, the degree of self-sufficiency in oil rose from 97% in 1992 to 105% in 1993.

Fig. 4.1 shows the development of Danish oil and gas production in the period from 1983 to 1993. Gas production consists of gas supplied to Dansk Naturgas A/S and gas utilized on the platforms.

For comparison, the development in current Danish energy consumption is also shown by Fig. 4.1.

Fig. 4.2 shows the development in gas supplies to Dansk Naturgas A/S since the start of gas production in 1984, broken down by field.

The annual oil and gas production figures for the period from 1972 to 1993 are shown in Appendix D, together with an outline of gas sales from 1984 to 1993, distributed on individual fields. Appendix D also provides an outline of monthly production of oil and gas for 1993.

Moreover, Appendix D contains two outlines of domestic energy consumption and production from 1972 to 1993, distributed on fuels and utilization, respectively, as well as financial key figures for Danish oil and gas production for the period 1972-1993.

Gas Flaring

A fraction of the gas produced (4.2%) is used for energy supplies to the platforms in the North Sea, while a slightly smaller amount (3.1%) had to be flared, and thus was not utilized.

Production

In 1993, the amount of gas used for energy supplies (as fuel) constituted 264 million Nm^3.

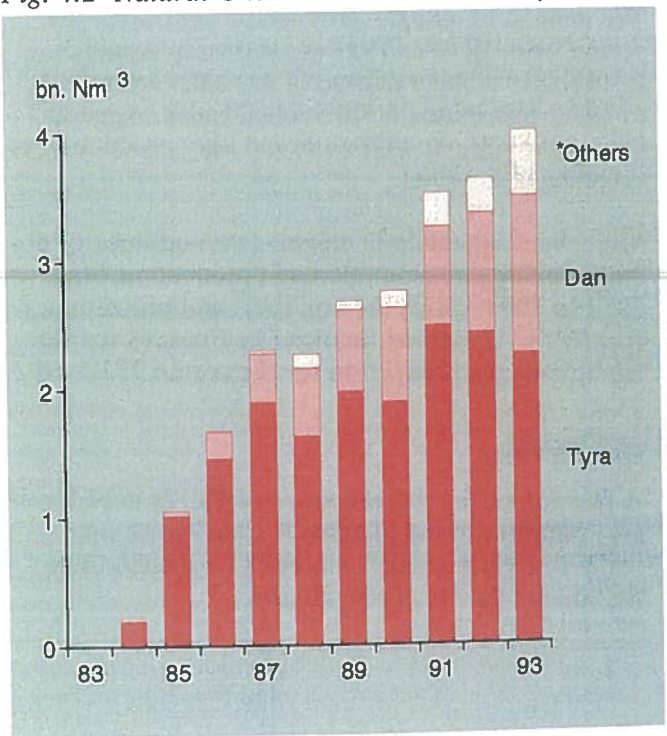
The gas not utilized (flared) in 1993 amounted to a total of 199 million Nm^3, of which 12 million Nm^3 was sour gas (i.e. containing hydrogen sulphide) from the Dagmar Field. The gas produced in the Dagmar Field is flared due to the problems connected with utilizing the poisonous gas from the field.

Since the beginning of 1992, the maximum amount of gas allowed to be flared during normal operations (excepting the Dagmar Field) has been fixed at 0.48 million Nm^3 per day. This corresponds to 176 million Nm^3 on an annual basis.

During short periods in 1993, exemptions from the existing flaring restrictions were granted in connection with the breakdown of compressors and major maintenance operations.

The offshore sector is not liable to carbon dioxide taxes. As part of implementing *Energy 2000, a Plan of Action for Sustainable Development*, discussions have been initiated regarding proposed initiatives to reduce the consumption of gas, e.g. by introducing energy-saving measures on offshore installations.

Fig. 4.2 Natural Gas Sales Broken Down by Field



* Gorm, Skjold, Rolf, Kraka, Regnar and Valdemar

New Gas Sales Contract

Since the start of gas production in October 1984, Danish natural gas has been supplied under two gas sales contracts concluded in 1979 and 1990, respectively.

The contract from 1979 provides for the supply of a total of 55 billion Nm^3 of natural gas from the four fields Tyra, Roar, Dan and Gorm, while another 38 billion Nm^3 of natural gas is to be supplied from a number of specific fields under the 1990 contract.

Negotiations between DUC and Dansk Naturgas A/S about gas sales exceeding the quantities stated above led to the conclusion of a new agreement in principle on June 8, 1993, regarding additional gas sales. The agreement in principle was approved by the Minister of Energy on June 24, 1993, and became binding on the parties upon contract signature on October 29, 1993.

An important consideration in drafting the contract was for Dansk Naturgas A/S to allow DUC to optimize gas production, both technically and financially, to the extent that this is compatible with the requirement for the reliability of natural gas supplies.

The two previous contracts provided for gas to be supplied from specific fields in the North Sea. However, under the new contract, natural gas is to be supplied from all fields comprised by A.P. Møller's Sole Concession of July 8, 1962.

The annual supplies under the new contract supplement the total gas sales stipulated by the two previous contracts, viz. approx. 93 billion Nm^3 of natural gas, of which about 24 billion Nm^3 had been supplied at end-1993. According to the 1993 contract, the aggregate supplies of natural gas sold under the three contracts will be based on a plateau of 7 billion Nm^3 per year as from January 1, 1997. This level will be upheld for a minimum of nine years, as the production plateau will be maintained for as long as possible.

Thus, the new gas contract does not stipulate a fixed total volume, but rather a fixed annual volume that will be supplied as long as DUC considers it technically and financially feasible to carry on production at this level.

Further, the new contract incorporates an option for Dansk Naturgas A/S to request additional supplies totalling up to 7.5 billion Nm^3 per year for a period of years, subject to the condition that the total minimum supplies of gas during the production plateau will remain unchanged, i.e. 63 billion Nm^3.

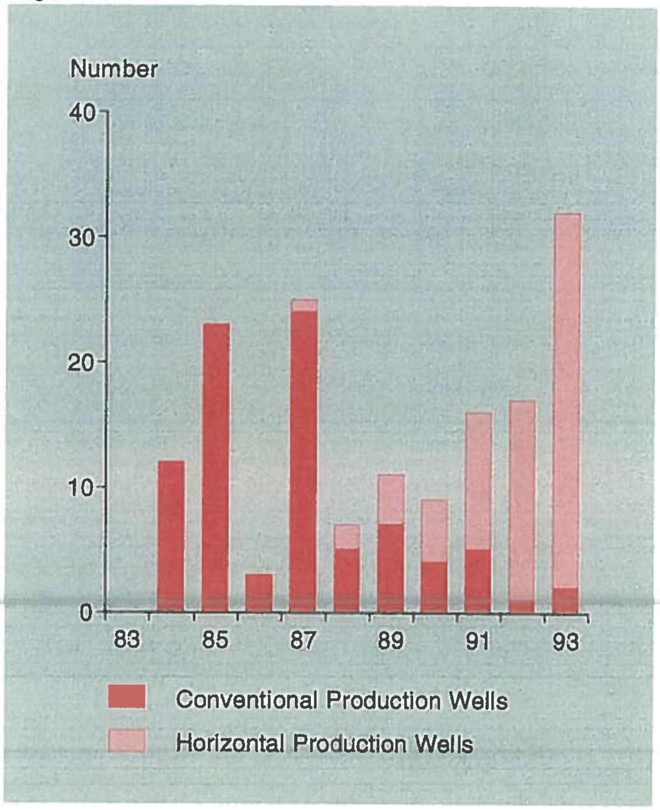
Developments in 1993 in General

In 1993, the planned development of the Tyra, Harald, Roar and Svend Fields was clarified, as DUC's revised plans for recovery from these fields were approved on October 29. At the same time, the dimension and routing of the oil pipeline connecting the northern fields with the Tyra Field were approved.

In addition, 1993 saw the culmination of the further development of the three old oil fields, Dan, Gorm and Skjold, as well as the commencement of production from two new fields. The first oil from the subsea-completed well in the Regnar Field, developed as a satellite to the Dan Field, was produced on September 26, 1993, while the Tyra satellite field, Valdemar, was brought on stream on October 5, 1993.

The development of the production facilities in the old fields and the commencement of production in the new fields resulted in a vast increase in Danish oil production from autumn 1993. From a level of production of approx. 160,000 barrels of oil per day during the first eight months of the year, production rose steadily month by month during the four last months of the year to more than 190,000 barrels of oil per day. At the turn of the year 1993/94, Danish oil production exceeded 200,000 barrels per day for the first time.

Fig. 4.3 Production Wells



The new records set in 1993 for the Danish production of oil were only possible due to the expansion of the transport capacity of the oil pipeline from the Gorm Field to Fredericia. Following this expansion, the transport capacity is now 210,000 barrels of oil per day, the equivalent of approx. 10.5 million tonnes per year.

Production Wells

In 1993, 32 new production and injection wells were completed in connection with developing the Danish fields in the North Sea.

The development in the number of production and injection wells in operation in the period from 1983 to 1993, broken down by conventional and horizontal wells, is shown in Fig. 4.3.

The 32 wells completed in producing fields in 1993 are distributed as follows: 14 wells in the Dan Field, three in the Tyra Field, six in the Gorm Field, four in the Skjold Field, three in the Valdemar Field, and one well in each of the Regnar and Kraka Fields.

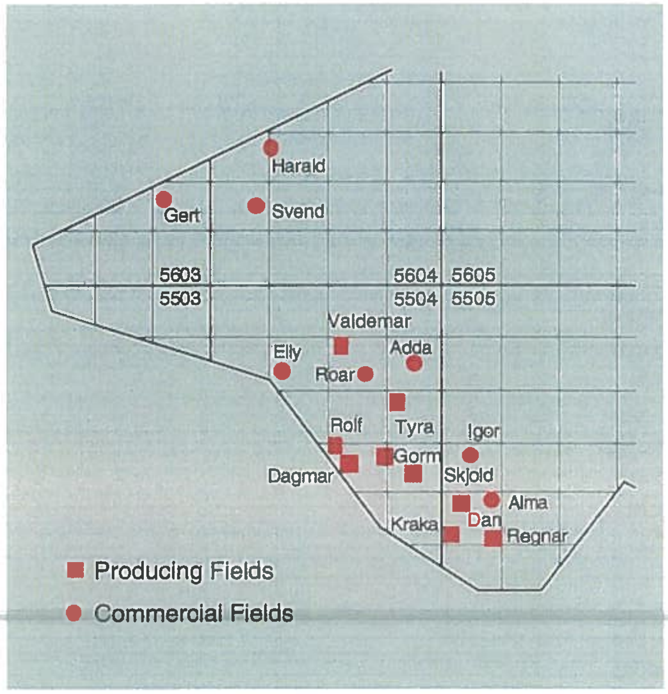
The unprecedented number of production wells completed in 1993 are further distinctive in that all the wells, with the exception of two, were drilled as horizontal wells. It should be noted that two of the wells in the Valdemar Field were tie-back wells drilled and tested as early as in 1989 and 1991, respectively.

The number of horizontal wells in operation in the Danish area has now been brought up to a total of 69, of which 62 are production wells and seven are water-injection wells. In this context, the highly deviated wells in the Skjold Field, which follow the stratification of the structure, are classified as horizontal wells. Five horizontal wells in the Dan Field, intended for later conversion into water-injection wells, operated as oil production wells at end-1993.

The number of horizontal wells will continue to increase in the next few years, as the development of a number of fields will be based on production from horizontal wells to a great extent.

This applies to fields already producing as well as to fields that are still in the project stage.

Fig. 4.4 Danish Oil and Gas Fields



Producing Fields

The Danish producing oil and gas fields are grouped round three processing centres, the Dan, Gorm and Tyra Centres. The following description of the nine fields that carried on production in 1993 is based on this grouping of fields.

Fig. 4.4 shows the present status and location of Danish oil and gas fields, while existing production and pipeline facilities for oil and gas appear from Fig. 4.6.

Appendix E provides an outline - with supplementary data - of producing fields, field developments in progress as well as new field developments.

The Dan Centre

This Centre is composed of the Dan, Kraka and Regnar Fields, as well as the Igor Field, as yet undeveloped. The development in oil production from the fields at the Dan Centre is shown in Fig. 4.5.

Total gas production from the fields at the Dan Centre amounted to 1.47 billion Nm^3 in 1993, of which 1.35 billion Nm^3 was transported to shore via the Tyra Centre. The rest of the gas was used as fuel or flared.

Dan

Dan is an oil field with a gas cap. Production was initiated in 1972.

The field was developed in phases through the 1970s, and the Dan F project, consisting of a new production centre with 24 wells, was implemented in 1987.

Based on the good results from the first horizontal well, which was drilled on an experimental basis i 1987, primary recovery from the field was enhanced in the period from 1988 to 1991. A total o 13 horizontal wells have been drilled.

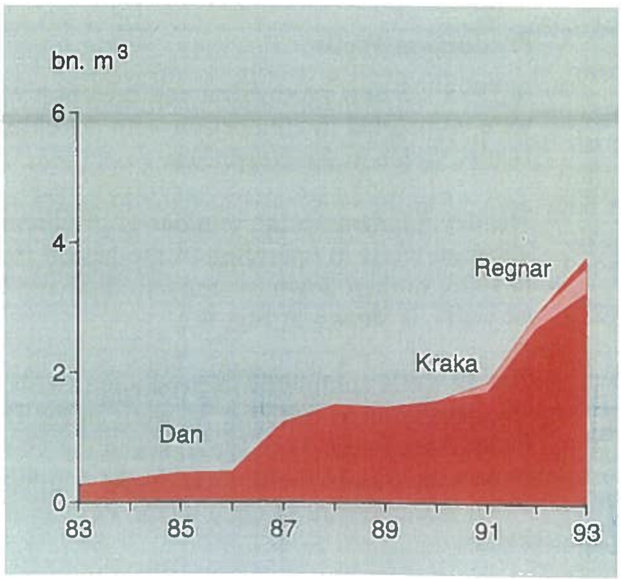
Moreover, recovery from the Dan Field under a water-injection pilot project (secondary recovery) was initiated during the same period.

The experience from drilling horizontal wells as well as the results of the water-injection pilot projects were the background for the 1991 plan for th ongoing development of the Dan Field. This plan provides for continued enhancement of primary recovery by drilling additional horizontal production wells and by initiating water injection in parts of the field.

In addition to drilling a vast number of new wells and converting existing wells, the Dan Field development project will increase the capacity of the processing facilities for the oil and gas produced as well as for injection water.

Further, two new STAR platforms were commissioned: one of them accommodates a new gas flare stack, while the other, which is connected to the Dan F complex by a bridge housing processing facilities, hosts seven new wells.

Fig. 4.5 Oil Production from the Fields at the Da Centre



Following the implementation of the planned deck extensions on three of the existing wellhead platforms, the Dan Field now has capacity for 78 wells.

In the course of 1993, 14 horizontal wells were drilled, two of them being existing conventional wells that were sidetracked. This is twice as many as in 1992, when seven horizontal wells were drilled.

Accordingly, the number of horizontal wells in the Dan Field now totals 35. Six of these are water-injection wells, all initially used as production wells.

After the completion of the new water-injection facilities, a number of wells were converted into injection wells. At end-1993, 14 wells in the Dan Field were used for water injection. Two of these wells are horizontal.

The large number of wells drilled in 1992 and 1993 brings up the total number of wells in the field to 74.

The ongoing development will provide the necessary experience for subsequently extending the secondary oil recovery technique to the other parts of the field, the southeastern flank of the field in particular, and possibly to the area under the gas cap.

After processing at Dan FC, oil and gas are transported to shore through the Gorm and Tyra Centres, respectively.

In 1993, Dan produced 3.26 million m^3 of oil compared to 2.70 million m^3 in 1992. Gas production amounted to 1.34 billion Nm^3.

The large (90%) increase in production from the Dan Field since 1991 is a reflection of the successful results from drilling horizontal wells and initiating water injection in the field. With a daily oil production of about 60,000 barrels, the Dan Field now clearly holds the position as the largest Danish oil field.

Kraka

Kraka is an oil field located approx. 7 km southwest of the Dan Field in the Contiguous Area. The field has been developed as a satellite to the Dan Field.

Oil production was initiated in March 1991 from two horizontal wells hosted by a STAR platform.

Based on the experience from production from the two first wells, another horizontal well, Kraka A-6 was drilled in 1992, in order to test new drilling techniques, among other reasons. The well was drilled with three horizontal well trajectories producing to the same main wellbore

In May 1993, the first well to be drilled in the fourth step of the development plan, Kraka A-7, started producing. This well has been drilled with one long horizontal section. Production experience from the Kraka A-7 well is favourable, and expectations for future recovery from the field have grown considerably.

A characteristic feature of the Kraka Field is the difficult recovery conditions, caused by the low permeability of the reservoir and low oil saturations, as well as the problems with preventing gas and water from reaching the wells.

In 1993, 0.39 million m^3 of oil was produced at the Kraka Field, as compared to 0.21 million m^3 in 1992.

Regnar

The Regnar Field is an oil field situated approx. 13 km southeast of the Dan Field in the Contiguous Area. The field was developed as a satellite to the Dan Field and was brought on stream in September 1993. Production takes place from a subsea-completed well which is connected to the Dan Field by a 6" multiphase pipeline. The subsea production system is remotely controlled from Dan FC via a surface buoy. Oil is produced from a single well of the conventional type.

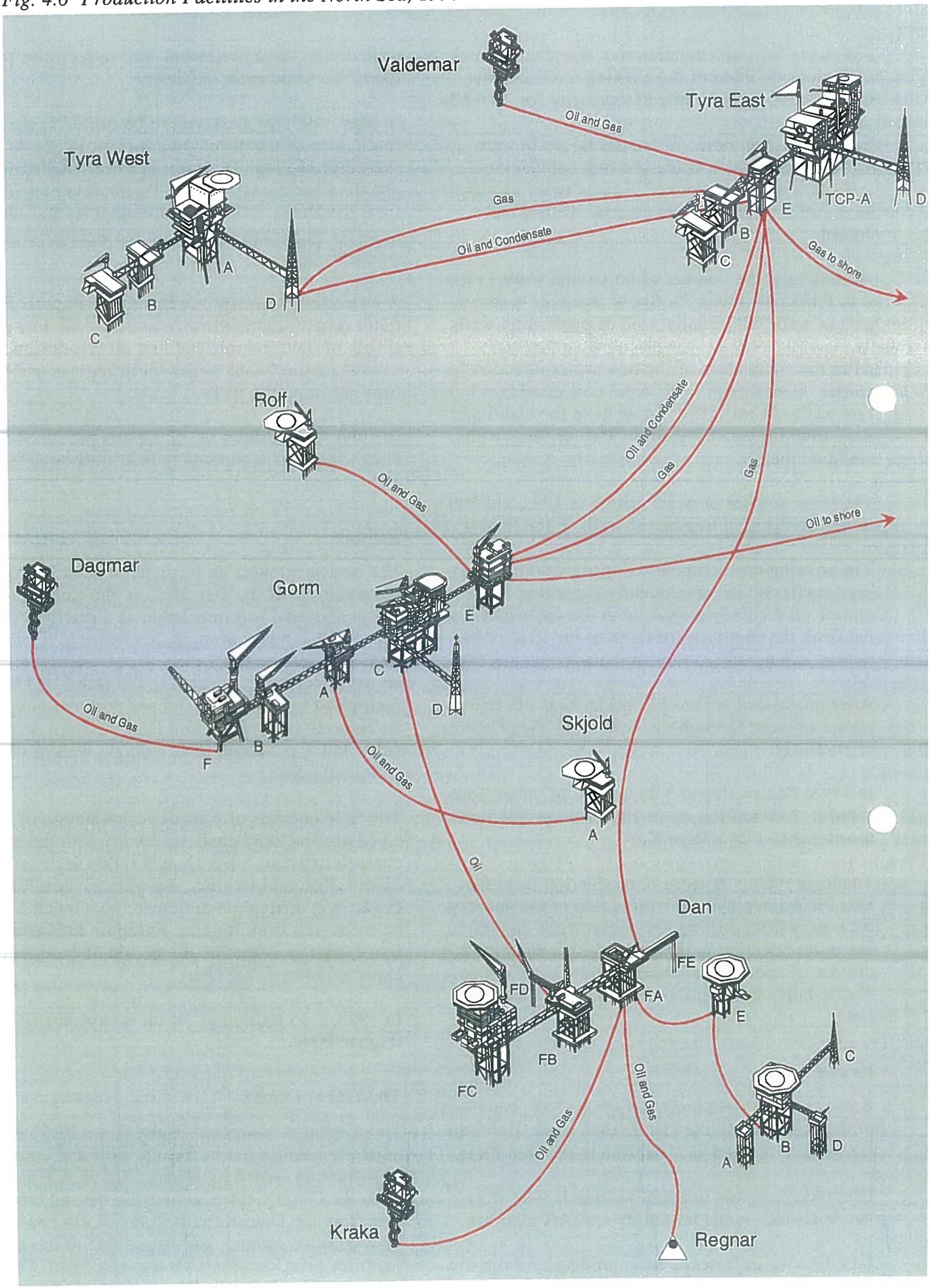
The field consists of a small accumulation of oil in a heavily fractured chalk reservoir, with the same characteristics as other Danish fields such as Skjold, Rolf and Dagmar. As was the case for these fields, it is difficult to anticipate how much oil can be recovered from Regnar. Based on the information currently available, the period of production is expected to be fairly short.

In 1993, 0.15 million m^3 of oil was produced at the Regnar Field.

The Gorm Centre

This Centre is composed of the Gorm Field and the adjacent satellite fields, Skjold, Rolf and Dagmar. The pipeline owned by Dansk Olierør A/S leads from the Gorm Centre, conveying oil and condensate from the Danish fields in the North Sea to the west coast of Jutland, and from there to the terminal facilities near Fredericia on the east coast. The development in oil production from the fields at the Gorm Centre is shown in Fig. 4.7.

Fig. 4.6 Production Facilities in the North Sea, 1993



1993 production totalled 991 million Nm^3 of gas in the fields connected to the Gorm Centre. Of this amount, 375 million Nm^3 of gas was supplied to Dansk Naturgas A/S via the Tyra Centre, while 420 million Nm^3 was reinjected into the Gorm Field.

Gorm

Gorm is an oil field situated 27 km northwest of the Dan Field. The field was brought on stream in 1981.

The reservoir consists of two reservoir blocks with different reservoir characteristics, termed the 'A' and the 'B' blocks, respectively.

In 1989/90, the initial phases of a water-injection project were implemented in selected areas of both reservoir blocks.

The experience gained from this water-injection project formed the basis for the ongoing field development, which was approved by the Ministry of Energy in 1992. The approved development project is based on water injection in the whole field.

The field development project involves flooding the reservoir in the 'A' block with water in order to improve the recovery factor. Initially, oil will be recovered from mid-flank areas of the reservoir, with simultaneous water injection in the flanks. In a later phase, recovery will be moved towards the crest of the structure, while water injection will be initiated in the areas where oil was produced previously.

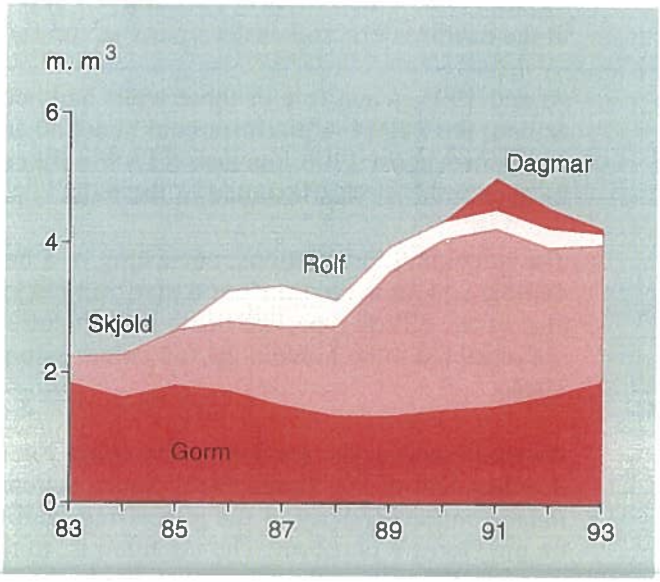
The development project further provides for gradual discontinuance of gas injection in the 'A' block. Thus, in 1993, only 420 million Nm^3 of gas was injected, relative to 710 million Nm^3 the year before.

With respect to the 'B' block, the intention is to similarly enhance recovery by increasing water injection under the oil zone, while increasing the number of production wells, particularly at the crest of the structure.

The implementation of the development project was initiated in 1992, when the first four wells were drilled, proceeded by the drilling of another six wells in 1993. Two of these wells are production wells, while the rest are water-injection wells. All these wells have been drilled as horizontal wells, with the exception of one injection well.

Thus, at end-1993, the status of the development project was that a total of ten wells had been drilled, viz. four production wells (one conventional and three horizontal wells) and six water-injection wells (one conventional and five horizontal wells).

Fig. 4.7 Oil Production from the Fields at the Gorm Centre



In addition, one well in the 'B' block has been converted from a water-injection well into a production well.

The actual development deviates substantially from the original plan; thus, a larger number of horizontal wells have been drilled than initially planned.

The ongoing development of the Gorm and Skjold Fields has necessitated an expansion of the existing facilities in the Gorm Field, particularly the water-processing and water-injection capacity. Thus, a new module has been installed on the Gorm F platform, housing the processing and injection facilities for the water produced.

In order to make room for the new wells, the wellhead module previously installed on Gorm F, with a total capacity for eight wells, was supplemented by a new wellhead module, with a total capacity for 16 wells.

In 1993, the Gorm Field produced 1.89 million m^3 of oil, a 14% increase over 1992.

Skjold

Skjold is an oil field located 10 km southeast of the Gorm Field. The oil produced is conveyed by a multiphase pipeline to the Gorm Field for processing, and the Skjold wells are supplied with lift gas and injection water from the Gorm Field.

Production commenced in 1982. The Skjold Field has been developed in stages, with each stage planned on the basis of the experience gained in the preceding stages. In 1986, water flooding of the reservoir was initiated.

Production

In December 1992, the Ministry of Energy approved a plan for the further development of the Skjold Field, which involves drilling ten new wells in the northeastern and eastern parts of the field.

At end-1993, when five of these wells had been drilled, the Skjold A platform could host no further wells. In August 1993, the new STAR wellhead platform (Skjold B) was installed in the field.

The remaining installations, consisting of a bridge module and an accommodation platform (Skjold C), also of the STAR type, are being manufactured and are expected to be hooked up and commissioned in 1994.

As mentioned in the section on the Gorm Field, the development of the Skjold Field places increased demands on the capacity of the processing facilities on the Gorm F platform. The intention is, to the extent possible, to reinject the water produced from the Gorm Field and its satellite fields, Skjold, Rolf and Dagmar, into the Gorm and Skjold reservoirs.

In 1994, another 12" pipeline will be laid between Skjold B and Gorm F for transporting the increased production from the Skjold Field. The use of the existing 6" pipeline has been changed, so that it now supplies the Skjold wells with lift gas from Gorm C.

At end-1993, a total of ten production wells and five injection wells were in operation in the Skjold Field.

In 1993, Skjold produced 2.10 million m^3 of oil, which is 9% less than in 1992. The decrease in production since 1991 is due to increased water production, resulting from water penetration in the production wells at the crest of the structure.

The increased number of wells in the flanks of the field have not been able to fully compensate for the reduced production from the central parts of the field.

Rolf

Rolf is an oil field situated 15 km west of the Gorm Field. In 1986, the field, developed as a satellite field to Gorm, was brought on stream with production from one well. In 1991, production was initiated from one more well in the field.

In August 1993, the Ministry of Energy approved a final plan for recovery from the Rolf Field. This approval was granted following extensive reservoir studies in the field. In granting its approval, the Ministry of Energy accepted that no further development of the field will be carried out for the time being.

After a period of further gathering of production experience from the field, DUC is to submit updated versions of these reservoir studies, for review by the energy authorities.

In 1993, the field produced 0.18 million m^3 of oil.

Dagmar

Dagmar is an oil field situated about 10 km west of the Gorm Field, developed as a satellite to Gorm.

The development of the field was planned in stages due to great uncertainty about the amount of recoverable oil reserves.

In June 1991, the first stage of the development plan was initiated, with production taking place from two wells.

Due to the high content of hydrogen sulphide in the associated gas, the production from Dagmar is processed by special facilities on the Gorm F platform. Only part of the gas produced is used as fuel, the rest being flared.

Since the beginning of 1991, production rates in the Dagmar Field have fallen rapidly. The characteristics of the Dagmar reservoir are similar to those of Skjold and Rolf, but the chalk in the Dagmar Field has a very limited imbibition capability. This means that the water that flows through the heavily fractured chalk contributes only slightly to releasing the oil that is trapped in the tight matrix of the chalk.

Therefore, based on the experience to date, production estimates for the Dagmar Field have had to be written down considerably. At end-1993, the field produced less than 1000 barrels of oil per day.

However, the rate of decline has slowed down considerably recently, and it is expected that production has begun to stabilize, albeit at a very low level.

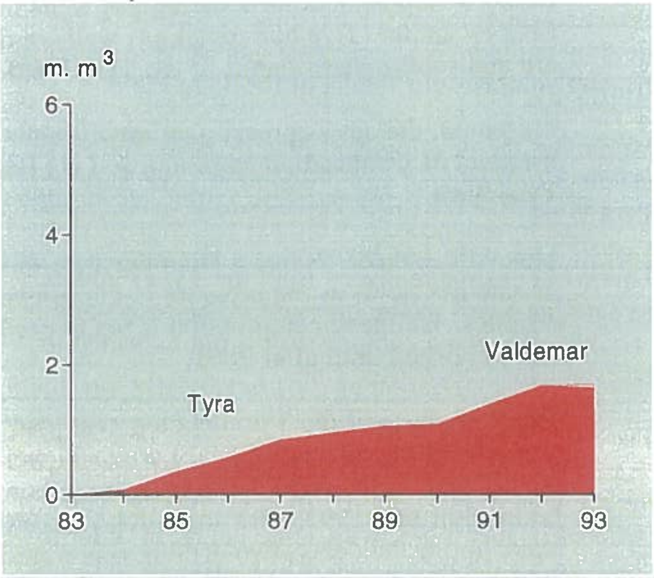
In 1993, the Dagmar Field produced 0.07 million m^3 of oil. Gas production amounted to 13 million Nm^3, of which 12 million Nm^3 was flared without being utilized.

The Tyra Centre

This Centre is composed of the Tyra Field and the new satellite field, Valdemar, which was brought on stream in 1993. As a consequence of the Ministry of Energy's approvals from 1993, a substantial development of the installations in the Tyra Field is planned within the next few years, with a view to hooking up a number of new fields for one thing. The Svend and Roar Fields will be hooked up in 1996, and the Harald Field in 1997. Production from the small future satellite fields, Adda, Tyra Southeast and Elly, is expected to commence later, also to be transported to the Tyra installations for processing.

The development in oil and condensate production from the fields at the Tyra Centre is shown in Fig. 4.8.

Fig. 4.8 Oil and Condensate Production at the Tyra Centre



Tyra

Tyra comprises a large gas cap overlying a thin black oil zone. The field is situated approx. 15 km northwest of the Gorm Field, and production commenced in 1984. From 1987, part of the gas produced was reinjected into the reservoir in order to utilize the excess production capacity to increase the production of condensate.

The preliminary results of the field delineation towards the southeast indicate that the Tyra structure covers a considerably larger area than assumed so far. Moreover, it is probable that the amounts of oil and gas in place are twice as high as previously estimated. Thus, a great deal of work on field delineation at Tyra remains.

As a result of the conclusion of an agreement in principle on June 8, 1993 for additional gas sales as from 1997, DUC submitted an application to the Ministry of Energy, including a development plan for the Tyra Field that was a revised version of the plan approved on January 14, 1993.

Future annual gas sales of up to 7.5 billion Nm^3 from 1997 mean, among other things, that the projected capacity of the compression facilities will have to be expanded. Moreover, the increased production requires a higher degree of integrated operation of the installations at Tyra East and Tyra West. Therefore, the revised development plan provides for an expansion of the planned internal transport capacity between the two platform complexes through the installation of three new gas pipelines. The two existing pipelines will be used for internal transport of liquid hydrocarbons.

The revised plan, which also contains an updated time schedule for the implementation of the individual phases of the project, was approved by the Ministry of Energy on October 29, 1993.

The expansion will be carried out in such a way that the new compression facilities can be used for injecting gas into the Tyra reservoir in periods with low gas sales. The new facilities required will be installed on the existing TWA platform as well as on a bridge module supported by a new STAR platform at Tyra West. The expansion will increase injection capacity almost four-fold.

The plan also involves further developing the oil zone under the original part of the field by drilling nine horizontal wells. Thus, the total number of horizontal oil wells at Tyra will increase to 17.

The expansion foreseen in the development plan also comprises facilities for satellite field production handling at Tyra East connecting the Svend, Roar and Harald Fields to Tyra, as well as for hooking up the future installations in the southeast area of the Tyra Field. These installations will be placed on a new bridge module supported by a STAR platform at Tyra East.

In addition, from 1996, surplus gas from the Roar and Harald gas fields, as well as from DUC's oil fields, will be injected into the reservoir in the Tyra Field when required.

In this connection, all gas wells at Tyra West will be converted into injection wells as from 1995, while half the gas wells at Tyra East will be converted from 1997.

The expanded gas injection project will result in increased recovery of condensate. At the same time, efforts will be made to ensure that oil recovery conditions do not deteriorate due to a premature decline in the reservoir pressure.

Further, the plan envisages that around 1997/98, in order to safeguard supply reliability, it will be necessary to supplement the existing gas wells in the field by another five horizontal gas wells in the eastern and southeastern flanks of the Tyra Field.

Moreover, the development plan involves the establishment of wellhead compression at Tyra East and Tyra West.

This will enhance recovery from the Tyra Field and its satellite fields as the pressure in the reservoirs declines. Wellhead compression is not expected to be established until after 2001.

The first phase of the Tyra development plan consists of drilling nine additional horizontal wells in the oil zone of the field. Drilling operations were initiated in July 1993, with some delay. In order to make up for the delay, two drilling rigs were in operation in the field at end-1993. Three oil wells were completed in 1993, so that a total of one conventional and eleven horizontal oil wells have now been drilled in the Tyra Field. In addition, a fair amount of oil is recovered from the gas wells of the field.

In 1993, 3.85 billion Nm^3 of gas was recovered from the Tyra Field, of which 1.45 billion Nm^3 was reinjected. The recovery of gas from Tyra fell somewhat compared to the year before. The heavily increased production of gas in the oil fields meant that smaller gas supplies were required from Tyra in order to uphold the rate of delivery to Dansk Naturgas A/S. Thus, in 1993, Tyra contributed 56% of total supplies, against 67% in 1992.

Total oil and condensate production from Tyra constituted 1.64 million m^3 in 1993, as compared to 1.67 million m^3 in 1992, a decline of 2%. Oil production in 1993 amounted to 0.98 million m^3, about the same level as in 1992, bringing aggregate production from the oil zone up to 3.67 million m^3.

Valdemar

Valdemar consists of a number of separate oil and gas deposits. The field is located approx. 20 km northwest of the Tyra Field. In autumn 1993, the Valdemar Field was developed as a satellite to Tyra. The wells are hosted by a platform of the STAR type, from which production is conveyed to Tyra East through an 8" multiphase pipeline.

The Valdemar Field comprises three discoveries, Bo, Boje and North Jens, made in 1977, 1982 and 1985, respectively. The Valdemar Field is vast by Danish standards. However, the reservoir that contains the largest amount of oil consists of very tight chalk of Aptian/Barremian age. Discoveries of this type of deposits have been made in other countries, but the Valdemar Field is the first field where attempts have been made to initiate production from a reservoir with these characteristics.

In March 1988, the Ministry of Energy approved a development plan for the field, which provides for phased development of the field, beginning with the area around the North Jens well. According to the original plan, recovery should have been initiated by October 1, 1991.

However, the recovery of oil proved more difficult than first assumed, and the experience gained from drilling the first two wells in 1989/90 led to a revision of the initial steps of the development plan, approved by the Ministry of Energy in July 1990. A later revision of the plan, approved in 1991, determined that oil production was to be started by January 1, 1994.

Production from the two wells temporarily suspended was commenced on October 5, 1993. The work connected with completing the third well was finalized later.

The first production experience from the field is encouraging, as high initial production rates have been attained in the Valdemar wells.

In 1993, 0.05 million m^3 of oil was recovered from the Valdemar Field. Gas production amounted to 29 million Nm^3.

Field Developments in Progress

Svend

The Svend Field consists of two oil deposits situated approx. 60 km northwest of the Tyra Field in block 5604/25: a northern deposit called North Arne, which was discovered in 1975, and a southern deposit called Otto, discovered in 1982.

In 1990, the Ministry of Energy approved the development plan for Svend, including a time schedule for the development.

Based on the Ministry of Energy's approval of the installation and operation of an oil and condensate pipeline from Harald West via Svend to Tyra East, DUC submitted an application to the Danish Energy Agency on July 1, 1993, requesting approval of an updated development concept for the Svend Field.

On October 29, 1993, the Danish Energy Agency approved the updated development concept for the

Svend Field. According to this plan, production will be commenced not later than April 1, 1996, from two horizontal wells, with one well drilled in each of the two Svend oil deposits. An unmanned wellhead platform of the STAR type that is designed for larger water depths will be installed in the field. The oil produced will be transported to the section of the Harald-Tyra oil pipeline laid in the first phase of the project, which covers the stretch from Svend to Tyra East.

Roar

Like the Tyra Field, Roar comprises a gas cap overlying a thin black oil zone. The field is situated approx. 10 km northwest of the Tyra Field in the Contiguous Area.

The Roar accumulation was discovered in 1968, and a plan for the development of the field was approved by the Ministry of Energy in 1980 in connection with the Ministry's approval of the natural gas project. According to the original plan, the commencement of gas production was scheduled for 1989.

However, the development of the field was postponed, and in 1990, the Ministry of Energy accepted that the field, together with the other gas fields, Harald and Igor, be developed to the extent and at the pace required in order to ensure the reliability of gas supplies.

Following the conclusion of the new gas sales contract on June 8, 1993, and the Ministry of Energy's approval of the '1992 Tyra Development Plan' on January 14, 1993, DUC submitted an application to the Danish Energy Agency in summer 1993, requesting approval of an updated development concept for Roar.

Against this background, on October 29, 1993, the Danish Energy Agency granted its approval for the commencement of production in the Roar Field from two horizontal wells on October 1, 1996, at the latest. In connection with the development, the production potential of the oil zone in the field is to be evaluated with a view to the possibility of initiating mingled production of oil and gas from twin horizontal wells.

The field is to be developed as an unmanned satellite to Tyra East, with one STAR platform. Gas and liquid will be separated in the field and conveyed in two pipelines, of 16" and 8", respectively, to the new reception facilities at Tyra East.

Harald

Harald consists of two gas accumulations approx. 80 km north of Tyra in blocks 5604/21 and 22, just south of the border between the Norwegian and Danish sectors.The Harald Field consists of Lulu discovered in 1980, and West Lulu discovered in 1983.

As mentioned above in the description of the Roar Field, the Ministry of Energy approved a development plan for Harald, including a time schedule for the development, in 1990. According to this approval, the field was to be brought on stream as and when necessary in order to ensure the reliability of gas supplies.

Following the conclusion of the new gas sales contract on June 8, 1993, and the Ministry of Energy's approval of the '1992 Tyra Development Plan', DUC submitted an application to the Danish Energy Agency in July 1993, requesting approval of an updated development concept for the Harald Field.

Against this background, on October 29, 1993, the Danish Energy Agency granted its approval for production startup in the Harald Field on October 1, 1997, at the latest, with production taking place from three wells in the western deposit, Harald West. Recovery from the eastern deposit, Harald East, is to be initiated one year later, i.e. by October 1, 1998, from two wells.

One four-leg processing and wellhead platform, Harald WA, will be installed at Harald West, connected by a bridge to a STAR platform with accommodation for operational and maintenance personnel, Harald WB. Under normal conditions, the Harald installations will be controlled remotely from the Tyra Field. A STAR wellhead platform of the same type as the Svend platform will be installed at Harald East.

On the Harald WA platform, production will be separated into a gas flow, to be transported through a gas pipeline to Tyra East, and a condensate flow, to be conveyed to the extension of the 16" oil and condensate pipeline that transports the Svend production to Tyra East. The Harald WA platform will be designed to allow for possible further expansion with a view to converting it into an actual processing centre for the northern area.

Other Fields

Appendix E contains an outline with key figures of the fields for which development plans have been submitted.

For further particulars, reference is made to the previous editions of the Danish Energy Agency's Report on Oil and Gas Exploration and Production in Denmark.

Natural Gas Storage and Processing Facilities

Dansk Naturgas A/S has two natural gas storage facilities at its disposal, one at Lille Thorup near Viborg in Jutland, and one at Stenlille on Zealand. Both facilities are currently being expanded.

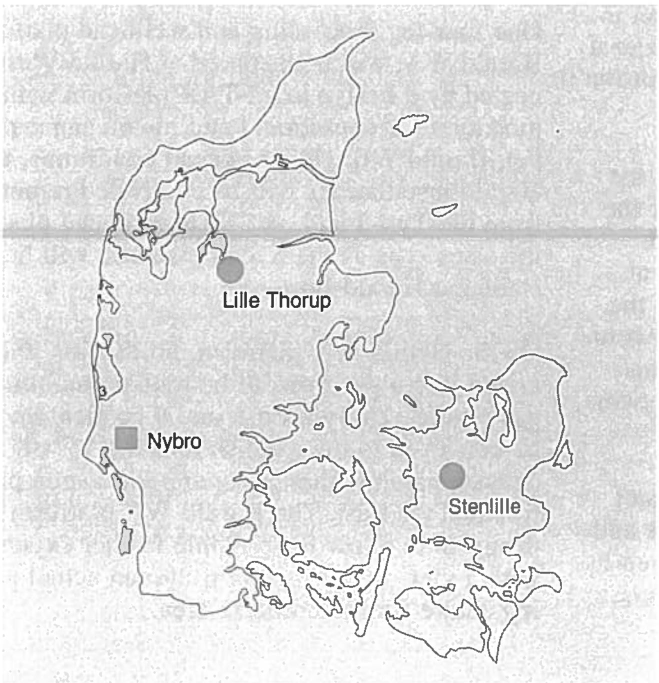
At Lille Thorup, six caverns have been established in a subterranean salt dome with a total capacity for 300 million Nm^3 of natural gas. At present, this storage facility is being expanded by a seventh cavern that will bring up total capacity to 360 million Nm^3 of natural gas.

At the Stenlille storage facility, a total of 338 million Nm^3 of natural gas had been injected into the aquifer of a sandstone structure at end-1993. Had any major interruptions of natural gas supplies occurred in the winter of 1993/94, it would have been possible to extract up to 100 million Nm^3 of natura gas from the storage facility.

As a consequence of the new agreement concluded between Dansk Naturgas A/S and DUC for annual gas sales of up to 7.5 billion Nm^3 from 1997, Dans Naturgas A/S has begun reassessing its natural gas storage requirements.

At the same time, Dansk Naturgas A/S has decided to expand the capacity of the gas processing facilities at Nybro. A new production line will be installed, increasing the daily gas processing capacity from 16 to 25 million Nm^3.

Fig. 4.9 Natural Gas Storage and Processing Facilities



5. Economy

Crude Oil Price and Dollar Exchange Rate

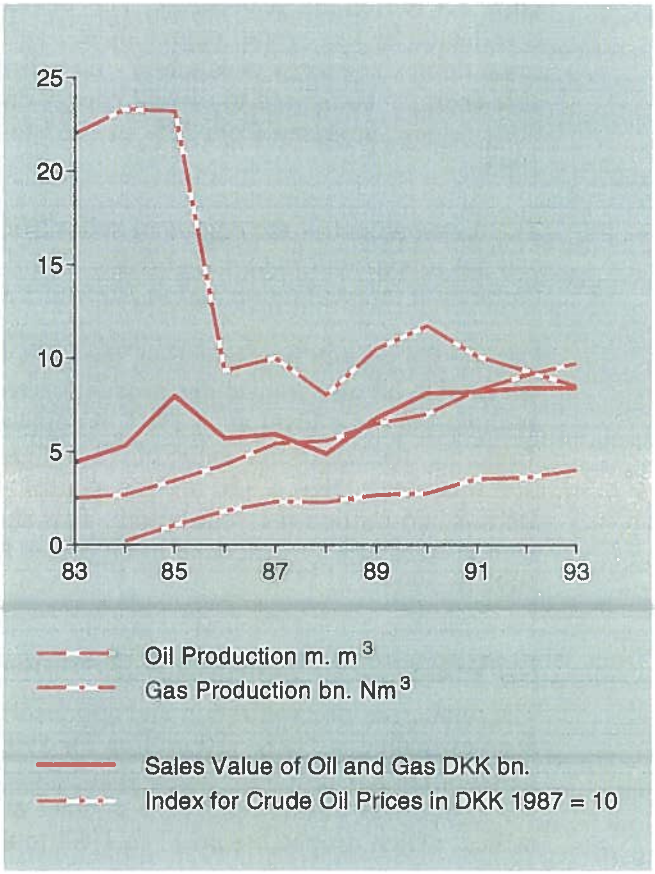
1993 was a remarkable year in that the international crude oil price (as quoted for Brent oil) at year-end was at about the same level (in real terms) as before the first oil crisis in 1973.

The average price for the whole year amounted to USD 17.0 per barrel, fluctuating from USD 19.5 per barrel at the beginning of the year to USD 12.9 per barrel at year-end. For comparison, the average price per barrel was USD 19.3 in 1992.

The development in oil prices appears from Table 5.1 and Fig. 5.1.

Generally, crude oil prices remained at a level of just over USD 18 per barrel until June, when prices started to drop. Apart from a brief price increase following an OPEC meeting in September, the price continued to decline throughout the autumn. In particular, the expectation that the UN would allow Iraq to resume its export of oil led to falling oil prices in June. In addition, the low global growth rate, an expected increase in exports from the North Sea, Kuwait and the former Soviet Union, as well as OPEC's inability to cut down production contributed to the falling prices.

Fig. 5.1 Sales Value and Production of Oil and Gas



During the first half of 1993, the USD exchange rate remained stable, at a level of about DKK 6.20 per USD, but then climbed to about DKK 7 per USD through July and August. The highest and lowest exchange rates in 1993 were DKK 7.16 per USD and DKK 6.02 per USD, respectively. For the year as a whole, the average USD exchange rate was DKK 6.49 per USD, as compared to DKK 6.04 per USD in 1992.

Table 5.1 Sales Value and Production of Oil and Gas, Nominal Prices

	1989	1990	1991	1992	1993*)
Sales Value (DKK million)					
Oil	5,360	6,394	6,630	6,536	6,650
Gas	1,410	1,713	1,722	1,970	1,800
Total	*6,770*	*8,107*	*8,352*	*8,506*	*8,450*
Production					
Oil m m^3	6.47	7.00	8.26	9.12	9.73
Gas, bn Nm^3	2.68	2.75	3.51	3.63	4.00
International Crude Oil Price (Brent)					
USD/bbl	18.11	23.70	20.15	19.31	17.00
DKK/USD	7.32	6.19	6.38	6.04	6.49
DKK per m^3	834	923	809	734	694

*) Estimate

Danish Oil and Gas Production

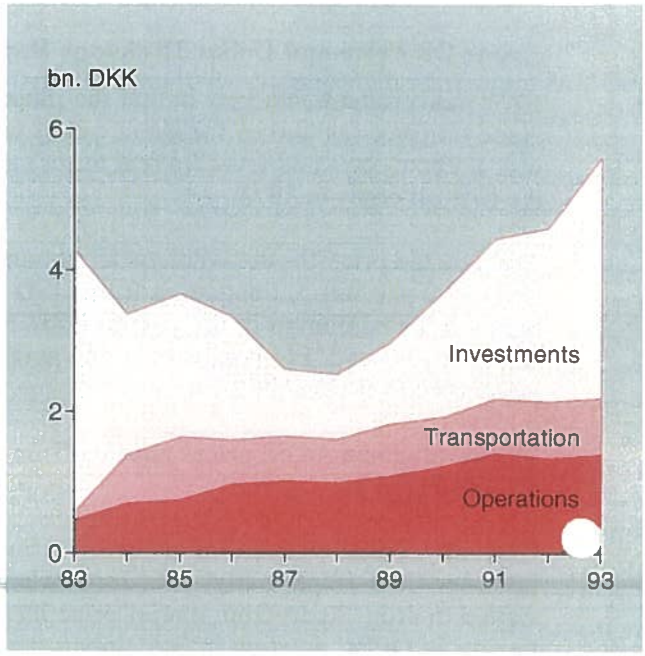
1993 saw an increase in the Danish production of oil and natural gas. Oil production went up by about 7%, while gas sales rose by about 10%. The amounts appear from Table 5.1 and Fig. 5.1. Expressed in tonnes oil equivalent, total oil and gas production amounted to about 12.5 million t.o.e. in 1993 against 11.6 million t.o.e. the year before, an increase of almost 8%.

The pronounced increase in oil production meant that in 1993, Denmark became self-sufficient in oil for the first time, as the degree of self-sufficiency in oil has now risen to 105%. The degree of self-sufficiency in oil and gas combined is now 119%. The increased production of oil and gas as well as lower prices have contributed substantially to the sharp drop in the net foreign-currency expenditure on energy imports since the mid-80s. Thus, the net expenditure was DKK 2.5 billion in 1993, as compared to DKK 3.1 billion the year before. This development is reflected by the overall degree of self-sufficiency (total domestic energy production - including renewable energy - compared to overall energy consumption), which increased from 25% in 1985 to 71% in 1993.

The development in the degree of self-sufficiency and net foreign-currency expenditure is outlined in the section on *production* and in Appendix D.

Despite the growth in production, the sales value of the Danish oil and natural gas production remained at about the same level as in 1992. As appears from Table 5.1, the total sales value of oil and gas production was about DKK 8,450 million against DKK 8,506 million the year before. This should be seen in light of a 12% decline in oil prices from 1992 to 1993.

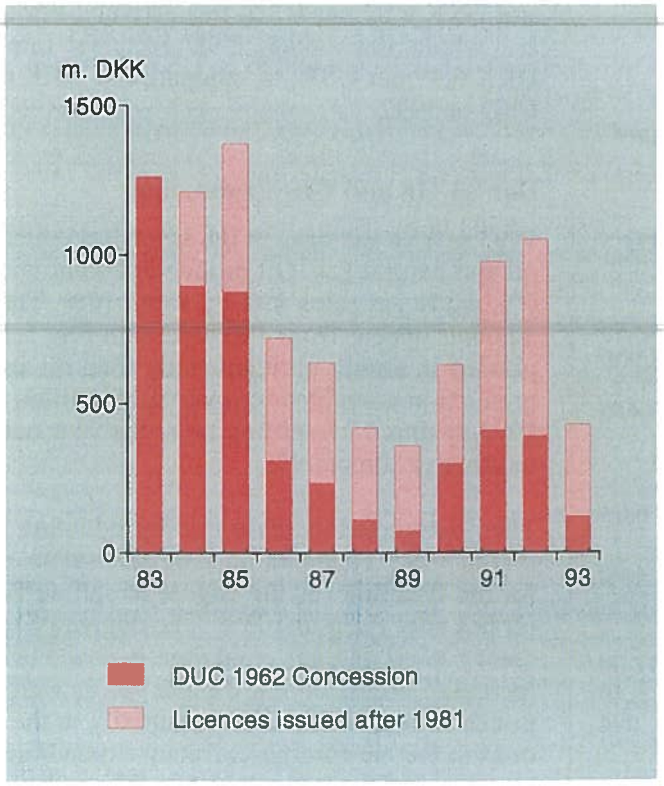
Fig. 5.3 Development, Operations and Transportation, Nominal Prices



Exploration, Development and Operation

The total costs of exploration and appraisal have been estimated at DKK 310 million for 1993, compared to DKK 1,040 million the year before. The low figure was influenced by the number of wells drilled, which dropped from 11 in 1992 to three in 1993.

Fig. 5.2 Costs of Exploration, Nominal Prices



These three wells were drilled under Statoil's licence 7/86, DOPAS' licence 1/92 and Amoco's licence 2/89. The development in the exploration costs incurred under DUC's Sole Concession and under the licences issued since 1984 is illustrated by Fig. 5.2.

The investments in field developments rose from DKK 2,450 million in 1992 to DKK 3,325 million in 1993. The investments relate mainly to installations in the Dan, Gorm and Skjold Fields and new production wells. A total of 32 production wells were completed in 1993, of which 14 were dr[illegible]d in the Dan Field.

Table 5.2 shows development expenses broken down by field. The item 'Not Allocated' includes the expenses that relate to several fields and the expenses defrayed by the individual partners in DUC. The figures for 1993 are preliminary. A more detailed description of the activities in the individual fields is given in the section on *production*.

The past 11 years' development in total investments, operating and transportation costs is shown in Fig. 5.3. In absolute figures, the total investments in development projects made by DUC up to and including 1993 amount to just under DKK 40 billion converted into 1994 prices. The corresponding operating and administrative costs amount to just under DKK 16 billion.

While the costs of development and operations indi-

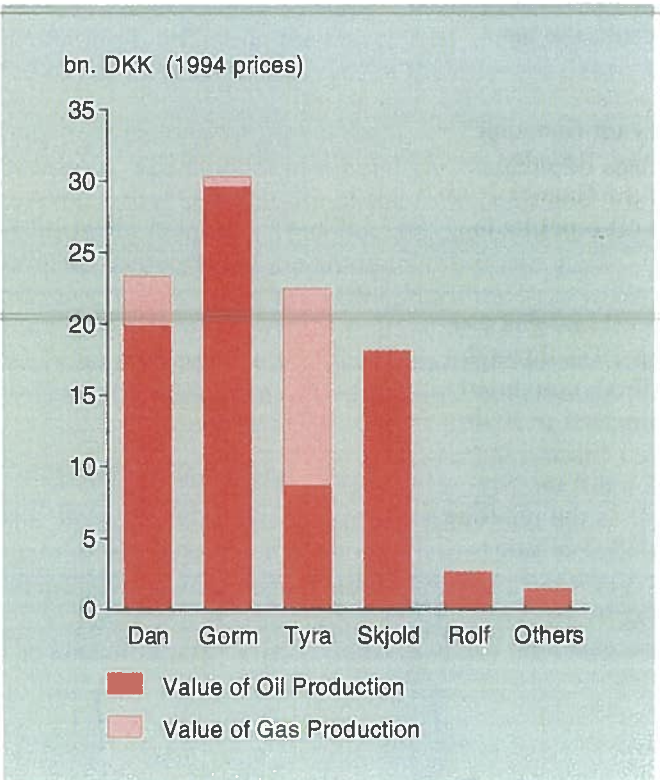
Table 5.2 DUC's Investments in Development Projects, DKK million, Nominal Prices

	1989	1990	1991	1992	1993*)
Dan	362	297	915	1,244	1,070
Gorm	204	563	409	411	680
Skjold	44	105	297	196	435
Rolf	21	1	50	-	-
Tyra	85	121	274	372	350
Kraka	195	227	87	97	75
Dagmar	8	246	77	2	-
Valdemar	223	123	21	27	375
Regnar	-	1	-	21	190
Not allocated	3	69	134	42	150
Total	*1,145*	*1,736*	*2,260*	*2,412*	*3,325*

*) Estimate

cated relate to facilities for the production of oil and gas, transportation costs only relate to the transportation of crude oil, including operating costs, financing costs and contributions towards the capital cost of the oil pipeline and terminal facilities. In addition, these costs include a so-called profit element of 5% of the value of the crude oil transported. This 5% is payable to the owner of the pipeline, Dansk Olierør A/S, which passes on 95% of the profit element to the state. So far, DUC is the only user of the pipeline, and is thus liable to pay all transportation costs.

Fig. 5.4 Value of Production 1972-1993



DUC currently has nine producing fields. The value of total production up to and including 1993 amounts to approx. DKK 98 billion, converted into 1994 prices. Fig. 5.4 shows the value broken down by field as well as by oil and gas production.

Another reflection of the scope of activities is found in considering the development in DUC's pretax results, which is shown by Table 5.3. Here, the operating costs shown include administrative and transportation costs, excluding the above-mentioned 5% profit element.

It should be noted that the information in the table is based on the annual accounts of the partners in DUC, for which reason the results do not necessarily correspond to the profits reported for tax purposes. The figures for 1993 are not yet available.

The state revenue derived from oil and gas production consists of four elements: corporate tax, royalty, the profit element of the oil pipeline tariff and hydrocarbon tax.

A common feature of all these taxes is that the proceeds are determined by the amounts produced.

The total amount of gas produced is metered at the Tyra East metering station, while the oil produced is metered at Dansk Olierør A/S' terminal facilities in Fredericia in connection with the lifting of the oil. The figures obtained upon metering gas at Tyra East are used as a basis for calculating the royalty payable. Likewise, the amounts of oil metered at Fredericia are used to calculate royalty and the 5% profit element.

Table 5.3 Pretax Results of the DUC Companies, DKK million, Nominal Prices

	1988	1989	1990	1991	1992
Income	5,103	6,716	7,692	8,446	8,467
Op. Costs	1,569	1,654	1,858	2,070	2,022
Interest Expenses	628	680	234	336	263
Exchange-Rate Adjustments	-324	+85	+282	-182	-171
Gross Income	2,582	4,468	5,882	5,858	6,011
Depreciation	1,495	1,553	1,600	2,373	2,126
Pretax Result	*1,088*	*2,915*	*4,282*	*3,485*	*3,885*

Table 5.4 State Revenue from Oil/Gas Production, DKK million, Nominal Prices

	1989	1990	1991	1992	1993*)
Hydrocarbon Tax	0	0	0	0	0
Corporate Tax	464	1,314	990	1,002	824
Royalty	523	633	639	666	650
Profit Element	209	257	264	274	280
Total	*1,196*	*2,204*	*1,893*	*1,942*	*1,754*

*) Estimate

The allocation of production to major fields and their satellites is made on the basis of measurements at the respective processing centres and test separator measurements for individual wells. In addition, the amount of oil transported through the oil pipeline is metered.

In future fields, the aim is to introduce a new generation of metering systems - the so-called *multiphase meters* - whereby it is possible to meter water, oil and gas directly, at lower cost and without prior separation in a test separator.

Direct state revenue from oil/gas production appears from Table 5.4. The revenue stated for each individual year is the amount assessed for that year. The figures for 1993 are estimates. In 1993, corporate tax was paid on account. As a result, the tax rate was reduced from 38% to 34%.

Thus, payment is effected in the relevant financial year, as is the case for hydrocarbon tax. Royalty falls due six months after the end of the financial year, while the profit element of the oil pipeline tariff is payable on a monthly basis.

The total state revenue derived from oil and gas production as from production startup in 1972 through 1993 amounts to almost DKK 19 billion, converted into 1994 prices. The revenue is composed of hydrocarbon tax amounting to about DKK 1 billion, corporate tax amounting to about DKK 7 billion, royalty of almost DKK 8 billion, as well as the pipeline tariff profit element of just under DKK 3 billion.

The analyses of state revenue relating to the five-year and twenty-year production forecasts are shown in the section on *forecasts*.

6. Reserves

An assessment of Danish oil and gas reserves is made annually by the Danish Energy Agency. The assessment at January 1, 1994 shows a minor decline in oil reserves of 6% and almost unchanged gas reserves.

Compared to last year's assessment, the total expected ultimate recovery of oil and condensate has been written down by 4 million m^3. Production in 1993, which reached the highest level so far, amounted to almost 10 million m^3. Thus, the decline in oil reserves totals 14 million m^3. The amount of reserves assessed implies that it will be possible to sustain oil production at the 1993 level for the next 21 years.

The reserves reflect the amounts of oil and gas that can be recovered by means of known technology under the prevailing economic conditions.

As in previous years, the assessment only includes reserves in structures in Danish territory where the presence of hydrocarbons has been conclusively established through drilling and testing.

Method and Definitions

The method used by the Danish Energy Agency in calculating the reserves makes allowance for the uncertainty involved in all the parameters used in the calculation. For each oil and gas field, the reserves assessed are expressed by three values: *Low, expected and high*, reflecting the margins of uncertainty tied to the oil and gas reserves in the relevant field.

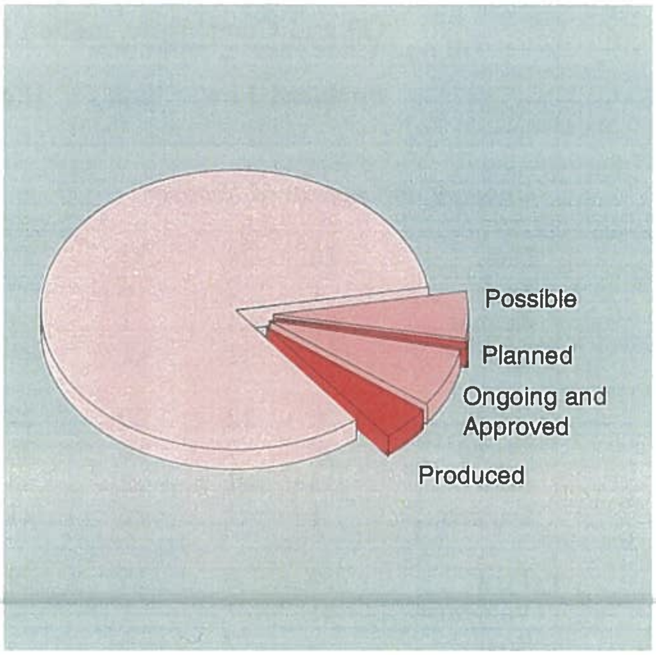
Only a percentage of the oil and gas in place can be recovered. The amount of oil and gas that can be recovered throughout the life of the field is termed the ultimate recovery. Thus, the difference between ultimate recovery and the amounts of oil and gas produced at any given time constitutes the reserves. The categories of reserves are illustrated by Fig. 6.1, where the relative size of the individual categories reflects the recovery of oil and condensate.

Categories of Reserves

The projects which are ongoing or for which the operator has submitted plans are divided into three categories: ongoing, approved and planned recovery.

The Danish Energy Agency also assesses the reserves recoverable under possible recovery projects for which the operator has not submitted concrete plans to the authorities.

Fig. 6.1 Categories of Reserves



The categories of reserves are defined as follows:

Ongoing Recovery
This category includes the reserves that are recoverable with the use of existing production facilities and wells. It is assumed that ordinary maintenance and workover operations are performed to ensure the continued functioning of the existing facilities.

Approved Recovery
If a development plan has been approved by the Ministry of Energy, and production has not yet been initiated, the reserves assessed to be recoverable are categorized as approved recovery.

This applies to the development of new fields as well as extensions and modifications of existing installations.

Planned Recovery
Planned recovery denotes projects described in a development plan that has been submitted to the authorities.

Likewise, reserves in deposits for which a declaration of commerciality has been filed are termed planned recovery.

Reserves

Table 6.1 Assessment of Reserves at January 1, 1994

Oil and Condensate, million m³

	Produced	Low	Exp.	High
Ongoing and Approved Recovery				
Dan	18	24	37	51
Kraka	1	2	4	5
Regnar	<1	<1	1	1
Igor	-	<1	<1	<1
Gorm	20	12	20	29
Skjold	18	7	16	26
Rolf	3	<1	2	4
Dagmar	1	<1	<1	<1
Tyra	10	6	15	24
Valdemar	<1	1	1	2
Roar	-	2	3	3
Adda	-	<1	1	2
Harald	-	5	7	9
Svend	-	3	5	7
Subtotal	*70*		*112*	
Planned Recovery				
Dagmar	-	<1	<1	<1
Valdemar	-	1	1	1
Elly	-	<1	1	1
Gert	-	1	2	3
Alma	-	1	1	2
Subtotal			*5*	
Possible Recovery				
Producing Fields	-	40	59	80
Other Fields	-	1	3	5
Discoveries	-	11	29	56
Subtotal			*91*	
Total	70		208	
January 1993	60		222	

Gas, billion Nm³

	Produced	Low	Exp.	High
Ongoing and Approved Recovery				
Dan	7	12	15	19
Kraka	<1	1	1	2
Regnar	<1	<1	<1	<1
Igor	-	1	2	3
Gorm	1	4	6	7
Skjold	2	1	1	2
Rolf	<1	<1	<1	<1
Dagmar	<1	<1	<1	<1
Tyra	18	32	57	84
Valdemar	<1	1	1	2
Roar	-	10	14	19
Adda	-	<1	1	2
Harald	-	20	25	31
Svend	-	<1	1	1
Subtotal	*29*		*126*	
Planned Recovery				
Dagmar	-	<1	<1	<1
Valdemar	-	1	1	1
Elly	-	2	5	7
Gert	-	<1	<1	<1
Alma	-	1	2	3
Subtotal			*8*	
Possible Recovery				
Producing Fields	-	10	18	25
Other Fields	-	4	9	16
Discoveries	-	19	43	72
Subtotal			*69*	
Total	29		203	
January 1993	24		202	

This also applies if an application has not yet been submitted for approval of a development plan.

Possible recovery
Possible recovery denotes reserves recoverable with the use of known technology, i.e. technology which is currently used in areas where the conditions are comparable to those prevailing in the North Sea. For instance, this includes water injection on a larger scale than before or wider application of horizontal wells.

For discoveries for which a declaration of commerciality has not yet been filed, the recoverable reserves are categorized as possible recovery. This category also includes recovery from discoveries considered to be non-commercial.

Reserves at January 1, 1994

Table 6.1 shows the Danish Energy Agency's assessment of oil/condensate and gas reserves, broken down by field and categorized as outlined above.

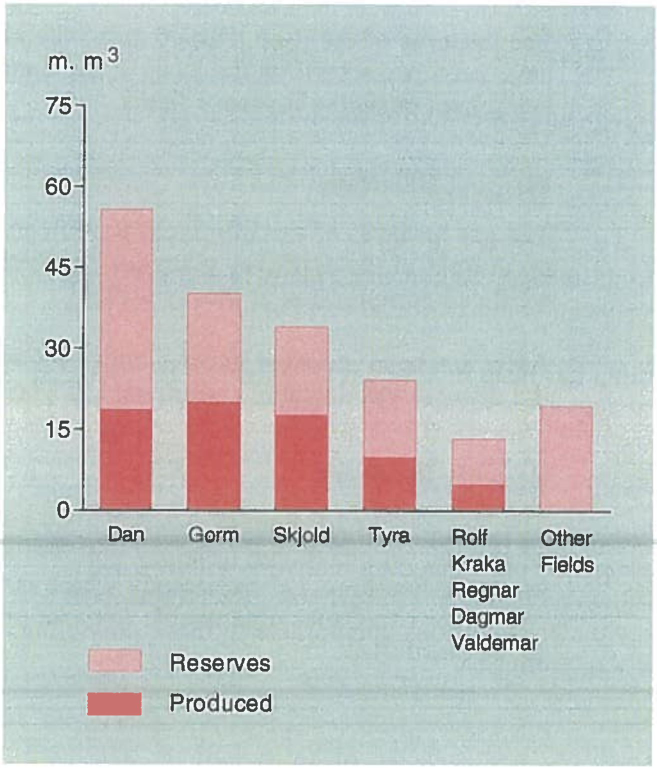
A low, expected and high estimate of reserves is given for each individual field, in order to illustrate the uncertainty attached to the assessment. In assessing Denmark's total reserves, it is not realistic to assume that either a high or a low figure will prove accurate for all fields. Therefore, for a large number of fields, the total assessment of reserves should be based on the expected value.

Fig. 6.2 shows the total amount of oil and condensate reserves assessed for the categories *ongoing, approved and planned recovery*. Production and reserves are shown for the nine producing fields and for the group of fields which have not yet been developed.

It appears from the figures for producing fields that between one-fourth and one-half of the recoverable reserves has been produced. It should be noted that for some producing fields, substantial additional reserves have been included under the category *possible recovery*.

It appears from Fig. 6.3 that the total amount of oil and condensate expected to be recovered ranges from 187 to 278 million m^3. The reserves assessed for planned and possible recovery, respectively, reflect the increasing uncertainty as to whether such reserves can be exploited commercially.

Fig. 6.2 Production and Reserves for the Categories Ongoing, Approved and Planned Recovery



Likewise, the figure illustrates that the amount of gas expected to be recovered ranges from 163 to 232 billion Nm^3. Gas production figures represent the net production, i.e. produced gas less reinjected gas. It should be noted that the amounts of gas stated deviate from the amounts which can be marketed as natural gas, the difference representing the amounts flared or consumed on the platforms, viz. 5-10% of total production.

There have been a number of revisions of the Danish Energy Agency's assessment of reserves compared to the assessment made in January 1993. These revisions are due to new production experience, updated development concepts and new well data.

The areas where significant revisions have been made are described below.

Ongoing and Approved Recovery

Based on the favourable production experience to date, the reserves of the Kraka Field have been written up.

Moreover, a minor markup of reserves has been made for Regnar as a consequence of promising production experience.

The reserves of the Roar, Harald and Svend Fields have been reassessed on the basis of the updated development concepts for these fields.

Planned Recovery

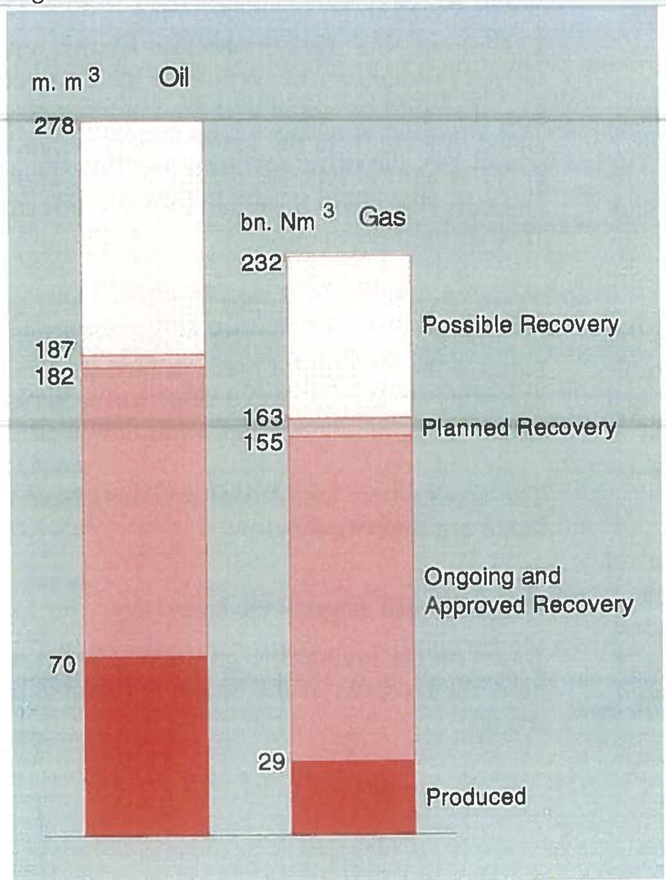
The gas reserves of the Elly Field have been written up in light of the approved plans for establishing wellhead compression at the Tyra Field.

Alma has been included under planned recovery, as the deposit was declared commercial in May 1993.

Possible Recovery

The Danish Energy Agency has reviewed a number of options for enhancing recovery with the use of known technology, i.e. technology which is used today under conditions comparable to those prevailing in the North Sea.

Fig. 6.3 Oil and Gas Production and Reserves



Based on reservoir calculations and overall estimates of investments, operating costs and oil price development, it is assessed that the recoverable reserves can be augmented considerably by implementing additional water-injection projects in the producing fields, including the Dan and Gorm Fields.

The drilling of horizontal wells is considered to fur ther increase the production potential of the oil zon in the Tyra Field as well as that of the tight Barremian chalk reservoir in the Valdemar Field.

It should be noted that in last year's assessment, th Valdemar reserves were included under the category *Other Fields*

For Harald, gas reserves resulting from the future i stallation of wellhead compressors have bee in- cluded under *Other Fields.*

Finally, a number of discoveries that are under eva uation are included, as well as discoveries that hav been declared non-commercial based on current technology and prices.

In this category, reserves attributable to discoverie under evaluation have been written down due to th disappointing results obtained in drilling the appra al well in the Tabita prospect.

Enhanced Oil Recovery (EOR)

The assessed recovery of oil and condensate, basec on known technology, corresponds to only approx. 17% of the hydrocarbons in place in the Danish area. This figure has been affected by the low amount of oil reserves expected to be recov ble from the relatively large accumulations in the Valc mar and Tyra Fields, due to the particularly diffict recovery conditions.

In fields like the Dan, Gorm and Skjold Fields, where the production conditions are more favourable, an average recovery factor of 32% of the hydrocarbons in place is expected, based on the assumption that known methods are used, including water and gas injection.

Because of these fairly low recovery factors, also known from other parts of the world, there is an ir centive for the oil companies and authorities to de velop methods to improve the recovery of oil. For instance, the methods in which research is carried on include the development and use of surfactants etc., the so-called EOR (enhanced oil recovery) methods.

7. Forecasts

Based on the assessment of reserves, the Danish Energy Agency prepares production forecasts and economic forecasts for the recovery of oil and natural gas in Denmark.

The present five-year forecast shows the Danish Energy Agency's expectations regarding activities in the next five years. The forecast also includes an evaluation of the Danish self-sufficiency in energy and of the net foreign-currency expenditure on energy imports.

In addition, the twenty-year forecast shows the Danish Energy Agency's assessment of the production potential for oil and natural gas in the longer term.

Five-Year Production Forecast

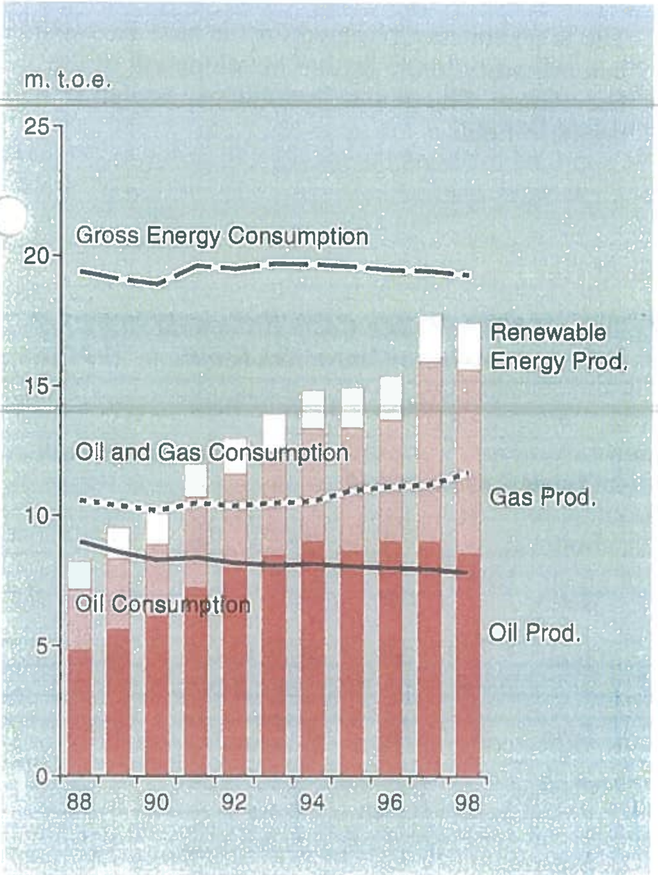
The five-year forecast uses the same categorization as the assessment of reserves, but includes only the categories ongoing, approved, and *planned recovery*.

Similarly, it is assumed that the existing processing facilities or planned extensions of these facilities can be used.

Table 7.1 Oil and Condensate Production Forecast, million m³

	1994	1995	1996	1997	1998
Ongoing and Approved					
Dan	2.9	2.8	2.8	2.7	2.5
Kraka	0.5	0.6	0.5	0.4	0.3
Regnar	0.5	0.1	-	-	-
Gorm	2.1	2.1	2.3	2.3	1.9
Skjold	1.6	1.7	1.5	1.4	1.2
Rolf	0.2	0.1	0.1	0.1	0.1
Dagmar	0.0	0.0	0.0	0.0	-
Tyra	2.0	2.2	1.9	1.7	1.1
Valdemar	0.4	0.3	0.2	0.1	0.1
Svend	-	-	0.6	0.7	0.6
Roar	-	-	0.1	0.3	0.3
Harald	-	-	-	0.4	1.5
Total	*10.3*	*9.9*	*10.0*	*10.1*	*9.6*
Planned	0.0	0.0	0.3	0.2	0.2
Expected	*10.3*	*9.9*	*10.3*	*10.3*	*9.8*

Fig. 7.1 Energy Consumption and Production



The natural gas forecast shows the amount of gas expected to be supplied to Dansk Naturgas A/S under the existing gas sales contracts.

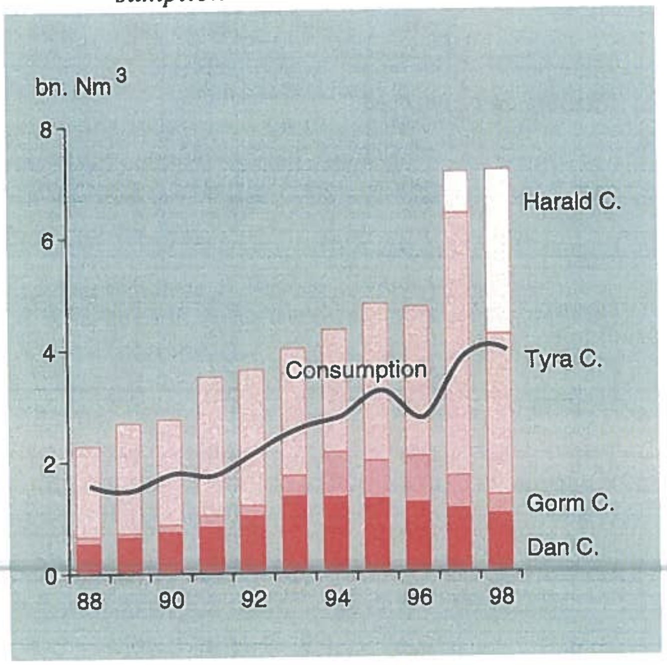
Oil and Natural Gas Production

Fig. 7.1 shows the expected development in the production of oil and gas as well as renewable energy, compared with the consumption of oil and gas and with total energy consumption.

As appears from Table 7.1, annual oil production is expected to reach approx. 10 million m³ in the forecast period. This will result in a degree of self-sufficiency in oil of about 110%.

In relation to the forecast in the Danish Energy Agency's report from spring 1993, expected production figures remain virtually unchanged. It should be noted that the expected production compares best with the figures for the *accelerated course* of production included in last year's report, as these figures were based on the anticipated conclusion of a new gas sales contract.

Fig. 7.2 Natural Gas Sales and Domestic Consumption



Within the categories *ongoing* and *approved recovery*, a decrease in production is expected in the Dan Field, because some of the production wells are to be converted into water-injection wells.

The production properties of the Kraka and Regnar Fields have exceeded expectations, and anticipated production figures have been written up as a result.

Table 7.2 Investments in Development Projects, DKK billion, 1994 prices

	1994	1995	1996	1997	1998
Ongoing and Approved					
Dan	0.6	0.1	-	-	-
Kraka	0.2	-	-		-
Gorm	0.9	0.9	0.4	-	-
Skjold	0.8	0.2	-	-	-
Tyra	1.4	1.7	0.8	0.1	0.5
Valdemar	0.0	-	-	-	-
Roar	0.1	0.3	0.4	-	-
Adda	-	-	-	-	0.4
Svend	0.1	0.4	0.3	-	-
Harald	0.7	1.1	0.8	1.1	0.4
Total	*4.8*	*4.7*	*2.7*	*1.2*	*1.3*
Planned	-	0.3	-	1.0	0.4
Expected	*4.8*	*5.0*	*2.7*	*2.2*	*1.7*

The development of the oil zone of the Tyra Field is progressing faster than expected, for which reason production figures for the forecast period have been increased.

The *planned recovery* category includes additional production resulting from the further development of the Valdemar Field as well as the development of the Gert Field.

Sales of natural gas under the existing contracts are shown in Fig. 7.2, broken down by the four processing centres. In addition, domestic consumption including the accumulation of stocks is shown. Thus, the difference between production and domestic consumption constitutes the expected export of natural gas to Sweden and Germany. The course of *consumption* shown for 1996/97 is attributable to extraordinary movements in stocks.

Expenses for Oil and Gas Activities

Expected investments, operating and administrative costs appear from Tables 7.2 and 7.3.

The new gas sales contract concluded in June between Dansk Naturgas A/S and DUC for additional natural gas supplies has established a basis for further investments, which must be added to those already approved.

The investments envisaged for the next five years relate primarily to the further development of the Dan, Gorm, Skjold and Tyra Fields, as well as the northern fields.

Table 7.3 Operating Costs Broken down by Processing Centre, DKK billion, 1994 prices

	1994	1995	1996	1997	1998
Ongoing and Approved					
Dan	0.4	0.4	0.4	0.4	0.4
Gorm	0.6	0.6	0.6	0.6	0.6
Tyra	0.5	0.5	0.5	0.6	0.7
Total	*1.5*	*1.5*	*1.5*	*1.6*	*1.7*
Planned	-	-	-	-	-
Expected	*1.5*	*1.5*	*1.5*	*1.6*	*1.7*

Fig. 7.3 Net Foreign-Currency Expenditure on Energy Imports

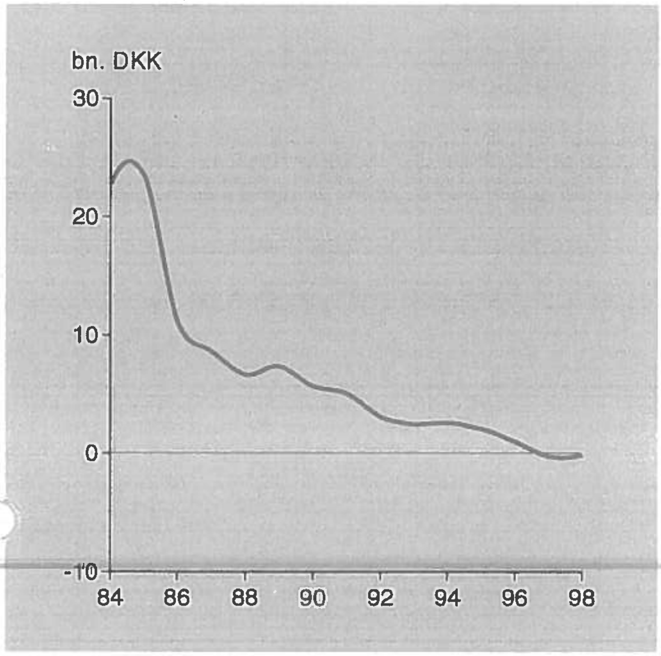


Table 7.6 Degree of Self-Sufficiency and Net Foreign-Currency Expenditure on Energy Imports

	1994	1995	1996	1997	1998
Production					
Crude Oil					
(m m^3)	10.3	9.9	10.3	10.3	9.8
Natural Gas*)					
(bn Nm^3)	4.7	5.2	5.1	7.6	7.7
Total Energy Consumption					
(PJ)	824	821	816	814	808
Degree of Self-Sufficiency (%)					
A)	127	123	124	143	134
B)	68	69	71	83	82
C)	76	77	80	92	91
Net Foreign-Currency Expenditure, DKK billion, 1994 prices					
(USD 16-23)	2.6	2.1	1.0	-0.2	-0.1
(USD 16)	1.8	1.6	0.7	-0.1	0

A) Oil and gas production vs domestic oil and gas consumption
B) Oil and gas production vs total domestic energy consumption
C) Total energy production vs total domestic energy consumption
*) Including Fuel Consumption Offshore

Table 7.4 Exploration and Appraisal Costs, DKK billion, 1994 prices

	1994	1995	1996	1997	1998
Total	*0.3*	*0.2*	*0.2*	*0.2*	*0.2*

Total investments in the period are estimated at DKK 16 billion. The estimated investments for Skjold and Dan have been downgraded slightly in relation to last year, as the planned production wells are expected to be drilled faster and at lower cost than originally anticipated.

Table 7.4 shows the exploration and appraisal costs expected to be incurred in connection with the activities carried on under exploration licences. The anticipated costs are almost unchanged in relation to last year's forecast.

Table 7.5 Oil Pipeline Transportation Costs, DKK billion, 1994 prices

	1994	1995	1996	1997	1998
Crude Oil Price:					
USD 16-23	0.9	0.9	0.9	0.9	0.9
USD 16	0.9	0.8	0.8	0.8	0.7

The users of the oil pipeline pay the capital cost and all operating costs connected with the use of the pipeline. In addition, a so-called profit element is payable, based on the value of the oil transported. Therefore, transportation costs are sensitive to the development in oil prices, as indicated by Table 7.5.

In calculating the expected transportation costs, two different crude oil price scenarios have been used. One scenario assumes a constant price in real terms of USD 16 per barrel, and the other operates with an increase in oil prices from USD 16 per barrel in 1994 to USD 21 per barrel in 1995, followed by a 1% increase in real terms in each of the subsequent years.

The high and the low price scenarios will be used as a basis for calculations made later in this section. In the calculations, the expected prices of natural gas and selected oil products have been based on the assumptions stated with respect to the development in the price of crude oil.

Self-Sufficiency and Net Foreign-Currency Expenditure

The degree of self-sufficiency in energy is expected to increase even further in the next few years. This development must be viewed in light of declining energy consumption, the expected increase in natural gas production and the stable oil production level. Table 7.6 shows the development in self-sufficiency based on three different methods: The expected production of hydrocarbons correlated to expected domestic hydrocarbon consumption (A) and to total domestic energy consumption (B). Finally, the degree of self-sufficiency is calculated by correlating total domestic energy production - including renewables - to total domestic energy consumption (C).

It appears that the degree of self-sufficiency according to all three methods is expected to increase during the forecast period. Total domestic energy production in relation to total consumption is expected to rise to 90%, while the degree of self-sufficiency in oil and gas is expected to increase to about 140%.

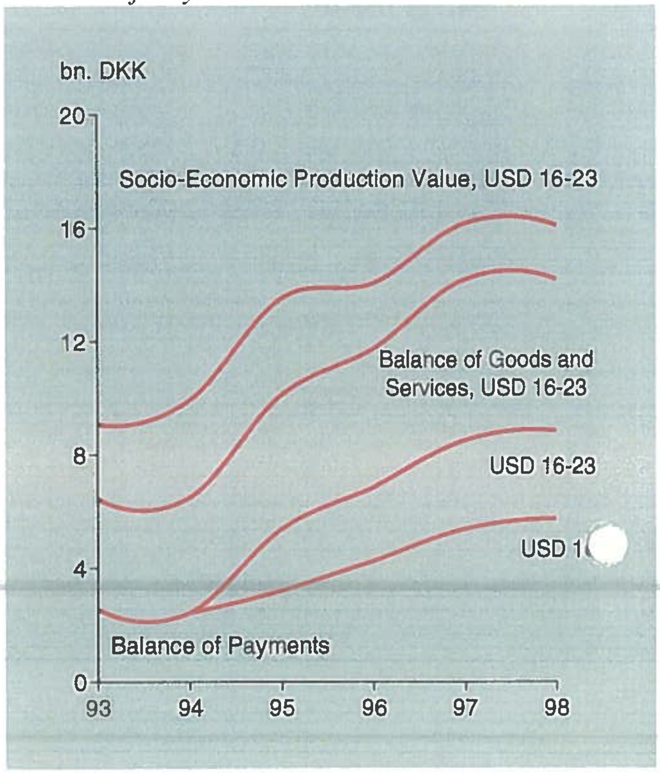
It should be noted that a degree of self-sufficiency in oil of more than 100% implies that Denmark is a net exporter of oil. However, at this time, the import of expensive petrol products outweighs the export of fairly cheap fuel oils. This drawback is not reflected by the degree of self-sufficiency, but does, of course, affect net foreign-currency expenditure on energy.

*Table 7.7 State Revenue from Oil/Gas Production, DKK billion, 1994 prices *)*

	1994	1995	1996	1997	1998
Hydrocarbon Tax	0.0	0.0	0.0	0.0	0.0
	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)
Corporate Tax	0.8	2.0	2.1	2.6	2.7
	(0.8)	(1.0)	(1.0)	(1.2)	(1.3)
Royalty	0.7	1.0	1.1	1.2	1.2
	(0.7)	(0.7)	(0.7)	(0.8)	(0.8)
Profit Element	0.3	0.4	0.4	0.4	0.4
	(0.3)	(0.3)	(0.3)	(0.3)	(0.3)
Total	*1.8*	*3.4*	*3.6*	*4.2*	*4.3*
	(1.8)	*(2.0)*	*(2.0)*	*(2.3)*	*(2.4)*

*) Assessed amounts

Fig. 7.4 Effect of Oil/Gas Activities on the Balance of Payments



The net foreign-currency expenditure has been calculated in terms of its immediate effect on energy product items in the balance of trade, which include all forms of energy. The calculation does not take into account the cost of imports for field developments and the transfer of dividends, etc. abroad.

Net foreign-currency expenditure has been calc[illegible]lated on the basis of the assumptions stated with respect to the development in the gross consumption of energy and in the production of oil and gas. One calculation, based on the scenario with increasing crude oil prices outlined above, shows that energy imports and exports will balance from 1997 (see Table 7.6 and Fig. 7.3).

A second calculation, based on an unchanged price per barrel of oil of USD 16 in real terms, shows a corresponding improvement in net foreign-currency expenditure.

State Revenue and Effect on Balance of Payments

Based on the assumptions made with respect to production, price development, investments and operating costs, the state revenue derived from oil and gas production has been estimated for the next five-year period.

The amounts stated are those assessed for the relevant years.

State revenues are greatly influenced by the development in oil prices and the dollar exchange rate. Therefore, the estimated state revenue is calculated on the basis of constant oil prices as well as increasing prices. For the whole forecast period, the dollar exchange rate is assumed to remain at DKK 7 per USD.

With respect to corporate tax in particular, the proceeds cannot be predicted with any accuracy due to the uncertainty attaching to the development in foreign-exchange rates, depreciation allowances for tax purposes, etc.

It appears from Table 7.7 that the state revenue for the forecast period is expected to total about DKK 11 billion based on a constant oil price (indicated in brackets) and about DKK 17 billion based on an increasing price scenario.

In recent years, the increased Danish production of oil and gas has had a favourable effect on the balance of payments, a development that is expected to continue in the years to come. Based on the assumptions stated with respect to oil prices, the effect of the activities in the Danish area of the North Sea on the balance of trade and the balance of payments has been calculated.

Fig. 7.5 Oil and Condensate Production

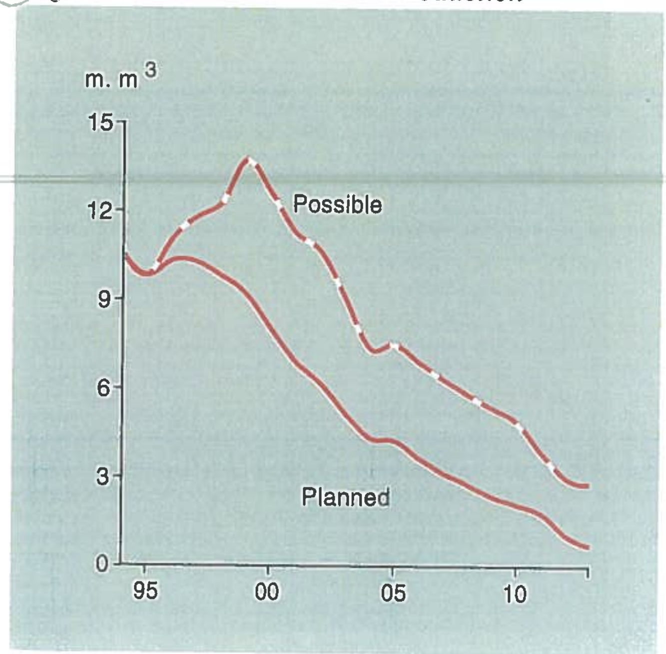


Table 7.8 Effect of Oil/Gas Activities on the Balance of Payments, DKK billion, 1994 prices

	1993	1994	1995	1996	1997	1998
Socio-Economic Production Value	9.1	9.9	13.5	14.1	16.2	16.1
Import Share	2.6	3.4	3.4	2.3	2.0	1.9
Balance of Goods and Services	6.4	6.5	10.1	11.7	14.2	14.2
Transfer of Interest and Dividends	3.9	4.1	4.7	4.9	5.7	5.4
Balance of Payments Current Account	2.5	2.4	5.4	6.8	8.5	8.8
(USD 16/bbl)	(2.5)	(2.4)	(3.2)	(4.3)	(5.4)	(5.7)

The production of oil and natural gas improves the balance of payments, due partly to the direct earnings derived from exporting part of the production, and partly to the foreign-currency expenditure saved, in that a share of production is used for domestic consumption, thus eliminating the need for energy imports otherwise required. Accordingly, the socio-economic value of production shown in Table 7.8 reflects the value of direct export revenue and the cost of imports saved.

When the import share of investments and operating costs is subtracted, the effect on the balance of goods and services results. In turn, the direct effect on the balance of payments on current account can be calculated when interest and dividends transferred abroad are deducted.

The effect on the balance of payments is very sensitive to fluctuations in the price of crude oil. Not surprisingly, the calculations based on constant prices and those based on increasing real prices show that the effect is greatest when using the second price scenario. The calculations based on an increasing real price show that the net effect on the balance of payments increases to DKK 9 billion in 1998.

This development is illustrated by Fig. 7.4.

Finally, it should be emphasized that the calculations in Table 7.8 and Fig. 7.4 are based on model calculations using standard assumptions with respect to import share, etc. Thus, the results are only based on figures published in accounts to a limited extent.

Fig. 7.6 Investments, 1994 prices

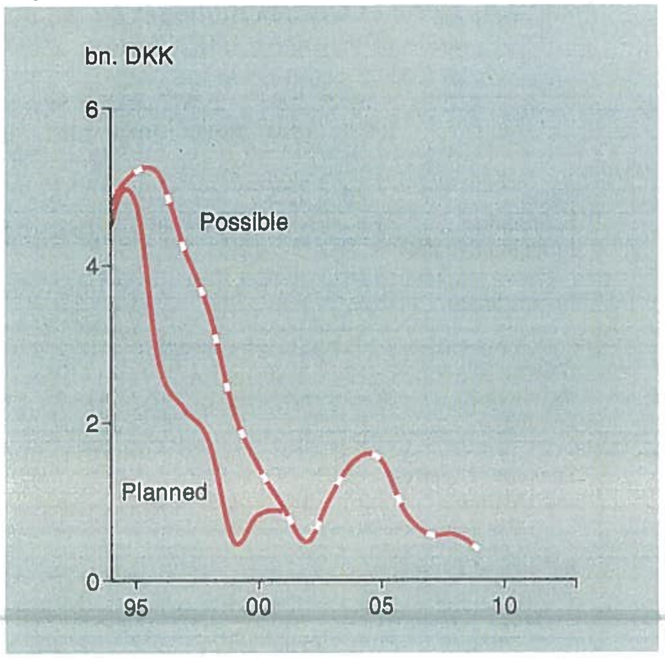
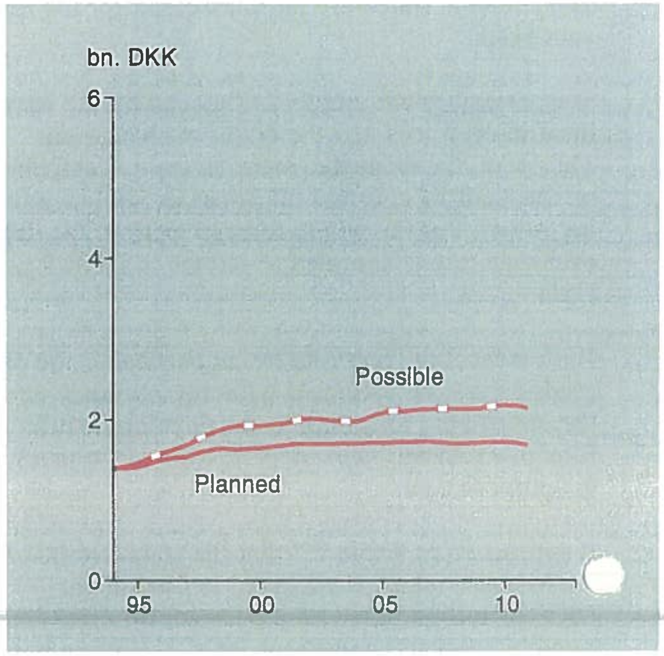


Fig. 7.7 Operating Costs, 1994 prices



Twenty-Year Production Forecast

The twenty-year forecast has been prepared according to the same method as the five-year forecast, and thus uses the same categorization as the assessment of reserves. However, unlike the five-year forecast, the category *possible recovery* is also included.

Oil and Natural Gas Production

Fig. 7.5 illustrates two oil and condensate production scenarios. The curve illustrating planned recovery is simply a continuation of the curve shown in Table 7.1, while the second curve includes *possible recovery*. Planned production remains fairly constant until 1998, after which production declines.

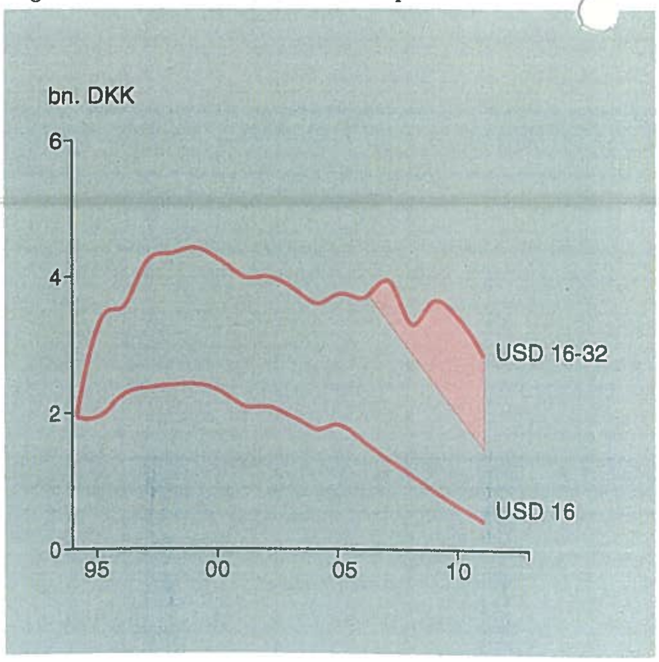
Within the category *possible recovery*, the production potential is based on the Danish Energy Agency's assessment of possibilities for initiating further production not based on development plans submitted.

Thus, the Danish Energy Agency estimates that the increased use of water injection in the producing fields such as Dan and Gorm represents further oil production potential, and moreover, that a potential for enhancing recovery from the oil zone in the Tyra Field as well as from the Kraka and Valdemar Fields exists. The forecast also includes potential further production from the Adda Field, as well as from a number of discoveries that are currently being evaluated.

It appears from Fig. 7.5 that the production potential amounts to about 10-13 million m^3 per year until the year 2002. Production is expected to decline subsequently.

It should be noted that for a period of time, the production potential will exceed the current capacity of the oil pipeline to transport production ashore. As mentioned above, the expectations for future oil production are based on the gratifying production results recorded in recent years. However, it should be emphasized that the assessment of possible recovery is subject to great uncertainty.

Fig. 7.8 Taxes and Dues, 1994 prices



As opposed to the production of oil, which can always be sold at the current market price, the production of natural gas requires that long-term sales contracts have been concluded.

Since the start of gas production in 1984, Danish natural gas has been supplied under two gas sales contracts providing for total supplies of 93 billion Nm^3.

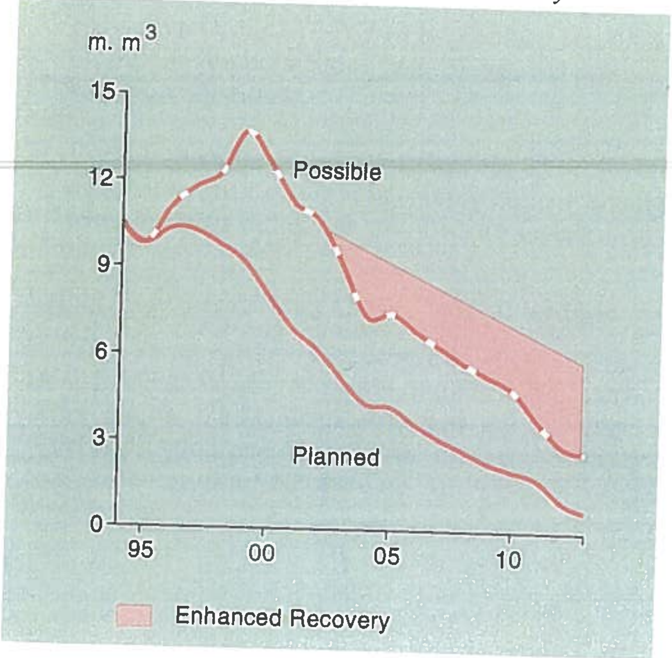
In 1993, a supplementary agreement was concluded between DUC and Dansk Naturgas A/S for the sale of additional gas supplies. The new gas sales contract does not stipulate a fixed total volume, but rather a fixed annual volume that will be supplied as from 1997 and onwards, for as long as DUC considers it technically and financially feasible to carry on production at this level.

In this connection, it should be pointed out that the existing contracts for the sale of gas to Dansk Naturgas A/S expire in 2012.

According to the Danish Energy Agency's twenty-year forecast for the planned course of production, total gas supplies will amount to 134 billion Nm^3, reckoned from the start of the natural gas project in 1984.

By way of comparison, the forecast for the possible course of production predicts total gas supplies of 150 billion Nm^3.

g. 7.9 Perspectives of Enhanced Recovery



Investments, Operating Costs and State Revenue

The expected investments and operating costs relating to the two different production scenarios appear from Figs. 7.6 and 7.7. For the planned course of production, total investments are estimated to amount to approx. DKK 19 billion, while investments of another DKK 16 billion are expected in order to realize the production potential in the *possible recovery* category.

Since 1970, approx. DKK 40 billion (1994 prices) has been invested in the development of the Danish oil and gas fields.

Based on the planned course of production, state revenue up to and including 2012 is shown in Fig. 7.8. The taxes and dues indicated are the amounts assessed for the relevant years.

The development in oil and gas prices greatly influences the state's revenue. Based on the two alternative price parameters chosen, it appears that the total state revenue from 1994 through 2011 will be DKK 35 billion higher in case of increasing prices than in case of a constant oil price. The two different curves are illustrated by Fig. 7.8.

Hydrocarbon tax is only expected to be levied towards the end of the forecast period (the hatched area in Fig. 7.8), in the case of increasing prices.

Enhanced Recovery

The oil production scenario outlined above is not to be considered the upper limit of Danish production potential.

Further production is possible if current efforts to develop enhanced recovery methods and improve equipment are continued and intensified. Moreover, the experience gained from the current development of the fields is expected to provide new opportunities for enhancing recovery.

Finally, the results of ongoing exploration activities are expected to lead to further production potential. A tentative forecast based on enhanced recovery from existing fields and discoveries is shown in Fig. 7.9.

8. Health, Safety and Environment

The Danish Energy Agency supervises health, safety and environmental matters in connection with the exploration and production of oil and natural gas in the Danish part of the North Sea.

With respect to fixed offshore installations, the Danish Energy Agency supervises health and safety as well as environmental matters. The supervision of mobile offshore installations is limited to matters that are not regulated by international safety conventions. Such supervision is handled by the Danish Maritime Authority.

New Regulations

In the course of 1993, the Danish Energy Agency issued the following Executive Orders to implement EU Directives:

- Executive Order No. 58 of February 9, 1993 on work at visual display units on offshore installations.
- Executive Order No. 60 of February 12, 1993 on manual handling of loads on offshore installations.
- Executive Order No. 605 of July 15, 1993 on the design of technical equipment on offshore installations.
- Executive Order No. 633 of July 27, 1993 on measures to prevent the risk of developing cancer from working with substances and materials, etc. on offshore installations.
- Executive Order No. 764 of September 16, 1993 on the implementation of regulations for offshore installations.
- Executive Order No. 839 of October 21, 1993 on medical control of work involving danger arising from ionizing radiations on offshore installations.

Safety Board for Fixed Offshore Installations

In 1993, an agreement was concluded between the Danish Metal Workers' Union, the Danish Electricians' Union, the Danish Restaurant and Brewery Workers' Union and Mærsk Olie og Gas AS on the establishment of a Safety Board for Fixed Offshore Installations.

In 1994, the Safety Board will look into matters concerning health and safety work (the safety organization) on fixed offshore installations. Against this background, the authorities have indicated that they will await the outcome of this work before deciding whether to issue rules and regulations in this area.

Further, the Safety Board has stated that it intends to review the safety management system for fixed offshore installations in the operational phase. Consequently, the authorities have postponed a decision on the possible need to prepare guidelines in this respect, until further notice.

Health, Safety and Environment on Mobile Offshore Installations

At end-1993, the six drilling rigs operating in the Danish sector were employed exclusively in drilling production wells for Mærsk Olie og Gas AS at the existing production facilities. Of these rigs, three were contracted from A. P. Møller, viz. *Maersk Exerter*, *Mærsk Endeavour* and *Mærsk Giant*, while the Shelf Explorer was contracted from the UK company, Ross Offshore, the *West Kappa* from Smedvig Ltd., also a UK company, and the *Neddrill Trigon* from the Dutch company, Neddrill. The *Maersk Exerter*, previously named *Trident X*, was taken over by A.P. Møller from Sedco Forex, a UK company, in mid-1993.

In 1993, Statoil drilled the exploration well Tabita-1 with the drilling rig *Glomar Moray Firth I* leased from the US company, Global Marine.

In the course of the year, the *Europipe* pipeline, extending from the Statpipe riser platform 16/11-S on the Norwegian continental shelf through the Danish sector to Nordney in Germany, was laid for Statoil by the pipe-laying barge, *Castoro Sei*, contracted from European Marine Contractors.

Moreover, pipelines were laid between production installations by the pipe-laying barge, *Stena Apache*. Unlike *Castoro Sei*, which lays pipelines in the conventional way by welding the pipe on board the barge, the *Stena Apache* lays the pipeline from a drum on which the pipe, previously welded ashore, is wound.

Finally, lifting operations were carried out by the crane barges *DB101* and *DB102* contracted from Heeremac, a Dutch company.

Health, Safety and Environment

In 1993, the former drilling rig *Mærsk Explorer*, owned by A.P. Møller, which has been converted into a flotel, was employed in the Gorm Field.

As in previous years, the Danish Energy Agency, in cooperation with the Danish Maritime Authority, among others, issued permissions for use and approved manning and organization plans, and also currently supervised the operation of the mobile installations.

The majority of the permissions for use and approvals issued in 1993 were granted to extend existing ones. With regard to four of the drilling rigs, for which exemptions from the Danish Energy Agency's regulations on living quarters have been granted, the extension of the permission for use was made conditional on an improvement in the standard of the living quarters. In 1993, the Danish Energy Agency approved a plan for the final layout of the accomodation facilities on the four rigs concerned. Thus, following the implementation of this plan in the course of 1994, the four rigs will be eligible for longer-term permissions for use (three- to five-year terms).

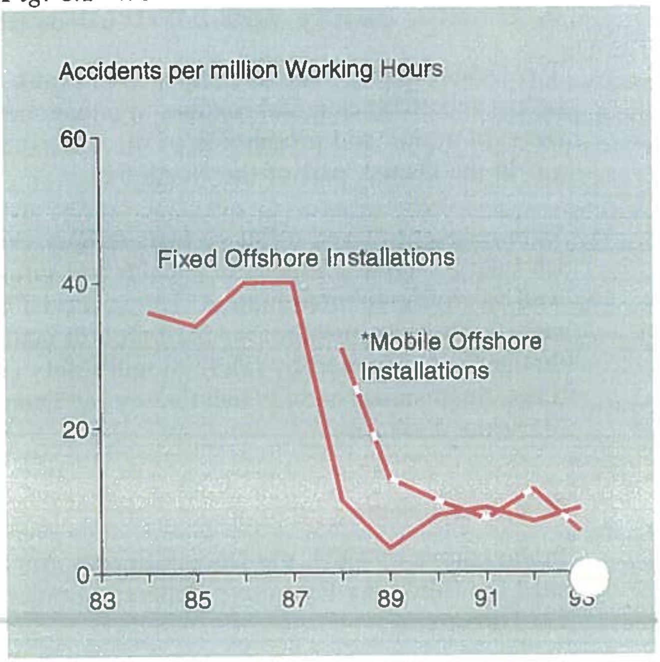
In the year under review, the Danish Energy Agency began drafting guidelines for safety cases for mobile offshore installations. The intention is to introduce a requirement at some time in 1994 to the effect that such safety cases must be prepared whenever an application is submitted for an extension of the permission for use of the relevant offshore installation.

In 1993, the Danish Energy Agency introduced a change in its supervision of safety and working environment on mobile offshore installations, which was increasingly carried out through audits of the control systems on the installations (systems based on certificates and procedures). The intention is for this development to continue in 1994, so that inspections will be carried out mainly as audits, rather than as observations of the physical conditions on board.

Table 8.1 Accidents per million Working Hours

Year	Fixed	Mobile
1988	10.0	31.0
1989	3.4	12.7
1990	7.9	9.9
1991	9.0	7.4
1992	7.1	11.5
1993	8.9	5.7

Fig. 8.1 Work-Related Accidents



*) Only registered from 1988

At the same time, this presupposes supplementary provisions in the Danish Energy Agency's guidelines on health and safety matters as well as control systems on the installations.

Health, Safety and Environment on Fixed Offshore Installations

As expected, 1993 was characterized by intense field development activity on the part of Mærsk Olie og Gas AS. In this connection, the Danish Energy Agency granted a number of permits for the development of new installations and for changes to existing ones.

Before the Ministry of Energy granted its approval for the further development of the Tyra Field, the Danish Energy Agency made an evaluation of the relevant health, safety and environmental matters.

Further, as mentioned in the section on *production*, the Danish Energy Agency approved the development of the Harald, Svend and Roar Fields, granted permission for the further development of the Skjold Field, and granted permissions for use, including for the Regnar and Valdemar Fields.

The work involved in granting approvals was increasingly based on the safety cases for the individual fields, as well as descriptions of the safety management systems. The purpose of the safety case is to demonstrate that the inherent control systems systematically ensure compliance with the authorities' requirements with respect to health, safety and environmental matters.

Table 8.2 Number of Working Hours on Offshore Installations

Year	Fixed	Mobile
1988	1,560,000	710,000
1989	1,451,000	870,000
1990	1,551,000	1,110,000
1991	1,897,000	1,748,000
1992	1,837,000	1,910,000
1993	2,140,000	2,090,000

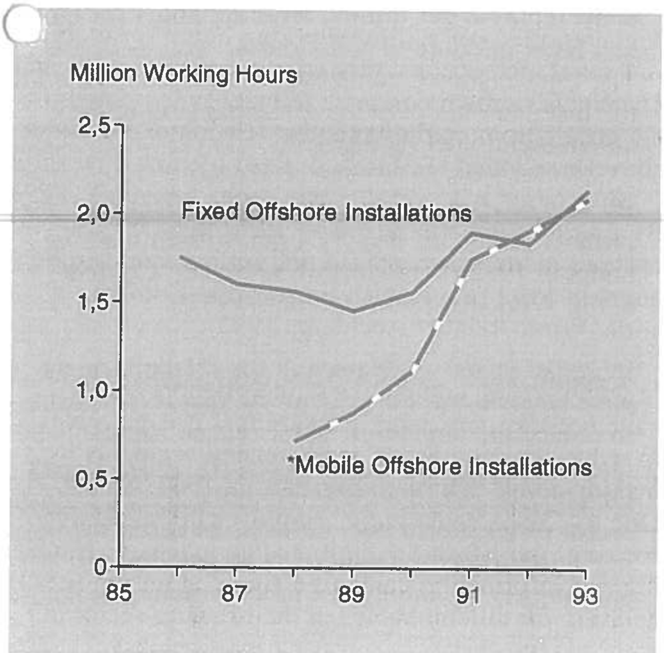
Moreover, it must appear from the safety case that all potential major accidents have been identified, that all existing risks have been assessed and all steps taken to minimize them.

Moreover, in granting approvals, the Danish Energy Agency has tended to place more emphasis on environmental and health matters.

The increased emphasis on environmental matters is reflected by the fact that the approvals of the Harald, Svend, Roar and Tyra field developments were granted subject to the condition that reports be prepared demonstrating that the installations were designed with a view to minimizing energy consumption.

As in previous years, the Danish Energy Agency has currently monitored the operation and maintenance of existing installations.

Fig. 8.2 Number of Working Hours on Offshore Installations



*) Only registered from 1988

Generally, supervision has focused on occupational health matters. In this connection, the Danish Energy Agency has paid special attention to work with mineral wool, noise and the maintenance of breathing air supply units. Further, the setup and operation of the safety organization have been discussed and assessed, particularly with regard to contractors' personnel.

In addition to the traditional inspections made by the Danish Energy Agency every year, a number of unannounced inspections on the installations were made in 1993. This did not give rise to any special measures.

International Cooperation

In 1993, the Danish Energy Agency continued its membership of a number of committees and working parties appointed by the Safety and Health Commission for the Mining and Other Extractive Industries under Directorate General V of the EU Commission. The main objective of joining this working party is to influence the drafting of EU rules and regulations on health and safety in the oil and gas sector.

Throughout 1993, the Danish Energy Agency continued its cooperation with the supervisory authorities of other countries in the North Sea area, in part through bilateral agreements, and in part through its participation in the North Sea Offshore Authorities Forum and working parties, including working parties on safety training and safety cases for mobile offshore installations.

As a result of this cooperation, a conference was held in Copenhagen in September 1993 about the harmonization of safety training in the North Sea area. In addition to the authorities in the North Sea countries, representatives of the operators and shipping companies that operate drilling rigs in the North Sea participated. The outcome of the conference was that the operators, who contribute greatly to determining the level of safety training offshore, are considering the possibility of mutually recognizing the individual countries' safety training courses.

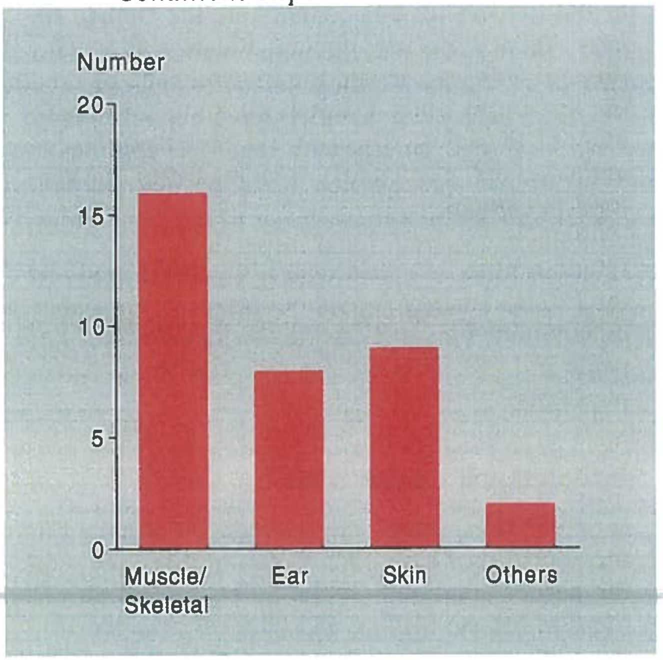
Notification of Industrial Injuries

For the purposes of the Danish Industrial Injuries Act, industrial injuries are defined as follows:

1. Work-related accidents.

2. Harmful exposure that does not last for more than a few days and that stems from the work.

Fig. 8.3 Recognized or Presumed Work-Induced Conditions Reported 1985-92



3. Occupational diseases included in the list of occupational and other work-related diseases drawn up by the National Board of Industrial Injuries.

The industrial injuries stated in the last two points are referred to collectively as work-induced conditions.

The employer must notify the Danish Energy Agency of work-related accidents that result in at least one day's unfitness for work. Likewise, doctors and dentists must report recognized or presumed work-induced conditions to the Danish Energy Agency.

The Danish Energy Agency uses two approaches in dealing with such notifications:

1. Performing an evaluation with a view to taking any measures in the specific case.

2. Performing an evaluation and compiling statistics with a view to general prevention and to prioritizing the areas that the supervisory work should address.

The statistics of work-related accidents and recognized or presumed work-induced conditions reported to the Danish Energy Agency are shown below.

Table 8.3 Recognized or Presumed Work-Induced Conditions Reported 1985-92

Diagnosis	Number	%
Muscle-Skeletal	16	45
Ear	8	23
Skin	9	26
Other	2	6
Total	*35*	*100*

Statistics of Work-Related Accidents 1993

In 1993, the Danish Energy Agency received 31 reports on work-related accidents offshore, broken down as 19 accidents on fixed offshore installations together with flotels, and 12 on other mobile offshore installations. None of the accidents resulted in death or serious personal injury.

When the 19 work-related accidents on fixed offshore installations reported are related to the number of hours worked (2,140,000 hrs.), it yields an accident frequency of 8.9 per million working hours. Moreover, when the 12 work-related accidents on mobile offshore installations, excluding flotels, reported in 1993 are related to the number of hours worked on these installations (2,090,000 hrs.), it yields an accident frequency of 5.7 per million working hours.

The number of working hours is calculated on the basis of information received from the companies and the person-on-board lists, based on an average workday of 13 hours.

Figure 8.1 and Table 8.1 show the number of accidents reported per million working hours for mobile and fixed offshore installations as well as flotels. The figures shown comprise all accidents related to the installation, operation and extension of the above-mentioned facilities.

By way of comparison, the accident frequency for onshore industries was 51.4 per million working hours in 1992 (the Danish Employers' Confederation, Work-Related Accidents 1992).

In recent years, companies in the offshore sector have become increasingly aware that it is possible to reduce the number of work-related accidents by making active efforts to this end. In 1987, Mærsk Olie og Gas AS, the major employer in the Danish sector of the North Sea, initiated an extensive training and information campaign aimed at unsafe act auditing for all employees in the offshore sector.

The result of this goal-directed training campaign is reflected by the accident frequency on mobile offshore installations. In 1993, the number of accidents reported per million working hours fell to about a fifth of the figure for 1988.

Fig. 8.2 and Table 8.2 show the number of working hours on fixed and mobile offshore installations. The number of hours worked on fixed offshore installations increased somewhat in 1993 and is approaching the maximum manning capacity of the installations. For mobile offshore installations, the number of working hours in the period from 1990 to 1993 nearly doubled, due to the large development projects carried out in the Danish sector during that period.

Statistics of Recognized or Presumed Work-Induced Conditions

In 1993, the Danish Energy Agency worked on improving the reporting and registration of recognized or presumed work-induced conditions, i.a. through cooperation with the Directorate of National Labour Inspection.

In the period from 1985 to 1992, the Danish Energy Agency was notified of 35 recognized or presumed work-induced conditions. In 1992, eight notifications were received. Table 8.3 and Fig. 8.3 illustrate the distribution of these conditions on diagnostic groups. Muscle-skeletal conditions denote conditions and pains in the back, shoulders, arms or legs.

Based on the notifications received, it is not possible to attribute the conditions directly to fixed or mobile offshore installations.

The notifications were made by contractors as well as operators. In Denmark, there were about 2,000 employees on mobile and fixed offshore installations who worked for a total of 3,747,000 hours in 1992. Table 8.4 shows the number of reports made in 1992, corresponding to 2.1 reports per million working hours or 4.0 per 1,000 employees.

Table 8.4 Recognized or Presumed Work-Induced Conditions Reported 1992

Diagnosis	Denmark	%	Norway	%
Muscle-Skeletal	5	62	42	40
Ear	2	25	27	25
Skin	1	13	26	25
Others	0	0	11	10
Total	*8*	*100*	*106*	*100*

The comparative figures registered by the Norwegian Oil Directorate are shown for the same year. In Norway, the number of employees working on mobile and fixed offshore installations totalled about 20,000 in 1992. The total number of working hours was 26,589,000. Thus, the number of reports made in Norway corresponded to 4.0 per million working hours or 5.3 per 1,000 employees.

9. Research

Licences

Exploration licences incorporate agreements on the provision of funds for research and development within activities which relate to exploration, production and development.

Such research and development projects were initiated in 1984, and at end-1993, projects worth approx. DKK 83 million had been completed or initiated.

Funds have been targeted at projects with the following objectives:

- To increase knowledge about geological and geophysical conditions in the subsoil that determine the formation and accumulation of oil and natural gas.
- To reduce costs of offshore structures and to develop installations and platforms for marginal fields, as well as exploration/production under extreme conditions.
- To limit and prevent impact on and damage to the environment.

Energy Research Programme 1994 (ERP 94)

Applications, recommendations and approvals regarding projects under ERP 94 were considered in 1993. The energy research programmes are financed by funds provided for in the Danish Finance Act. The Danish Energy Agency has the administrative and professional responsibility for considering and evaluating project applications within the area of oil and gas activities.

Based on recommendations by the Advisory Oil and Natural Gas Research Committee, funding is granted for projects within the area of oil and gas. Under ERP 94, 12 proposed projects have been nominated for funding. The budgets for these projects total DKK 43 million.

The principal criterion for funding is the importance of the projects to society and their relevance in terms of energy.

Further, in allocating funds, priority is accorded to projects that contribute to improving knowledge about oil and natural gas deposits in the Danish subsoil, and about production mechanisms and methods that enhance recovery from existing fields.

Within the area of equipment and installations, priority has been accorded to projects that aim at increasing the efficiency and lowering the cost of offshore production. With regard to arctic projects, priority is given to the projects that promote interest in exploration and production in arctic areas.

International Relations

Previous energy research programmes have resulted in close coordination of international research in this area, and the intent is for projects selected under this year's research programme to continue this coordinated approach. Moreover, the Danish Energy Agency endeavours to promote coordinated research through its representation on international committees and by supporting the integration of national projects into major international projects.

In recent years, the EU research programmes have incorporated projects targeted at the Eastern European countries. Denmark intends to follow up this development, and from 1995, Danish energy research programmes are expected to receive funding for oil and gas research in these geographic areas.

Chalk Research Programme

This research programme was started in 1982 on the initiative of Norwegian and Danish authorities, who recognized the need to join forces in order to promote knowledge about reservoir performance in the chalk fields in the North Sea during the production process. The expenses for the programme are shared between a number of oil companies that have an interest in such fields. The programme is administered by the oil company Amoco, and the steering committee is chaired by the Danish Energy Agency and the Norwegian Oil Directorate alternately.

The third phase of the programme was completed in 1992, and the fourth phase, which was planned in 1993, has now been initiated.

In the three first phases, research focused on the following topics:

- characterizing chalk
- mechanical properties of chalk
- effect of water injection
- well stimulation methods
- problems connected with recovering oil in the presence of gas.

In the fourth phase, the intention is to continue research within the three topics listed first.

Together with other research, this programme is a major contribution towards a better understanding of the mechanisms associated with compaction and water injection. The results obtained in these areas are crucial for dealing with compaction and subsidence as well as for optimizing the use of water injection. In a few studies, preliminary investigations have also been made into the use of more sophisticated methods, such as the injection of surfactants and polymers.

Initially, this research was primarily carried on abroad, in the oil companies' laboratories, for one thing. However, in recent years, Danish and Norwegian research centres have taken over an increasing share of this research.

A total of DKK 43 million was invested in this research in the three initial stages, and the budgeted cost of the fourth phase is about DKK 18 million.

EU Research and Development Programmes

The fourth EU framework programme is being prepared, and the contours of the individual programmes have been outlined. The fourth framework programme for research, technological development and demonstration will run from 1994 to 1998, and the first individual programmes are expected to be completed at the end of 1994 or the beginning of 1995.

The budget allocations for the non-nuclear energy research programme amount to approx. ECU 1 billion.

Oil and gas research under this programme will include the development of technologies for improved reservoir management, three-dimensional models/analyses and sophisticated geochemical and geophysical prospecting methods.

The THERMIE programme is being phased out, as the final round has been closed and the applications submitted are under consideration. Thus, the final allocation of funds under THERMIE 94 will be determined in mid-1994.

The THERMIE 93 and JOULE II research programmes have been concluded with a satisfactory result for Danish applicants, albeit with a modest result for the oil and gas sector.

Licences in Denmark

Group	Share
Dansk Undergrunds Consortium (DUC):	
The Sole Concession of July 8, 1962	
Blocks: 5504/5 and 6 (Elly)	
Blocks: 5603/27 and 28 (Gert)	
Blocks: 5504/10 and 14 (Rolf)	
Block: 5604/25 (Svend)	
Blocks: 5604/21 and 22 (Harald)	
Blocks: 5504/7, 8, 11, 12, 15 and 16 5505/13, 17 and 18 (Contiguous Area)	
A.P. Møller (Concessionaires)	39.00%
Shell Olie- og Gasudvinding Danmark	46.00%
Texaco Denmark Inc.	15.00%
Mærsk Olie og Gas AS is operator	

2nd Round:

Group	Share
Licence 7/86	
Blocks: 5604/22 and 26	
Statoil Efterforskning og Produktion A/S	33.54%
Total Marine Danmark	15.19%
LD Energi A/S	9.49%
EAC Energy A/S	5.06%
DENERCO K/S	11.39%
DOPAS	25.32%
Statoil is operator and DANOP will be operator in a development phase	

3rd Round:

Group	Share
Licences 1/89, 2/89	
Blocks: 5504/6 and 10 (1/89)	
Block: 5603/26 (2/89)	
Amoco Denmark Exploration Co.	70.00%
FLS-Energy A/S	5.00%
DENERCO K/S	5.00%
DOPAS	20.00%
Amoco is operator	
Licence 3/89	
Blocks: 5606/13, 14, 15, 17 and 18	
Amoco Denmark Exploration Co.	80.00%
FLS-Energy A/S	5.00%
DENERCO K/S	5.00%
DOPAS	10.00%
Amoco is operator	
Licence 7/89	
Block: 5504/2	
Blocks: 5604/25, 29 and 30	
Norsk Hydro Udforskning a.s.	21.75%
Du Pont E & P No. 6 B.V.	29.00%
British Gas Expl. & Prod. Ltd.	18.13%
Danoil Exploration A/S	1.81%
Korn- og Foderstof Kompagniet A/S	1.81%
DENERCO K/S	7.50%
DOPAS	20.00%
Norsk Hydro is operator	
Licence 8/89	
Block: 5603/32	
Block: 5604/29	
Norsk Hydro Udforskning a.s.	30.63%
British Gas Expl. & Prod. Ltd.	25.54%
Danoil Exploration A/S	2.55%
Korn- og Foderstof Kompagniet A/S	2.55%
DENERCO K/S	10.56%
DOPAS	28.17%
DANOP is operator	
Licence 9/89	
Blocks: 5509/5, 6, 7, 9, 10 and 11	
Jordan Dansk Corporation	60.71%
G.B.T. Northern Corporation	24.29%
DENERCO K/S	5.00%
DOPAS	10.00%
DANOP is operator	
Licence 10/89	
Blocks: 5603/27 and 31	
A.P. Møller	26.66%
Shell Olie- og Gasudvinding Danmark	26.66%
Texaco Denmark Inc.	26.66%
DOPAS	20.00%
Mærsk Olie og Gas AS is operator	
Licence 11/89	
Blocks: 5504/3 and 4	
RWE-DEA Denmark Oil GmbH	23.75%
Wintershall Danmark A/S	36.25%
DENERCO K/S	20.00%
DOPAS	20.00%
DANOP is operator	

Appendix A

Group	Share
Licences awarded in 1990:	
Licence 1/90	
Block: 5604/18	
Statoil Efterforskning og Produktion A/S	33.54%
Total Marine Danmark	15.19%
LD Energi A/S	9.49%
EAC Energy A/S	5.06%
DENERCO K/S	11.39%
DOPAS	25.32%
Statoil is operator and DANOP is co-operator	
Licence 2/90	
Blocks: 5604/23 and 24	
Statoil Efterforskning og Produktion A/S	40.42%
Total Marine Danmark	18.31%
LD Energi A/S	11.44%
EAC Energy A/S	6.10%
DENERCO K/S	13.73%
DOPAS	10.00%
DANOP is operator	
Licence 3/90	
Block: 5603/28	
A.P. Møller	31.20%
Shell Olie- og Gasudvinding Danmark	36.80%
Texaco Denmark Inc.	12.00%
DOPAS	20.00%
Mærsk Olie og Gas AS is operator	
Licences awarded in 1992:	
Licence 1/92	
Blocks: 5508/27, 28 and 32	
DOPAS	50.00%
RWE-DEA Denmark Oil GmbH	35.00%
Ruhrgas Aktiengesellschaft	10.00%
DENERCO K/S	5.00%
DANOP is operator	

Appendix B

Exploration and Appraisal Wells, 1986-1993

Well name Number	Operator Drilling Rig	Lat. North Long. East	Total Depth Formation	Spudded Completed
Lulu-2 5604/22-2	Mærsk Olie og Gas Mærsk Endeavour	56°19'06" 04°17'31"	3603 metres U.Permian	1985-12-15 1986-03-18
Diamant-1 5603/32-2	Phillips Glomar Labrador 1	56°00'23" 03°53'44"	4204 metres L.Permian	1986-01-11 1986-03-18
East Rosa-3 5504/15-5	Mærsk Olie og Gas Dyvi Epsilon	55°35'37" 04°36'31"	1569 metres U.Permian	1986-01-20 1986-03-19
Ravn-1 5504/01-2	Amoco Dyvi Epsilon	55°52'36" 04°13'52"	4968 metres L.Permian	1986-03-24 1986-07-21
East Rosa Fl.-1 5504/15-6	Mærsk Olie og Gas Mærsk Endeavour	55°33'51" 04°37'54"	3037 metres U.Jurassic	1986-03-24 1986-04-30
Mi. Rosa Fl.-1 5504/15-7	Mærsk Olie og Gas Mærsk Endeavour	55°35'27" 04°31'33"	3035 metres L.Cretaceous	1986-05-04 1986-06-11
West Lulu-4 5604/21-6	Mærsk Olie og Gas Mærsk Endeavour	56°19'05" 04°10'17"	3814 metres L.Triassic	1986-07-28 1986-09-13
Gwen-2 560[illegible]-3	Mærsk Olie og Gas Mærsk Endeavour	56°06'52" 04°04'10"	4363 metres L.Triassic	1986-09-30 1986-12-15
Mejrup-1 5608/19-1	Phillips Kenting 36	56°22'39" 08°40'36"	2481 metres U.Triassic	1987-03-22 1987-04-29
Felicia-1 5708/18-1	Statoil Mærsk Guardian	57°26'18" 08°18'41"	5280 metres L.Permian	1987-07-04 1987-12-03
Gert-3 5603/28-2	Mærsk Olie og Gas Mærsk Endeavour	56°12'43" 03°45'49"	5002 metres Palaeozoic	1987-07-21 1987-10-28
Stenlille-2 5511/15-2	Danop Kenting 36	55°32'17" 11°36'18"	1614 metres U.Triassic	1987-07-27 1987-08-28
benholt-1 605/20-1	Phillips Dyvi Sigma	56°23'26" 05°58'29"	2558 metres Precambrian	1987-08-11 1987-09-24
Dyb Gorm-1 504/16-5	Mærsk Olie og Gas Zapata Scotian	55°34'04" 04°45'50"	3823 metres Triassic	1987-08-18 1987-12-04
tenlille-3 511/15-3	Danop Kenting 36	55°32'17" 11°36'18"	1456 metres L.Jurassic	1987-08-30 1987-09-16
avn-2 504/05-1	Amoco Dan Earl	55°50'34" 04°13'40"	4466 metres Triassic	1987-09-16 1987-11-17
ostrup-11 509[illegible]11	Danop Kenting 36	56°37'55" 09°25'24"	1517 metres U.Permian	1987-10-10 1987-11-07
ly-2 504/06-2	Mærsk Olie og Gas Neddrill Trigon	55°47'19" 04°19'04"	4104 metres Triassic	1987-11-15 1988-05-31
ppe-1 03/28-3	Norsk Hydro Mærsk Guardian	56°11'04" 03°54'36"	5047 metres L.Permian	1987-12-10 1988-03-02
rg-1 08/32-2	Danop Kenting 34	55°02'57" 08°48'23"	3063 metres Palaeozoic	1988-04-18 1988-05-29
lnare-1 04/26-1	Statoil Mærsk Endeavour	56°10'13" 04°26'41"	4735 metres U.Jurassic	1988-06-04 1988-09-19
nlille-4 11/15-4	Danop Kenting 36	55°31'06" 11°35'14"	1646 metres U.Triassic	1988-07-19 1988-08-09
nlille-5 1/15-5	Danop Kenting 36	55°32'08" 11°37'33"	1662 metres U.Triassic	1988-08-14 1988-09-03
nlille-6 1/15-6	Danop Kenting 36	55°33'29" 11°39'09"	1690 metres U.Triassic	1988-09-07 1988-09-27
denskjold-1 3/03-2	Danop Neddrill Trigon	55°56'19" 03°32'31"	3702 metres L.Permian	1988-12-14 1989-02-04
lille-1 4/30-1	Norsk Hydro Glomar Moray Firth	55°00'54" 14°18'43"	3589 metres Silurian	1989-04-09 1989-06-06
Stina-1 5414/07-1	Amoco Glomar Moray Firth	54°47'20" 14°37'44"	2482 metres Silurian	1989-06-12 1989-07-11
Falk-1 5504/06-3	Amoco Glomar Moray Firth	55°50'01" 04°18'50"	4200 metres U.Triassic	1989-07-24 1989-09-05
Gert-4 5603/27-4	Mærsk Olie og Gas Mærsk Endeavour	56°13'18" 03°43'48"		1989-11-02 1990-05-16
Alma-1 5505/17-10	Mærsk Olie og Gas Mærsk Giant	55°28'58" 05°12'33"		1990-03-18 1990-08-16
Amalie-1 5604/26-2	Statoil Neddrill Trigon	56°14'39" 04°22'02"	5320 metres Jurassic	1990-08-01 1991-06-17
Stenlille-7 5511/15-7	Danop Kenting 31	55°32'18" 11°36'27"		1990-09-10 1990-12-17
E-5 5504/12-4	Mærsk Olie og Gas West Sigma	55°40'25" 04°53'11"		1991-02-05 1991-05-11
Skjold Fl.-1 5504/16-6	Mærsk Olie og Gas West Kappa	55°33'23" 04°53'51"		1991-05-10 1991-09-22
Eg-1 5503/04-2	Agip Neddrill Trigon	55°57'09" 03°58'25"	4500 metres U.Permian	1991-06-24 1991-09-23
Baron-1 5604/30-2	Norsk Hydro Mærsk Jutlander	56°01'44" 04°15'29"	999 metres	1991-07-25 1991-08-01
Baron-2 5604/30-3	Norsk Hydro Mærsk Jutlander	56°01'44" 04°15'29"	5100 metres U.Jurassic	1991-08-01 1992-01-13
Tyra TWC-3P 5504/11-3	Mærsk Olie og Gas Mærsk Giant	55°42'56" 04°44'56"		1991-09-14 1991-11-24
Elly-3 5504/06-5	Mærsk Olie og Gas Mærsk Endeavour	55°47'19" 04°22'02"		1991-09-12 1992-02-12
S. E. Adda-1 5504/08-5	Mærsk Olie og Gas Mærsk Giant	55°47'56" 04°55'07"		1992-01-26 1992-03-05
Dagmar-6 5504/15-8	Mærsk Olie og Gas Mærsk Endeavour	55°35'04" 04°35'50"		1992-02-22 1992-04-11
E-6 5504/12-5	Mærsk Olie og Gas Mærsk Giant	55°40'29" 04°53'22"		1992-03-12 1992-05-12
Lulita-1 5604/22-3	Mærsk Olie og Gas Mærsk Giant	56°20'46" 04°16'24"	3749 metres M. Jurassic	1992-05-17 1992-12-20
E-7 5504/12-6	Mærsk Olie og Gas West Sigma	55°40'43" 04°49'24"		1992-06-11 1992-07-18
Bertel-1 5603/32-3	Danop West Omikron	56°02'12" 03°58'03"	4810 metres Triassic	1992-06-27 1992-10-07
Ida-1 5606/13-1	Amoco Ross Explorer	56°32'11" 06°06'58"	1663 metres Triassic	1992-09-14 1992-09-30
Rita-1 5603/27-5	Mærsk Olie og Gas Mærsk Endeavour	56°09'09" 03°34'13"	4758 metres Triassic	1992-09-18 1993-03-03
Skarv-1 5504/10-2	Amoco Ross Explorer	55°43'14" 04°24'58"	3935 metres Triassic	1992-10-04 1992-11-17
Jelling-1 5509/10-1	Danop Kenting 31	55°44'22" 09°22'33"	1933 metres Precambrian	1992-10-05 1992-10-24
Alma-2 5505/17-11	Mærsk Olie og Gas Shelf Explorer	55°29'50" 05°13'37"		1992-10-18 1993-02-06
Løgumkloster-2 5508/32-3	Danop Kenting 31	55°02'00" 08°56'32"	2768 metres L.Permian?	1993-09-01 1993-10-17
Tabita-1 5604/26-3	Statoil Glomar Moray Firth	56°13'37" 04°23'47"	4313 metres U.Jurassic	1993-09-13 1993-12-10

Appendix C

Exploratory Surveys 1993

Survey	Operator Contractor	Type	Initiated Completed	Area	Collected in 1993
BE93C	BEB Geco-Prakla	Offshore 2D	1993-02-17 1993-03-16	Central Graben 5504	530 km
GE93N	Geco Geophysical Co. Geco Geophysical Co.	Offshore 2D	1993-10-17 1993-10-29	The North Sea 5706, 5707, 5708	194 km
DK93C	Mærsk Olie og Gas AS Master Seismic AS	Offshore 2D	1993-02-06 1993-02-15	Central Graben Cont. Area	695 km
DK93C	Maersk Öl und Gas GmbH Master Seismic AS	Offshore 2D	1993-01-29 1993-02-15	Central Graben	76 km
RD93B	RWE-DEA CGG	Offshore 2D	1993-07-26 1993-07-31	The Baltic	110 km
GE93C	Geco Geophysical Co. Geco Geophysical Co.	Offshore 3D	1993-03-18 1993-04-22	Central Graben 5603, 5604	276 km
DK93C	Mærsk Olie og Gas AS Simon Horizon Ltd.	Offshore 3D	1992-08-10 1993-02-12	Central Graben Skjold	3,773 km
DK93C	Mærsk Olie og Gas AS Geco-Prakla	Offshore 3D	1993-03-13 1993-05-06	Central Graben Tyra	11,213 km
DK93C	Mærsk Olie og Gas AS Geco-Prakla	Offshore 3D	1993-03-13 1993-05-06	Central Graben Roar	6,325 km
DK93C	Mærsk Olie og Gas AS Geco-Prakla	Offshore 3D	1993-05-06 1993-06-18	Central Graben Skjold	4,850 km
DK93C	Mærsk Olie og Gas AS Geco-Prakla	Offshore 3D	1993-05-06 1993-06-18	Central Graben Igor	12,063 km

h Oil Production 1972-1993, million m^3

Dan	Gorm	Skjold	Tyra	Rolf	Kraka	Dagmar	Regnar	Valdemar	*Total*
0.11									*0.11*
0.15									*0.15*
0.10									*0.10*
0.19									*0.19*
0.23									*0.23*
0.58									*0.58*
0.49									*0.49*
0.49									*0.49*
0.34									*0.34*
0.34	0.53								*0.87*
0.31	1.64	0.02							*1.97*
0.27	1.84	0.40							*2.51*
0.36	1.62	0.65	0.07						*2.70*
0.45	1.80	0.85	0.35						*3.45*
0.47	1.72	1.07	0.57	0.47					*4.30*
1.23	1.50	1.21	0.84	0.63					*5.41*
1.50	1.35	1.37	0.95	0.40					*5.57*
1.47	1.35	2.21	1.05	0.39					*6.47*
1.58	1.44	2.63	1.08	0.27					*7.00*
1.72	1.50	2.73	1.39	0.29	0.14	0.47			*8.24*
2.70	1.66	2.28	1.67	0.30	0.21	0.31			*9.13*
3.26	1.89	2.10	1.64	0.18	0.39	0.07	0.15	0.05	*9.73*
18.34	*19.84*	*17.52*	*9.61*	*2.93*	*0.74*	*0.85*	*0.15*	*0.05*	*70.03*

h Gas Production 1972-1993, billion Nm^3

Dan	Gorm	Skjold	Tyra	Rolf	Kraka	Dagmar	Regnar	Valdemar	*Total*	*Sold*
0.02									*0.02*	
0.03									*0.03*	
0.03									*0.03*	
0.06									*0.06*	
0.07									*0.07*	
0.17									*0.17*	
0.16									*0.16*	
0.16									*0.16*	
0.07									*0.07*	
0.08	0.08								*0.16*	
0.08	0.27	0.00							*0.35*	
0.08	0.43	0.04							*0.55*	
0.13	0.51	0.06	0.26						*0.96*	*0.22*
0.21	0.64	0.07	1.11						*2.03*	*1.06*
0.24	0.78	0.10	1.63	0.02					*2.77*	*1.80*
0.44	0.88	0.10	2.65	0.03					*4.10*	*2.30*
0.60	0.98	0.11	3.36	0.02					*5.07*	*2.27*
0.71	0.89	0.19	3.52	0.02					*5.33*	*2.68*
0.80	0.81	0.22	3.30	0.01					*5.14*	*2.75*
0.88	0.84	0.23	3.67	0.01	0.06	0.07			*5.76*	*3.52*
1.06	0.84	0.21	3.94	0.01	0.09	0.05			*6.20*	*3.63*
1.34	0.78	0.19	3.85	0.01	0.13	0.01	0.01	0.03	*6.35*	*4.00*
7.42	*8.73*	*1.52*	*27.29*	*0.13*	*0.28*	*0.13*	*0.01*	*0.03*	*45.54*	*24.25*

amount of gas has been reinjected

Appendix D 2

Natural Gas Supplies from Danish Fields 1984-1993, million Nm³

Year	Dan	Kraka	Regnar	Gorm	Skjold	Rolf	Dagmar	Tyra	Valdemar	*Total*
1984	7	-	-	19	2	-	-	192	-	*220*
1985	49	-	-	0	0	-	-	1015	-	*1064*
1986	211	-	-	116	14	3	-	1460	-	*1804*
1987	378	-	-	21	2	1	-	1898	-	*2300*
1988	534	-	-	96	11	1	-	1629	-	*2271*
1989	639	-	-	55	12	1	-	1977	-	*2684*
1990	737	-	-	99	27	1	-	1889	-	*2753*
1991	769	49	-	167	46	2	-	2484	-	*3517*
1992	932	78	-	151	38	2	-	2427	-	*3628*
1993	1228	115	7	298	75	3	-	2262	17	*4005*
Total	*5484*	*242*	*7*	*1022*	*227*	*14*	-	*17234*	*17*	*24246*

Monthly Oil and Condensate Production 1993, thousand m³

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	*1993*
Dan	261	233	264	262	268	265	277	278	282	295	277	298	*3262*
Kraka	7	19	17	20	23	47	50	44	41	41	42	40	*390*
Regnar	-	-	-	-	-	-	-	-	2	46	45	53	*145*
Gorm	151	129	143	135	140	161	161	156	168	172	184	190	*1889*
Skjold	196	167	205	191	187	171	177	172	169	152	158	158	*2103*
Rolf	18	15	17	18	16	17	19	11	13	11	9	13	*176*
Dagmar	4	8	8	7	6	6	6	4	5	4	5	5	*67*
Tyra	162	142	151	126	128	119	109	116	132	140	140	173	*1639*
Valdemar	-	-	-	-	-	-	-	-	-	8	24	21	*53*
Total	*798*	*713*	*805*	*759*	*767*	*786*	*799*	*781*	*812*	*870*	*884*	*951*	*9724*

Monthly Gas Production 1993, million Nm³

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	*1993*
Dan	117	111	122	116	119	111	108	107	102	112	104	107	*1336*
Kraka	3	8	8	10	10	10	14	13	12	13	12	11	*125*
Regnar	-	-	-	-	-	-	-	-	<1	2	2	3	*8*
Gorm	76	57	64	53	44	63	68	53	59	73	88	77	*775*
Skjold	19	16	20	16	16	13	12	17	16	15	17	18	*195*
Rolf	1	1	1	1	1	1	1	<1	1	<1	<1	1	*8*
Dagmar	1	1	1	1	1	1	1	1	1	1	1	1	*13*
Tyra	425	364	357	263	269	255	234	253	330	353	359	392	*3853*
Valdemar	-	-	-	-	-	-	-	-	-	4	13	12	*29*
Total	*642*	*558*	*573*	*459*	*459*	*455*	*439*	*444*	*522*	*573*	*596*	*621*	*6342*

Domestic Energy Supplies 1972-1993, Distributed on Fuels, as well as Energy Production (million t.o.e.) and Degree of Self-Sufficiency (per cent)

	Oil	Gas	Coal	Renewable Energy, etc.	*Total*	Energy Production	Self-Sufficiency %
1972	17.9	-	1.2	0.3	*19.4*	0.4	2
1973*)	17.4	-	1.9	0.2	*19.5*	0.3	2
1974*)	15.9	-	1.7	0.2	*17.8*	0.3	2
1975	15.2	-	2.0	0.3	*17.6*	0.5	3
1976	16.0	-	2.9	0.4	*19.2*	0.6	3
1977	16.0	-	3.3	0.4	*19.6*	0.9	4
1978	16.0	-	4.0	0.4	*20.5*	0.9	4
1979	15.9	-	4.8	0.5	*21.2*	0.9	4
1980	13.2	-	5.7	0.6	*19.5*	0.9	5
1981	11.6	0.0	6.0	0.7	*18.3*	1.5	8
1982	10.8	0.0	6.2	0.8	*17.9*	2.5	14
1983	10.2	0.1	6.6	0.8	*17.8*	3.1	17
1984	10.2	0.2	7.1	0.9	*18.3*	3.5	19
1985	10.4	0.7	7.4	0.9	*19.3*	4.9	25
1986	10.2	1.2	7.4	1.0	*19.7*	6.5	33
1987	9.7	1.5	7.7	1.1	*20.0*	8.0	40
1988	9.0	1.6	7.7	1.1	*19.4*	8.3	43
1989	8.6	1.8	7.6	1.2	*19.1*	9.6	50
1990	8.3	1.9	7.6	1.2	*18.9*	10.2	54
1991	8.4	2.1	7.8	1.3	*19.6*	12.0	61
1992	8.2	2.2	7.6	1.4	*19.5*	13.0	67
1993*)	8.1	2.4	7.6	1.5	*19.7*	14.0	71

Climatic correction has not been applied, as opposed to other surveys of consumption.
The survey indicates gross energy consumption, i.e. including shrinkage. *) Estimate

Domestic Energy Consumption 1972-1993, Distributed on Utilization, million t.o.e.

	Residential	Process	Transport	Elec. Appl. etc.	Non-Energy	*Total*
1972	7.5	4.8	3.4	2.8	1.0	*19.4*
1973*)	7.5	5.2	3.3	2.6	0.9	*19.5*
1974*)	6.3	4.9	3.1	2.6	0.9	*17.8*
1975	6.4	4.5	3.2	2.6	0.9	*17.6*
1976	7.2	4.8	3.4	2.9	0.9	*19.2*
1977	7.0	5.1	3.5	3.1	0.9	*19.6*
1978	7.2	5.4	3.8	3.3	0.8	*20.5*
1979	7.6	5.6	3.8	3.4	0.9	*21.2*
1980	6.5	5.4	3.5	3.4	0.8	*19.5*
1981	5.9	4.9	3.3	3.4	0.7	*18.3*
1982	5.7	4.6	3.5	3.4	0.7	*17.9*
1983	5.5	4.6	3.6	3.4	0.7	*17.8*
1984	5.4	4.8	3.7	3.6	0.8	*18.3*
1985	6.2	5.0	3.8	3.6	0.8	*19.3*
1986	6.0	5.3	3.9	3.7	0.9	*19.7*
1987	6.1	5.2	4.0	3.8	1.0	*20.0*
1988	5.4	5.1	4.0	3.9	1.0	*19.4*
1989	4.9	5.2	4.1	3.9	1.0	*19.1*
1990	4.8	5.2	4.1	3.8	0.9	*18.9*
1991	5.3	5.4	4.2	3.9	0.9	*19.6*
1992	5.1	5.3	4.2	3.9	1.0	*19.5*
1993*)	5.2	5.3	4.2	4.0	1.0	*19.7*

Including shrinkage. Climatic correction has not been applied.*) Estimate

Appendix D 4

Financial Key Figures

	Investments in Field Development DKK million	Operating Costs for Fields [1] DKK million	Exploration Costs [2] DKK million	Crude Oil Price [3] USD/bbl	Exchange Rate DKK/USD	Inflation Rate [4] per cent	Net Foreign-Currency Expenditure on Energy Import DKK million
1972	105	32	28	3.0	7.0	6.6	3.3
1973	9	34	83	4.6	6.1	9.3	4.3
1974	38	58	76	11.6	6.1	15.2	9.8
1975	139	64	118	12.3	5.8	19.6	9.4
1976	372	71	114	12.3	6.1	9.0	10.3
1977	64	88	176	14.0	6.0	11.2	11.4
1978	71	128	55	14.0	5.5	10.0	10.9
1979	387	146	78	20.4	5.3	9.6	15.5
1980	956	169	201	37.5	5.6	12.3	21.2
1981	1651	402	257	37.4	7.1	11.7	25.9
1982	3948	652	566	34.0	8.4	10.2	25.9
1983	3528	615	1264	30.5	9.1	6.9	21.9
1984	1596	1405	1211	28.2	10.4	6.3	22.8
1985	1956	2256	1373	27.2	10.6	4.7	23.4
1986	1694	1598	721	14.7	8.1	3.6	11.2
1987	914	1655	639	18.4	6.8	4.0	8.7
1988	897	1604	420	14.8	6.7	4.6	6.7
1989	1145	1821	300	18.0	7.3	4.8	7.4
1990	1736	1924	594	23.5	6.2	2.6	5.7
1991	2260	2173	989	20.0	6.4	2.4	5.1
1992	2450	2140	1040	18.9	6.0	2.1	3.1
1993	3325	2245	310	14.8	6.5	1.2	2.5

Nominal Prices [1]) Including transportation costs [2]) All licences [3]) Danish crude oil [4]) Consumer prices

lucing Fields

Dan Centre

name:	**Dan**
ɛct:	Abby
on:	Block 5505/17
ssion:	A.P. Møller
tor:	Mærsk Olie & Gas AS
vered:	1971
ɔn stream:	1972
cing wells:	60
.ch horizontal:	33
on wells:	14
.ch horizontal:	2
d h:	40 m (131 ft)
ge:	20 km² (5,000 acres)
voir depth:	1,850 m (6,070 ft)
voir rock:	Chalk
gical age:	Danian and late Cretaceous
ves Expectation:	
	37.3 million m³ (235 MMbbls)
	15.4 billion Nm³ (573 BSCF)
lative Production:	
	18.34 million m³ (115 MMbbls)
	7.42 billion Nm³ (276 BSCF)

w of Geology

an anticlinal structure induced through salt ics of the Zechstein/Triassic. The chalk reser- as adequate porosity, although strongly re- permeability. A major fault divides the field vo reservoir blocks. There is a gas cap in the Water injection has been initiated to enhance overy.

ction Facilities

eld installation comprises six wellhead plat- (A, D, E, FA, FB and FE), two processing/ modation platforms (B and FC) and two gas tacks (C and FD).

sing of the produced oil and gas takes place at Dan FC. The older processing facilities at have since 1987 been used for temporary, in- al well production testing only. Final processing of the produced oil is performed at Dan FC prior to export ashore via the booster platform, Gorm E. The gas is pre-processed at Dan FC and further transported to Tyra East for final processing and export ashore.

In 1991/93, the processing facilities were extended in order to handle the increased production resulting from the ongoing field development. At the same time, the water treatment and pumping facilities for water injection were extended.

The processing facilities at the Dan Field handle production from the Kraka and Regnar Fields.

There are accommodation facilities for 91 persons in the Dan Field, Dan FC accommodating 86 persons.

Field name:	**Kraka**
Prospect:	Anne
Location:	Block 5505/17
Concession:	A.P. Møller
Operator:	Mærsk Olie & Gas AS
Discovered:	1966
Year on stream:	1991
Producing wells:	4
of which horizontal:	4
Water depth:	45 m (148 ft)
Acreage:	20 km² (5,000 acres)
Reservoir depth:	1,800 m (5,900 ft)
Reservoir rock:	Chalk
Geological age:	Danian and late Cretaceous
Reserves Expectation:	
Oil:	3.8 million m³ (24 MMbbls)
Gas:	1.2 billion Nm³ (45 BSCF)
Cumulative Production:	
Oil:	0.74 million m³ (5 MMbbl)
Gas:	0.28 billion Nm³ (10 BSCF)

Review of Geology

Kraka is an anticlinal structure induced through Zechstein salt tectonics, which to a certain degree has caused fracturing in the chalk. The chalk reservoir has adequate porosity, although reduced permeability. The thin oil pay zone is further characterized by high water saturations. There is a small gas cap in the field.

Production Facilities

Kraka is a satellite development to Dan FC, including an unmanned production platform of the STAR-A type. The produced oil and gas are transported to Dan FC for processing and export ashore.

Field name:	**Regnar**
Prospect:	Nils
Location:	Block 5505/17
Concession:	A.P. Møller
Operator:	Mærsk Olie & Gas AS
Discovered:	1979
Year on stream:	September 1993
Producing wells:	1
Water depth:	45 m (148 ft)
Acreage:	8 km^2 (2,000 acres)
Reservoir depth:	1,700 m (5,600 ft)
Reservoir rock:	Chalk and Carbonates
Geological age:	Late Cretaceous and Zechstein
Reserves Expectation:	
Oil:	0.6 million m^3 (4 MMbbls)
Gas:	<0.1billion m^3 (1 BSCF)
Cumulative Production:	
Oil:	0.15 million m^3 (1 MMbbl)
Gas:	0.01 billion Nm^3 (0.4 BSCF)

Review of Geology

The Regnar field is an anticlinal structure, induced through Zechstein salt tectonics. The structure is heavily fractured, resulting in favourable reservoir conductivity (compare Skjold, Rolf and Dagmar). The Regnar-3 well proves to have unusually good production characteristics.

Production Facilities

The Regnar Field has been developed as a satellite to the Dan Field. Production takes place in a subsea-completed well. The oil and gas produced are transported through a multiphase pipeline to Dan FC for processing and export ashore.

The Gorm Centre

Field name:	**Gorm**
Prospect:	Vern
Location:	Blocks 5504/15 and 16
Concession:	A.P. Møller
Operator:	Mærsk Olie & Gas AS
Discovered:	1971
Year on stream:	1981
Producing wells:	26
of which horizontal:	4
Gas injection wells:	2
Water injection wells:	10
of which horizontal:	5
Water depth:	39 m (128 ft)
Acreage:	12 km^2 (3,000 acres)
Reservoir depth:	2,200 m (7,200 ft)
Reservoir rock:	Chalk
Geological age:	Danian and late Cretaceous
Reserves Expectation:	
Oil:	20.3 million m^3 (128 MMbbls)
Gas:	5.9 billion Nm^3 (220 BSCF)
Cumulative production:	
Oil:	19.84 million m^3 (125 MMbbls)
Gas:	8.73 billion Nm^3 (325 BSCF)
Injection gas:	7.85 billion Nm^3 (292 BSCF)
Net gas:	0.88 billion Nm^3 (33 BSCF)

Review of Geology

Gorm is an anticlinal structure induced through Zechstein salt tectonics. A major fault extending north-south divides the field into two individual reservoirs. The 'A' reservoir block is heavily fractured.

Initially, there was no gas cap in the Gorm Field, but since the field was brought on stream, the injection of gas has resulted in the formation of an artificial gas cap in the 'A' block. Both gas and water are injected into the reservoir in order to enhance oil recovery.

?roduction Facilities

[he Gorm Field consists of two wellhead platforms A and B), one processing/accommodation platform C), one gas flare stack (D), one riser/booster plat-'orm (E) and one combined wellhead/processing/)ooster platform (F). Four caissons with a capacity 'or a total of 24 wells have been installed on Gorm ⁼.

[he Gorm F facilities consist of two oil stabiliza-ion plants, one receiving the sour oil and gas from he Dagmar Field, and the other receiving the oil ınd gas produced in the Skjold Field. Moreover,)rocessing/pumping facilities for injection water to)e used in the Gorm and Skjold Fields have been in-talled on Gorm F.

'in processing of oil and gas takes place at Gorm : prior to export ashore via Gorm E (oil) and Tyra :ast (gas). The gas-reinjection facilities are in-talled at Gorm C.

[here are accommodation facilities on Gorm C for '8 persons.

'ield name:	**Skjold**
?rospect:	Ruth
.ocation:	Block 5504/16
:oncession:	A.P. Møller
)perator:	Mærsk Olie & Gas AS
)iscovered:	1977
'ear on stream:	1982
?roducing wells:	10
ıf which horizontal:	6
V inj. wells:	5
Vater depth:	40 m (131 ft)
\creage:	10 km^2 (2,500 acres)
₹eservoir depth:	1,600 m (5,200 ft)
₹eservoir rock:	Chalk
;eological age:	Danian and late Cretaceous
₹eserves Expectation:	
)il:	16.4 million m^3 (103 MMbbls)
;as:	1.4 billion Nm^3 (52 BSCF)
:umulative Production:	
)il:	17.52 million m^3 (110 MMbbls)
;as:	1.52 billion Nm^3 (57 BSCF)

Review of Geology

The Skjold Field is an anticlinal structure induced through Zechstein salt tectonics. The structure is heavily fractured, resulting in favourable reservoir conductivity, in particular within the crestal part of the structure. New surveys have shown that the reservoir in the northeastern and eastern parts of the field is much less heavily fractured than in the other parts of the field. Water is injected into the reservoir to enhance oil recovery.

Production Facilities

The Skjold Field comprises a satellite development to the Gorm Field, including one unmanned wellhead platform, Skjold A. The deck on Skjold A has been extended, so that the wellhead platform can now host 15 wells instead of nine.

In 1993, a STAR wellhead platform, Skjold B, was installed, with a capacity for seven wells.

There are no processing facilities at the Skjold Field, and the production is transported to separate facilities on the Gorm F platform, which also houses facilities providing the Skjold Field with injection water.

The Skjold B platform and the future accommodation platform, Skjold C, are comprised by the 1992 development plan. Both platforms will be connected by bridges to Skjold A. The bridge between Skjold A and Skjold B will involve an increase in the deck area and will house a crane. The plan further envisages the installation of a supplementary pipeline for transporting the Skjold production to the Gorm Field. In 1993, the use of the existing 6" pipeline between Skjold and Gorm was changed, so that it now supplies the Skjold wells with lift gas from the Gorm Field.

Field name:	**Rolf**
Prospect:	Middle Rosa
Location:	Blocks 5504/14 and 15
Concession:	A.P. Møller
Operator:	Mærsk Olie & Gas AS
Discovered:	1981
Year on stream:	1986
Producing wells:	2
Observation well:	1
Water depth:	34 m (112 ft)
Acreage:	8 km^2 (2,000 acres)
Reservoir depth:	1,800 m (5,900 ft)
Reservoir rock:	Chalk and Carbonates
Geological age:	Danian, late Cretaceous and Zechstein

Reserves Expectation:

Oil:	2.0 million m^3 (13 MMbbls)
Gas:	0.1 billion Nm^3 (4 BSCF)

Cumulative Production:

Oil:	2.93 million m^3 (18 MMbbls)
Gas:	0.13 billion Nm^3 (5 BSCF)

Review of Geology

Rolf is an anticlinal structure induced through Zechstein salt tectonics. The chalk reservoir is heavily fractured resulting in favourable reservoir conductivity (compare Skjold). The aquifer in the Rolf Field has proved highly efficient.

Production Facilities

The Rolf Field is a satellite development to the Gorm Field with an unmanned wellhead platform. The production is transported to the Gorm F platform via pipeline for stabilization together with production from the Skjold Field.

Field name:	**Dagmar**
Prospect:	East Rosa
Location:	Block 5504/15
Concession:	A.P. Møller
Operator:	Mærsk Olie & Gas AS
Discovered:	1983
Year on stream:	1991
Producing wells:	2
Water depth:	34 m (112 ft)
Acreage:	9 km^2 (2,200 acres)
Reservoir depth:	1,400 m (4,600 ft)
Reservoir rock:	Chalk and Carbonates
Geological age:	Danian, late Cretaceous and Zechstein

Reserves Expectation:

Oil:	0.1 million m^3 (1 MMbbls)
Gas:	<0.1 billion Nm^3 (1 BSCF)

Cumulative Production:

Oil:	0.85 million m^3 (5 MMbbls)
Gas:	0.13 billion Nm^3 (5 BSCF)

Review of Geology

The Dagmar field is an anticlinal structure, induced through Zechstein salt tectonics. The structure is heavily fractured, resulting in favourable reservoir conductivity (compare Skjold). Initially, production rates were high, but the production experience gained to date seems to indicate that the production characteristics are less favourable than in the Skjold and Rolf Fields.

Production Facilities

The Dagmar field is a satellite development to Gorm including one unmanned production platform of the STAR-A type. The production is transported to Gorm F, where special facilities for handling the sour gas from the Dagmar Field have been installed. The gas from Dagmar is flared on Gorm F without being utilized.

The Tyra Centre

Field name:	**Tyra**
Prospect:	Cora
Location:	Blocks 5504/11 and 12
Concession:	A.P. Møller
Operator:	Mærsk Olie & Gas AS
Discovered:	1968
Year on stream:	1984
Producing wells:	40
of which horizontal:	12
Gas injection wells:	8
Water depth:	37-40 m (121-131 ft)
Acreage:	90 km^2 (22,000 acres)
Reservoir depth:	2,000 m (6,600 ft)
Reservoir rock:	Chalk
Geological age:	Danian and late Cretaceous

Reserves Expectation:

Oil:	8.2 million m^3 (52 MMbbls)
Condensate:	6.3 million m^3 (40 MMbbls)
Gas:	57.3 billion Nm^3 (2.13 TSCF)

Cumulative Production:

Oil:	3.67 million m^3 (23 MMbbls)
Condensate:	5.94 million m^3 (37 MMbbls)
Gas:	27.29 billion Nm^3 (1.02 TSCF)

jection gas:	8.80 billion Nm^3 (0.33 TSCF)
et gas:	18.49 billion Nm^3 (0.69 TSCF)

eview of Geology

ıe Tyra Field is an anticlinal structure, probably lated to tectonic inversion or salt tectonics or ɔth. A marked permeability barrier separates the anian and the Maastrichtian chalk reservoir rocks. evised mapping of the Tyra structure, based in ırt on delineation wells drilled in 1991 and 1992, ıows that the structure covers a much larger area an previously assumed.

ıe accumulation consists of a gas cap overlying a in black oil zone. A gas recycling project has :e[illegible]ıitiated at Tyra West in order to enhance con- :nsate production. The newly developed horizontal 'illing technique has made it possible to exploit e oil zone, as well. However, the oil zone has not :en finally appraised.

roduction Facilities

ıe production facilities include two major produc- ɔn complexes, Tyra West and Tyra East, each con- sting of two wellhead platforms, one processing/ :commodation platform, and one gas flare stack; a ɔer platform has been installed at Tyra East hous- g the gas export outlet into the main gas pipeline.

nal processing of gas and stabilization of black l/ condensate take place at Tyra East. The stabi- zed hydrocarbon liquids are transported to Gorm r export ashore. Gas recycling facilities have been s[illegible]ed at Tyra West for enhanced condensate re- ɔvery. There are total accommodation facilities at e Tyra Field for 176 persons (96 at Tyra East and) at Tyra West).

1993, an extensive development plan for the yra Field was approved, providing for a major ex- nsion of the production facilities at Tyra West as ell as Tyra East. The development plan for Tyra 'est includes the installation of gas processing fa- lities supported by a pile, as well as the installa- ɔn of a bridge module supported by a STAR plat- ırm at the TWB platform. The bridge module will ɔuse new gas processing and compression fa- lities. At Tyra East, the development plan envis- ;es the installation of a bridge module supported / a STAR platform at the TEE platform. This 'idge module will house the facilities for receiving ıd handling production from the satellite fields, g., Roar, Svend and Harald.

The large expansion of the Tyra Field installations resulting from the conclusion of the new gas sales contract necessitates a higher degree of integrated operation of the processing facilities at Tyra East and Tyra West. Therefore, the two existing pipe- lines between the two platform complexes will be supplemented by another three pipelines before the startup of increased gas supplies in 1997.

In 1993, production from the Valdemar Field began to be processed at the Tyra East complex. The oil and condensate produced in the Tyra and Valdemar Fields are transported to shore via Gorm E, while gas production from the other processing centres in the Dan and Gorm Fields is conveyed to Tyra East for export ashore together with gas production from the Tyra Centre.

Field name:	**Valdemar**
Prospects:	Bo, Boje, North Jens
Location:	Blocks 5504/7 and 11
Concession:	A.P. Møller
Operator:	Mærsk Olie & Gas AS
Discovered:	1977 (Bo), 1982 (Boje), and 1985 (North Jens)
Year on stream:	October 1993
Producing wells:	3
of which horizontal:	3
Water depth:	38 m (125 ft)
Late Cretaceous reservoir:	
Acreage:	16 km^2 (4,000 acres)
Reservoir depth:	2,000 m (6,600 ft)
Early Cretaceous reservoir:	
Acreage:	200 km^2 (50,000 acres)
Reservoir depth:	2,600 m (8,500 ft)
Reservoir rock:	Chalk
Geological age:	Danian, late and early Cretaceous
Reserves Expectation:	
Oil:	2.0 million m^3 (13 MMbbls)
Gas:	2.2 billion Nm^3 (82 BSCF)
Cumulative Production:	
Oil:	0.05 million m^3 (0.3 MMbbls)
Gas:	0.03 billion Nm^3 (1 BSCF)

Appendix E 1

Review of Geology

Valdemar comprises several separate reservoirs, i.e. oil and gas reservoirs in chalk of Danian/Maastrichtian and Campanian age and oil reservoirs in chalk of Aptian/Barremian age (Tuxen formation). The properties of the late Cretaceous reservoirs are comparable to other Danish fields like Gorm and Tyra, while the Aptian/Barremian chalk possesses very difficult production properties. Some fracturing has been indicated in certain areas of the field, which improves the productivity.

Production Facilities

Valdemar has been developed as a satellite to Tyra, including an unmanned production platform of the STAR-A type. The production is transported to Tyra East for processing and export ashore.

v Field Developments

l name:	**Roar**
pect:	Bent
ıtion:	Block 5504/7
cessionaire:	A.P. Møller
rator:	Mærsk Olie & Gas AS
overed:	1968
. plan approved:	1993
r on stream:	1996 (planned)
er depth:	46 m (150 ft)
ervoir depth:	2,070 m (6,800 ft)
ervoir rock:	Chalk
logical age:	Danian and late Cretaceous

d name:	**Harald**
spects:	Lulu/West Lulu
ation:	Blocks 5604/21 and 22
ıcessionaire:	A.P. Møller
erator:	Mærsk Olie & Gas AS
covered:	1980 (Lulu) and 1983 (West Lulu)
/. plan approved:	1993
ald West:	
ar on stream:	1997 (planned)
ter depth:	64 m (210 ft)
servoir depth:	3,650 m (12,000 ft)
servoir rock:	Sandstone
ological age:	Middle Jurassic
rald East:	
ar on stream:	1998 (planned)
ater depth:	64 m (210 ft)
servoir depth:	2,700 m (8,900 ft)
servoir rock:	Chalk
ological age:	Danian and late Cretaceous

eld name:	**Svend**
ospects:	North Arne/Otto
ocation:	Block 5604/25
oncessionaire:	A.P. Møller
perator:	Mærsk Olie & Gas AS
iscovered:	1975 (North Arne) and 1982 (Otto)
ev. plan approved:	1993
ear on stream:	1996 (planned)
Water depth:	65 m (213 ft)
Reservoir depth:	2,200 m and 2,400 m (7,200 ft and 7,900 ft)
Reservoir rock:	Chalk
Geological age:	Danian and late Cretaceous

Field name:	**Adda**
Location:	Block 5504/8
Concessionaire:	A.P. Møller
Operator:	Mærsk Olie & Gas AS
Discovered:	1977
Dev. plan approved:	1990
Year on stream:	1999 (planned)
Water depth:	38 m (125 ft)
Late Cretaceous reservoir:	
Reservoir depth:	2,200 m (7,200 ft)
Reservoir rock:	Chalk
Early Cretaceous reservoir:	
Reservoir depth:	2,300 m (7,500 ft)
Reservoir rock:	Chalk

Field name:	**Igor**
Location:	Block 5505/13
Concessionaire:	A.P. Møller
Operator:	Mærsk Olie & Gas AS
Discovered:	1968
Dev. plan approved:	1990
Year on stream:	1999 (planned)
Water depth:	50 m (164 ft)
Reservoir depth:	2,000 m (6,600 ft)
Reservoir rock:	Chalk
Geological age:	Danian and late Cretaceous

Field name:	**Gert**
Location:	Blocks 5603/27 and 28
Concessionaire:	A.P. Møller
Operator:	Mærsk Olie & Gas AS
Discovered:	1984
Dev. plan submitted:	1991
Water depth:	70 m (230 ft)
Reservoir depth:	4,900 m (16,100 ft)
Reservoir rock:	Sandstone
Geological age:	Late Jurassic

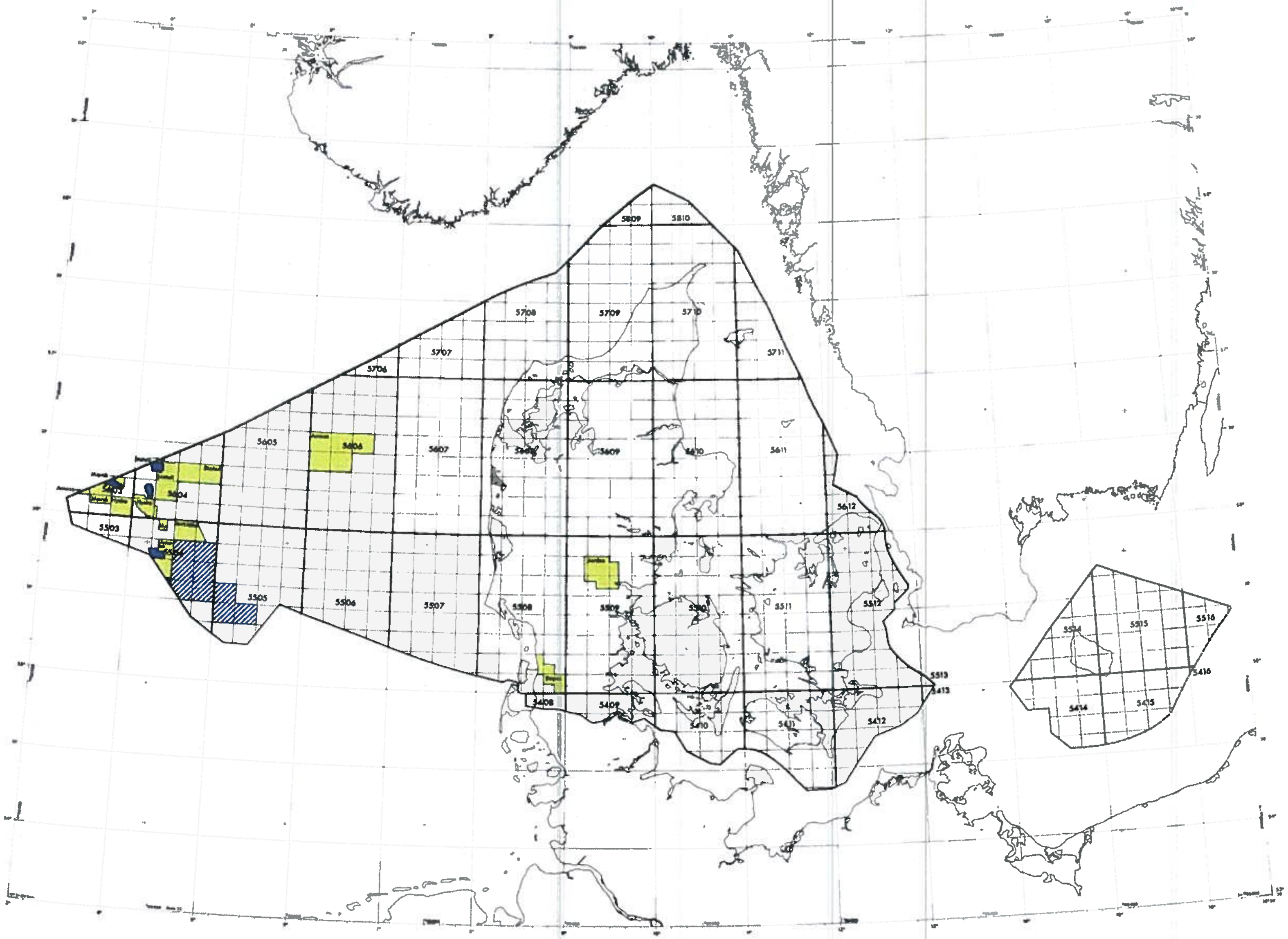
Appendix E 2 and E 3

Field name:	**Elly**
Location:	Block 5504/6
Concessionaire:	A.P. Møller
Operator:	Mærsk Olie & Gas AS
Discovered:	1984
Dev. plan submitted:	1992
Water depth:	40 m (131 ft)
Reservoir depth:	3,200 m and 4,000 m (10,500 ft and 13,000 ft)
Reservoir rock:	Chalk and sandstone
Geological age:	Late Cretaceous and Jurassic

Prospect and Field Designations

Prospect Name	Field Name
Abby	Dan
Vern	Gorm
Cora	Tyra
Ruth	Skjold
Middle Rosa	Rolf
Bent	Roar
Anne	Kraka
Lulu/West Lulu	Harald
East Rosa	Dagmar
Boje/North Jens/Bo	Valdemar
North Arne/Otto	Svend
Nils	Regnar

The Danish Licence Area January 1, 1994



DUC 1962 Licence

Contiguous Area (DUC 1962)

Licences issued after 1981

Danish Energy Agency