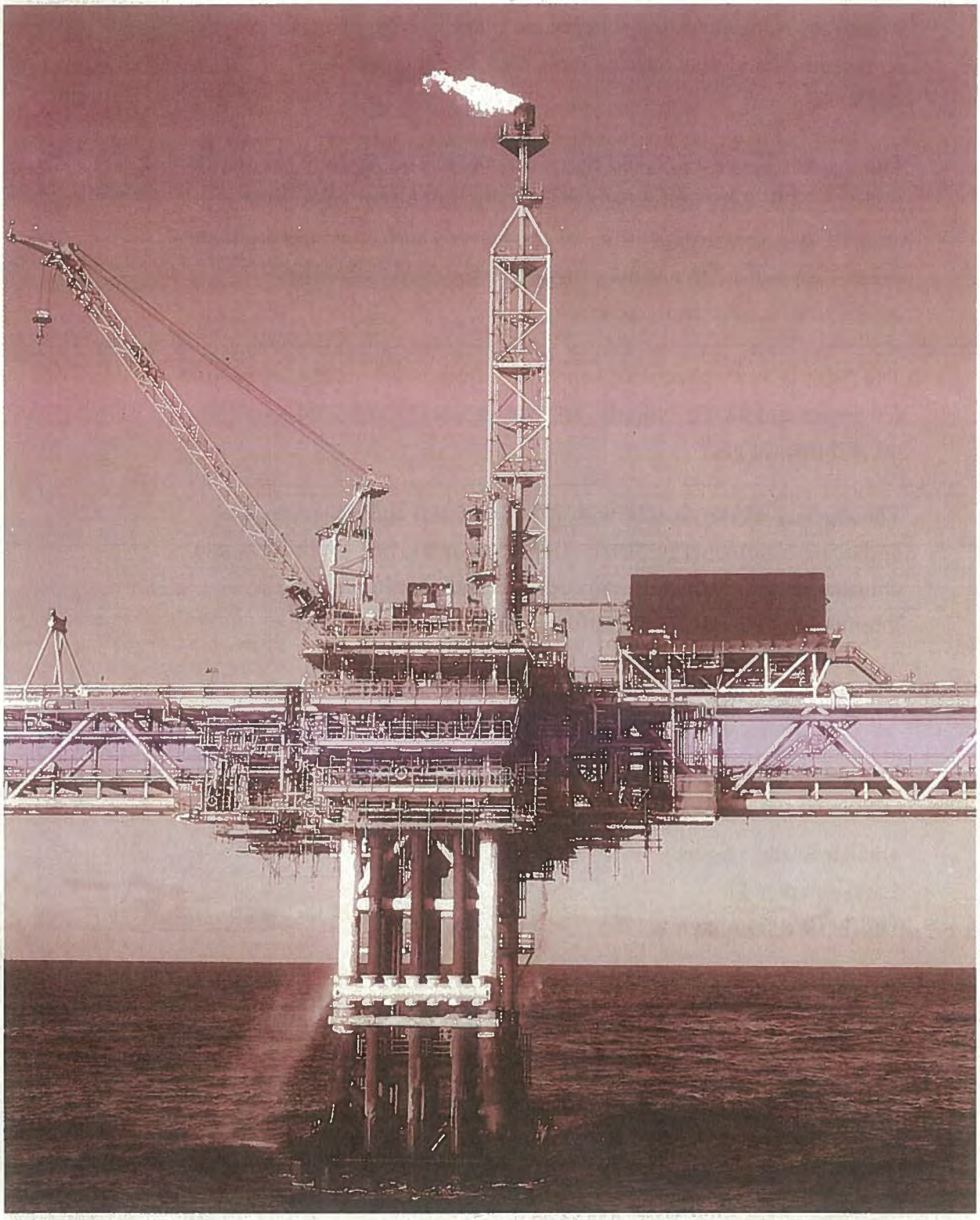
MINISTRY OF ENERGY
Danish Energy Agency



Oil and Gas Production in Denmark 1991

The Danish Energy Agency is an institution under the Ministry of Energy. Other institutions are Risø Research Centre and the Mineral Resources Administration (Greenland), The Ministry further represents public interests in Dansk Olie og Naturgas A/S (D.O.N.G.).

The Agency was established by law in 1976. The Agency assists the Minister of Energy and other government authorities in energy matters. It is the responsibility of the Agency to follow and evaluate the Danish and international progress in the fields of energy production, supply and research.

The Agency in its executive capability administers energy legislation for power and heating supply, alternative energy and production of oil and natural gas.

The Agency works closely with local, regional and departemental authorities, with energy distribution companies, licence holders and consumers. The Danish Energy Agency also participates in international energy co-operation.

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Foreword

1991 was a good year for exploration and production of Danish oil and natural gas.

Oil and natural gas production reached an unprecedented level, and Denmark became self-sufficient in oil and natural gas taken as a whole. Danish oil production meets 86% of our needs. Natural gas supplies were sufficient to meet domestic demand, and another 1.3 billion Nm^3 was exported to Sweden and Germany.

Danish energy production now covers 61% of total consumption.

Exploration continued at a high level of activity, and three interesting discoveries which will be evaluated over the next few years were made.

The gratifying production experience, in particular the use of water injection in the oil fields and the drilling of horizontal production wells, means that the Danish Energy Agency has upgraded its appraisal of Danish oil and natural gas reserves considerably. Thus, estimated oil reserves have increased by 22% as compared to last year, and natural gas reserves have been written up by 17%.

In the short term, the increase in estimated oil reserves is expected to result in the production of about 9 million m^3 of oil per year, possibly increasing to about 10-11 million m^3 per year in the somewhat longer term.

The increased natural gas reserves will make it possible to supply more natural gas than that supplied under existing contracts.

Field development activities were extensive in 1991, affecting all producing fields. At the same time, the Kraka and Dagmar oil fields were brought on stream. Again this year, the large-scale oil and gas activities were carried on without any major accidents, either to persons or to the environment.

Copenhagen, July 1992

Ib Larsen

Director

Conversion Factors

Conversion Factors

1 m^3 Crude Oil = 0.859 tonne ≈ 36.3 GJ

1 m^3 Motor Gasoline = 0.75 tonne ≈ 32.9 GJ

1 m^3 Middle Distillate = 0.84 tonne ≈ 35.9 GJ

1 m^3 Heavy Fuel Oil = 0.98 tonne ≈ 39.6 GJ

1 barrel = 0.159 m^3

1 Nm^3 Natural Gas = 1.057 Sm^3

1 tonne Steam Coal ≈ 25.3 GJ

1 tonne Coal (other) ≈ 26.1 GJ

Nm^3 (normal cubic metre) at 0°, 101.325 kPa

Sm^3 (standard cubic metre) at 15°C, 101.325 kPa

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

Contents

As of January 1, 1992, the Danish Energy Agency is composed of a management, secretariat and nine divisions. In connection with the reorganization and rationalization currently underway in the public sector, the number of divisions was reduced from eleven to nine in 1991. At the beginning of 1992, the Agency employed the equivalent of 173 full-time employees.

Oil and gas exploration and production activities are handled by three divisions, viz. divisions 3, 4 and 6, which cover the following areas of responsibility:

The Third Division. Exploration and Production - Oil and Gas

Seismic surveys, exploration, development and production. Licensing rounds, proposed strategies for inviting applications and awarding licences.

Assessment of resources and reservoirs as well as geological evaluations. Assessment of reserves, forecasts and analyses of Danish production potential, as well as evaluation of proposals for development plans and infrastructure. Oil and natural gas economy. Supervising the operations carried on by licensees, etc.

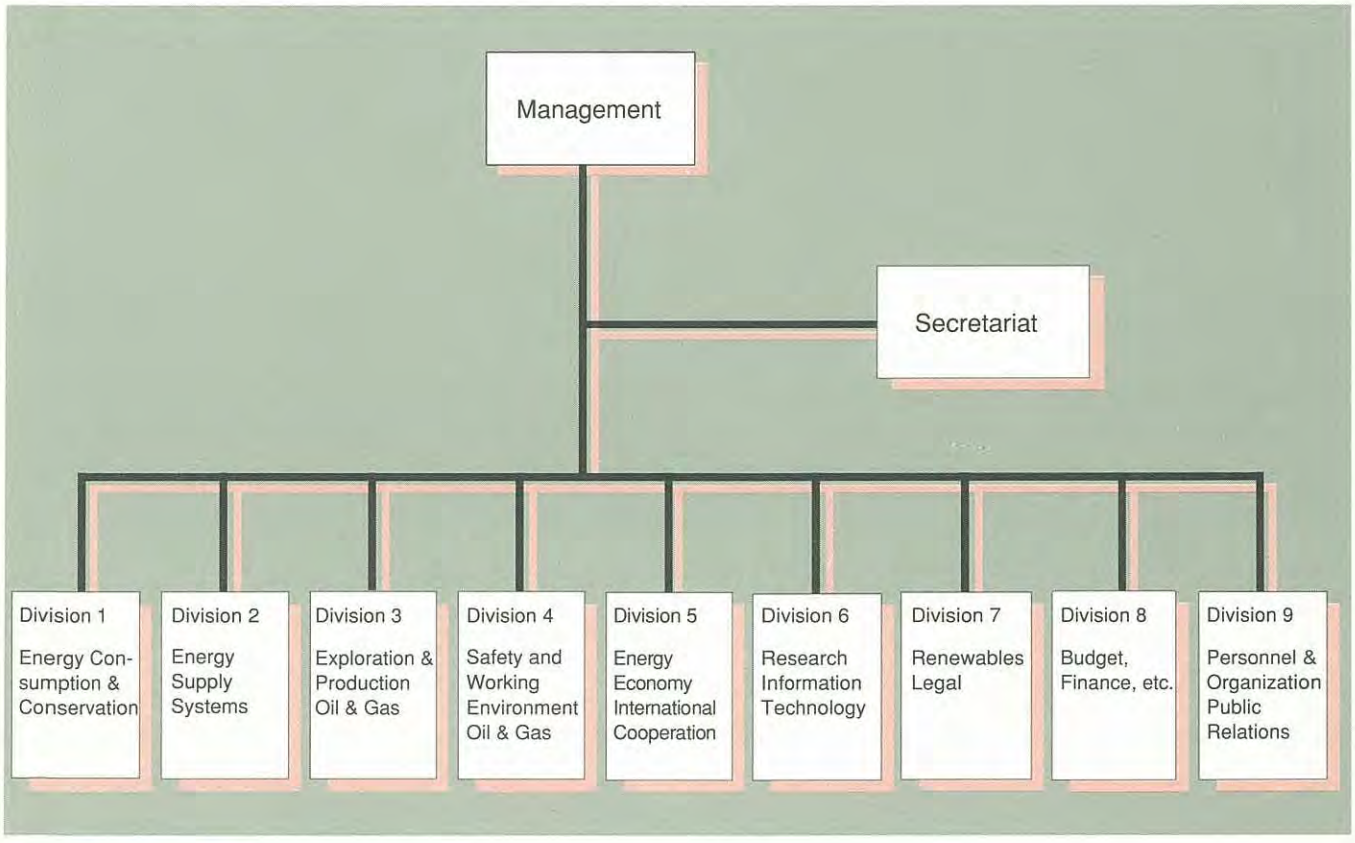
The Fourth Division. Safety and Working Environment -Oil and Gas

Safety and working environment on offshore installations, safety supervision of drilling operations, approving manning tables and supervising D.O.N.G. A/S' transmission systems. Drawing up regulations in this connection. Membership of the Action Committee and the Coordination Committee.
At the beginning of 1991, the division was reorganized so that the supervisory activities are now handled by two sections, one responsible for fixed offshore installations, i.e. production facilities complete with pipelines in the North Sea, and the other dealing with mobile offshore installations, i.e. drilling rigs, crane barges, hotel platforms, etc. The reason for dividing these responsibilities between two different sections is the dissimilarity between regulations and areas of work for mobile and fixed offshore installations.

The Sixth Division. Research and Information Technology

In addition to informatics, this division coordinates training and research activities in the oil and gas sector.

Fig. 1.1 Organization of the Danish Energy Agency



In 1991, four exploration wells and two appraisal wells were spudded in the North Sea, an increase in activities in relation to 1990. This higher level of activity is expected to be maintained in 1992, primarily because the drilling obligations imposed on the licensees in the third licensing round have to be fulfilled.

Drilling activities in 1991 resulted in three new discoveries. The discovery made by the Statoil group, Amalie, has attracted special attention.

Dansk Undergrunds Consortium (DUC) continues its exploration activities in the Contiguous Area. In 1991, the Danish Energy Agency approved a revised work programme for this area for the years 1991-1996. The work programme comprises various geological and geophysical surveys as well as drilling activities.

An outline of the 18 groups which had been awarded licences for exploration and production in Danish territory at end-1991 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-1991.

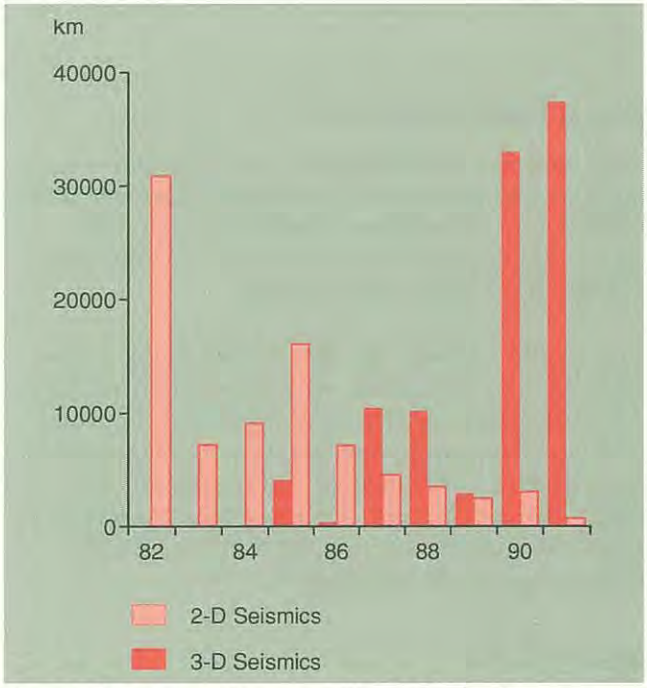
Seismic Surveys

In total, 38,143 km of seismic surveying data were collected in Denmark during 1991. Three-dimensional (3-D) surveys accounted for 37,426 km, and the remaining 717 km of seismic lines were shot in two-dimensional (2-D) surveys. The 3-D surveys provide a much better basis for accurate mapping of the subsurface, but require a closer grid of seismic lines. Nearly all seismic surveys are carried out by Danish licensees. Only 43 km of data were collected by Norwegian licensees in border-straddling structures.

As appears from Fig. 2.1, the level of activity remains as high as in 1990. This is due primarily to the 3-D surveys made by DUC. The high level of activity is expected to be maintained in 1992.

78 km of seismic surveying data were collected on shore in Mid Jutland under the so-called Give licence (9/89). The survey was performed by DANOP in its capacity as operator for the Jordan group. A global geochemical survey was carried out by Hoff International Offshore Team Inc. in 1991. A total of 214 cores were extracted from the sea bed in Danish waters, primarily in the Baltic. This survey is part of a global geochemical investigation aimed at acquiring further knowledge about hydrocarbon potentials.

Fig. 2.1 Annual Seismic Survey Activities 1982-1991



Appendix C contains an outline of seismic surveys performed in 1991.

Drilling Activities

In 1991, four exploration wells were spudded. These wells are described in more detail in the section on exploration wells. In addition, two appraisal wells were spudded. These wells are described in the section on appraisal activities.

A total of 13 production wells were drilled in connection with field developments in the North Sea. Ten of these wells are horizontal wells. Five wells were spudded in the Dan Field, four in the Tyra Field, three in the Skjold Field, and one in the Rolf Field. As appears from Fig. 2.3, the high level of activity from 1990 was maintained in 1991. In 1992, it is expected that at least as many wells will be drilled in the producing fields. As in 1991, the majority of these wells will be horizontal.

Finally, one well was drilled in connection with establishing a gas storage facility near Stenlille on Zealand.

The wells in the North Sea were drilled by seven different rigs, operating for a total period of approx. 63 rig months. The rigs used were Shelf Driller, Mærsk Endeavour, West Sigma, Mærsk Giant, West Kappa, Neddrill Trigon and Mærsk Jutlander. The onshore rig Kenting 31 was used for drilling the well at Stenlille.

Exploration Wells

The following exploration wells were spudded in 1991:

Skjold Flank-1 5504/16-6

This well was drilled in DUC's Contiguous Area, approx. four km north of the Skjold platform. The objective of the well was Middle Jurassic sandstone, analogous to the reservoir discovered when drilling the Alma-1 well in 1990.

The Skjold Flank-1 well was drilled in the period from May to September, with Mærsk Olie og Gas AS as the operator. The total depth was 4,550 metres, and traces of hydrocarbons were encountered at a depth of 3,000 metres. The results are currently being evaluated. An appraisal programme for the discovery was submitted to the Danish Energy Agency in March 1992.

Eg-1 5503/4-2

This well was drilled in an area of the North Sea allocated to the Agip group in the second licensing round. It was drilled from June to September 1991 with Agip as the operator to a total depth of 4,500 metres below sea level, reaching layers presumed to be from the Permian period. The Eg-1 well encountered traces of hydrocarbons in Jurassic sandstone, but no production test was carried out.

Fig. 2.2 Exploration and Appraisal Wells 1982-1991

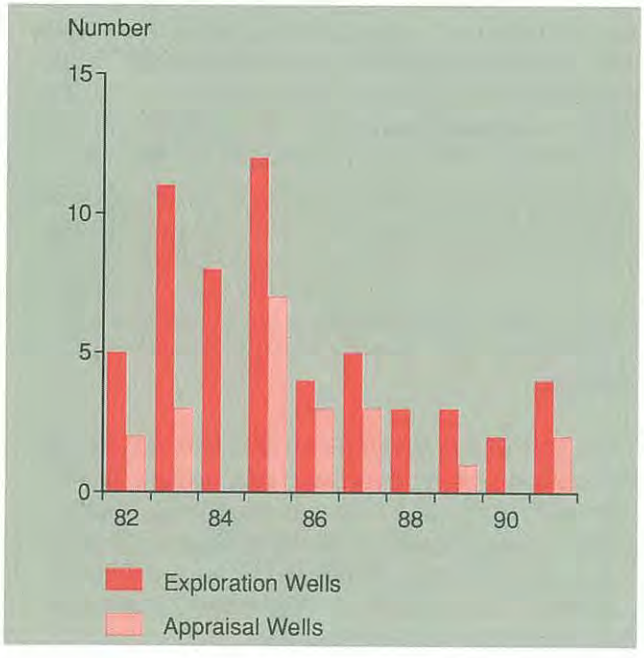
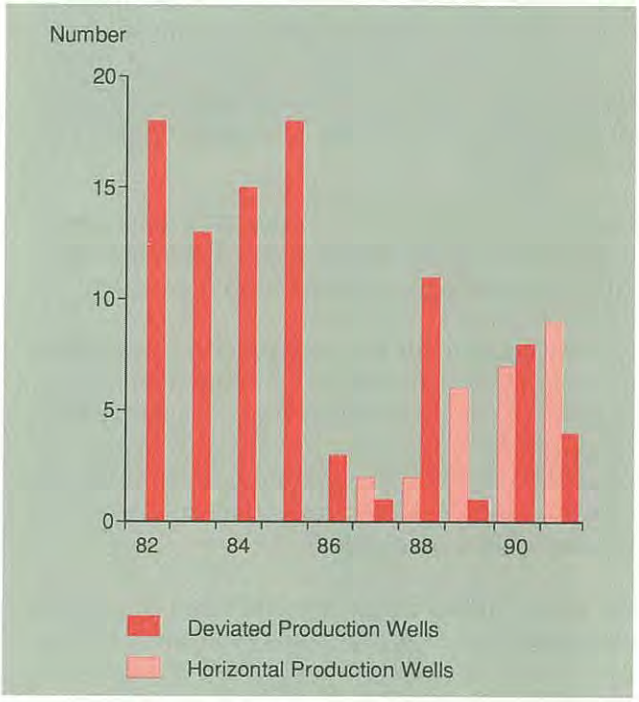


Fig. 2.3 Production Wells 1982-1991



Baron-2 5604/30-3

This well was drilled in an area of the North Sea which was awarded to the Norsk Hydro group in the third licensing round. Drilling operations were carried on from August 1991 to January 1992 with Norsk Hydro as operator. It terminated in layers of late Jurassic age at a total depth of 5,100 metres vertically below sea level.

The Baron-2 well confirmed the presence of hydrocarbons in chalk layers in the so-called South Arne structure, which was previously penetrated by DUC when drilling the well I-1. No production test was carried out in Baron-2. The Norsk Hydro group will continue its evaluation of the area. The Baron-1 well was drilled approx. 20 metres from Baron-2. Due to technical problems, drilling had to be stopped at a depth of about 1,000 metres.

TWC-3P 5504/11-3

TWC-3 was drilled in the Contiguous Area in the Tyra Field as a combined exploration and production well. TWC-3P was drilled in the period from September to December 1991 with Mærsk Olie og Gas AS as the operator.

New Discoveries

In addition to the discoveries made by the wells Skjold Flank-1 and E-5 (the latter is described in the section on appraisal wells), in 1991 hydrocar-

bons were encountered by the Amalie-1 well, spudded in 1990.

Amalie-1 5604/26-2

This well was drilled approx. 12 km southeast of the Harald Field, in an area of the North Sea allocated to the Statoil group in the second licensing round. It was drilled from August 1990 to June 1991 with Statoil as operator to a total depth 5,320 metres below sea level. The well reached layers of Jurassic age, and confirmed the presence of oil and gas in several Jurassic and Cretaceous layers. Production tests were attempted in three different layers, two of them successful. Both oil and gas were produced in these tests.

The Danish Energy Agency considers the results promising, but more investigations are needed in the area in order to better assess the extent of the oil and gas reserves in the new discoveries. In January 1992, the Statoil group submitted an appraisal programme for the new discovery to the Danish Energy Agency.

One encouraging factor is that the Amalie well encountered oil and gas in deep sand layers. Only very few discoveries of this nature have been made in Danish territory, and no production has been initiated from these layers as yet.

Appraisal Activities

The following appraisal wells were spudded in 1991:

South East Tyra (E-5) 5504/12-4

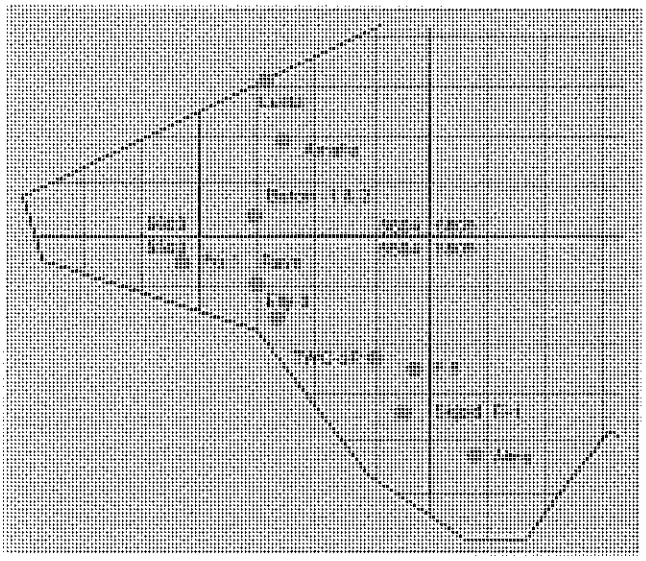
The purpose of drilling this well was to get information about the southeastern part of the reservoir in the Tyra Field in the Contiguous Area. It was drilled from February to May 1991 with Mærsk Olie og Gas AS as operator.

The well, which reached a total depth of 2,163 metres, confirmed the presence of hydrocarbons, and a production test was performed. In November 1991, Mærsk Olie og Gas AS submitted an appraisal programme to the Danish Energy Agency. The programme outlines the further appraisal work which Mærsk Olie og Gas AS intends to carry out in the southeastern part of the Tyra Field.

Elly-3 5504/6-4

This well is an appraisal well drilled in the Elly Field, which was declared commercial in 1988.

Fig. 2.4 Exploration Wells and Discoveries in the Central Graben



Elly-3 was spudded in September 1991 with Mærsk Olie og Gas AS as operator. A production test was carried out in January 1992.

Moreover, the Amoco group and DUC evaluated the following discoveries in 1991:

Ravn 5504/1

The Amoco group made a discovery in the Ravn-1 well, which was drilled in 1986. During testing, oil was produced from Jurassic sandstone layers.

The Amoco group is still carrying on exploration in the area as well as evaluating the discovery made; see below under "Changes in Licences".

Alma 5505/17

When drilling the Alma-1 well in 1990, DUC made a discovery in a Middle Jurassic reservoir. DUC is still evaluating this discovery, and in this connection, the Danish Energy Agency approved an appraisal programme for Alma in 1991.

Changes in Licences

Amoco 2/84 5504/1, 2, 5 and 6

The Amoco group obtained a further two-year extension of licence 2/84, which thus expires in 1994. The group has drilled three wells in the area. A discovery was made in the Ravn-1 well, which was drilled in 1986. The two next wells, Ravn-2 and Falk-1, were drilled in 1987 and 1989, respectively.

Jordan 9/89 5509/5, 6, 9 and 10

In 1991, an extension of the area allocated to the Jordan group under licence 9/89 was granted. Consequently, this licence covers block 5509/6 and parts of blocks 5509/5, 7, 9, 10 and 11.

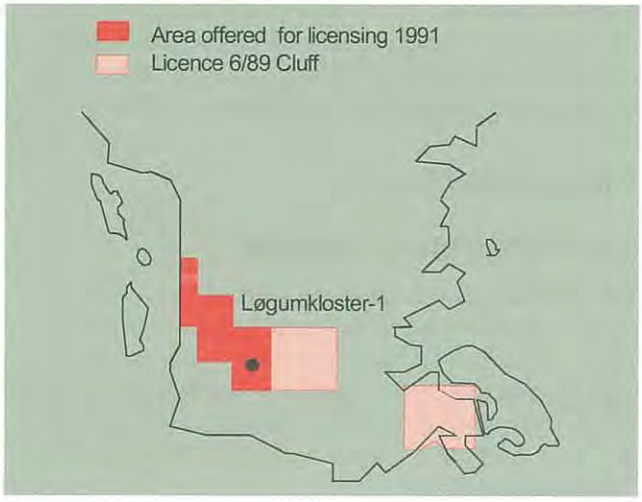
The Løgumkloster Licensing Round

In December 1991, the Ministry of Energy invited applications for an exploration licence in an area near Løgumkloster in South Jutland, the deadline for submitting applications being March 3, 1992.

Hydrocarbons were discovered by DUC in 1980 in the well Løgumkloster-1. However, this discovery was not declared commercial, among other reasons, because the amounts of hydrocarbons produced were considered insufficient. For another, nitrogen and the poisonous gas hydrogen sulphide were produced together with the hydrocarbons during the production test, and removing these gases with the technology available at the time would have been very costly.
Therefore, in 1985, the area around the discovery was relinquished to the state. Since then, Dansk Olie- og Gasproduktion A/S (DOPAS) has carried out thorough investigations resulting in a more optimistic evaluation of the area. Against this background, the Ministry of Energy has invited applications for a licence in this area. The area offered for licensing is about 290 km2 and covers parts of blocks 5508/27, 28 and 32 (Fig. 2.5). This licensing round differs from previous rounds in that in advance, DOPAS was granted a 50% share of the consortium assumed to be set up on the basis of applications received. Moreover, it is a condition that the operatorship will be undertaken by DANOP. Minimum requirements have been set in advance for the work programme, which includes one unconditional well in the main prospect near Løgumkloster, as well as two conditional wells (drill or drop) in the remaining prospects within the licensed area. On the basis of the applications received, an exploration licence covering part of blocks 5508/27, 28 and 32 was awarded on May 6, 1992 to a consortium with the following participants:

Dansk Olie- og Gasproduktion A/S	50%
RWE-DEA Denmark Oil GmbH	35%
Ruhrgas Aktiengesellschaft	10%
DENERCO K/S	5%

Fig. 2.5 Area Offered for Licensing in South Jutland



Relinquishments

Some of the areas awarded to groups of companies in the second licensing round in 1986 and in the third licensing round in 1989 were relinquished in the course of 1991. The Norsk Hydro group relinquished areas near Bornholm in blocks 5514/29 and 30, as well as in blocks 5414/1 and 2, comprised by licence 5/86. The Pernille-1 well was drilled under this licence. The Cluff group relinquished two of the four blocks comprised by licence 6/89, viz. blocks 5409/2 and 5509/30. So far no wells have been drilled under this licence.

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 1991, data regarding the following exploration and appraisal wells were released:

Offshore:

Lulu-2	5604/22-2	DUC
East Rosa-3	5504/15-5	DUC
Ravn-1	5504/01-2	Amoco
East Rosa Flank-1	5504/15-6	DUC
Mid-Rosa Flank-1	5504/15-7	DUC
West Lulu-4	5604/21-6	DUC
Gwen-2	5604/29-3	DUC
Felicia-1	5708/18-1	Statoil
Tordenskjold-1	5505/03-2	DANOP
Pernille-1	5514/30-1	Norsk Hydro

Onshore:

Borg-1	5508/32-2	DANOP

Information about released well data is provided by the Geological Survey of Denmark.

In 1991, Danish oil and gas production took place in seven fields: Dan, Gorm, Skjold, Rolf, Tyra, Kraka and Dagmar. The Kraka and Dagmar Fields were brought on stream in the year under review. Dansk Undergrunds Consortium, DUC, is in charge of recovery from all these fields. The operator is Mærsk Olie og Gas AS.

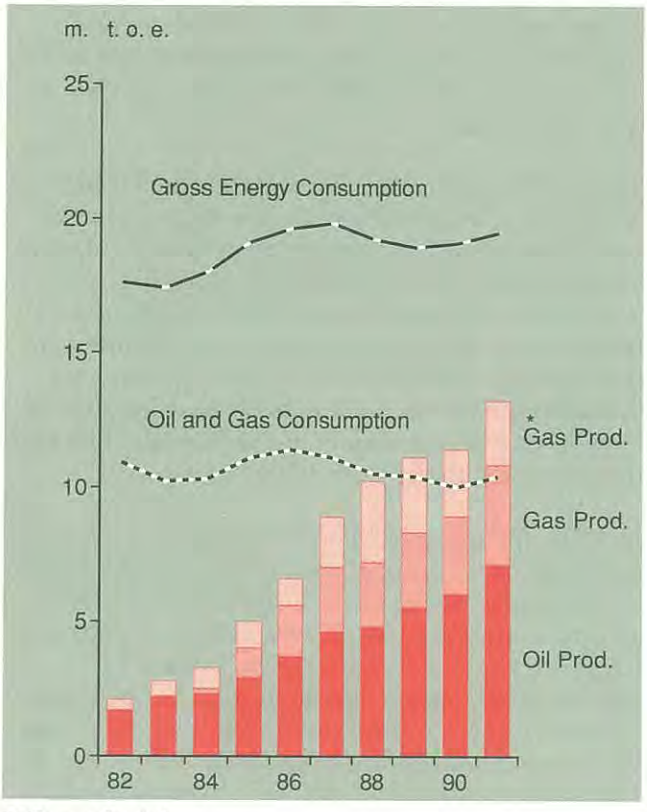
All the fields mentioned above are situated in the Contiguous Area in the southern region of the Danish area in the Central Graben.

Oil and Gas Production

Total oil and condensate production in 1991 amounted to 8.3 million m^3, equal to 7.1 million tonnes, an 18% increase as compared to 1990.

Gas production amounted to 5.76 billion Nm^3 (normal cubic metres), an increase of 12% in relation to 1990. Of this amount, 3.67 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, 3.51 billion Nm^3 (61%) was supplied to Dansk Naturgas A/S, while 1.80 billion Nm^3 (31%) was reinjected in the Gorm and Tyra Fields.

Fig. 3.1 Consumption and Production of Oil and Natural Gas 1982-1991



*) Gas not landed.

The production of oil and gas in 1991, including the amount consumed on the platforms, totalled 10.7 million t.o.e (tonnes oil equivalent), which is 21% more than in 1990.

Domestic energy consumption in 1991 totalled 19.4 million t.o.e., while the consumption of oil products and natural gas amounted to 10.5 million t.o.e. Thus, in 1991, the degree of self-sufficiency for hydrocarbon products (oil and gas) was 103% against 89% in 1990. At the same time, the degree of self-sufficiency in oil rose from 75% in 1990 to 86% in 1991.

The annual oil and gas production figures for the period from 1972 to 1991 are shown in Appendix D together with an outline of monthly production for 1991. Moreover, Appendix D contains two outlines of domestic energy consumption and production from 1972 to 1991, distributed on fuels and utilization, respectively, as well as financial key figures for Danish oil and gas production for the period 1972-1991.

Gas Flaring

A fraction of the gas produced (4%) is used for energy supplies to the platforms in the North Sea, while about the same amount had to be flared, and thus was not utilized.

In 1991, 227 million Nm^3 of gas was used as fuel.

The gas flared in 1991 amounted to a total of 223 million Nm^3, of which 58 million Nm^3 was sour gas (i.e. containing hydrogen sulphide) from the Dagmar Field. In the initial production period, special rules apply to gas flaring in the Dagmar Field, allowing gas to be flared in excess of the limits otherwise applicable. Special rules have been drawn up for Dagmar due to the problems of utilizing the poisonous gas from the field.

In the remaining fields, it is allowed to flare up to 0.35 million Nm^3 of gas per day during normal operations. This corresponds to 128 million Nm^3 on an annual basis.

An exemption from the existing flaring restrictions was granted in 1991 in connection with the implementation of projects for expanding the gas processing facilities at the Dan Field.

Oil and Condensate Recovery in 1991

1991 was an eventful year for the development of oil and gas production in Denmark.

For the first time since 1986, two new oil fields were brought on stream. Kraka and Dagmar increased oil production by approx. 20,000 barrels per day.

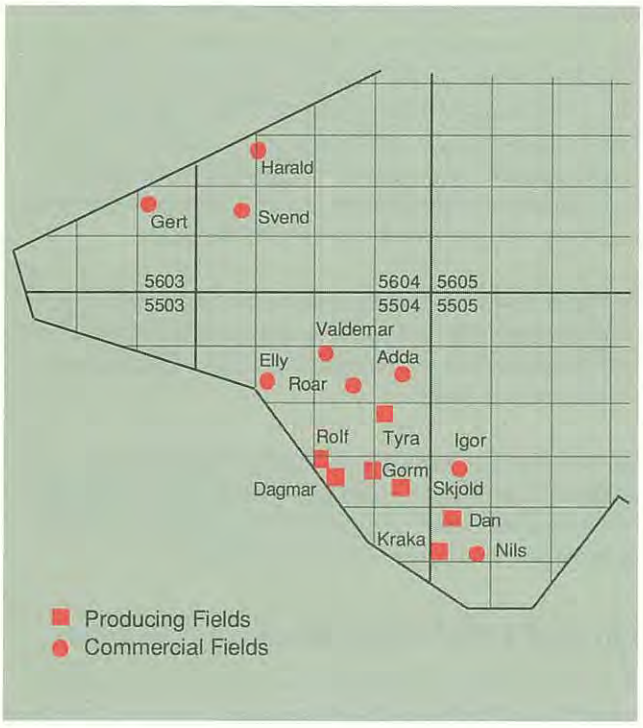
In addition, development projects were implemented at all the existing five fields.

In the course of the year, extensive new development plans for two of the existing fields, Dan and Gorm, were presented, along with a plan for accelerated production from two fields in the so-called northern area, viz. Svend and Harald.

For the Dan and Gorm development projects, water is injected into the reservoirs on a large scale. In both fields, water-injection pilot projects have been implemented in recent years, and the positive results are now being utilized in the new projects, both planned for implementation over a four- or five-year period.

An application from June 1991 for accelerating the development of the Svend and Harald Fields in the northern part of the Danish Central Graben was approved by the Ministry of Energy at the beginning of 1992. The plan envisaged integrated development of these fields with the Valdemar Field. Subsequently, Mærsk Olie og Gas AS decided not to implement the revised development plan, and the three fields will thus be developed in accordance with the previous approval from 1990.

Fig. 3.2 Danish Oil and Gas Fields



In this connection, the start of production from the Valdemar Field will be postponed for one year.

In February 1992, Mærsk Olie og Gas AS obtained approval for postponing the start of production from the Roar gas field until October 1, 1994, i.e. one year later than stated in the 1990 approval. The postponement is due to the natural gas sales forecasts presented by Dansk Naturgas A/S.

Moreover, the Concessionaires submitted a development plan for the Gert oil field in 1991. In 1992 a development plan for the Elly gas field and a revised development plan for the Regnar (previously Nils) oil field were submitted.

In the revised plan for the development of the small Nils Field, the Concessionaires propose a satellite development hooked up to the Dan Centre, with production taking place from a subsea well. According to the application, this project will replace the development concept approved previously, comprising a simple three-legged platform, also hooked up to the Dan Centre. The Nils Field is still expected to be brought on stream about 1993/94.

To an increasing extent, recovery from the Danish fields takes place through horizontal wells. At end-1991, there were 24 horizontal producing wells in Danish territory, and this number will be increased considerably in future years, as the development of the Dan, Gorm, Tyra, Svend, Valdemar and Kraka Fields, and possibly the Roar Field as well, will be based either wholly or partially on this new technology.

State-of-the-art technology, which makes it possible to drill long wells producing from different zones, has gained increasing importance in Danish oil production. In a number of fields, these wells have been completed with extensive hydraulic fracturing of the reservoir, where the fractures are subsequently filled with sand. Most recently, hydrocarbons have been extracted from a number of open-hole sections which fan out from the last section of casing in the wells in question.

In 1991, the operator Mærsk Olie og Gas AS set new records by drilling some of the world's longest horizontal wells. In the Dan Field, the MFA-18 well is thus the longest well drilled to date using this technology - the total well depth is approx. 4,300 metres measured from the platform. Moreover, the TWB-11 well in the Tyra Field has the longest horizontal section so far, extending for more than 2,500 metres through a thin oil zone.

In autumn 1991, the capacity for transporting oil from the Danish North Sea fields was expanded by the commissioning of a booster facility near Filsø on the west coast of Jutland. When friction- reducing agents are added, it is thus possible to bring up to 190,000 barrels of oil ashore per day, corresponding to about 9.5 million tonnes on an annual basis.

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 seven fields which carried on production in 1991 is based on this grouping of fields.

Appendix E provides an outline of the producing fields which includes supplementary data.

The Dan Centre

This Centre is composed of the Dan and Kraka Fields, which are both producing fields, as well as the planned Regnar and Igor Fields.

Dan

Dan is an oil field with a free gas cap. Production was initiated in 1972. Through the 1970s, the field was developed in phases, and in 1987 the Dan F project, consisting of a new 24-slot platform complex, was implemented.

The first horizontal well, which was drilled on an experimental basis in 1987, led to vast expansion of primary recovery from the field in the period from 1988 to 1991. A total of 12 horizontal wells was drilled.

The water-injection pilot project initiated in 1987, where water was injected into a converted oil well adjacent to four traditional wells, was supplemented by a new pilot project in 1991, where water was injected into four converted production wells adjacent to a horizontal production well.

The satisfactory results of the development project based on horizontal wells as well as the initial water-injection attempts were the background for the Ministry of Energy's approval in October 1991 of the overall plan for further development of the Dan Field.

The plan envisages continued expansion of primary recovery through a more finely meshed network of wells. This means that an additional 18 horizontal production wells will be drilled.

Fig. 3.3 Oil Production from the Fields at the Dan Centre 1982-1991, million m³

In addition, water injection will be initiated in large parts of the field. For this purpose, four horizontal and eight conventional injection wells will be drilled, while nine existing production wells will be converted into injection wells.

The implementation of the development plan described above will provide the necessary experience for subsequently extending the secondary oil recovery technique to the remaining parts of the field, in particular to the area under the gas cap as well as the southern flank of the field.

The development project will require a considerable extension of the installations in the field, and it is planned to add two new platforms to the Dan F complex: A new gas flare platform (FD) and a new seven-slot wellhead platform (FE). Both platforms will be of the STAR type. The FE platform will be connected to the Dan FA platform by a bridge, where the new processing and injection water pumping facilities will be installed.

In the course of 1991, six new horizontal wells in the Dan Field were brought on stream. Moreover, reinjection of produced water into a converted production well was approved, so that at the end of the year, water was injected into six wells in the Dan Field.

In connection with the current development of the field, the capacity of the gas processing plant at Dan FC has been extended to a capacity of 150 MMscfd. Furthermore, water processing facilities (with a capacity of 30,000 barrels of water per day) have been installed on the bridge connecting the FB and the FC platforms at Dan F to replace the temporary facilities used in the initial phases of the pilot project.

For the purpose of the new pilot project, a pipeline for injection water has been laid between the Dan F complex and the Dan E platform.

At end-1991, production took place from five wellhead platforms, A, D and E, initially incorporating six wells each, as well as the FA and FB platforms, initially with 12 wells each.

The FA, FB and D platforms have been extended to accommodate a total of 25, 24, and 10 wells, respectively.

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

In 1991, Dan produced 1.72 million m^3 of oil compared to 1.58 million m^3 in 1990. Gas production amounted to 0.88 billion Nm^3.

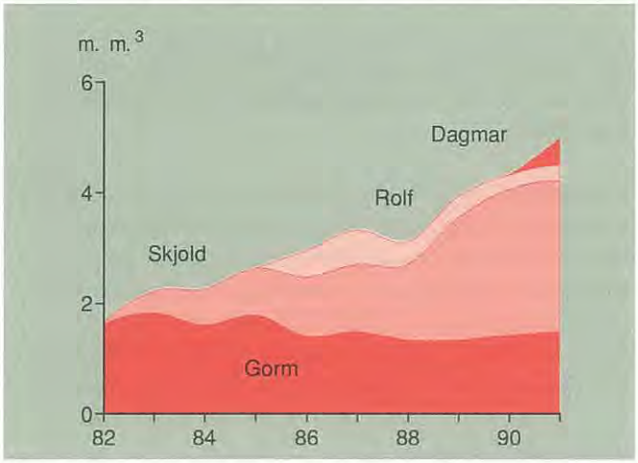
Kraka

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

Oil production was initiated from two horizontal wells in the field in March 1991. The implemented development plan represents the first stage of the development plan approved by the Ministry of Energy in 1988.

After the end of the six-month production testing period, an evaluation report was submitted to the Danish Energy Agency in September 1991, proposing that the production potential in the southern part of the field be evaluated by drilling a horizontal well.

Fig. 3.4 Oil Production from the Fields at the Gorm Centre 1982-1991, million m^3



The difficult recovery conditions, due partly to the low permeability of the reservoir and partly to the problems of preventing gas and water from penetrating the wells, have caused the Concessionaires to propose a conservative development strategy for the Kraka Field. Thus, the experience gained in each individual stage of development is subsequently evaluated with a view to planning the next stage. After another 12 months of production, it will be decided whether to proceed with the last step in this initial phase of the development plan for the Kraka Field, which provides for the drilling of more wells.

In 1991, 0.14 million m^3 of oil was produced at the Kraka Field.
Total gas production from the fields at the Dan Centre amounted to 0.94 billion Nm^3 in 1991, of which 0.82 million Nm^3 was transported to shore via the Tyra Centre. The rest of the gas was used as fuel on the platforms or flared.

The Gorm Centre

This Centre is composed of the Gorm Field and the adjacent satellite fields, Skjold, Rolf and Dagmar, all of which are producing fields.

Gorm

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

In 1989/90, secondary oil recovery by means of water injection was initiated in selected parts of the fields. These pilot projects were to form the basis for the later preparation of an overall plan for initiating water injection in the whole field.

In December 1991, DUC submitted a combined plan for the further development of the Gorm Field, based on secondary oil recovery by means of water injection. This plan provides for the drilling of up to 21 new wells. In addition, it is planned to convert nine existing wells into water injection wells.

A number of the new production and injection wells are envisioned as horizontal wells.

The Concessionaires' overall strategy for the further development of the field incorporates increased water injection and the discontinuance of

gas injection, while increasing the number of production wells, particularly at the crest of the structure.

The whole project is proposed to be implemented over a five-year period from 1992. All the additional installations which are required for implementing the current plan will be placed on the new Gorm F platform. Thus, a new deck will be installed on the platform, and to make room for the new wells, the two existing caissons, which have a capacity for a total of eight wells, will be supplemented by two new, larger caissons with a capacity for a total of 16 wells. Accordingly, Gorm F will be able to accommodate 24 wells.

Thus, a large extension of the Gorm F platform, which became operational in June 1991, is already being prepared. The Gorm F platform took a heavy load off the processing facilities at Gorm C, as the stabilization plant here is no longer to handle production from the satellite fields, Skjold and Rolf.
Moreover, the completion of the platform meant that the provisional water-processing plant placed on the rebuilt drilling rig at the Skjold platform was no longer required.

In 1991, the Gorm Field produced 1.50 million m^3 of oil, a 4% increase as compared to 1990.

Skjold

Skjold is an oil field located 10 km southeast of the Gorm Field. The field has been developed as a satellite to Gorm.

Production commenced in 1982, and in 1986, water flooding of the reservoir was initiated. At the turn of the year 1991/92, production was taking place from four wells, while water was injected in six wells.

Another three wells were added in 1991, viz. one production well and two water injection wells. The ongoing development of the Skjold Field is aimed at displacing the oil from the whole reservoir into the producing wells at the top of the reservoir, through gradual water flooding of the whole field.

Future recovery is expected to take place from an increased number of production wells in the crestal part of the structure, with the use of increased water injection at the flanks of the field.
In 1991, water penetration was detected in two of the production wells in the Skjold Field. However, the water content of the oil produced is so insignificant that it has been possible to maintain the same level of production in the field.

As mentioned above, in June 1991, new processing facilities on the Gorm F platform for handling the oil from the satellite fields connected to the Gorm Centre were taken into operation. The gas produced in the Skjold and Rolf Fields is transmitted from the Gorm F plant to the gas processing facilities at Gorm C for further processing.

In 1991, Skjold produced 2.73 million m^3 of oil, up 4% on the 1990 figure.

Rolf

Rolf is an oil field situated 15 km west of the Gorm Field. In 1986, the field was developed as a satellite field to Gorm, with production taking place from one well.

From June 1991, the Rolf production was processed together with the Skjold production at the new processing facilities at Gorm F.

In May 1991, production was initiated from one more well in the field. At the same time, recovery from the original production well was supplemented by recovery from the Zechstein carbonates under the chalk reservoir.

Since 1987, oil production has increasingly been accompanied by water.

The production of water increased at a moderate rate in 1991, so that about one half of production consists of water today.

In 1991, the field produced 0.29 million m^3 of oil, which is 8% more than in 1990.

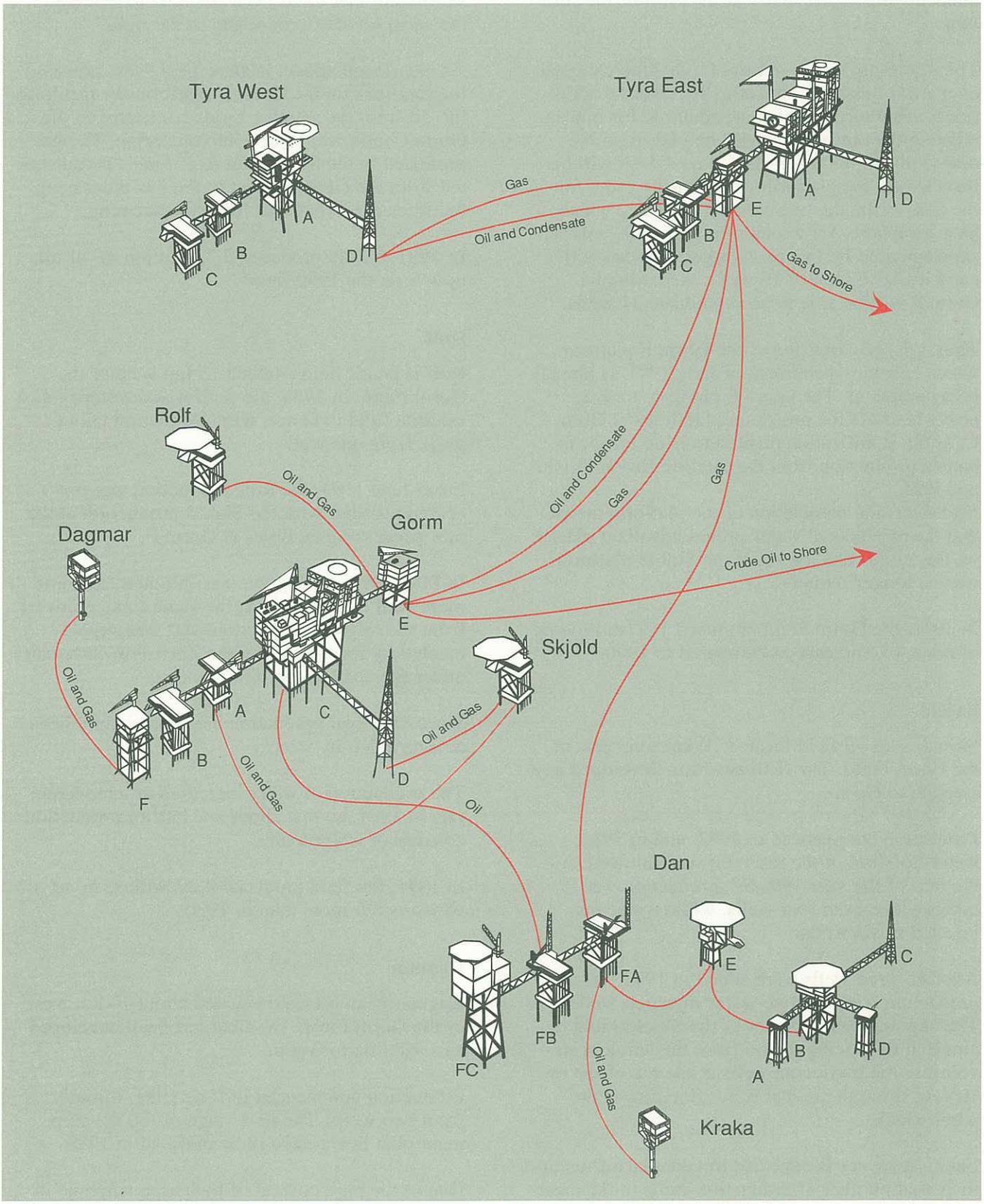
Dagmar

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

Production commenced in June 1991, initially from two wells. The next stage of the development plan is expected to be initiated in 1993.

Due to the high content of hydrogen sulphide in the associated gas, the production from Dagmar is processed by special facilities on the new Gorm F platform. In the initial production period, some of the gas is used as fuel, while the rest is flared.

Fig. 3.5 Production Facilities in the North Sea



The geology of the field is subject to great uncertainty. Thus, it is probable that the field contains several, separate reservoirs.

In February 1992, the Danish Energy Agency granted its approval for the drilling of one appraisal well in the western part of the field.

Due to difficult drilling conditions, it is not possible to reach the whole reservoir from the existing platform. Thus, if production is to take place from the new well, this will require a subsea production system or an independent platform.

In 1991, the Dagmar Field produced 0.48 million m^3 of oil. Gas production amounted to 65 million Nm^3, of which 58 million Nm^3 was flared without being utilized.

With the exception of the Dagmar Field, production totalled 1.09 billion Nm^3 of gas in the fields connected to the Gorm Centre. Of this amount, 215 million Nm^3 of gas was supplied to Dansk Naturgas A/S via the Tyra Centre, while 735 million Nm^3 was reinjected into the Gorm Field.

The Tyra Centre

This Centre is composed of the Tyra Field, which is currently the only producing field, and the planned satellite fields, Roar, Adda and Valdemar, as well as the new Elly Field.

Tyra

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

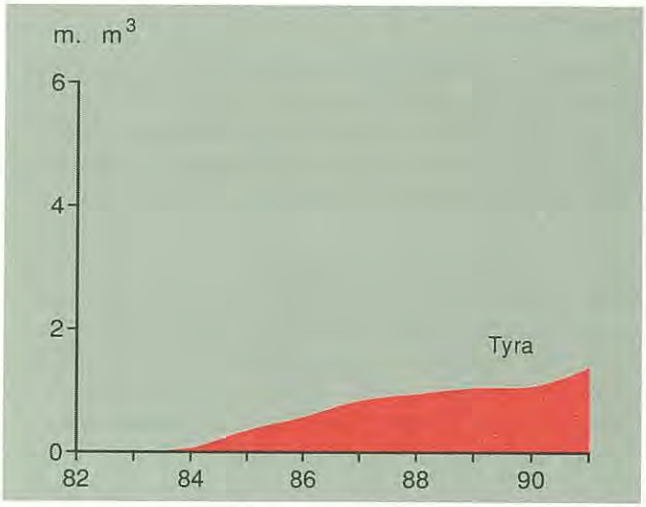
Ongoing testing has proved that the oil zone in the field, originally considered to be of only marginal interest, has greater oil production potential than previously assumed.

The drilling of long, horizontal wells, with multiple completion has yielded particularly encouraging results.

Already in 1990, two horizontal oil wells were brought on stream in the Tyra Field, with multiple completion used in one of the wells. Both wells proved that good results are obtainable in the Tyra Field's oil reservoir with horizontal drilling. Moreover, the new production technology holds great advantages. In February 1991, the Danish Energy Agency approved an extension of the ongoing testing to include new areas of the field through the drilling of three long, horizontal wells.

At the same time, the time limit for submitting an evaluation report comprising a plan for the further development of the Tyra Field was extended until September 30, 1992.

Fig. 3.6 Oil and Condensate Production at the Tyra Centre 1984-1991, million m^3



The preliminary results from the wells are encouraging, and the Danish Energy Agency has subsequently approved the inclusion of another horizontal well in the test programme.

The drilling of horizontal wells has increased the potential for exploiting the oil zone in the Tyra Field, and recovery from the oil zone is expected to be intensified in the next few years.

In an attempt to delimit the Tyra Field towards the southeast, an appraisal well, E-5, was drilled in 1991 approx. eight km southeast of the Tyra East complex. The well showed that parts of the southeastern flank of the Tyra structure may contain separate accumulations of hydrocarbons. As mentioned in the section on exploration, Mærsk Olie og Gas AS submitted a report on the relevant discovery, Southeast Tyra, including a programme for further evaluation work, for the Danish Energy Agency's approval.

In 1991, 3.67 billion Nm^3 of gas was recovered from the Tyra Field, of which 1.07 billion Nm^3 was reinjected. Thus, gas production has increased by 11% in relation to 1990.

Total oil and condensate production constituted 1.39 million m^3 in 1991, as compared to 1.08 million m^3 in 1990, an increase of 28%. A substantial portion of this increase is attributable to the greatly enhanced oil recovery from the field. Oil production accounts for 0.65 million m^3, bringing aggregate production from the oil zone up to 1.73 million m^3.

Field Developments in Progress

Valdemar

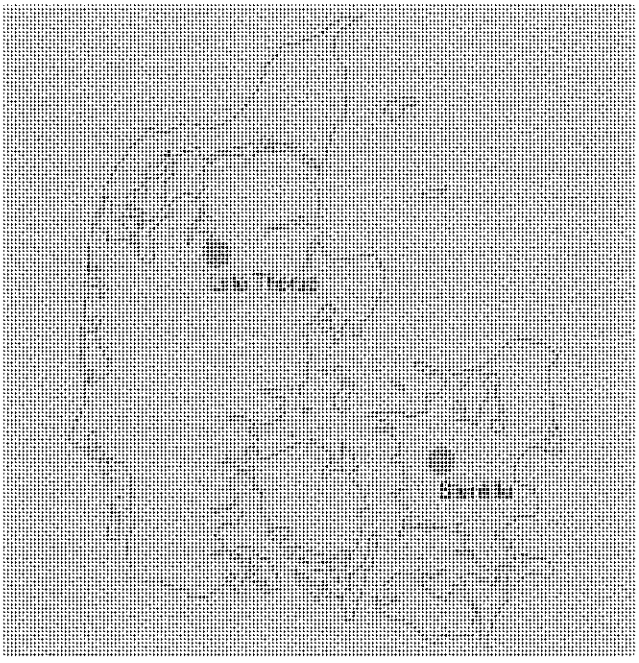
Valdemar consists of a number of separate oil and gas zones. The field is located approx. 20 km northwest of the Tyra Field. It covers an area of about 200 km^2, and is thus the largest Danish accumulation of hydrocarbons discovered so far.

The Valdemar Field incorporates the Bo discovery well, drilled in 1977, the Boje discovery well from 1982, and North Jens from 1985. In March 1988, the Ministry of Energy approved a development plan for the field. This plan provides for phased development of the field, beginning with the area around the North Jens well. According to the original plan, production from up to four horizontal wells should have been initiated by October 1, 1991.

However, recovery from the Barremian reservoir of extremely low permeability proved more difficult than first assumed, and the experience gained when 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 on July 13, 1990. The revised plan operates on the premise that production will start from three horizontal wells in December 1992.

A STAR platform is to be installed in the field, which will be hooked up with the processing plant at Tyra East.

Fig. 3.7 Natural Gas Storage Facilities



In June 1991, Mærsk Olie og Gas AS submitted a plan for accelerated production from the northern Harald and Svend Fields. The development of these fields was linked to development of the Valdemar Field. In light of the time schedule for implementation, the Ministry of Energy granted an application for postponing production startup in the Valdemar Field by 12 months, making the deadline January 1, 1994.

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 Facilities

As the natural gas market in Northern Germany and the former German Democratic Republic is advancing, Dansk Naturgas A/S estimates that in the case of an emergency, it will not be possible to import supplies from Germany as large as previously assumed. Therefore, on December 6, 1991, Dansk Naturgas A/S was granted permission by the Ministry of Energy to extend the natural gas storage facility at Ll. Torup by a seventh cavern. The capacity of the cavern is planned to be 60 million Nm^3, and it should be ready for use in 1996. The six existing caverns at Ll. Torup have a total capacity of 300 million Nm^3.

At Dansk Naturgas A/S' other natural gas storage facility, which is being established at Stenlille in a sandstone structure filled with water, work is progressing according to plan. Thus, at December 31, 1991, a total of eight wells had been drilled and 114 million Nm^3 of natural gas injected into the storage facility.

The storage facility will be provided with two extraction trains with a total extraction capacity of 7.2 million Nm^3 per day, as well as one or two gas injection trains with a capacity of 1.2 million Nm^3 per day each.

If, in an emergency, supplies of gas are required in excess of the amounts which can be supplied from Ll. Torup, up to 90 million Nm^3 can be supplied from the gas storage facility at Stenlille from end-1993. According to the gas storage plans available, Dansk Naturgas A/S will dispose of gas storage facilities with a total capacity of up to 450 million Nm^3 at end-1994.

Assessment of Reserves

An assessment of Danish oil and gas reserves is made annually by the Danish Energy Agency.

The Danish Energy Agency's assessment at January 1, 1992 shows an increase in oil and gas reserves of 22% and 17%, respectively. Although oil production was at an all-time high in 1991, total oil reserves are considered to be higher than at any time before. It will be possible to sustain oil production at the 1991 level for the next 27 years, against 21 years based on last year's assessment.

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

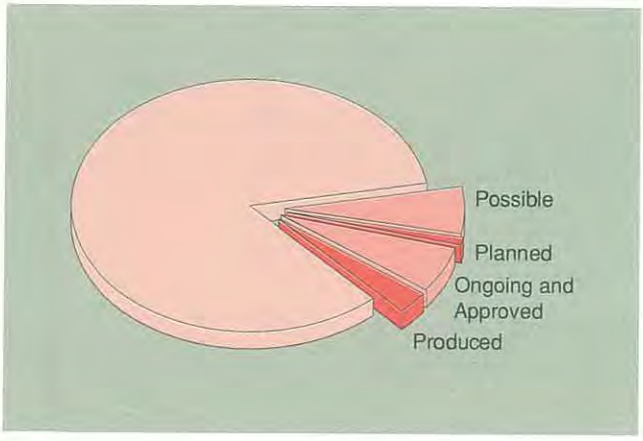
As in previous years, the assessment only includes reserves in structures in Danish territory where the presence of hydrocarbons has been conclusively established through drilling and testing.

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. 4.1, where the relative size of the individual categories reflects the oil and condensate recovered.

Fig. 4.1 Categories of Reserves



Categories of Reserves

The projects which are ongoing or for which the operator has submitted plans, are termed ongoing, approved and planned recovery.

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

The categories of reserves are defined as follows:

Ongoing Recovery

This category includes the reserves which 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 which is being considered by the authorities.

In connection with structures for which a declaration of commerciality has been filed, the reserves in question are also termed planned recovery.

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.

Table 4.1 Assessment of Reserves at January 1, 1992

	Oil and Condensate, million m³				Gas, billion Nm³			
	Produced	Low	Exp.	High	Produced	Low	Exp.	High
Ongoing and Approved Recovery					*Ongoing and Approved Recovery*			
Dan	12	28	42	55	Dan	5	12	18	23
Kraka	<1	1	2	3	Kraka	<1	<1	1	1
Regnar	-	<1	<1	1	Regnar	-	<1	<1	<1
Igor	-	<1	<1	<1	Igor	-	1	2	3
Gorm	16	7	13	18	Gorm	<1	3	5	7
Skjold	13	7	15	28	Skjold	1	1	1	2
Rolf	3	1	2	3	Rolf	<1	<1	<1	<1
Dagmar	1	<1	1	2	Dagmar	<1	<1	<1	<1
Tyra	6	5	7	9	Tyra	14	23	33	42
Valdemar	-	<1	1	2	Valdemar	-	<1	1	1
Roar	-	2	2	3	Roar	-	9	12	17
Adda	-	<1	1	2	Adda	-	1	1	2
Harald	-	4	5	7	Harald	-	20	25	31
Svend	-	4	7	10	Svend	-	1	2	3
Subtotal	*51*		*98*		*Subtotal*	*20*		*101*	
Planned Recovery					*Planned Recovery*				
Kraka	-	1	2	2	Kraka	-	<1	1	1
Gorm	-	9	11	14	Gorm	-	1	1	2
Dagmar	-	1	2	4	Dagmar	-	<1	<1	<1
Valdemar	-	<1	1	2	Valdemar	-	<1	1	1
Elly	-	<1	<1	1	Elly	-	1	3	5
Gert	-	1	2	3	Gert	-	<1	<1	<1
Subtotal			*18*		*Subtotal*			*6*	
Possible Recovery					*Possible Recovery*				
Producing Fields	-	33	50	66	Producing Fields	-	5	11	15
Other Fields	-	6	14	24	Other Fields	-	5	14	26
Discoveries	-	18	39	64	Discoveries	-	31	58	90
Subtotal			*103*		*Subtotal*			*83*	
Total	51		219		Total	20		190	
January 1991	43		179		January 1991	16		162	

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.

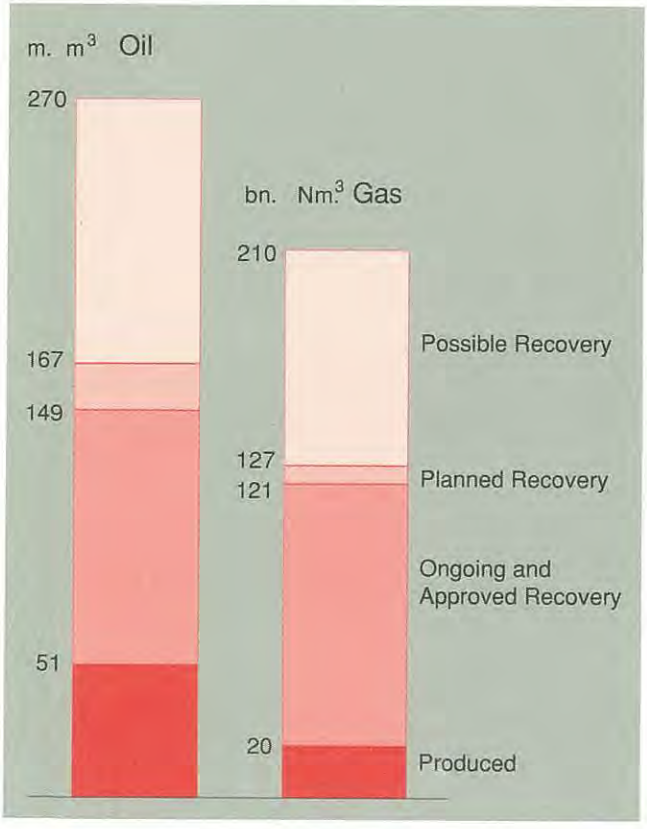
Reserves at January 1, 1992

Table 4.1 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 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.

It appears from Fig. 4.2 that the total amount of oil and condensate expected to be recovered ranges from 167 to 270 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. 4.2 Oil and Gas Reserves



Likewise, the figure illustrates that the amount of gas expected to be recovered ranges from 127 to 210 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 used as fuel on the platforms, viz. about 10% of total production.

A number of revisions of the Danish Energy Agency's assessment of reserves have been made compared to the assessment made in January 1991. One of the reasons is the planned or approved further development of the Dan and Gorm Fields.

Moreover, the assessed production potential in the category possible recovery is much higher than last year.
The areas where significant revisions have been made are described below.

Ongoing and Approved Recovery

In 1991, a major development project based on water injection was approved for the Dan Field, resulting in an increase of the oil reserves to 42 million m^3.

Production at the Skjold Field is now beginning to contain water, and the assessed recoverable reserves have therefore been written down by two million m^3.

Based on a new evaluation of the reservoir, the oil reserves at the Valdemar Field have been written down by three million m^3.

Planned Recovery

Further development of the Gorm Field has been planned through the use of water injection, resulting in an increase of the oil reserves of 11 million m^3.

Oil reserves at the Valdemar Field have been written down considerably due to a reassessment of the reservoir conditions.

Based on a new geological evaluation, the oil reserves at the Gert Field have been written down by four million m^3.

The reserves at the Elly Field remain unchanged in relation to last year. The data obtained when drilling the newest appraisal well are not included in the assessment.

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.

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

The drilling of horizontal wells is considered to increase the production potential of the oil zone in the Tyra Field. Moreover, an amount has been included which corresponds to increased drainage of gas in the flanking areas of the field.

A substantial percentage of possible recovery from *other fields* consists of additional reserves in the tight Barremian limestone zone in the Valdemar and Adda Fields.

Finally, a number of discoveries which are under evaluation or which have been declared non-commercial are included.

Enhanced Oil Recovery (EOR)

The recovery of oil and condensate within the four above-mentioned reserve categories corresponds to approx. 16% of the hydrocarbons in place in the Danish fields, while the recoverable reserves in the seven producing fields constitute approx. 22% of the amounts in place in these fields.

The geological conditions present problems in most Danish oil fields, meaning that the oil is not easily recoverable due to capillary constraints.

EOR (enhanced oil recovery) methods are being developed continuously, including the injection of chemicals and gases into the reservoir for the purpose of reducing surface tensions between reservoir rock and oil.

In recent years, laboratory tests have been carried out in Denmark where chemicals (detergents) are added to the injection water. The tests are performed under the same pressure and temperature conditions as in the reservoirs.

This laboratory work has not been completed, and it is therefore too early to judge whether the addition of chemicals can enhance recovery on economically viable terms.

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, however, including only the categories ongoing, approved, and planned recovery. The forecast is based on the assumption that the existing processing facilities or planned extensions of these facilities can be used. Further, it is assumed that the hydrocarbons produced do not exceed the existing pipeline capacity.

Fig. 5.1 Energy Comsumption and Production 1992-96

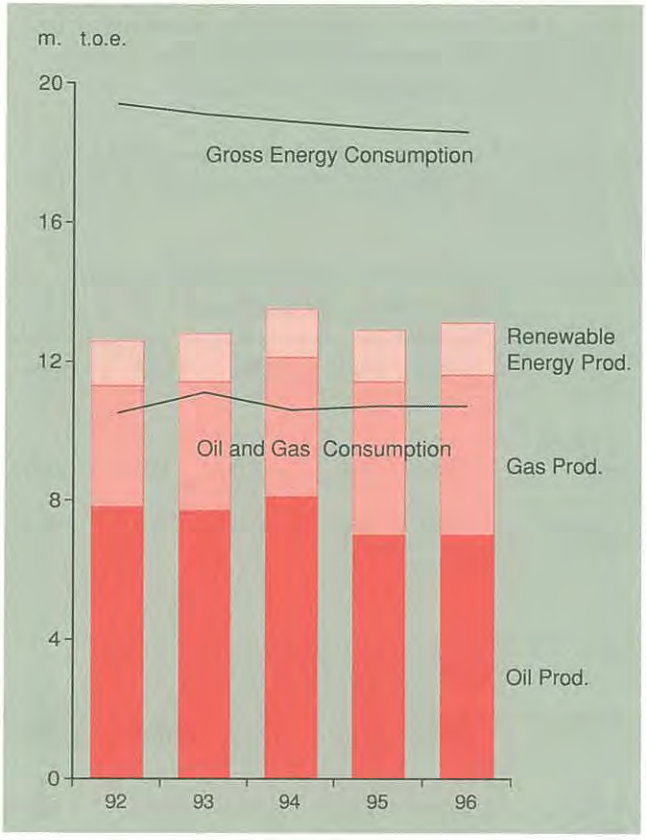


Table 5.1 Oil and Condensate Production Forecast, million m³

	1992	1993	1994	1995	1996
Ongoing and Approved Recovery					
Dan	2.4	3.0	3.1	2.7	2.4
Kraka	0.2	0.3	0.3	0.3	0.2
Regnar	-	-	0.4	0.1	-
Gorm	1.5	1.3	1.0	0.9	0.9
Skjold	2.4	1.9	1.5	1.3	1.1
Rolf	0.3	0.3	0.2	0.2	0.1
Dagmar	0.5	0.2	0.1	0.1	-
Tyra	1.7	1.4	1.1	0.8	0.6
Valdemar	-	-	0.5	0.2	0.1
Roar	-	-	0.1	0.4	0.3
Subtotal	*9.0*	*8.3*	*8.3*	*6.9*	*5.9*
Planned Recovery	0.1	0.7	1.1	1.3	2.3
Expected production	*9.1*	*9.0*	*9.5*	*8.2*	*8.2*

The natural gas forecast shows expected gas sales to Dansk Naturgas A/S.

As appears from Table 5.1, oil production is expected to reach 9.5 million m³ in 1994. Thus, the degree of self-sufficiency in oil alone will be around 100%. After that, production is expected to decline.

In relation to the forecast in the Danish Energy Agency's report from spring 1991, expected production figures have been upgraded for 1993 and

Table 5.2 Natural Gas Sales Forecast, billion Nm³

	1992	1993	1994	1995	1996
Dan Centre	0.8	1.1	1.2	1.1	1.0
Gorm Centre	0.3	0.8	0.8	0.7	0.9
Tyra Centre	2.4	1.9	2.1	2.7	2.8
Expected Sales	3.5	3.8	4.1	4.5	4.7

1994. Within the categories ongoing and approved recovery, a substantial increase in production is expected from the Dan Field as the result of an extensive development project based on water injection.

For the Gorm Field, a minor revaluation has been made because of the positive production experience. The increase for the Tyra Field is attributable to additional production from wells in the oil zone of the field which previously belonged to the category planned recovery.

The production from the Skjold Field is beginning to be accompanied by water. Therefore, a minor writedown of expected production has been made.

The category planned recovery includes additional production resulting from the further development of the Gorm, Dagmar and Valdemar Fields.

In Table 5.2, the production of natural gas is distributed on the three processing centres.

Expected investments and operating costs appear from Tables 5.3 and 5.4. The figures reveal that major investments are envisaged for the next few years. The approved development plan for the Dan Field based on water injection and a plan for the further development of the Gorm Field are some of the projects which require substantial investments. Investments for the five-year period are expected to total DKK 11.5 billion.

Table 5.3 Investments in Development Projects. DKK billion (1992 prices)

	1992	1993	1994	1995	1996
Ongoing and Approved Projects					
Dan	0.9	1.4	1.0	0.4	0.1
Kraka	0.2	-	0.2	-	
Regnar	-	0.3	-	-	
Gorm	-	-	-	-	
Skjold	-	-	-	-	
Rolf	-	-	-	-	
Dagmar	-	-	-	-	
Tyra	0.1	-	-	-	
Valdemar	0.1	0.4	-	-	
Roar	-	0.2	0.5	-	
Harald	-	-	-	-	1.1
Subtotal	*1.3*	*2.3*	*1.7*	*0.4*	*1.2*
Planned Projects	0.6	1.1	0.8	1.1	0.9
Expected Investments	*1.9*	*3.4*	*2.6*	*1.5*	*2.1*

Table 5.4 Operation Costs. DKK billion (1992 prices)

	1992	1993	1994	1995	1996
Ongoing and Approved Projects					
Dan	0.3	0.3	0.4	0.4	0.4
Kraka	0.0	0.0	0.0	0.0	0.0
Regnar	0.0	0.0	0.0	0.0	0.0
Gorm	0.2	0.2	0.2	0.2	0.2
Skjold	0.2	0.2	0.2	0.2	0.2
Rolf	0.0	0.0	0.0	0.0	0.0
Dagmar	0.0	0.0	0.0	0.0	0.0
Tyra	0.3	0.3	0.3	0.3	0.3
Valdemar	0.0	0.0	0.0	0.0	0.0
Roar	0.0	0.0	0.0	0.0	0.0
Subtotal	*1.1*	*1.2*	*1.3*	*1.3*	*1.3*
Planned Projects	0.1	0.1	0.1	0.1	0.1
Expected Costs	*1.2*	*1.3*	*1.3*	*1.3*	*1.3*

In Table 5.5 the expected costs of transportation of oil from the Danish fields are presented for the next 5 years.

Table 5.5 Oil Pipeline Transportation Costs. DKK billion (1992 prices)

	1992	1993	1994	1995	1996
$ 23-29/ bbl	0.9	0.9	1.0	0.9	0.9
$ 20/bbl	0.8	0.8	0.8	0.7	0.7

Table 5.6 Exploration and Appraisal Costs. DKK billion (1992 prices)

	1992	1993	1994	1995	1996
Total	0.9	0.4	0.3	0.2	0.2

Table 5.6 Degree of Self-Sufficiency and Net Foreign-Currency Expenditure on Energy Imports, 1992-1996

	1992	1993	1994	1995	1996
Production					
Crude Oil (million m^3)	9.1	9.0	9.5	8.2	8.2
Natural Gas (billlion Nm^3)	3.5	3.8	4.1	4.5	4.7
Total Energy Consumption (PJ)	811	802	793	784	778
Degree of Self-Sufficiency (%)					
A)	108	109	115	107	109
B)	59	61	65	62	63
C)	66	68	73	69	72
Net Foreign-Currency Expenditure on Energy Imports billion DKK					
($ 23-29)	5.1	5.1	4.3	5.6	5.4
($ 20)	4.5	4.3	3.5	4.3	4.1
Crude Oil Price USD/barrel					
$ 23-29	23	26	28	29	29
$ 20	20	20	20	20	20
DKK/USD	7.00	7.00	7.00	7.00	7.00

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

The exploration and appraisal costs stated in Table 5.6 have been adjusted upwards, due in part to the successful exploration activities carried out in 1990-1991 which will lead to the drilling of an increased number of appraisal wells.

Self-Sufficiency and Net Foreign-Currency Expenditure

The calculation of the degree of self-sufficiency and net foreign-currency expenditure appears from Table 5.7.

It should be noted that the degree of self-sufficiency for oil and natural gas combined will be more than 100% in the next five years, and that the self-sufficiency in energy will be about 70%. The following methods have been used for the three different calculations of self-sufficiency: The expected production of hydrocarbons is correlated to expected domestic hydrocarbon consumption (A) and to total domestic energy consumption (B). Finally, the degree of self-sufficiency (C) is calculated by correlating total domestic energy production - including renewables - to total domestic energy consumption. The calculation of net foreign-currency expenditure is based on the assumptions stated with respect to the price of crude oil. Net foreign-currency expenditure has been calculated on the basis of two different price brackets in order to illustrate the sensitivity of this critical parameter.

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.

Energy consumption and production are shown in Fig. 5.1, in terms of million t.o.e. (tonnes oil equivalent) for the sake of comparison.

Fig. 5.2 Oil and Condensate Production 1992-2011

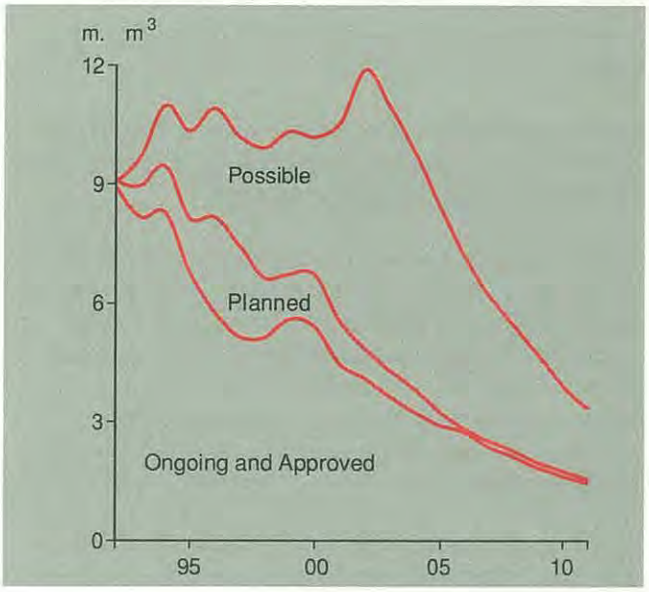


Fig. 5.3 Sales Gas Production 1992-2011

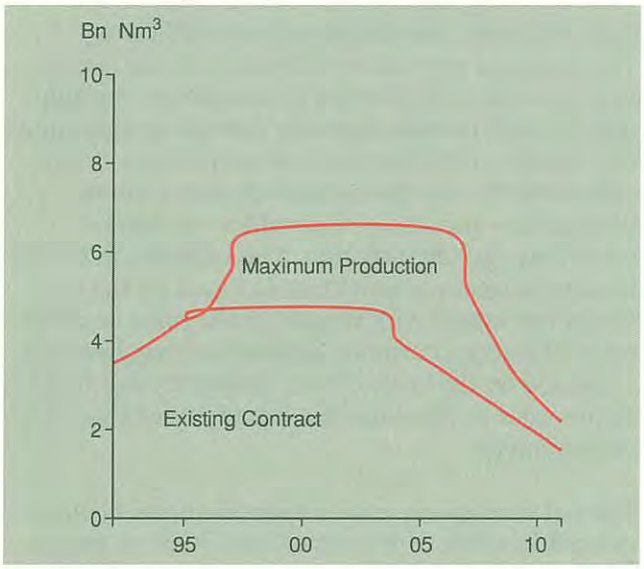
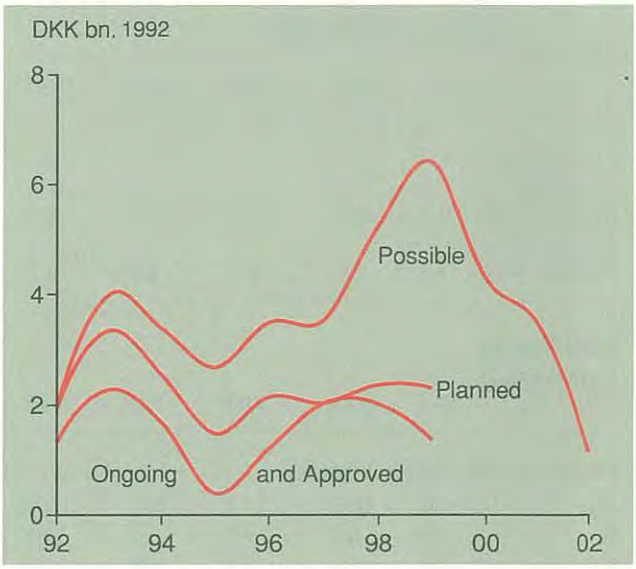


Fig. 5.4 Investments 1992-2011



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, the category possible recovery is also included, unlike in the five-year forecast.

Crude Oil and Natural Gas Production

Fig. 5.2 illustrates three crude oil and condensate production scenarios.

The illustration of ongoing/approved recovery shows a decline towards the end of the 1990s, followed by an increase. This increase is due mainly to the phased development of the Harald and Svend Fields in the northern part of the Danish area.

The illustration of planned recovery is based on development plans for Kraka, Gorm, Dagmar and Valdemar, as well as Elly and Gert.

Within the category possible recovery, reserves - and consequently the production potential - have been written up considerably in relation to previous years. The production potential in this category is based on the Danish Energy Agency's assessment of possibilities for initiating further production which are not based on development plans submitted.

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

It appears from Fig. 5.2 that total oil production is expected to peak at about 10-11 million m^3 in the year 2003, and subsequently to decline. In relation to previous forecasts, the production potential under possible recovery has been written up considerably.

Fig. 5.5 Operating Costs 1992-2011

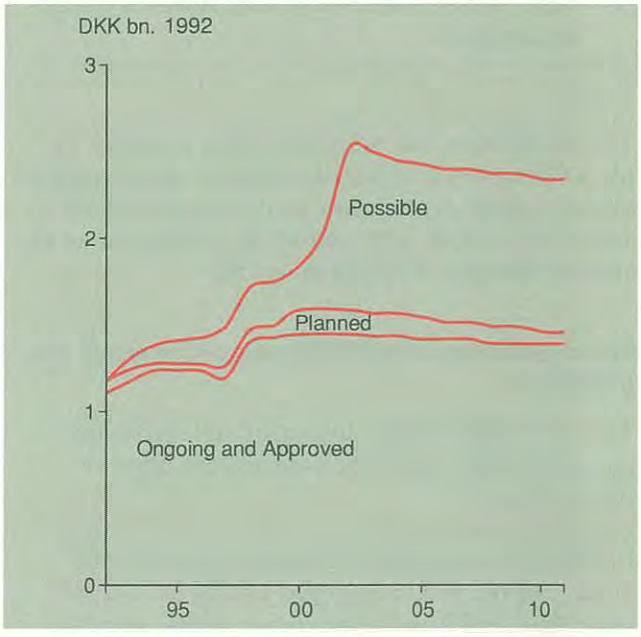


Table 5.7 Predicted Production, Investments and Operating Costs for Oil/Gas Activities 1992-1996, billion DKK (1992 prices)

	1992	1993	1994	1995	1996
Oil Production (million m^3)	9.1	9.0	9.5	8.2	8.2
Natural Gas Production (billion Nm^3)	3.5	3.8	4.1	4.5	4.7
Crude Oil Price					
USD 23-29	23	26	28	29	29
USD 20	20	20	20	20	20
Capital Costs:					
Exploration	0.9	0.4	0.3	0.2	0.2
Field Development	1.9	3.4	2.6	1.5	2.1
Natural Gas	1.1	0.8	1.4	1.5	0.3
Operating Costs:					
Fields	1.2	1.3	1.3	1.3	1.3
Natural Gas Network	0.9	0.9	0.9	0.9	0.9
Oil Pipeline	0.2	0.2	0.2	0.2	0.2

As mentioned above, the revaluation is based on the gratifying production results recorded in recent years, but at the same time, it should be emphasized that the assessment of the production potential is subject to great uncertainty.

Fig. 5.3 illustrates the perspectives of natural gas production. 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.

Therefore, the interval between maximum production and existing natural gas contracts represents the amount which can be sold under new gas sales contracts.

The lower curve represents the amount sold under the two contracts concluded between DUC and Dansk Naturgas A/S, totalling 93 billion Nm^3.

The upper curve represents the maximum production which can be transported through the existing gas pipeline to Nybro. The course of production may vary considerably in relation to the example shown, which simply indicates the upper and lower limits of natural gas production. If natural gas production remains at maximum, production will total approx. 120 billion Nm^3 from the start of the natural gas project in 1984 until the end of the forecast period in 2011.

Investments and Operating Costs

The investments and operating costs relating to the different production scenarios appear from Figs. 5.4 and 5.5.

Within the category approved recovery, the high level of investments in the latter half of the 1990s is notable. This is due mainly to the development of the northern area. Total investments within the categories ongoing, approved and planned development amount to approx. DKK 18 billion in the forecast period. If the category possible recovery is included, investments increase to DKK 40 billion. Thus, it is expensive to realize the production potential reflected by the category possible recovery.

Up to and including 1991, approx. DKK 33 billion (1992 prices) was invested in the development projects.

Within the category possible recovery, operating costs are expected to approach DKK 2.5 billion annually at the turn of the century.

Fig. 5.6 Perspectives of Enhanced Recovery

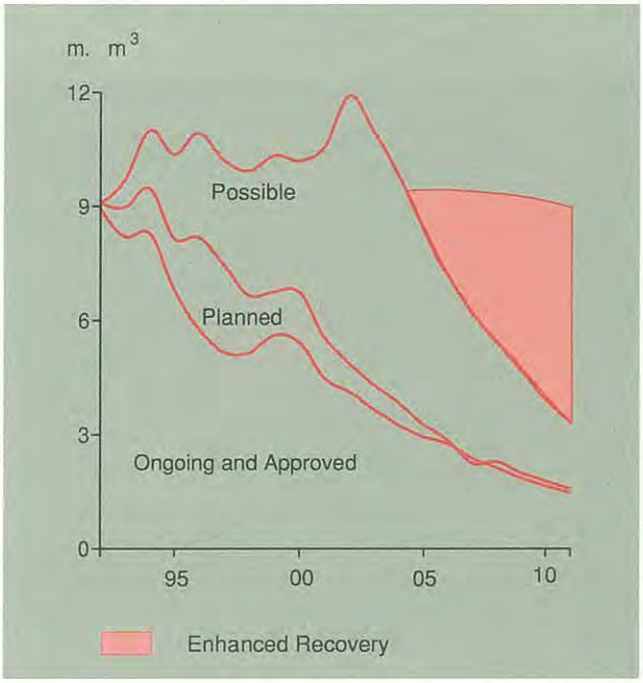


Table 5.9 State Revenue from Oil/Gas Production 1992-1996, DKK billion (1992 prices)

	1992	1993	1994	1995	1996
Hydrocarbon Tax	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)
Coporate Tax	2.1 (1.6)	2.3 (1.5)	2.8 (1.6)	2.7 (1.5)	3.1 (1.7)
Royalty	0.9 (0.8)	1.0 (0.8)	1.2 (0.9)	1.1 (0.8)	1.2 (0.8)
Profit Element	0.4 (0.4)	0.5 (0.4)	0.5 (0.4)	0.5 (0.3)	0.5 (0.3)
Total	*3.4 (2.8)*	*3,8 (2.7)*	*4.5 (2.8)*	*4.3 (2.6)*	*4.7 (2.8)*

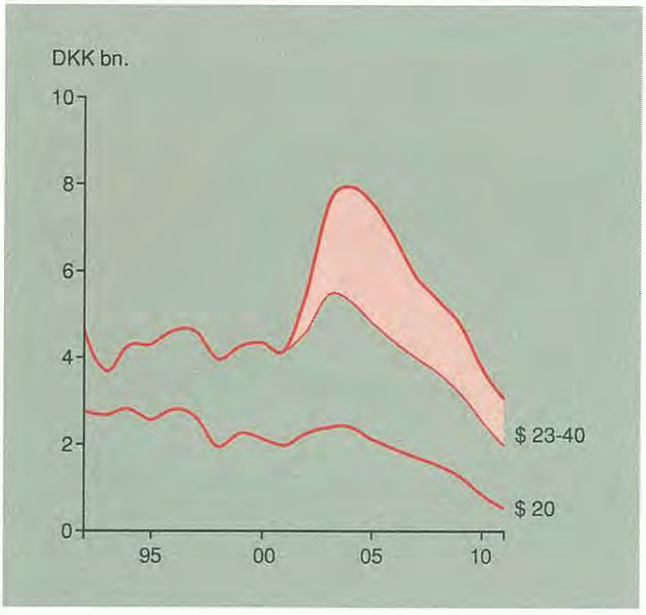
Enhanced Recovery

The oil production scenario outlined above should not 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. 5.6.

Fig. 5.7 Taxes and Dues 1992-2011, DKK billion (1992 prices)



State Revenue

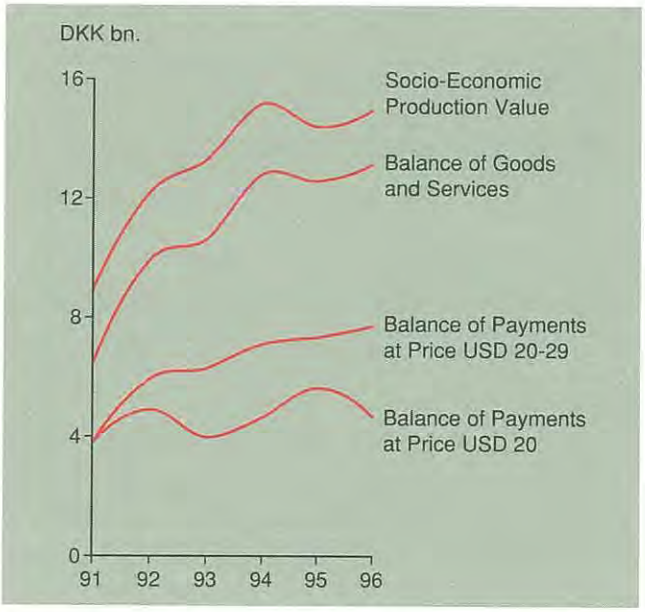
Based on the figures shown in Table 5.8, an estimate of state revenue for the next five years has been given in Table 5.9. The amounts stated are those assessed for the relevant years. With respect to corporate tax, it should be noted that the proceeds are subject to great uncertainty, as, for instance, foreign-exchange adjustments have not been included.

Please note that the figures in brackets represent an alternative development in oil and gas prices in order to illustrate the sensitivity of these critical parameters. In the scenario based on increasing prices, the state revenue for the next five years is expected to total about DKK 21 billion, whereas a constant oil price of USD 20/bbl will result in a total revenue of only about DKK 14 billion.

Table 5.10 Effect of Oil/Gas Activities on the Balance of Payments 1991-1996, DKK billion (1992 prices)

	1991	1992	1993	1994	1995	1996
Socio-Economic Production Value	8.9	12.2	13.3	15.2	14.4	15.0
Import Share	2.5	2.3	2.7	2.4	1.8	1.8
Balance of Goods and Services	6.5	9.9	10.6	12.8	12.6	13.1
Transfer of Interest and Dividends	2.8	4.0	4.8	5.7	5.2	5.4
The Balance of Payments on Current Account	3.6	5.9	5.8	7.1	7.3	7.7
(20 USD/bbl)	(3.6)	(4.9)	(4.0)	(4.6)	(4.6)	(4.6)

Fig. 5.8 Effect of Oil/Gas Activities on the Balance of Payments 1991-1996, DKK billion (1992 prices)



State revenue in the longer term is illustrated by Fig. 5.7, based on two different assumptions, viz. increasing oil prices and a constant price of USD 20/bbl.

In the calculation, expected oil production is based on the twenty-year forecast for planned recovery. Natural gas sales are based on the five-year forecast and the quantities stipulated in the agreement in principle concluded between DUC and Dansk Naturgas A/S.

Thus, the state revenue calculation is based on a conservative estimate of future production.

As shown, the development in oil prices determines the size of the direct revenue the state will derive from oil and gas production. Moreover, Fig. 5.7 illustrates that the special hydrocarbon tax (highlighted area) becomes payable in the higher price bracket and is not payable at a lower oil price level.

It should be added that oil price fluctuations will also affect the scope of investments, etc. However, the calculations do not allow for this factor.

In the section on economy, the historical revenue is shown.

Effect on Balance of Payments

Based on the assumptions in Table 5.8, the effect of Danish oil and natural gas production on the balance of trade and the balance of payments is shown in Table 5.10.

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. Against this background, the socio-economic value of production has been calculated for the period from 1991 to 1996.

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

As mentioned above, Table 5.10 does not indicate direct export earnings, but reflects the improvement of the balance of goods and services and the balance of payments resulting from the Danish energy production. The Table is based on increasing oil prices, supplemented with figures (in brackets) showing the effect in the case of a constant oil price of USD 20/bbl.

The greatest effect on the balance of payments results if oil prices increase. This illustrates very clearly how beneficial Danish production is for the national economy when oil prices are rising, as heavy imports at a high cost would otherwise have been required. Moreover, the effect on the balance of goods and services and the balance of payments on current account is illustrated in Fig. 5.8.

It should be emphasized that the calculations in Table 5.10 and Fig. 5.8 are based on model calculations using standard assumptions with respect to import share, etc. Thus, the results are not based on figures published in accounts. However, this does not change the fact that Danish production of oil and natural gas has an extremely favourable effect on the balance of payments.

At the beginning of 1991, the international crude oil situation was precarious because of the escalation of the Gulf crisis. Thus, at the beginning of January 1991, the international crude oil price ranged between USD 25 and 30 per barrel.

When war broke out on January 17, 1991, oil prices plummeted. At the same time, the International Energy Agency upheld an international emergency plan for the release of up to 2.5 million barrels of oil to the market per day. This contributed to the decline of the international crude oil price to USD 19 per barrel.

Subsequently, the international crude oil price was stabilized at a level between USD 18 and 21 per barrel until August. In the third quarter, oil prices went up because of the attempted coup d'etat in the former Soviet Union and the resulting uncertainty about the development in oil exports from that area.

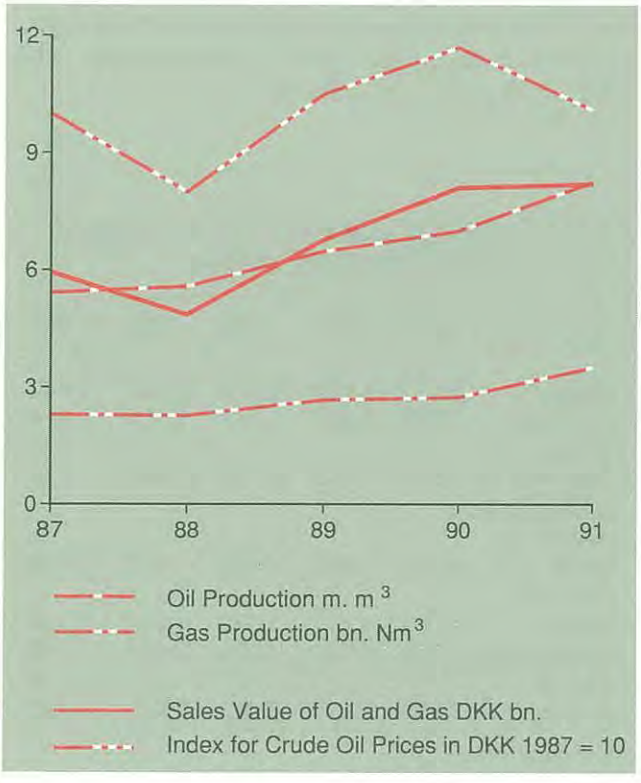
Crude oil prices moved upwards to a level of about USD 22 per barrel in October 1991, as surplus capacity was limited, and normal weather conditions and ordinary demand could therefore have led to a tense supply situation throughout the winter.

Table 6.1 Sales Value and Production of Oil and Gas 1987-1991

	1987	1988	1989	1990	1991*)
Sales Value (DKK million)					
Oil	4,270	3,500	5,360	6,394	6,600
Gas	1,660	1,355	1,410	1,713	1,600
Total	*5,930*	*4,855*	*6,770*	*8,107*	*8,200*
Production					
Oil, million. m^3	5.10	5.57	6.70	7.00	8.26
Gas, billion Nm^3	2.30	2.27	2.68	2.75	3.51
International Crude Oil Price *(Brent)*					
USD/bbl	18.38	14.94	18.11	23.70	2.15
DKK/USD	6.84	6.74	7.32	6.19	6.80
DKK per m^3	791	633	834	923	809

Nominal Prices, *) Estimate

Fig. 6.1 Sales Value and Production of Oil and Gas 1987-1991



However, since November 1991, crude oil prices have declined due to lower demand than expected in the OECD countries among others, because of the continued recession and a mild winter. In addition, oil supplies on the world market were ample, for one thing because OPEC maintained its high production level. Consequently, the international crude oil price was about USD 18 per barrel at the end of 1991, corresponding to the level in the first two months of 1992.

In the first half of 1991, the USD exchange rate increased from just under DKK 6 per USD to just under DKK 7 per USD midway through the year. During autumn, the USD exchange rate declined steadily, falling to about DKK 6 per USD at the end of the year.

Danish Oil and Gas Production

Danish oil and natural gas production amounted to a total of 10.7 million t.o.e. in 1991. The degree of self-sufficiency in oil was 86% and 103% in oil and gas combined.

Thus, Danish production contributes increasingly to the security of supply for hydrocarbon products.

The sales value of the Danish oil and natural gas production constituted DKK 8.2 billion in 1991, an increase of only 1% in relation to 1990. The limited increase in value, despite the growth in production, is attributable to the lower prices of oil and gas.

Exploration, Development and Operation

The total costs of exploration and recovery of oil and gas appear from Table 6.2. Total costs for 1991 have been estimated at DKK 4.4 billion, an increase of 17% compared to 1990. To this must be added oil transportation costs in the amount of DKK 0.8 billion.

Total transportation costs for crude oil include operating costs, financing costs and contributions towards the capital cost of the oil pipeline and terminal facilities. In addition, the pipeline tariff payable includes a profit element of 5% of the value of the crude oil transported. The oil pipeline is owned by Dansk Olierør A/S, which passes on 90% of the profit element to the state. As the only user of the pipeline, DUC currently pays the total transportation costs.

The level of investments was high in 1991, both in exploration and development activities. In the producing fields Dan, Gorm, Skjold, Rolf and Tyra, recovery has been intensified through the completion of more wells. At the same time, Kraka and Dagmar have been brought on stream.

Table 6.2 Costs of Exploration, Development and Operations, DKK million

	1987	1988	1989	1990	1991*)
Exploration and Appraisal					
DUC	234	110	73	298	360
Other Companies	524	450	427	519	600
Total	*758*	*560*	*500*	*817*	*960*
Development (DUC)	914	897	1,145	1,736	2,315
Operations and Adm. (DUC)	1,023	1,000	1,094	1,226	1,150
Oil Pipeline Transportation Costs	632	604	727	698	775

Nominal Prices *) Estimate

Table 6.3 DUC's Investments in Development Projects, DKK million

	1987	1988	1989	1990	1991
Dan	641	223	362	306	915
Gorm	11	262	204	580	410
Skjold	62	236	44	108	300
Rolf	10	-	21	1	50
Tyra	188	107	85	125	275
Kraka	-	4	195	234	90
Dagmar	-	-	8	254	75
Valdemar	-	7	223	127	0
Not allocated	2	58	3	1	200
Total	*914*	*897*	*1,145*	*1,736*	*2,315*

Nominal Prices *) Estimate

Table 6.3 shows development expenses broken down by field. The figures for 1991 are preliminary. The item 'Not Allocated' includes the expenses which relate to several fields, certain entries made in connection with closing the accounts and the expenses defrayed by the individual partners in DUC. Total investments in DUC's development projects through 1991 amount to about DKK 33 billion, converted into 1992 prices. The corresponding operating costs amount to approx. DKK 13 billion.

The pretax results recorded by the DUC companies appear from Table 6.4. It should be noted that in this table, the operating costs include transportation costs, but not the 5% profit element. The 1991 result is not yet available.

Table 6.4 Pretax Results of the DUC Companies 1986-1990, DKK million

	1986	1987	1988	1989	1990
Income	5,633	5,823	5,103	6,716	7,692
Op. Costs	1,706	1,663	1,569	1,654	1,814
Interest Expenses	529	492	628	680	234
Exchange Rate Adjustments	+1,385	+943	-324	+85	+118
Gross Income	4,783	4,611	2,582	4,468	5,762
Depreciation	1,539	1,586	1,495	1,553	1,600
Pretax Result	*3,244*	*3,025*	*1,088*	*2,915*	*4,162*

Nominal Prices

Table 6.5 State Revenue from Oil/Gas Production 1987-1991, DKK million

	1987	1988	1989	1990	1991*)
Hydrocarbon Tax	0	0	0	0	0
Corporate Tax	732	0	464	1,314	1,100
Royalty	437	360	523	633	631
Profit Element	189	145	232	285	297
Total	*1,358*	*505*	*1,219*	*2,232*	*2,028*

Nominal Prices *) Estimate

Direct state revenue derived from oil/gas production appears from Table 6.5. Annual accounts have not yet been filed for 1991, for which reason the calculation of corporate tax in particular is subject to great uncertainty.

The revenue stated for each individual year is the amount assessed for that year. Corporate tax is paid ten months after the end of the financial year. Hydrocarbon tax is generally payable in the relevant financial year, royalty falls due six months after the end of the financial year, and the profit element of the oil pipeline tariff is payable on a monthly basis.

The amounts of oil sold are metered at the Gorm E platform and at the terminal facilities in Fredericia. The amounts of gas sold are metered at Tyra East. These measurements are used to calculate royalty and the profit element of the pipeline tariff.

Total state revenue from production startup in 1972 through 1991 amounts to DKK 14.2 billion, converted into 1992 prices. The revenue is composed of hydrocarbon tax amounting to DKK 0.7 billion, corporate tax amounting to DKK 5.2 billion, royalty of DKK 6.3 billion, as well as a pipeline tariff profit element of DKK 2.0 billion.

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

Safety and Working Environment

The Danish Energy Agency supervises safety and working environment in connection with the exploration and production of oil and gas in the Danish part of the North Sea.

With respect to fixed offshore installations, the Danish Energy Agency monitors safety, working environment and environmental matters. The Agency's supervisory work is carried out primarily according to rules paralleling those applicable on shore.

However, with respect to mobile offshore installations, safety matters are largely regulated by international conventions. Moreover, the supervision of this area is shared with the Danish Maritime Authority, so that virtually all matters concerning the safety of the installations are handled by the Danish Maritime Authority, while the Danish Energy Agency evaluates most environmental matters.

As a consequence of the provision laid down in the Safety Order requiring operators to set up control systems in order to ensure compliance with the authorities' requirements, the supervisory work carried out by the Danish Energy Agency has undergone changes in recent years, with a view to providing supervision of a more general nature with less regulation and control of details.

Thus, the intention is that as far as possible, supervisory work should be aimed at the operators' control systems and should be carried out according to uniform conditions and principles with respect to form, method, and degree of detail in all the areas supervised by the Danish Energy Agency. Attempts are being made to implement this reorganization of the Agency's supervisory work in close cooperation with operators in order to help them establish expedient control systems which give the Agency the necessary basis for its supervision. Thus, in individual areas, guidelines have been prepared for the control systems, whereas the overall supervision of other areas is carried out without the existence of any guidelines.

Risk Assessments Resulting from the Piper Alpha Disaster

The Lord Cullen investigatory committee which was set up after the explosion on July 6, 1988 on the British Piper Alpha platform published a report on the disaster in November 1990.

In cooperation with the Danish Maritime Authority, the Danish Energy Agency reviewed the report in order to determine whether its recommendations gave cause to change the Danish regulations or standard practice for Danish offshore installations. At the beginning of 1991, the two authorities submitted a recommendation which was endorsed by the Coordination Committee on April 17, 1991.

The main conclusion in the recommendation is that major changes are not required in the Danish area. This is mainly due to the fact that Danish regulations and established practice have already provided the necessary basis for preventing similar disasters. However, in light of the report, it was decided to systematize and extend existing requirements with respect to safety evaluations, so that allowance is also made for procedures, smoke development, evacuation, etc. In addition, risk assessment and risk control are to be incorporated into the operators' control systems, and a separate risk assessment is to be made for each installation individually.

In future, these risk assessments together with the control systems, will constitute the most important basis for the Danish Energy Agency's supervision of safety matters. Guidelines stipulating the detailed contents of risk assessments are being prepared, and are expected to be available in mid-1992.

For mobile offshore installations, the requirements for risk assessments will be laid down following coordination with the other North Sea countries, so that standard rules which meet with wide ac- ceptance can be drawn up.

International Cooperation

In recent years, there has been an increasing tendency to regulate health, safety and environmental matters through international cooperation. This is done partly through the preparation of EC Regulations and partly through the work performed by other international bodies.

In this connection, the Danish Energy Agency participates in the preparation of proposed regulations which are of particular relevance to the Danish offshore industry. Such projects include the proposed EC Council Directive on Health and Safety in the Extractive Industries and the revision of the Paris and Oslo Conventions regarding environmental protection of the North Atlantic, including the North Sea and the Kattegat.

Further, the Danish Energy Agency is in direct contact with the authorities in neighbouring countries in order to ensure the best possible coordination of new regulations laid down for the North Sea area.

New Regulations

Preparing Technical Regulations for Drilling Rigs

In cooperation with the Danish Maritime Authority, the Danish Energy Agency has completed the preparation of guidelines for the design of and equipment on board new drilling rigs, intended to supplement the international maritime rules for rigs. Following the completion of these guidelines, the preparation of corresponding guidelines for existing drilling rigs has been initiated.

Safety Organization on Mobile Offshore Installations

In 1991, the work on regulating health and safety matters under the provisions of the Danish Act on Certain Marine Installations continued in close cooperation between authorities and employer/employee in the Coordination Committee. For one thing, an Executive Order on health and safety work on mobile offshore installations is being prepared. This Order is expected to be issued in 1992. It will subsequently be decided whether corresponding rules for fixed offshore installations should be prepared.

Evaluation and Implementation of EC Council Directives

In connection with the safety regulation work performed in the EC, in 1991 the authorities and the Coordination Committee considered the following proposed EC Council Directives of relevance to offshore installations:

- Amendments to the Machinery Directive.
- Minimum Requirements for Health and Safety in the Extractive Industries
- Restrictions on Working Hours
- Protection of Female Workers during Pregnancy and Motherhood
- Minimum Requirements for Health and Safety at Temporary and Mobile Work Sites

Moreover, in 1991 the Danish Energy Agency began preparing rules to implement a number of Directives on working environment.

Safety and Working Environment on Mobile Offshore Installations

In 1991, the Danish Energy Agency, in cooperation with the Danish Maritime Authority, granted permission for the use of - and subsequently inspected - three drilling rigs, two accommodation platforms, three crane barges and one pipelaying barge. Moreover, the Danish Energy Agency supervised the construction and conversion of two drilling rigs.

The Danish Energy Agency's supervision focused on such areas as noise, dangerous substances and materials and accommodation conditions, as well as the set of procedures and certificates documenting that the operation of an installation meets the requirements as to health and safety and environmental protection (the control system). In this connection, the Agency concentrated on procedures for preventive maintenance and the safety training of personnel.

Safety and Working Environment on Fixed Offshore Installations

In 1991, the supervision of the working environment on fixed offshore installations focused on strengthening contact to the safety organization. The rules laid down by the Danish Health and Safety Executive for the setup and operation of safety organizations on shore currently apply to fixed offshore installations as well. As mentioned above in connection with the preparation of new regulations, it is being considered whether there is a need for issuing special rules on health and safety work on fixed offshore installations, so that provision can be made for the special working conditions prevailing offshore, e.g. for contractors' employees.

Protecting the Marine Environment

Work to protect the marine environment is carried out in cooperation between the Ministry of Energy and the National Agency of Environmental Protection.

To the extent possible, attempts are made to limit the use of substances and materials which are damaging to health and the environment by replacing

them with less harmful substances and materials. In this connection, it may be mentioned that the use of oil-base drilling mud, which can endanger the marine environment as well as the working environment, has virtually been discontinued in the Danish area. Water-base drilling fluids which fulfil the technical drilling conditions that previously necessitated the use of oil-base drilling mud have now been developed.

Criteria for Manning Unmanned Platforms

In connection with the startup of operations on the Dagmar and Kraka platforms, both of which are unmanned and based on a very simple design to which all access takes place by boat, the Danish Energy Agency has set up weather criteria for the manning of the platforms. In continuation of this work, an analysis was made as to the possibilities for evacuation by lifeboat from the unmanned platforms Dan E, Skjold and Rolf. This analysis showed that evacuation by lifeboat involved some risk under certain weather conditions. Therefore, weather criteria for the manning of these platforms were also introduced.

Hydrogen Sulphide Emergency Measures

The development of the Dagmar Field, where the gas produced has a high content of hydrogen sulphide, has made it necessary to set up hydrogen sulphide emergency measures on Gorm F, where the Dagmar production is processed.

Hydrogen sulphide is a highly poisonous gas which can be lethal even in very low concentrations.

The Danish Energy Agency has evaluated the need for special equipment, procedures and safety training, so that the sour gas can be handled safely. Against this background, the Danish Energy Agency has approved the hydrogen sulphide emergency measures on Gorm F and Dagmar, including detection equipment, personal protection, alarm procedures and special training for everyone working on the installations.

Table 7.1 Accident Frequency for Fixed Offshore Installations and Flotels

	1987	1988	1989	1990	1991
Accidents per million working hours	40	10	3.4	7.9	9.0

Accidents and Injuries 1991

The criterion for whether a work-related accident/injury is to be registered and reported to the Danish Energy Agency is that the accident must result in at least one day's unfitness for work in addition to the day that the accident occurred.

Table 7.2 Accident Frequency for Mobile Offshore Installations

	1988	1989	1990	1991
Accidents per million working hours	31.0	12.7	9.9	7.4

In 1991, the Danish Energy Agency received 30 reports on accidents offshore, broken down as 17 accidents on fixed offshore installations together with flotels, and 13 on other mobile offshore installations. None of the accidents resulted in death or serious personal injury.
When the 17 work-related accidents on fixed offshore installations reported are related to the number of hours worked (1,896,849), it results in an accident frequency of 9.0 per million working hours.

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

Table 7.1 shows the accident frequency per million working hours for the period from 1987 to 1991 for fixed offshore installations together with flotels. The table comprises all accidents occurring during the operation, installation and extension of facilities. It appears from the table that the accident frequency on fixed offshore installations fell sharply in the period from 1987 to 1989 and then increased slightly in 1990 and 1991.

Table 7.2 shows the accident frequency for mobile offshore installations per million working hours in the period 1988-1991. As appears from the table, the accident frequency declined on mobile offshore installations in that period.
When the 13 work-related accidents on mobile offshore installations, excluding flotels, reported in 1991 are related to the number of hours worked (1,747,722) on these installations, it results in an accident frequency of 7.4 per million working hours.

Licences

The licences granted in the first, second and third licensing rounds 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-1991 projects worth approx. DKK 60 million had been implemented, and projects worth approx. DKK 12 million are in progress.

Funds have been made available particularly for research and development in the following areas:

- Increased knowledge about geological and geophysical conditions in the subsurface which determine the formation and accumulation of oil and natural gas.
- Reduced costs of offshore structures, installations, development of marginal fields and exploration/production under arctic conditions.
- Limiting and preventing impact and damage to the environment.

Energy Research Programme 1992 (ERP 92)

The Danish Energy Agency has the professional responsibility for evaluating project applications within the area of oil and gas activities.

Under the ERP 92 programme, an advisory committee has nominated 12 projects out of 30 applications for funding. The 12 projects represent a total R&D amount of DKK 36 million.

ERP 92 and EC Research and Development Programmes

In recent years, attempts to link Danish ERP research and development projects to relevant international research have proved successful. This applies in particular to the EC energy research and development programmes.

Thus, as far as ERP 92 is concerned, approx. 50% of the projects approved under the programme are linked to international projects. The Danish Energy Agency has deliberately aimed at strengthening these ties, particularly in light of the completion of the Single Market, but also in light of the new openness in international relations, with a special view to the democratization efforts in Eastern Europe and the former Soviet Union.

EC Research and Development Programmes

The Danish Energy Agency is a member of the advisory committee under Directorate General XVII of the EC Commission regarding the new THERMIE programme for promoting European energy technology. The programme is divided into two phases, each with a budget of DKK 2.8 billion for the periods 1990-92 and 1993-94. The programme plays an important role in the implementation of Community policy, particularly in connection with the completion of the Single Market. Just recently, an Eastern European dimension has been added, as it has been decided to establish THERMIE promotion centres in Russia, White Russia, the three Baltic republics, Poland, Czechoslovakia, Hungary and Bulgaria. The centre activities will include more effective exploitation of oil and natural gas reserves.

The result of the 1990 and 1991 THERMIE rounds is now available, and the last round in the first phase of the 1992 programme has begun. In the first round of THERMIE in 1990, where the budget was fairly low, no Danish hydrocarbon projects received support, although Danish involvement was generally satisfactory. The 1991 result was even more satisfactory, with a Danish share of almost 12%, and with three of the 12 approved Danish hydrocarbon projects being supported. See Table 8.1.

Moreover, the Danish Energy Agency is a member of the advisory committee for the JOULE programme for research and development of non-nuclear energy set up under the auspices of Directorate General XII of the EC Commission. This programme is part of the large framework programme for research and technological development.

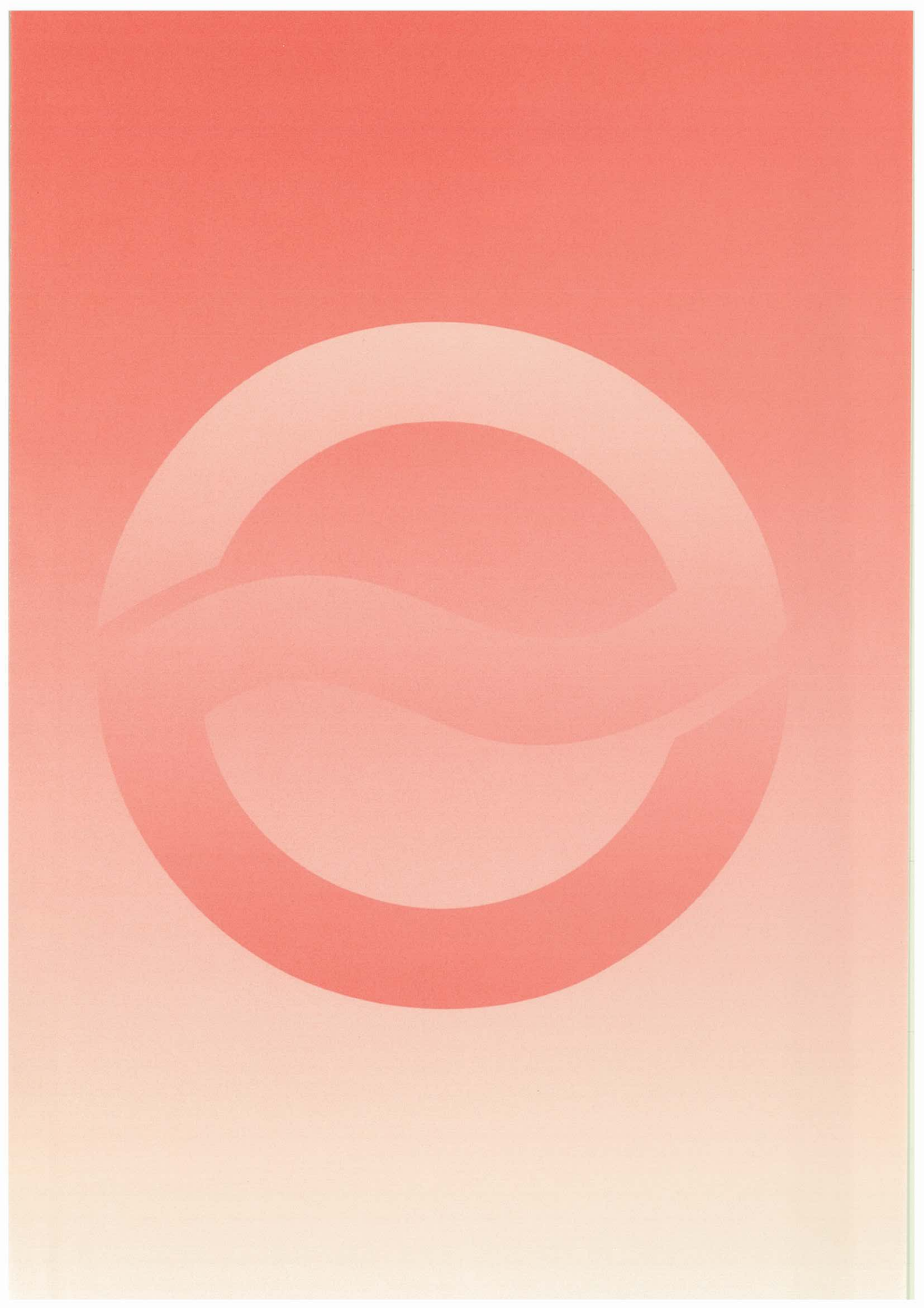
In 1990, the total support granted under the JOULE programme was DKK 950 million. Projects with Danish participation have received support of approx. DKK 36 million. Of the hydrocarbon projects, five projects with Danish participation have received support within the areas prospecting and exploration technology, production technology and the transformation of hydrocarbons, see Table 8.1.

At end-1991, the new JOULE II programme was announced, the deadline for submitting applications for the major programme areas being February 14, 1992. This programme also includes projects within the oil and gas sector. The final results of the project evaluation will not be available until end-1992, one reason being that con-

Table 8.1 EC Funding of Danish Oil and Gas Technology Projects

Project	EC Funding (DKK million)	Participant
The 1991 THERMIE programme:		
1. Exploration and production	1.8	Cool Sorption A/S
2. Exploration and production	2.5	The Technical University of Denmark
3. Exploration and production	2.1	The Geological Survey of Denmark
Total	*6.4*	
The JOULE programme:		
1. Prospecting and exploration technology	3.5	The Technical University of Denmark
2. Production technology	1.5	The University of Århus
3. Production technology	1.0	The Geological Survey of Denmark
4. Production technology	1.6	The University of Copenhagen
5. Transformation of hydrocarbons	1.9	Haldor Topsøe A/S
Total	*9.5*	

tract negotiations are rendered difficult by the participation of many different nationalities in the projects. The budget total for JOULE II is DKK 1.3 billion, to be granted over a three-year period.



Licences in Denmark

(December 31, 1991)

Group	Share
Dansk Undergrunds Consortium (DUC):	
The Sole Concession of July 8, 1962	
Blocks 5603/27 and 28, 5604/21, 22 and 25	
5504/5, 6, 7, 8, 10, 11, 12, 14, 15 and 16,	
5505/13, 17 and 18	
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	
1st Round:	
Licence 2/84, Blocks 5504/1, 2, 5 and 6	
Amoco Denmark Exploration Co.	
(operator)	66.67%
FLS-Energy A/S	10.00%
DOPAS	23.33%
2nd Round:	
Licence 1/86, Blocks 5503/4, 5604/29,	
5507/18, 21 and 22	
Agip Danmark Olie- og Gasefter-	
forskning AS (operator)	40.00%
Fina Exploration Denmark S.A.	28.80%
ÖMV Erdöl-Aufsuchungsges. m.b.H.	11.20%
DOPAS	20.00%
Licence 2/86, Blocks 5414/7 and 11	
Amoco Denmark Exploration Co.	
(operator)	75.00%
FLS-Energy A/S	5.00%
DOPAS	20.00%
Licences 3/86, 4/86	
Blocks 5603/28 and 31, 5604/25,	
5503/3 and 4	
Norsk Hydro Udforskning a.s. (operator)	19.50%
Enterprise Petroleum Ltd.	19.50%
British Gas Expl. & Prod. Ltd.	13.70%
Amerada Hess (Denmark) A/S	9.80%
Dansk Oliesøgning K/S	7.50%
Korn- og Foderstof Kompagniet A/S	2.50%
DENERCO K/S	7.50%
DOPAS	20.00%
DANOP is operator under Licence 4/86	
(the group's westernmost area)	

Group	Share
Licence 7/86, Blocks 5604/22 and 26	
Statoil Efterforskning og	
Produktion A/S (operator)	26.50%
BHP Petroleum Inc.	
represented by Hamilton Brothers	21.00%
Total Marine Danmark	12.00%
LD Energi A/S	7.50%
EAC Energy A/S	4.00%
DENERCO K/S	9.00%
DOPAS	20.00%
DANOP will be operator in a development	
phase	
3rd Round:	
Licence 1/89, 2/89	
Blocks 5603/26, 5504/6 and 10	
Amoco Denmark Exploration Co.	
(operator)	70.00%
FLS-Energy A/S	5.00%
DENERCO K/S	5.00%
DOPAS	20.00%
Licence 3/89, 4/89	
Blocks 5606/13, 14, 15, 17 and	
18, 5514/30 and 31, 5414/2, 3,	
5, 6, 10, 11, 14 and 15	
Amoco Denmark Exploration Co.	
(operator)	80.00%
FLS-Energy A/S	5.00%
DENERCO K/S	5.00%
DOPAS	10.00%
Licence 5/89, Blocks 5503/8 and 5504/5	
Elwerath Erdgas und Erdöl GmbH	14.17%
Brigitta Erdgas und Erdöl GmbH	15.15%
C. Deilmann AG	6.60%
Deutsche Schachtbau- und	
Tiefbohrgesellschaft GmbH	7.58%
RWE-DEA Denmark Oil GmbH	5.15%
Elf Aquitaine Deutschland GmbH	8.70%
Wintershall Danmark Expl. A/S	7.58%
Preussag AG	7.58%
DENERCO K/S	7.50%
DOPAS	20.00%
BEB is operator	
DANOP is co-operator	

Appendix A

Group	Share
Licence 6/89, Blocks 5409/3 and 5509/29	
Cluff Oil plc. (operator)	63.00%
Zenith Resources Ltd.	27.00%
DOPAS	10.00%
DANOP will be operator in a development phase	
Licence 7/89, 8/89, Blocks 5504/2, 5604/25, 29 and 30, 5603/32	
Norsk Hydro Udforskning a.s. (operator)	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%
DANOP is operator under licence 8/89 (the group's westernmost area)	
Licence 9/89, Blocks 5509/5, 6, 9 and 10	
Jordan Dansk Corporation	25.00%
G.B.T. Northern Corporation	15.00%
Maxus Denmark, Inc.	45.00%
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	36.25%
Wintershall Danmark A/S	36.25%
DENERCO K/S	7.50%
DOPAS	20.00%
DANOP is operator	
Licence 12/89, Block 5414/8	
RWE-DEA Denmark Oil GmbH	42.50%
Wintershall Danmark Østersøen A/S	42.50%
DENERCO K/S	5.00%
DOPAS	10.00%
DANOP is operator	

Licences awarded in 1990:

Licence 1/90, Block 5604/18	
Statoil Efterforskning og Produktion A/S (operator)	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%
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	

Exploration and Appraisal Wells, 1986-1991

Well name Number	Operator Rig	Lat. North Long. East	Total Depth Formation	Spud Compl.
Lulu-2	Mærsk Olie og Gas	56°19'60"	3605 metres	1985-12-15
5604/22-2	Mærsk Endeavour	04°17'31"	U.Permian	1986-03-18
Diamant-1	Phillips	56°00'23"	4242 metres	1986-01-10
5603/32-2	Glomar Labrador 1	03°53'44"	L.Permian	1986-03-18
Øst Rosa-3	Mærsk Olie og Gas	55°35'36"	1569 metres	1986-01-20
5504/15-5	Dyvi Epsilon	04°36'31"	U.Permian	1986-03-10
Ravn-1	Amoco	55°52'35"	5013 metres	1986-03-24
5504/01-2	Dyvi Epsilon	04°13'52"	Permian	1986-07-17
Øst Rosa Fl.-1	Mærsk Olie og Gas	55°33'51"	3045 metres	1986-03-24
5504/15-6	Mærsk Endeavour	04°37'50"	U.Jurassic	1986-04-30
Midt Rosa Fl.-1	Mærsk Olie og Gas	55°35'27"	3039 metres	1986-05-04
5504/15-7	Mærsk Endeavour	04°31'33"	L.Cret.	1986-06-11
Vest Lulu-4	Mærsk Olie og Gas	56°19'05"	3919 metres	1986-07-27
5604/21-6	Mærsk Endeavour	04°10'16"	L.Triassic	1986-09-12
Gwen-2	Mærsk Olie og Gas	56°06'52"	4368 metres	1986-09-30
5604/29-3	Mærsk Endeavour	04°04'10"	L.Triassic	1986-12-15
Mejrup-1	Philips	56°22'39"	2532 metres	1987-03-22
5608/19-1	Kenting 36	08°40'36"	Triassic	1987-04-29
Felicia-1	Statoil	57°26'18"	5321 metres	1987-07-03
5708-18-1	Mærsk Guardian	08°18'41"	Permian	1987-12-03
Gert-3	Mærsk Olie og Gas	56°12'43"		1987-07-21
5603/28-2	Mærsk Endeavour	03°45'49"		1987-10-28
Stenlille-2	Danop	55°32'17"		1987-07-27
5511/15-2	Kenting 36	11°36'18"		1987-08-28
Ibenholt-1	Phillips	56°23'26"	2599 metres	1987-08-11
5605/20-1	Dyvi Sigma	05°58'29"	Precambrian	1987-09-24
Dyb Gorm-1	Mærsk Olie og Gas	55°34'04"		1987-08-18
5504/16-5	Zapata Scotian	04°45'50"		1987-12-04
Stenlille-3	Danop	55°32'17"		1987-08-30
5511/15-3	Kenting 36	11°36'18"		1987-09-16
Ravn-2	Amoco	55°50'35"	4507 metres	1987-09-16
5504/05-1	Dan Earl	04°13'41"	Triassic	1987-11-17
Tostrup-11	Danop	56°37'55"		1987-10-10
5609/10-11	Kenting 36	09°25'24"		1987-11-07
Elly-2	Mærsk Olie og Gas	55°47'19"		1987-11-15
5504/06-2	Neddrill Trigon	04°19'05"		1988-05-31
Jeppe-1	Norsk Hydro	56°11'04"	5050 metres	1987-12-10
5603/28-3	Mærsk Guardian	03°54'36"	Permian	1988-03-02
Borg-1	Danop	55°02'57"	Palaeozoic	1988-04-18
5508/32-2	Kenting 34	08°48'23"	3074 metres	1988-05-29
Gulnare-1	Statoil	56°10'13"	4735 metres	1988-06-02
5604/26-1	Mærsk Endeavour	04°26'41"	Jurassic	1988-09-19
Stenlille-4	Danop	55°31'06"		1988-07-19
5511/15-4	Kenting 36	11°35'14"		1988-08-09
Stenlille-5	Danop	55°32'08"		1988-08-14
5511/15-5	Kenting 36	11°37'33"		1988-09-03
Stenlille-6	Danop	55°33'29"		1988-09-07
5511/15-6	Kenting 36	11°39'09"		1988-09-27
Tordenskjold-1	Danop	55°56'19"	3703 metres	1988-12-14
5503/03-2	Neddrill Trigon	03°32'31"	L.Permian	1989-02-04
Pernille-1	Norsk Hydro	55°00'54"	3588 metres	1989-04-07
5514/30-1	Glomer Moray Firth	14°18'43"	Palaeozoic	1989-06-06
Stina-1	Amoco	54°47'20"	2482 metres	1989-06-12
5414/7-1	Glomar Moray Firth	14°37'44"	Palaeozoic	1989-07-11
Falk-1	Amoco	55°50'01"	4200 metres	1989-07-23
5504/6-3	Glomar Moray Firth	04°18'50"	Triassic	1989-09-05
Gert-4	Mærsk Olie og Gas	56°13'18"		1989-11-02
5603/27-4	Mærsk Endeavour	03°43'48"		1990-05-16
Alma-1	Mærsk Olie og Gas	55°28'58"		1990-03-18
5505/17-10	Mærsk Giant	05°12'33"		1990-08-16
Amalie-1/1A	Statoil	56°14'39"	5320 metres	1990-08-01
5604/26-2	Neddrill Trigon	04°22'02"	Jurassic	1991-06-17
Stenlille-7	Danop	55°32'18"		1990-09-10
5511/15-7	Kenting 31	11°36'27"		1990-12-17
E-5	Mærsk Olie og Gas	55°40'25"		1991-02-05
5504/12-4	West Sigma	04°53'10"		1991-05-11
Skjold Fl.-1	Mærsk Olie og Gas	55°33'24"		1991-05-10
5504/16-6	West Kappa	04°53'51"		1991-09-22
Eg-1	Agip	55°57'09"	4500 metres	1991-06-24
5503/4-2	Neddrill Trigon	03°58'25"	Permian ?	1991-09-23
Baron-1	Norsk Hydro	56°01'44"	999 metres	1991-07-25
5604/30-2	Mærsk Jutlander	04°15'30"		1991-08-01
Baron-2/2A	Norsk Hydro	56°01'44"	5100 metres	1991-08-01
5604/30-3	Mærsk Jutlander	04°15'30"	U.Jurassic	1992-01-13
Tyra TWC-3P	Mærsk Olie og Gas	55°42'56"		1991-09-14
5504/11-3	Mærsk Giant	04°44'56"		1991-12-08
Elly-3	Mærsk Olie og Gas	55°47'19"		1991-09-12
5504/6-4	Mærsk Endeavour	04°22'02"		1992-02-12
Stenlille-8	Danop	55°32'19"		1991-11-08
5511/15-8	Kenting 31	11°36'26"		1992-01-16

Appendix C

Exploratory Surveys 1991

Survey	Operator Contractor	Type	Initiated Completed	Area	Collected in 1991
Seismic Surveys					
AM91C	Amoco Norway Teledyne Exploration	Offshore 2D	1991-03-15 1991-03-16	Central Graben	43 km
AM91C	Amoco Denmark Teledyne Exploration	Offshore 3D	1991-05-24 1991-06-17	Central Graben Elly 1/89	1,783 km
AM91C	Amoco Denmark Teledyne Exploration	Offshore 2D	1991-06-15 1991-06-15	Central Graben 2/84	83 km
AM91N	Amoco Denmark Teledyne Exploration	Offshore 2D	1991-06-20 1991-06-27	North Sea 3/89	449 km
DK91C	Mærsk Olie og Gas AS Simon-Horizon Ltd.	Offshore 2D	1991-05-19 1991-05-20	Central Graben Emma	64 km
DK91C	Mærsk Olie og Gas AS Simon-Horizon Ltd.	Offshore 3D	1991-05-26 1991-07-25	Central Graben Alma	11,306 km
DK91C	Mærsk Olie og Gas AS Simon-Horizon Ltd.	Offshore 3D	1991-07-18 1991-10-25	Central Graben North Arne	13,713 km
DK91C	Mærsk Olie og Gas AS Simon-Horizon Ltd.	Offshore 3D	1991-07-29 1991-10-26	Central Graben South Roar	3,214 km
DK91C	Mærsk Olie og Gas AS Simon-Horizon Ltd.	Offshore 3D	1991-07-30 1991-10-26	Central Graben South East Tyra	7,410 km
DN91D	Danop/Jordan CGG	Onshore	1991-09-10 1991-09-20	Jutland Give	78 km
Geochemical Surveys					
HO91A	Hoff Int. Off. Serv. Team Petroleum Geology Invest.	Offshore	1991-06-22 1991-09-09	The Baltic Inner waters	214 cores

Danish Oil Production 1972-1991, million m³

Year	Dan	Gorm	Skjold	Tyra	Rolf	Kraka	Dagmar	*Total*
1972	0.11							*0.11*
1973	0.15							*0.15*
1974	0.10							*0.10*
1975	0.19							*0.19*
1976	0.23							*0.23*
1977	0.58							*0.58*
1978	0.49							*0.49*
1979	0.49							*0.49*
1980	0.34							*0.34*
1981	0.34	0.53						*0.87*
1982	0.31	1.64	0.02					*1.97*
1983	0.27	1.84	0.40					*2.51*
1984	0.36	1.62	0.65	0.07				*2.70*
1985	0.45	1.80	0.85	0.35				*3.45*
1986	0.47	1.72	1.07	0.57	0.47			*4.30*
1987	1.23	1.50	1.21	0.84	0.63			*5.41*
1988	1.50	1.35	1.37	0.95	0.40			5.57
1989	1.47	1.35	2.21	1.05	0.39			*6.47*
1990	1.58	1.44	2.63	1.08	0.27			*7.00*
1991	1.72	1.50	2.73	1.39	0.29	0.14	0.48	*8.25*
Total	*12.38*	*16.29*	*13.14*	*6.30*	*2.45*	*0.14*	*0.48*	*51.18*

Danish Gas Production 1972-1991, billion Nm³

Year	Dan	Gorm	Skjold	Tyra	Rolf	Kraka	Dagmar	*Total*	*Sold*
1972	0.02							*0.02*	
1973	0.03							*0.03*	
1974	0.03							*0.03*	
1975	0.06							*0.06*	
1976	0.07							*0.07*	
1977	0.17							*0.17*	
1978	0.16							*0.16*	
1979	0.16							*0.16*	
1980	0.07							*0.07*	
1981	0.08	0.08						*0.16*	
1982	0.08	0.27	0.00					*0.35*	
1983	0.08	0.43	0.04					*0.55*	
1984	0.13	0.51	0.06	0.26				*0.96*	*0.22*
1985	0.21	0.64	0.07	1.11				*2.03*	*1.04*
1986	0.24	0.78	0.10	1.63	0.02			*2.77*	*1.80*
1987	0.44	0.88	0.10	2.65	0.03			*4.10*	*2.30*
1988	0.60	0.98	0.11	3.36	0.02			*5.07*	*2.27*
1989	0.71	0.89	0.19	3.52	0.02			*5.33*	*2.68*
1990	0.80	0.81	0.22	3.30	0.01			*5.14*	*2.75*
1991	0.88	0.84	0.23	3.67	0.01	0.06	0.07	*5.76*	*3.51*
Total	*5.02*	*7.11*	*1.12*	*19.50*	*0.11*	*0.06*	*0.07*	*32.99*	*16.57*

A large amount of gas has been reinjected

Appendix D2

Monthly Oil and Condensate Production 1991, thousand m^3

	Jan	Feb	March	April	May	June	July	Aug	Sep	Oct	Nov	Dec	*1991*
Dan	141	126	136	114	142	143	152	152	151	151	155	162	*1723*
Gorm	132	113	140	114	122	115	125	126	118	131	130	135	*1501*
Skjold	231	217	239	225	236	236	231	228	222	227	219	222	*2734*
Tyra	132	121	129	115	114	111	84	105	101	118	128	128	*1386*
Rolf	25	23	17	7	30	34	26	25	26	26	25	29	*293*
Kraka			3	19	22	18	16	15	13	14	9	16	*144*
Dagmar						7	64	84	82	91	76	70	*475*
Total	*661*	*600*	*663*	*593*	*665*	*664*	*697*	*735*	*714*	*759*	*742*	*762*	*8256*

Monthly Gas Production 1991, million Nm^3

	Jan	Feb	March	April	May	June	July	Aug	Sep	Oct	Nov	Dec	*1991*
Dan	68	63	7	47	66	70	84	84	83	83	83	81	*879*
Gorm	69	65	71	72	73	69	69	71	65	69	70	80	*843*
Skjold	19	18	20	19	20	21	19	17	20	22	20	18	*233*
Tyra	375	343	368	307	294	303	169	219	238	320	371	363	*3672*
Rolf	1	1	1	<1	1	2	1	1	1	1	1	1	*12*
Kraka			1	5	7	7	7	7	6	7	4	7	*56*
Dagmar						1	8	10	10	14	12	11	*65*
Total	*533*	*490*	*527*	*450*	*462*	*472*	*357*	*409*	*422*	*516*	*561*	*562*	*5760*

Domestic Energy Consumption 1972-1991. Distributed on Fuels, Energy Production and Degree of Self-sufficiency, million t.o.e.

	Oil	Gas	Coal	Renewable Energy, etc.	*Total*	Energy Production	Self-sufficiency %
1972	17.9	-	1.1	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	-	2.8	0.4	*19.2*	0.6	3
1977	16.0	-	3.2	0.4	*19.6*	0.9	4
1978	16.0	-	4.0	0.3	*20.4*	0.7	4
1979	15.9	-	4.8	0.5	*21.2*	0.9	4
1980	13.2	-	5.7	0.5	*19.4*	0.8	4
1981	11.6	0.0	5.9	0.6	*18.2*	1.4	8
1982	10.8	0.0	6.2	0.7	*17.7*	2.4	14
1983	10.2	0.0	6.6	0.7	*17.6*	3.0	17
1984	10.1	0.2	7.1	0.8	*18.2*	3.4	19
1985	10.4	0.7	7.4	0.8	*19.2*	4.8	25
1986	10.2	1.2	7.4	0.9	*19.6*	6.4	33
1987	9.7	1.5	7.7	1.0	*19.9*	8.0	40
1988	9.0	1.6	7.7	1.0	*19.3*	8.1	42
1989	8.6	1.8	7.6	1.1	*19.1*	9.4	49
1990	8.2	1.8	7.6	1.1	*18.8*	10.0	53
1991*)	8.4	2.1	7.8	1.2	*19.4*	11.8	61

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 1972-1991. Distributed on Utilization, million t.o.e.

	Residential	Process	Transport	Elec. Appl. etc.	Non-energy	*Total*
1972	7.4	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	7.1	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	*20.4*
1979	7.5	5.6	3.8	3.4	0.9	*21.2*
1980	6.4	5.4	3.5	3.4	0.8	*19.4*
1981	5.8	4.9	3.3	3.4	0.7	*18.2*
1982	5.6	4.6	3.5	3.4	0.7	*17.7*
1983	5.4	4.6	3.6	3.4	0.7	*17.6*
1984	5.3	4.8	3.7	3.6	0.8	*18.2*
1985	6.1	5.0	3.8	3.6	0.8	*19.2*
1986	5.8	5.3	3.9	3.7	0.9	*19.6*
1987	6.0	5.2	4.0	3.8	1.0	*19.9*
1988	5.3	5.1	4.0	3.9	1.0	*19.3*
1989	4.9	5.2	4.1	3.9	1.0	*19.1*
1990	4.8	5.2	4.1	3.8	0.9	*18.8*
1991*)	5.1	5.3	4.2	3.9	0.9	*19.4*

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

Financial Key Figures

	Investments in Field Development DKK million	Operating Costs for Fields DKK million	Exploration Costs 1) DKK million	Crude Oil Price 2) USD/bbl	Exchange Rate DKK/USD	Inflation Rate 3) per cent	Net Foreign Currency Expenditure on Energy Import DKK million
1972	105	19	28	3.0	7.0	6.57	3.3
1973	9	21	83	4.6	6.1	9.30	4.3
1974	38	51	76	11.6	6.1	15.18	9.8
1975	139	51	118	12.3	5.8	19.62	9.4
1976	372	58	114	12.3	6.1	9.02	10.3
1977	64	66	176	14.0	6.0	11.18	11.4
1978	71	98	55	14.0	5.5	9.99	10.9
1979	387	121	78	20.4	5.3	9.63	15.5
1980	956	148	201	37.5	5.6	12.34	21.2
1981	1651	327	257	37.4	7.1	11.68	25.9
1982	3948	556	266	34.0	8.4	10.15	25.9
1983	3528	505	1264	30.5	9.1	6.92	21.9
1984	1596	721	1211	28.2	10.4	6.28	22.8
1985	1956	756	1373	27.2	10.6	4.74	23.4
1986	1694	981	721	14.7	8.1	3.62	11.2
1987	914	1023	758	18.4	6.8	4.02	8.7
1988	897	1000	560	14.8	6.7	4.56	6.7
1989	1145	1094	500	18.0	7.3	4.79	7.4
1990	1736	1226	817	23.5	6.2	2.60	5.7
1991	2315	1150	960	20.0	6.4	2.40	5.1

Nominal Prices. 1) All licensees 2) Danish crude oil 3) Consumer prices

The Dan Centre

Field name:	**Dan**
Prospect:	Abby
Location:	Block 5505/17
Concession:	A.P. Møller
Operator:	Mærsk Olie & Gas AS
Discovered:	1971
Year on stream:	1972
Producing wells:	49
of which horizontal:	14
Injection wells:	6
Water depth:	40 m (131 ft)
Acreage:	30 km^2 (7,400 acres)
Reservoir depth:	1,850 m (6,070 ft)
Reservoir rock:	Chalk (Danian/ Maastrichtian)
Reserves Expectation	
Oil:	42 million m^3 (265 MMbbls)
Gas:	18 billion Nm^3 (670 BSCF)
Cumulative Production	
Oil:	12.38 million m^3 (78 MMbbls)
Gas:	5.02 billion Nm^3 (187 BSCF)

Review of Geology

Dan is an anticlinal structure induced through salt tectonics of the Zechstein/Triassic. The chalk reservoir has an adequate porosity, although strongly reduced permeability. A major northeast-southwest fault divides the field into two independent reservoirs.

Production Facilities

The field installation comprises five wellhead platforms (A, D, E, FA and FB), two processing/ accommodation platforms (B and FC) and one gas flare stack (C).

Processing of the produced oil and gas takes place mainly at Dan FC. The older processing facilities at Dan B have since 1989 been used for temporary, individual well production testing only. Final processing of the produced oil is performed at Dan FC prior to export ashore via the booster platform at Gorm E. The gas is pre-processed at Dan FC and transported to Tyra East for final processing and export ashore. Water treatment and pumping facilities for water injection are installed on the bridge between the FB and FC platforms. In 1991, a major extension of the facilities at the Dan Field was approved, consisting of two new platforms of the STAR type, of which one platform, FD, is to be used for a new flare stack, while the other, FE, is to serve as a seven-slot wellhead platform. Moreover, a bridge module with new water-injection facilities is to terminate on FE. Further, the processing facilities at the Dan Field handle production received from the Kraka Field. Dan B has accommodation facilities for five persons, and Dan FC can accommodate 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:	March 1991
Producing wells:	2
of which horizontal:	2
Water depth:	45 m (148 ft)
Acreage:	6 km^2 (1500 acres)
Reservoir depth:	1,800 m (5,900 ft)
Reservoir rock:	Chalk (Danian/ Maastrichtian)
Reserves Expectation	
Oil:	3 million m^3 (19 MMbbls)
Gas:	2 billion Nm^3 (75 BSCF)
Cumulative Production	
Oil:	0.14 million m^3 (1 MMbbl)
Gas:	0.06 billion Nm^3 (2 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 saturation. 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 type. The produced oil and gas are transported 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:	21
Gas injection wells:	2
Water injection wells:	5
Water depth:	39 m (128 ft)
Acreage:	12 km² (3,000 acres)
Reservoir depth:	2,200 m (7,218 ft)
Reservoir rock:	Chalk (Danian/ Maastrichtian)
Reserves Expectation	
Oil:	24 million m³ (151 MMbbls)
Gas:	6 billion Nm³ (223 BSCF)
Cumulative production	
Oil:	16.30 million m³ (103 MMbbls)
Gas:	7.10 billion Nm³ (264 BSCF)
Injection gas:	6.72 billion Nm³ (250 BSCF)
Net gas:	0.38 billion Nm³ (14 BSCF)

Review of Geology

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

Production Facilities

The Gorm Field consists of two wellhead platforms (A and B), one processing/accommodation platform (C), one gas flare stack (D), one riser/booster platform (E) and one processing/pumping platform (F).

The Gorm F facilities consist of two oil stabilization plants, one receiving the sour oil and gas from the Dagmar Field, and the other receiving the oil and gas produced in the Skjold and Rolf Fields. Moreover, processing/pumping facilities for injection water to be used in the Gorm and Skjold Fields have been installed on Gorm F. Final processing of oil and gas takes place at Gorm C prior to export ashore via Gorm E (oil) and Tyra East (gas). The gas reinjection facilities are installed at Gorm C. There are accommodation facilities on Gorm C for 98 persons.

Field name:	**Skjold**
Prospect:	Ruth
Location:	Block 5504/16
Concession:	A.P. Møller
Operator:	Mærsk Olie & Gas AS
Discovered:	1977
Year on stream:	1982
Producing wells:	4
Water injection wells:	6
Water depth:	40 m (131 ft)
Acreage:	10 km² (2,500 acres)
Reservoir depth:	1,600 m (5,250 ft)
Reservoir rock:	Chalk (Danian/ Maastrichtian)
Reserves Expectation	
Oil:	15 million m³ (94 MMbbls)
Gas:	1 billion Nm³ (37 BSCF)
Cumulative Production	
Oil:	13.14 million m³ (83 MMbbls)
Gas:	1.12 billion Nm³ (42 BSCF)

Review of Geology

The Skjold Field is an anticlinal structure induced through Zechstein salt tectonics. The structure is heavily fractured, which has resulted in favourable reservoir conductivity, in particular within the crestal part of the structure.

Production Facilities

The Skjold Field comprises a satellite development to the Gorm Field, including one unmanned wellhead platform. There are no processing facilities in the Skjold Field, and the oil and gas produced are transported to separate facilities on the Gorm F platform, which also includes facilities providing the Skjold Field with injection water. In 1991, a test separator was installed on the Skjold platform for metering production from the individual wells.

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:	5 km² (1,200 acres)
Reservoir depth:	1,800 m (5,900 ft)
Reservoir rock:	1) Chalk (Danian/ Maastrichtian) 2) Carbonates (Zechstein)
Reserves Expectation	
Oil:	2 million m³ (13 MMbbls)
Gas:	<1 billion Nm³ (<37 BSCF)
Cumulative Production	
Oil:	2.45 million m³ (15 MMbbls)
Gas:	0.11 billion Nm³ (4 BSCF)

Review of Geology

Rolf is an anticlinal structure created through Zechstein salt tectonics. The chalk reservoir is heavily fractured resulting in favourable reservoir conductivity (compare Skjold). The underlying Zechstein reservoir shows similar characteristics.

Production Facilities

The Rolf Field is a satellite development to the Gorm Field with an unmanned wellhead platform. The produced oil and gas are 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:	June 1991
Producing wells:	2
Water depth:	34 m (112 ft)
Acreage:	9 km² (2,200 acres)
Reservoir depth:	1,400 m (4,600 ft)
Reservoir rock:	Chalk (Danian/ Maastrichtian)
Reserves Expectation	
Oil:	3 million m³ (19 MMbbls)
Gas:	1 billion Nm³ (37 BSCF)
Cumulative Production	
Oil:	0.47 million m³ (3 MMbbls)
Gas:	0.07 billion Nm³ (3 billion 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. The reservoir fluid contains hydrogen sulphide.

Production Facilities

The Dagmar field is a satellite development to Gorm including one unmanned production platform of the STAR type. The production is transported to Gorm F for separate processing and export ashore.

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:	34
of which horizontal:	6
Gas injection wells:	8
Water depth:	37-40 m (121-131 ft)
Acreage:	52 km² (12,800 acres)
Reservoir depth:	2,000 m (6,562 ft)
Reservoir rock:	Chalk (Danian/ Maastrichtian)
Reserves Expectation	
Oil:	3 million m³ (19 MMbbls)
Condensate:	4 million m³ (25 MMbbls)
Gas:	33 billion Nm³ (1.2 TSCF)

Cumulative Production

Oil:	1.73 million m^3 (11 MMbbls)
Condensate:	4.57 million m^3 (29 MMbbls)
Gas:	19.50 billion Nm^3 (726 BSCF)
Injection gas:	5.98 billion Nm^3 (223 BSCF)
Net gas:	13.52 billion Nm^3 (503 BSCF)

Review of Geology

The Tyra Field is an anticlinal structure, probably related to tectonic inversion or salt tectonics or both. A marked permeability barrier separates the Danian and the Maastrichtian chalk reservoir rocks.

Production Facilities

The production facilities include two major production complexes, Tyra West and Tyra East, each consisting of two wellhead platforms, one processing/accommodation platform, and one gas flare stack; a riser platform has been installed at Tyra East housing the gas export outlet into the main gas pipeline.

Final processing of gas and stabilization of black oil/condensate take place at Tyra East. The stabilized hydrocarbon liquids are transported to Gorm for export ashore. Gas recycling facilities have been installed at Tyra West for enhanced condensate recovery. There are total accommodation facilities at the Tyra Field for 176 persons (96 at Tyra East and 80 at Tyra West). It is planned to expand the capacity of the facilities at Tyra East for receiving production from fields to be developed within the next few years, including Valdemar and Roar.

Field Developments in Progress

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:	1993/94 (planned)
Producing wells:	3 (planned)
Water depth:	38 m (125 ft)
Upper Cretaceous reservoir:	
Acreage:	16 km^2 (4,000 acres)
Reservoir depth:	2,000 m (6,560 ft)
Reservoir rock:	Chalk
Lower Cretaceous reservoir:	
Acreage:	200 km^2 (50.000 acres)
Reservoir depth:	2,600 m (8,530 ft)
Reservoir rock:	Limestone

Reserves Expectation

Oil:	2 million m^3 (13 MMbbls)
Gas:	2 billion Nm^3 (75 BSCF)

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 limestone of Aptian/Barremian age (Tuxen formation). The properties of the Upper Chalk reservoirs are comparable to other Danish fields like Gorm and Tyra, while the Aptian/Barremian limestones possess very difficult production properties. Some fracturing has been indicated in certain areas of the limestone reservoir, which improves the productivity.

Production Facilities

Valdemar will be developed as a satellite to Tyra, including an unmanned production platform of the STAR type. The produced oil and gas will be transported to Tyra East for processing and export ashore.

New Field Developments

Field name: **Regnar**

Location: Block 5505/17
Concessionaire: A.P.Møller
Operator: Mærsk Olie & Gas AS
Discovered: 1979
Development plan approved: 1988
Year on stream: 1993/94 (planned)

Field name: **Roar**

Prospect: Bent
Location: Block 5504/7
Concessionaire: A.P. Møller
Operator: Mærsk Olie & Gas AS
Discovered: 1968
Development plan approved: 1990
Year on stream: 1994 (planned)

Field name: **Harald**

Prospects: Lulu/West Lulu
Location: Blocks 5604/21 and 22
Concessionaire: A.P. Møller
Operator: Mærsk Olie & Gas AS
Discovered: 1980 (Lulu) and 1983 (West Lulu)
Development plan approved: 1990
Year on stream: 1998 (planned)

Field name: **Svend**

Prospects: North Arne/Otto
Location: Block 5604/25
Concessionaire: A.P. Møller
Operator: Mærsk Olie & Gas AS
Discovered: 1975 (North Arne) and 1982 (Otto)
Development plan approved: 1990
Year on stream: 1999/2000 (planned)

Field name: **Adda**

Location: Block 5504/8
Concessionaire: A.P.Møller
Operator: Mærsk Olie & Gas AS
Discovered: 1977
Development plan approved: 1990
Year on stream: 1999 (planned)

Field name: **Igor**

Location: Block 5505/13
Concessionaire: A.P. Møller
Operator: Mærsk Olie & Gas AS
Discovered: 1968
Development plan approved: 1990
Year on stream: 1999 (planned)

Field name: **Gert**

Location: Blocks 5603/27 and 28
Concessionaire: A.P. Møller
Operator: Mærsk Olie & Gas AS
Discovered: 1984
Development plan submitted: 1991

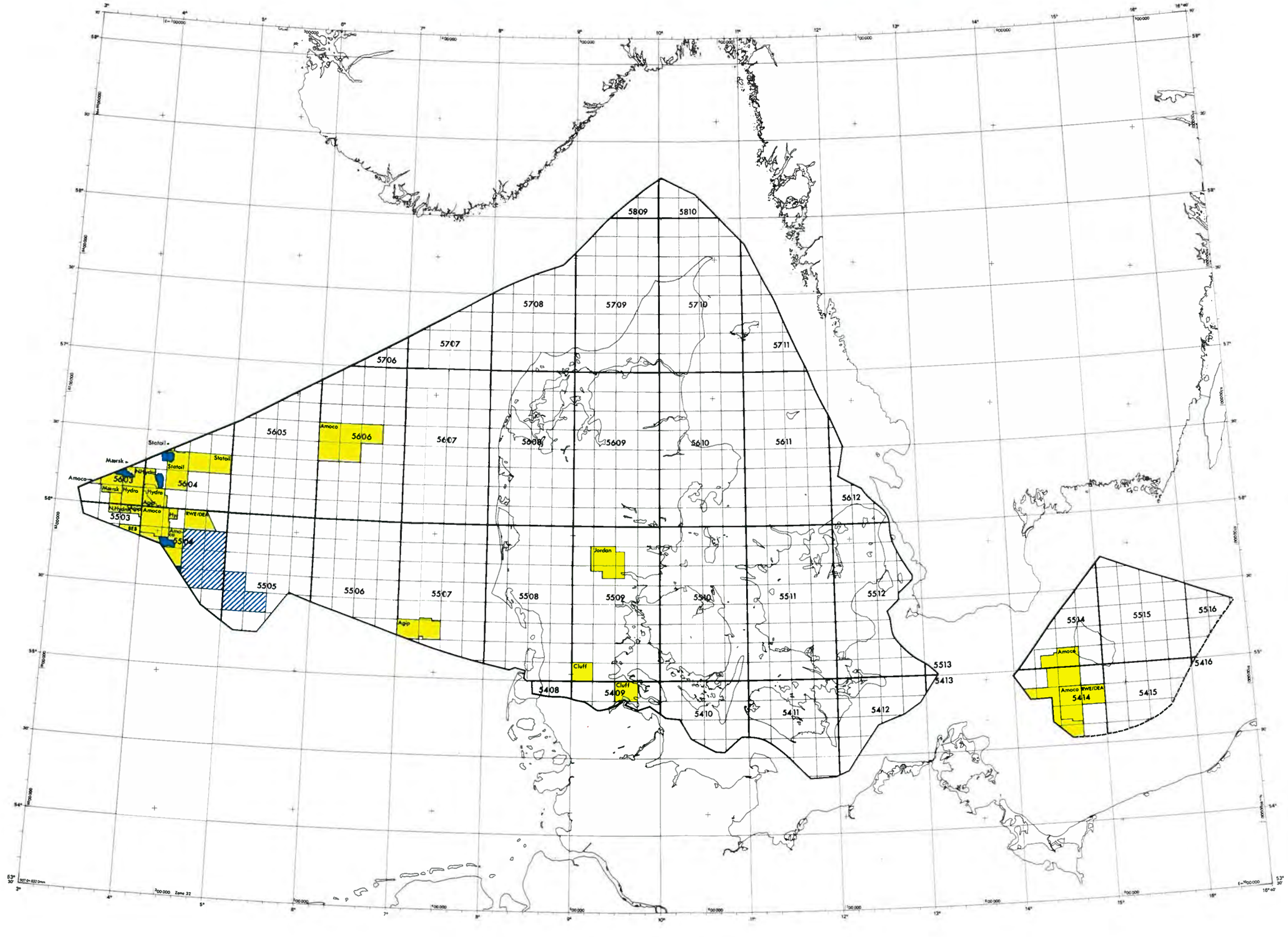
Field name: **Elly**

Location: Block 5504/6
Concessionaire: A.P. Møller
Operator: Mærsk Olie & Gas AS
Discovered: 1984
Development plan submitted: 1992

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	Valdemar
North Arne/Otto	Svend
Nils	Regnar

The Danish Licence Area January, 1 1992



DUC 1962 Licence

Contiguous Area (DUC 1962)

Licences issued after 1981

Danish Energy Agency