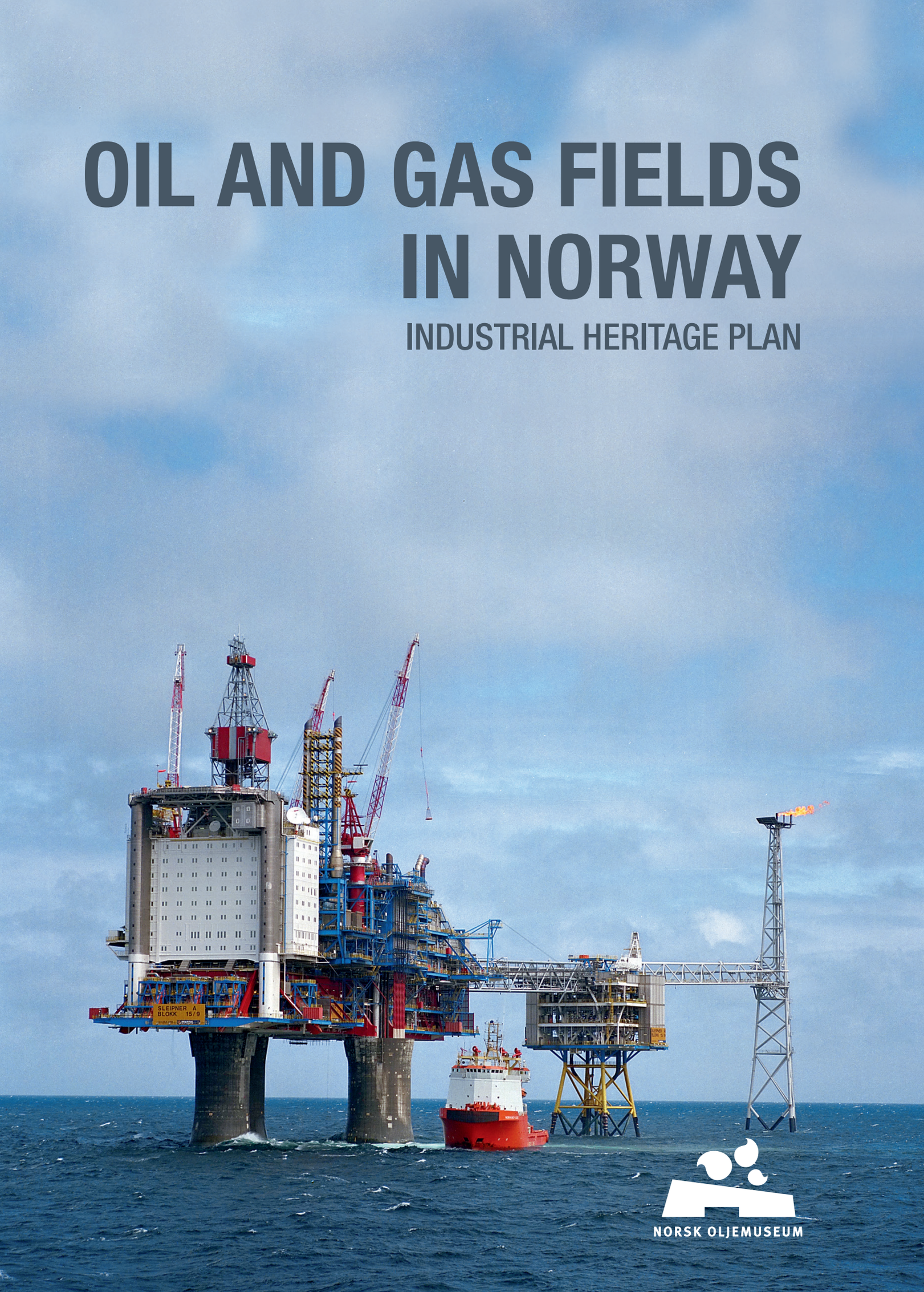
OIL AND GAS FIELDS IN NORWAY

INDUSTRIAL HERITAGE PLAN



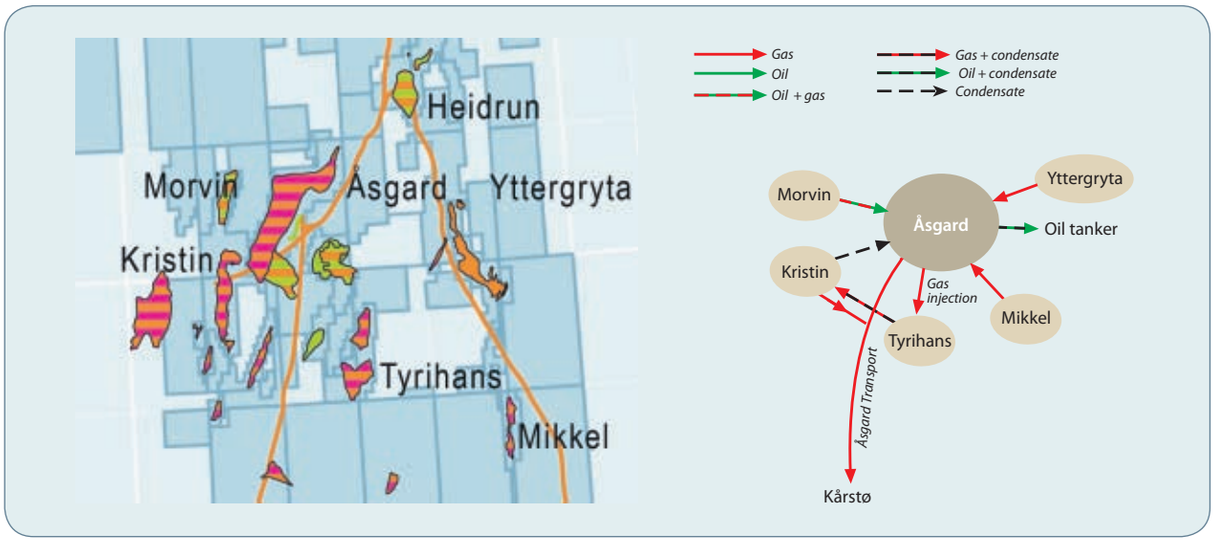
NORSK OLJEMUSEUM

THE ÅSGARD AREA

The Åsgard area lies on the Halten Bank in the Norwegian Sea, 200 kilometres off Trøndelag and 50 south of Heidrun. Developing Åsgard opened a transport route for oil and gas from the Halten Bank. This access to infrastructure made it possible to develop Kristin, Mikkel, Tyrihans, Morvin and Yttergryta and to tie these fields into the Åsgard Transport system, which carries gas to Kårstø.

Developing Åsgard represented a subsea technology leap. The fixed platforms familiar from the North Sea have been replaced by diverless deepwater solutions installed and operated from the surface by advanced remote control systems. Much of the existing technology required further development.

Kristin has been developed with a subsea production facility and wellstream transfer to a semi-submersible platform for processing. A reservoir pressure of 910 bar and temperature of 170°C – both high values – make Kristin the most demanding subsea development to date on the NCS.



Åsgard

This oil and gas field represents an integration of the Smørbukk, Smørbukk South and Midgard discoveries made in 1981, 1984 and 1985 respectively. Statoil is the operator. Major cost overruns were experienced during the development of Åsgard, mostly in relation to the A and B platforms, which led to the replacement of the Statoil leadership.

Reservoir and recovery strategy

Smørbukk is a rotated fault block bordered by faults to the west and north and by a structurally deeper area to the south and east. Structures in the Garn, Ile, Tofte, Tilje and Åre formations are of Jurassic age and contain gas, condensate and oil. The reservoir lies between 2 500-4 850 metres down, which gives well paths from 5-8 000 metres long. Smørbukk South, with reservoir rocks in the Garn, Ile and Tilje formations, is of early to middle Jurassic age and contains oil, gas and condensate. Midgard is divided into four structural segments, with the main reservoir in the middle Jurassic Garn and Ile formations.

The reservoir's overall area calls for a great many wells. Smørbukk in particular has presented a number of challenges, and is regarded as one of the most difficult reservoirs on the NCS. In addition to high pressure and temperature, its flow characteristics present a big challenge.

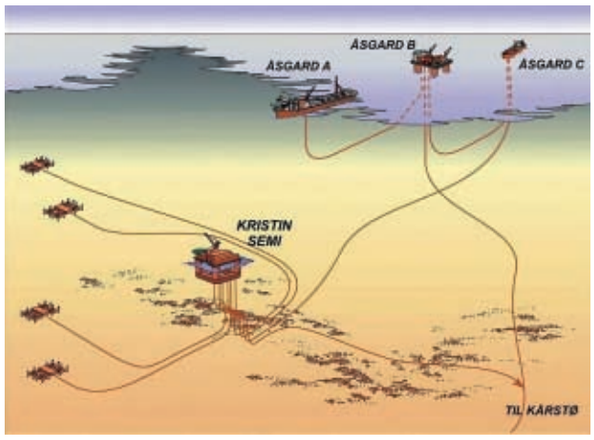
Oil production from Smørbukk and Smørbukk South is assisted by gas injection. Midgard is produced through pressure reduction. A thin oil zone 11.5 metres thick under the Midgard gas cap is not due to be produced.

Transport

Oil and condensate are temporarily stored on the field and taken ashore by shuttle tanker. Rich gas is piped through the Åsgard Transport system to the Kårstø processing plant for processing/fractionating of the NGLs. Dry gas is transported on to continental Europe through the Europipe II line. Condensate from Åsgard has been blended with oil from the autumn of 2006 and sold as Halten Blend.

Development solution

Tests and studies showed that a traditional solution would require several fixed platforms to cover the big area. That would have been much too expensive, and the same natural challenges would remain.



The Åsgard and Kristin fields. Illustration: Statoil

Fixed platforms would also have required more time, and would have made it harder to conduct as much work in parallel. This meant a large subsea developed was required, with processing equipment placed on floating installations. That in turn called for new and largely untested technology to cope with the natural conditions.

The water depth varies from 240-310 metres, which presented challenges in bringing wellstreams under very varying pressures up through the risers.

Åsgard has been developed with subsea-completed wells tied back to the Åsgard A ship, which processes and stores oil, and the semi-submersible Åsgard B platform, which handles gas and condensate. The Åsgard C condensate storage vessel is tied back to the B installation.

The production facilities are spread over an area of 20 by 60 kilometres, larger than the whole of Manhattan in New York. Ranked as the world's biggest subsea production system to date, Åsgard embraces at total of 53 wells in 18 seabed templates.

In addition to handling Åsgard's own production, the B installation processes gas from Mikkel and condensate from Kristin and Tyrihans.

Åsgard A production ship

When installed, Åsgard A ranked as the world's largest ship for processing oil and condensate production. It measures 278 metres long by 45 wide, with an oil storage capacity of 920 000 barrels. In place on 8 February 1999, it began oil production on 19 May that year. Aker Maritime was responsible for building the vessel, with the hull fabricated at

Åsgard A. Photo: Øyvind Hagen/Statoil

Hitachi in Japan. A high level of gas injection placed big demands on Åsgard A's equipment, with a particularly robust swivel and powerful flexible risers.

Åsgard B floating processing platform

This semi-submersible floater supports gas processing and stabilisation of oil and condensate. It was developed by Kværner/GVA Consultants in Gothenburg as a GVA70 unit, with the hull constructed by Daewoo Heavy Industries in Korea. The topside modules came from Poland, Russia, the Netherlands, Sweden and Egersund in Norway, and were mated with the hull in Stavanger. Kværner Oil and Gas was main contractor for the construction project. At the time, this unit was the largest semi-submersible ever built for production, with a topside weight of 3 700 tonnes. When compared with other floating production installations, its processing capacity is larger than the sum of Njord and Visund. Åsgard B has a substantial power requirement because of the need to compress large gas volumes. It began production on 1 October 2000.

Åsgard B. Photo: Øyvind Hagen/Statoil

Åsgard C storage ship for condensate

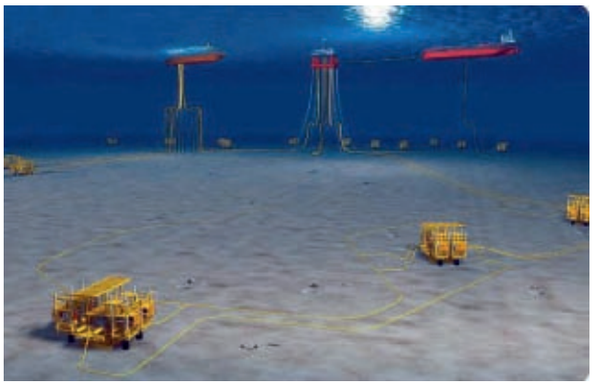
This vessel was launched at Bilbao in Spain during September 1999 and named m/t Jorunn Knutsen. It has operated since 2000 as a storage ship for condensate production from Åsgard, and bears the Åsgard C name as long as it remains on the field. The vessel is owned by Knutsen OAS Shipping, which is responsible for crewing, operation and maintenance, while Statoil bears overall responsibility towards the Petroleum Safety Authority Norway and its partners. Following a conversion in 2005, the ship is used as a shared condensate store for Åsgard

Åsgard C. Photo: Dag-Tore Anfinsen/Statoil

and Kristin. In connection with the conversion and extended use, Statoil secured a new charter with the owner which provides options up to 2018.

Åsgard E-Z subsea installations

The subsea templates were designed by FMC Technologies in Kongsberg and fabricated at Dunfermline in Scotland.



Åsgard subsea installations. Illustration: FMC Technologies

Åsgard

Blocks	6406/3, 6407/2, 6407/3, 6506/11, 6506/12 and 6507/11
Production licences	062, 074, 094, 094 B, 134 and 237
Awarded	1981, 1982, 1984, 1987, 1998 and 2002
Total recoverable reserves	614 mill bbl oil 185.9 bn scm gas 36.1 mill tonnes NGL 16 mill scm condensate
Remaining at 31 Dec 2008	217 mill bbl oil 110.8 bn scm gas 23 mill tonnes NGL
Discovery year	1981
Approved for development	14 Jun 1996
On stream	19 May 1999
Operator	Statoil
Operations organisation	Stjørdal
Main supply base	Kristiansund

Licensees

Petoro	35.69%
Statoil	34.57%
Eni Norge	14.82%
Total E&P Norge	7.68%
ExxonMobil	7.24%

Mikkel

This gas and condensate field lies in 200 metres of water on the eastern side of the Halten Bank in the Norwegian Sea, about 40 kilometres south of Midgard and 30 north of Draugen. Discovered in 1987, Mikkel began production on 1 October 2003.

Reservoir and recovery strategy

Mikkel has a 300-metre-thick gas and condensate column and a thin underlying oil zone. Located 2 500 metres down, the good-quality reservoirs are built up from middle Jurassic sandstones in six structures separated by faults. The field is produced through pressure reduction.

Transport

The wellstream from Mikkel is carried to Åsgard B for processing, with condensate separated from the gas and stabilised before being shipped from the field together with Åsgard output. The condensate is sold as oil (Åsgard Blend). Rich gas is piped through the Åsgard Transport line to Kårstø for separation of the NGLs and onward transmission of dry gas to continental Europe through Europipe II.

Development solution

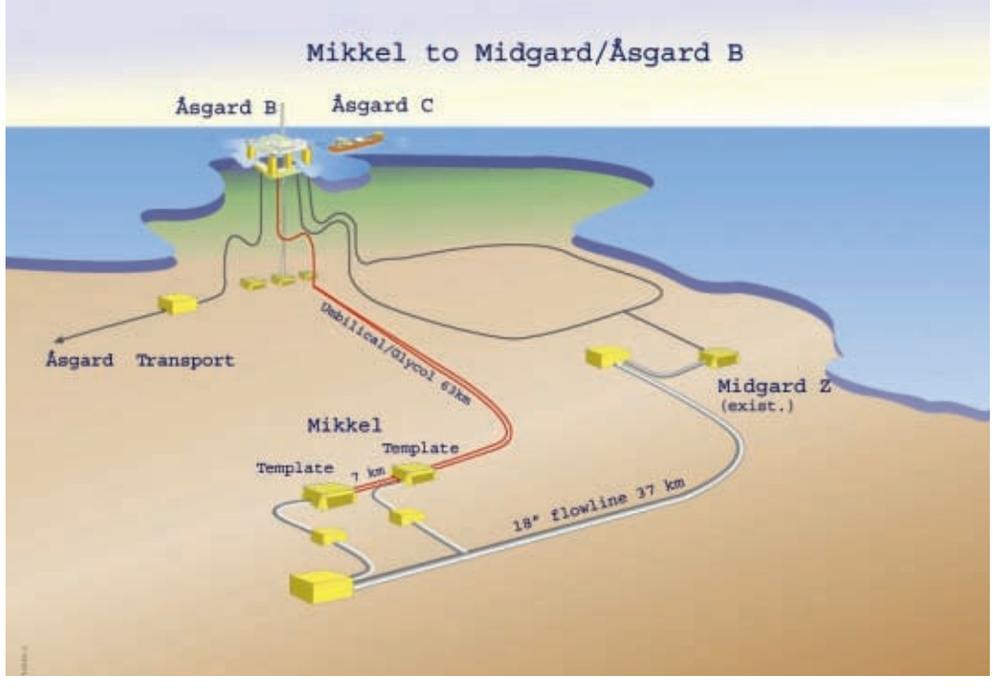
Two subsea installations, Mikkel A and B, are tied back to Åsgard B.

Mikkel

Blocks	6407/5 and 6407/6
Production licences	092 and 121
Awarded	1984 and 1986
Total recoverable reserves	28.9 mill bbl oil 21.9 bn scm gas 6 mill tonnes NGL 2.3 mill scm condensate
Remaining at 31 Dec 2008	19.5 mill bbl oil 13 bn scm gas 3.6 mill tonnes NGL
Discovery year	1987
Approved for development	17 Dec 2001
On stream	1 Aug 2003
Operator	Statoil
Operations organisation	Stjørdal
Main supply base	Kristiansund

Licensees

Statoil	43.97%
ExxonMobil	33.48%
Eni Norge	14.90%
Total E&P Norge	7.65%



Subsea installations on Mikkel, with the pipeline to Åsgard B. Illustration: Statoil