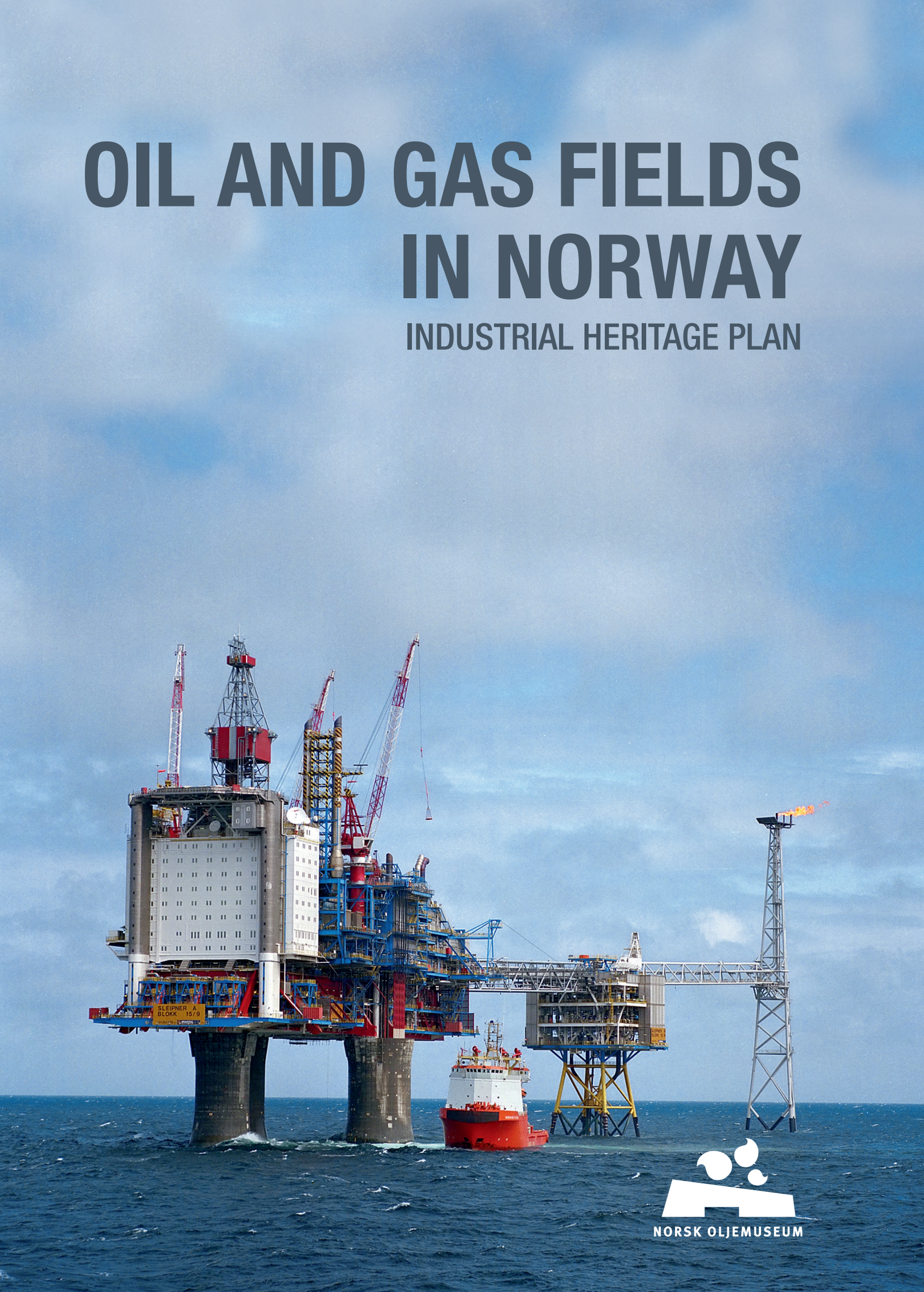
OIL AND GAS FIELDS IN NORWAY

INDUSTRIAL HERITAGE PLAN



NORSK OLJEMUSEUM

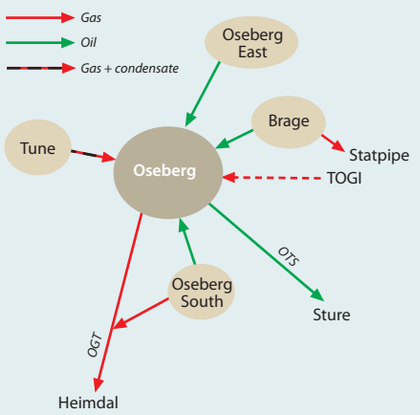
THE OSEBERG AREA

The Oseberg area lies about 140 kilometres north-west of Bergen and embraces Oseberg, Oseberg West, Oseberg west flank, Oseberg Delta, Oseberg East and Oseberg South as well as Tune and Brage.

Oseberg

This oil and gas field was discovered in 1979 in about 100 metres of water. It has been developed for a two-stage recovery of oil and gas resources in the area. During the first phase, oil is produced with the injection of processed gas, both associated and imported, to maintain reservoir pressure. Stage two involves the production, processing and export of the gas. Oseberg was the first Norwegian field to receive gas from another reservoir for injection and pressure support to improve oil production. The Troll-Oseberg gas injection (TOGI) project was very demanding in technological terms and crucial for boosting the recovery factor on Oseberg. Statoil was operator for the exploration phase in block 30/6, but the operatorship was transferred on 1 April 1982 to Norsk Hydro. Elf was technical assistant for the development.

Test production from the Petrojarl 1 ship was introduced on Oseberg. This long-term trial provided valuable information about optimising recovery from the field.



The Oseberg area embraces many different licences, but licence interest there were harmonised in connection with the sale of SDFI holdings in 2002. This was done to ensure more efficient development of the area across the various licences.

Reservoir and recovery strategy

Oseberg is an oil field with an overlying gas cap located on the outer edge of the Viking Graben. Comprising several reservoirs in the Brent group of middle Jurassic age, it is divided into a number of structures. The main reservoir lies in the Oseberg and Tarbert formations, but the Etive and Ness formations are also produced. Generally speaking, reservoir properties are good.

The field is produced with pressure maintenance through gas, water and water alternating gas (WAG) injection. Massive gas injection high up in the structure has resulted in very good oil displacement and the formation of a large gas cap, which will be produced in coming years. Injection gas was earlier imported from such sources as TOGI and Oseberg West.

TOGI was a subsea module installed in 300 metres of water on Troll East and remotely operated from the Oseberg field centre 48 kilometres away. The unprocessed wellstream was carried in a multiphase flow pipeline over the same distance. In technological terms, TOGI represented a big step forward. Petroleum production had never previously been planned and executed in such water depths. Nor had the transport of unprocessed wellstreams or remote control of subsea wells been conducted over such a distance in the North Sea. Many of the solutions required had to be specially developed. Components never previously combined had to be modified for Togi ultimately to function. Moreover, the module could be maintained without diver assistance.

This project gave Hydro valuable technological experience, which strengthened its position on the NCS. It accordingly represented a milestone for the company, which also influenced the development of Troll Oil. The expertise acquired was further developed in the Toll and Ormen Lange developments, where unprocessed wellstreams are piped to land.

The TOGI module was on stream from 1991 to 2002, delivering 21.4 billion scm of gas for injection to improve Oseberg oil recovery. Its wells were plugged in 2004.

Lifting the TOGI module. Photo: Norsk Hydro

Transport

In addition to producing Oseberg's own oil and gas, the field centre is a hub for such output from nearby fields and for onward transport of oil to Sture near Bergen and gas via Heimdal to St Fergus in Scotland.

- Oseberg A receives oil from Oseberg South, Oseberg East, Brage and Veslefrikk
- Oseberg B receives oil from Oseberg west flank
- Oseberg C receives gas from Oseberg West and delivers oil and gas to Oseberg A
- Oseberg D receives gas and condensate from Oseberg Delta and Tune.

Oil is gathered at the Oseberg field centre and piped through the Oseberg Transport System (OTS) to the Sture terminal. Gas exports began in 2000 through the new Oseberg Gas Transport (OGT) pipeline from Oseberg D to the Heimdal riser platform (HRP), and

on through Vesterled to St Fergus. Huldra gas is carried in a dedicated pipeline to Heimdal. Gas from Brage and Veslefrikk goes through Statpipe to Kårstø and on to continental Europe. From 1994-2001, Frostpipe carried oil and condensate from Frigg to Oseberg for onward transport to Sture. This pipeline has since been shut in.

Development solution

The field centre embraces the Oseberg A, B and D platforms, tied together by bridges at the southern end of the reservoir, while the Oseberg C installation stands 14 kilometres to the north.

Phase one of the development covered the concrete Oseberg A facility, with processing equipment, injection modules and living quarters, and the steel B platform equipped for drilling and production. The second phase involved the D and C steel platforms, with the first used for gas processing and the other built as an integrated production, drilling and quarters installation.

Oseberg has a total oil production capacity of about 500 000 barrels per day. Horizontal drilling acquired particular importance. Output from the field centre utilises 30 production wells, including two separate subsea completions. In addition come 10 injectors for gas and water. Three multilaterals have also been drilled from Oseberg C.

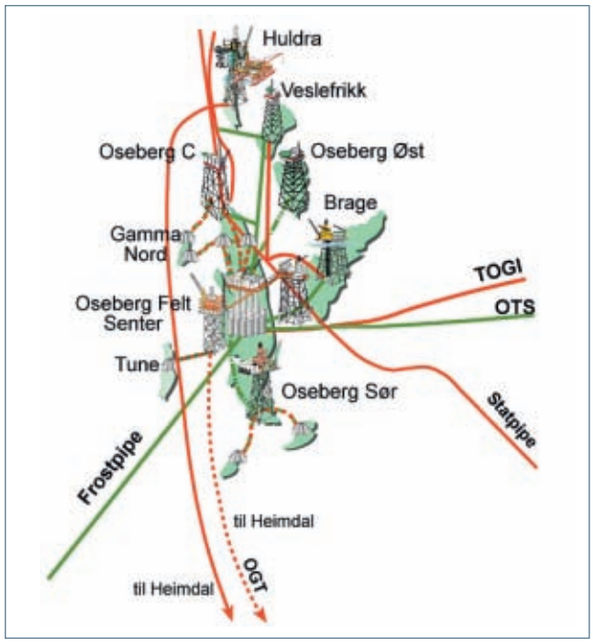


Illustration: Norsk Hydro

The Oseberg field centre with the B, A and D platforms. Photo: Vegar Stokset/Statoil

Oseberg C. Photo: Helge Hansen/Statoil

Oseberg A
The main contractor for this concrete platform was Norwegian Contractors, which built the Condeep GBS – with a base area of roughly 1.7 hectares and 30 cells – at Hinnavågen in Stavanger. Aker Stord fabricated the topside, which was mated with the GBS at Stord in June 1987. Installed on the field in 1988, the platform carries processing equipment, injection modules and living quarters. The GBS cells are not used for intermediate oil storage. Oseberg A is an example of the new accommodation standards introduced to the NCS in the 1980s on such fields as Ekofisk and Gullfaks.

Oseberg B
This steel platform was installed in 1987. The main fabrication contractor was Norconsult/McDermott, with the jacket built at Aker Verdal north of Trondheim. Linked to the A platform by a bridge, Oseberg B is used for drilling, production and water injection.

Oseberg D
Earlier called Oseberg Gas, this steel platform carries equipment for gas processing and export. Installed in the spring of 1999, it is tied to the field centre by a bridge. A dedicated module to receive gas and condensate from Tune was positioned on Oseberg D in 2002. It also receives gas and condensate from Oseberg Delta through two pipelines.

Oseberg C
This integrated steel production, drilling and quarters platform stands 14 kilometres north of the field centre, and came on stream in 1991. Gas from Oseberg West and oil and gas from Oseberg C are carried in pipelines to Oseberg A.

Eighteen wells, including a separate subsea completion, produce oil and gas from Oseberg C. A further eight wells inject gas and water for pressure maintenance.

Oseberg West

Development of Oseberg West was approved in December 1988, and the first well came on stream in October 1991. This field is covered by the production licence for the Oseberg area and forms part of the development plan for the northern Oseberg field. It was developed in part to deliver extra gas for injection, but has proved to contain more oil than expected. The gas is delivered through a four-kilometre pipeline to Oseberg C. Oseberg West produces through a single subsea template.

Oseberg Delta

This gas and condensate discovery lies about 10 kilometres west of the Oseberg field centre, with the bulk of its resources in blocks 30/8 and 30/9. Most of the field is covered by production licence 079, with a small part in PL 190. Oseberg Delta has been developed with a single subsea template for two production wells, tied back to Oseberg D for processing and export. The field came on stream in June 2008.

Oseberg west flank

Located 10 kilometres north-west of the field centre, the Oseberg west flank subsea development was launched in 2003 after oil and gas were proven by three exploration wells drilled in 1985-2001.

Starting in February 2006, petroleum produced from a seabed template with four well slots is piped to Oseberg B for processing and transport.

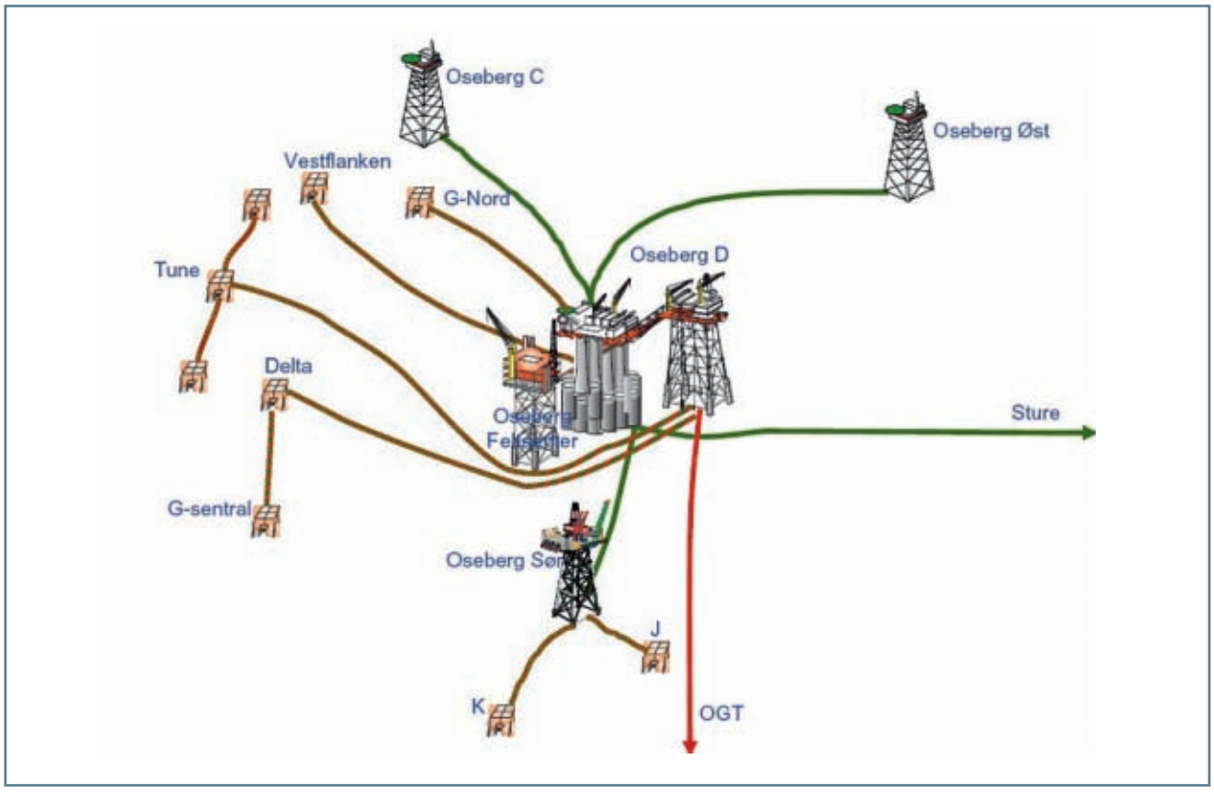


Illustration: Norsk Hydro

Oseberg South

This oil field lies directly south of Oseberg in about 100 metres of water, and came on stream in February 2000.

Reservoir and recovery strategy

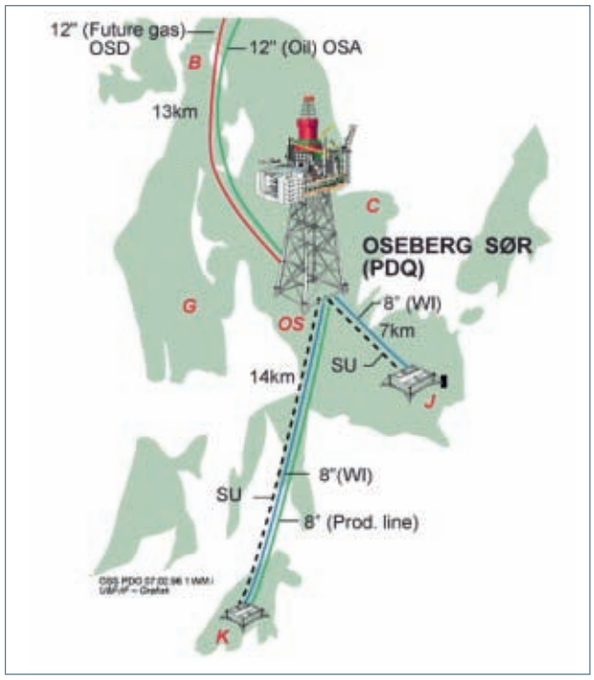
Oseberg South embraces 10 separate structures in Jurassic sandstones at depths of 2 200-2 800 metres. The main reservoirs are located in the Tarbert and Heather formations. Reservoir quality is moderate. The field produces primarily with the aid of waterflooding, but water alternative gas (WAG) injection is also used in some parts.

Development solution

Installations on the field comprise the Oseberg South platform and the J and K subsea modules, with four wells in each seabed template.

The platform is an integrated steel production, drilling and quarters installation, with oil partly processed before being piped to the Oseberg field centre. Gas is piped via OGT to Statpipe. The northern part of Oseberg South is produced through wells drilled from the field centre.

Oil production began from Oseberg South in February 2000. The platform has 30 well slots, while four wells are planned from Oseberg B.



Oseberg South. Illustration: Norsk Hydro

Oseberg South. Photo: Helge Hansen/Statoil

Oseberg East

Located north-east of Oseberg in 160 metres of water, the Oseberg East oil field was proven in 1981 in block 30/6 and is covered by production licence 053 awarded in 1979. It began production on 3 May 1999.

Reservoir and recovery strategy

The main reservoir lies 2 700-3 100 metres deep and comprises two structures separated by a sealing fault. Each contains several oil-bearing zones with varying reservoir properties in the middle Jurassic Brent group. The field produces with the aid of pressure maintenance through both water and water alternating gas (WAG) injection. Fifteen wells have been drilled, including eight for production. Two of these are now shut in. In addition come two water producers as well as three water, one WAG and one gas injectors. Gas injection began in September 1999 and waterflooding started the following April. Maximum oil production is about 75 000 barrels per day. A new seven-well drilling programme has been launched to increase oil output.

Transport

Oil is piped to the Oseberg field centre for processing and export through the OTS to Sture. The gas is largely used for injection, gas lift and fuel.

Development solution

The Oseberg East platform is an integrated steel production, drilling and quarters unit equipped for first-stage separation of oil, water and gas. It has a crew of 40.

A topside weighing just over 8 000 tonnes, this is the smallest platform on Oseberg.

Oseberg East. Photo: Terje S Knudsen/Statoil

Oseberg

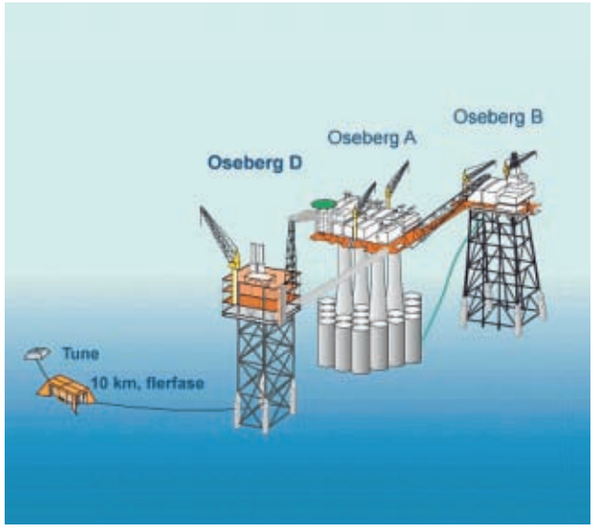
Blocks	30/6 and 30/9
Production licences	053 and 079
Awarded	1979 and 1982
Total recoverable reserves	2 300 mill bbl oil 107 bn scm gas 9.3 mill tonnes NGL
Remaining at 31 Dec 2008	133 mill bbl oil 85.6 bn scm gas 3.5 mill tonnes NGL
Discovery year	1979
Approved for development	5 Jun 1984
On stream	1 Dec 1988
Operator	Statoil
Operations organisation	Bergen
Main supply base	Mongstad

Licensees, Oseberg area unit

Statoil	49.3%
Petoro	33.6%
Total E&P Norge	10.0%
ExxonMobil	4.7%
ConocoPhillips	2.4%

Tune

This gas and condensate field lies in 95 metres of water about 10 kilometres west of the Oseberg field centre. Discovered by an exploration well in 1995, it was appraised with a further well the year after. Virtually all its reserves lie in production licence 190, but some also extend into PLs 034 and 053. PLs 190 and 034 have the same licensees, and these have purchased the production rights to the reserves in PL 053.



The Tune tie-back to Oseberg D. Illustration: Norsk Hydro

Reservoir and recovery strategy

The reservoir is built up from middle Jurassic sandstones at a depth of roughly 3 400 metres, and produces through pressure reduction. Low-pressure production has now been sanctioned in order to improve recovery.

Transport

Condensate from Tune is stabilised on the Oseberg field centre and piped to Sture through the OTS. The gas is injected in Oseberg, with the Tune licensees receiving sales gas from Oseberg in return.

Development solution

Tune has been developed with a six-slot subsea template placed centrally on the field. Four production wells were drilled initially. The template is tied back by two 12-inch pipelines to Oseberg D, where a receiving module for Tune production has been installed.

Tune South

This discovery has been developed as an independent satellite four kilometres from the existing template, and began production on 18 July 2009.

Tune

Blocks	30/5, 30/6 and 30/8
Production licences	034, 053 and 190
Awarded	1969, 1979 and 1993
Total recoverable reserves	20.1 mill bbl oil 18 bn scm gas 0.2 mill tonnes NGL
Remaining at 31 Dec 2008	1.9 mill bbl oil 2.9 bn scm gas 0.1 mill tonnes NGL
Discovery year	1996
Approved for development	17 Dec 1999
On stream	28 Nov 2002
Operator	Statoil
Operations organisation	Bergen
Main supply base	Mongstad

Licensees

Statoil	50%
Petoro	40%
Total E&P Norge	10%

Brage

Located east of Oseberg, the Brage oil field was discovered in 1980 and began producing on 23 September 1993. Plateau production was reached in 1998 at 120 000 barrels per day. This has now declined to about 40 000 daily barrels.

Reservoir and recovery strategy

Brage comprises sandstone reservoirs in the Statfjord and Fensfjord formations of early and middle Jurassic age respectively. Oil and gas are also found in the late Jurassic Sognefjord formation.

Production is based on water injection in the Statfjord and water and gas injection in the Fensfjord. Wells in the latter formation produce with gas lift. The Sognefjord is produced through natural pressure reduction, but plans called for gas injection to start in 2008.

Transport

The oil is piped to Oseberg B and on through the OTS to Sture. A gas pipeline ties into Statpipe.

Development solution

Brage A is an integrated steel production, drilling and quarters platform which stands in 140 metres of water.

The Brage platform. Photo: Helge Hansen/Statoil

Brage

Blocks	30/6, 31/4 and 31/7
Production licences	053B, 055 and 185
Awarded	1979, 1991 and 1998
Total recoverable reserves	346.5 mill bbl oil
	3.9 bn scm gas
	1.3 mill tonnes NGL
Remaining at 31 Dec 2008	31.5 mill bbl oil
	1.2 bn scm gas
	0.2 mill tonnes NGL
Discovery year	1980
Approved for development	29 Mar 1990
On stream	23 Sep 1993

Operator	Statoil
Operations organisation	Bergen
Main supply base	Mongstad

Licensees

Statoil	32.70%
Talisman Energy Norge	33.84%
Petoro	14.26%
Altinex Oil	12.26%
Endeavour Energy Norge	4.44%
Wintershall Norge	2.50%