

# OIL AND GAS FIELDS IN NORWAY

## INDUSTRIAL HERITAGE PLAN



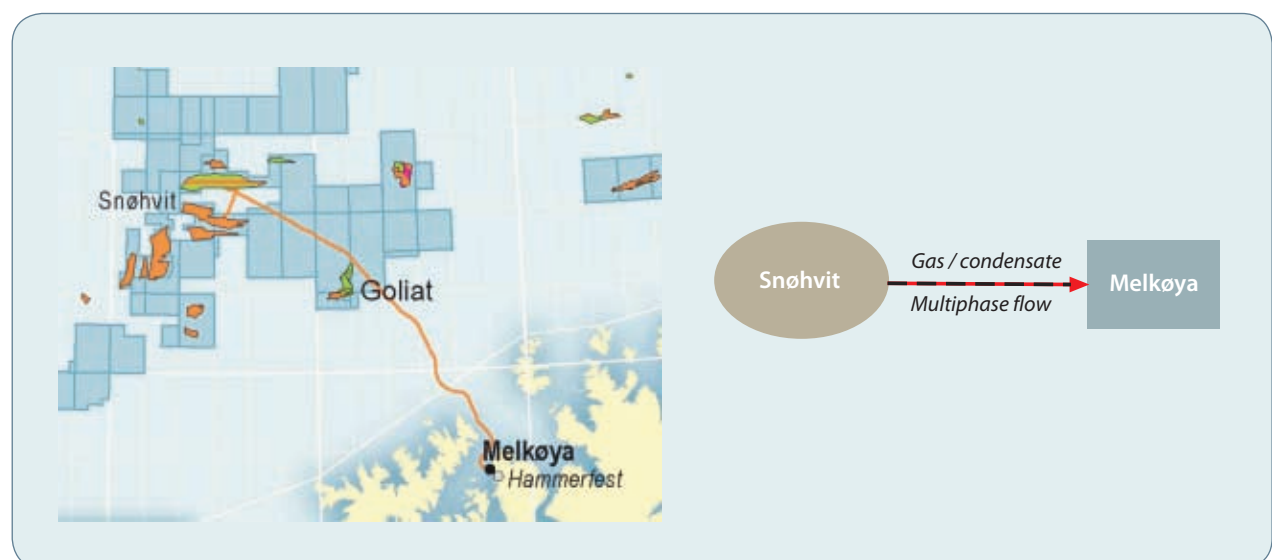
NORSK OLJEMUSEUM



# SNØHVIT

The Snøhvit field contains gas with condensate and a thin underlying oil zone, and lies in 310-340 metres of water in the central part of the Hammerfest Basin in the Barents Sea. It was the first gas discovery in this part of the NCS to be developed, and is due to produce for 30 years. Exports of liquefied natural gas (LNG) by ship have permitted a major gas development beyond the reach of pipelines to continental European markets, and opened new outlets for Norwegian gas.

Discovered in 1984 by the West Vanguard rig at 71° 35' 59.68" N and 21° 9' 22.79" E, Snøhvit began test output in the spring of 2006 from the first production well drilled and completed by the Polar Pioneer rig. The field came fully on stream in the summer of 2007, when the initial LNG cargoes were shipped from Melkøya to markets in Spain and the USA. This was first time America received natural gas supplies from Europe.





Melkøya outside Hammerfest. Photo: Eiliv Leren/Statoil

### Snøhvit

Blocks	7120/6, 7, 8 and 9, and 7121/4, 5 and 7
Production licences	064, 077, 078, 097, 099 and 100
Awarded	1981, 1982, 1984 and 1985

Total recoverable reserves	160.6 bn scm gas 8.1 mill scm condensate 6.3 mill tonnes NGL
Remaining at 31 Dec 2008	158.1 bn scm gas 17.5 mill scm condensate 6.2 mill tonnes NGL

Discovery year	1984
Approved for development	7 Mar 2002
On stream	21 Aug 2007
Operator	Statoil
Operations organisation	Harstad and Stjørdal

### Licensees

Statoil	33.53%
Petoro	30.00%
Total E&P Norge	18.40%
GDF Suez E&P Norge	12.00%
Hess Norge	3.26%
RWE Dea Norge	2.81%

In addition to gas, Snøhvit produces some NGL and condensate. An assessment of producing the thin oil zone was launched as a result of higher crude prices and delays to the gas development. After a new well, however, it was decided in September 2007 to halt such evaluations since recovery is not considered profitable.

### Reservoir and recovery strategy

Snøhvit's reservoirs are formed of Jurassic sandstones, with a thin oil zone beneath the condensate. The sub-surface structures comprise seven separate petroleum deposits, which are covered by a joint development of production infrastructure. Located about 2 300 metres down, they will be produced by pressure reduction.

### Development solution

The Snøhvit development comprises three components – subsea installations in 330 metres of water on the field, a 26-inch multiphase flow pipeline running 143 kilometres to land, and the processing plant on Melkøya island outside Hammerfest in northern Norway. In addition come two pipelines for chemical transport, an umbilical, and a pipeline returning carbon dioxide to the field for injection.



Eight production wells and a carbon injector have been drilled on Snøhvit so far. The field is the first on the NCS to be operated entirely by remote control from land.

Natural gas is brought ashore to the world's northernmost gas liquefaction plant, which is also the first in Europe. Rich gas arriving at Melkøya must be processed before being cooled down to LNG and exported in special carriers. The plant contains facilities for separating carbon dioxide and chemicals from the gas stream before liquefaction. After being pumped back to the field in a dedicated pipeline, the carbon dioxide is injected into a suitable aquifer beneath the oil and gas zones. Around 700 000 tonnes will be stored annually.

LNG is primarily shipped from Melkøya to customers in the USA, as well as to Spain and France. Liquefied petroleum gases (LPG) and condensate are sent by sea to other markets. Every fifth or sixth day, one of the world's largest LNG carriers will load at the plant. That adds up to about 70 shipments per year. Each of the five dedicated LNG carriers is 290 metres long and can carry some 140 000 cubic



*A Snøhvit template on its way to Hammerfest.*

*Photo: Eilev Leren/Statoil*

metres. Operator Statoil and five of the other Snøhvit licensees have chartered three vessels – Arctic Princess, Arctic Voyager and Arctic Discoverer – from Norway's Leif Høegh & Co and Mitsui OSK Lines of Japan. French licensees GDF Suez E&P Norge and Total handle their own share production with a carrier each – Provalys and Arctic Lady respectively.



*Arctic Voyager discharging at Cove Point in the USA. Photo: Roar Lindefjeld/Statoil*