CO_2
- capture to storage

In combination, SINTEF, NTNU and StatoilHydro have been considering the challenges of CO_2 management for nearly 30 years.

This affects our common future!

Events

1972
Stockholm - The first environmental conference under UN administration – a programme for environmental issues set up.

SINTEF NTNU StatoilHydro

17-10-2007

The first Norwegian studies on CO_2

1980
Studies of CO_2 capture by absorption and the first PhD on the subject.

1986
SINTEF introduces the concept of gas power-stations with CO_2 capture and examines the possibility of CO_2 storage on the Continental Shelf.

1988
Statoil evaluate the possibilities for CO_2 management.

1989
NTNU/SINTEF work out the possibilities for CO_2 capture from gas power-stations.

1987
The Brundtland Commission's final report "Our Common Future", Sustainable Development was identified as a new concept in the report.

Epoch 1970 - 1995

Sleipner
– CO_2 capture and storage

CO_2 capture at Kårstø: - co-operation between Aker Kværner and SINTEF/NTNU.

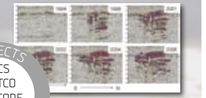
Gro Harlem Brundtland proposed a new tax on CO_2 emissions in Norway, of US$ 45/tonne in 1992.

The Research Council of Norway starts the Klimatek Programme.

The Research Council of Norway

CO_2 injection at Sleipner

Verification of storage integrity and information activities to increase public understanding of the subject.



PROJECTS
SACS
GESTCO
CO2STORE
NORSTORE

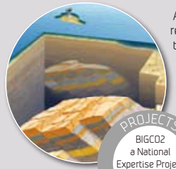
1997
The Kyoto Protocol
– UN agreements on international climate politics.

The CO_2 Value Chain
- the elements come into place

Power stations with CO_2 removal edge nearer. Plans published for more installations.
The British-Norwegian taskforce "CO_2 Infrastructure for the North Sea" established, led by the Norwegian Minister of Energy.

2002

The Gullfaks CO_2 study



A comprehensive reservoir study of the use of CO_2 for Increased Oil Recovery.

PROJECTS
BIGCO2
a National Expertise Project on CO_2 capture

Events

Kyoto Protocol comes into force
– obligations for reduction of greenhouse gas emissions.

The EU introduces quota-trading for CO_2.

In Salah, Algeria
CO_2 storage onshore

PROJECTS
ENCAP
CASTOR
COACH (China)
ULCOS
DYNAMIS

Just Catch™ technology introduced by Aker Kværner.

2003 Carbon Sequestration Leadership Forum (CSLF).
The highest international forum for development of climate technology and co-operation between countries.
EU 6 Framework Programme started.

2005

GASSNOVA

PROJECTS
Merging of CO_2 resources from the Norwegian Research Council and Gassnova.
Norges forskningsråd
CLIMIT project start.

2005 Gassnova established – the State's centre for gas power-station technology including CO_2 handling.
Objective:- to promote the development of future-orientated, environmentally-friendly and cost-effective gas technology.

Interest takes off

BELLONA

Report "Profitability in CO_2 Capture & Storage" published.

The world's largest conference on CO_2 technology held in Trondheim with over 1000 participants.

The costs of capturing and storing CO_2 calculated by a group of international experts in 2005.

Soria Moria declaration: ..."the State shall contribute to ensure that all gas power-stations in Norway shall have CO_2 capture ..."
IPCC report: "...there is more than a 90% chance that climate change is caused by mankind ..."

continue...

CO_2
- capture to storage

...continue

Snøhvit
- CO_2 capture and storage

NVE reports that CO_2 removal at Kårstø will cost NOK 700/tonne.

A Gassco study for the DeD sets out the possibilities for a CO_2 value chain in the North Sea.

NOU 2006/18: "The Norwegian Commission on Low Emissions believe that it is necessary, do-able and not impossibly expensive to reduce Norway's greenhouse gas emissions by 2/3 by 2050."
Zero Emission Platform EU – 2006– " 10 to 12 operative power-stations with CO_2 capture by 2020".

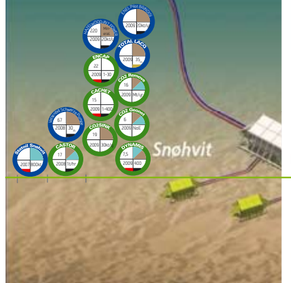
2006 — 2007

Hydrogen power stations

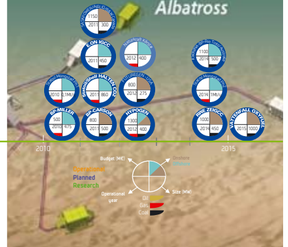
Hydrogen-fired gas turbines of the future.

PROJECTS

BIGH2



The State enters into an agreement with Statoil concerning the world's first gas power-station with CO_2 capture.



Test Centre Mongstad

TCM established with the following international partners:

- The Norwegian State
- Statoil
- Hydro
- Shell
- DONG
- Vattenfall

Kårstø - Norway's first large-scale gas power-station started up in 2007 without CO_2 removal.

Events

Stoltenberg announces a moon-landing in his New Year speech!

The Norwegian participants gather their strength

Aker Kværner, SINTEF and NTNU entered into a co-operation agreement to develop more effective and environmentally-friendly chemicals for CO_2 capture. This has the potential to result in a significant reduction in global emissions as well as contributing to the development of Norwegian technology. We have many seeds to sow that could contribute to the announced Norwegian moon-landing and the vision of Norwegian technology leadership within climate science.

Thanks to the strategic and long-sighted funding of research by the Norwegian Research Council and Gassnova, plus participation in numerous industrial- and EU projects, we have built up a unique expertise base in this field within SINTEF and NTNU.

The London Protocol and the OSPAR Convention agree that CO_2 storage under the seabed is permissible.

The CO_2 National Team

The quintet in the picture have their share of the honour for changing opinions, both in Norway and in the EU countries.

"Interesting, but unrealistic and too expensive" was the judgement passed when the idea was first proposed. Statoil has demonstrated that CO_2 from the Sleipner field in the North Sea could be stored deep under the seabed. SINTEF and NTNU are taking part in positioning Norway far ahead in the research into capture and storage of CO_2.

We participate in a broad spectrum of EU projects on the subject. SINTEF leads a ten-year project, the largest CO_2 project in Europe.

Nothing less!

Nord Pool has started trading of CO_2 quotas.

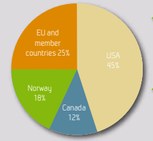
"...The gas power station at Kårstø will become an important display window; a unique chance for Norway to show the world that CO_2 management is possible and how this definitely can be implemented along the entire chain from capture via transport to storage."

From the left:
CO_2 co-ordinator Olav Kårstad (Statoil, senior researcher), Thor Mejdell (SINTEF Materials & Chemistry), Nils A. Rekke (director of gas technology in SINTEF), Professor May-Britt Hägg (NTNU) and Erik Lindeberg, (research leader SINTEF Petroleum Research).

We work for achieving the moon-landing in and for Norway,

– it is NTNU/SINTEF who train the astronauts!

CO_2 research



- SINTEF and NTNU performed circa 5% of the world's publicly financed R&D in 2005.
- SINTEF/NTNU is the largest research participant within EU CO_2 research.