

Current CCS Activities Norway

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Overview of Presentation

- The Norwegian Context and CCS activities
- Government ambitions on CCS
- Current work on "CO₂-chain"
- RD & D – Gassnova, Climit
- International cooperation
- Legal issues – proceedings in the Ospar-, London- and UNFCCC-conventions

The Norwegian Context

- Stationary energy supply is dominated by hydropower - vulnerable to variations in rainfall.
- Debate for more than 10 years on gas fired power stations and carbon capture and storage: How to balance improvement in the energy balance with our Kyoto challenge?
- Norwegian NGOs favour CCS as a climate mitigation option –in the public debate CCS is an accepted option

The CCS Potential: A Resource Management Perspective

- Report from the Norwegian Petroleum Directorate (2004):
 - difficult to transfer experience from onshore CO₂ for EOR-projects to offshore projects
 - injection of CO₂ competes with other methods to enhance recovery rate
 - 20 fields on the NCS identified as candidates for CO₂-injection based on geology and size
- Report concludes that the 20 fields have a **technical** potential for 150-300 million Sm³ ekstra oil
- **That is, IF enough CO₂ could be made available**
 - **at the optimum time in their production life**
 - **at commercial conditions**



Key Norwegian CCS Projects

- Norway currently has two projects on CO₂-storage:
 - Sleipner, 1 million tonnes annually, since 1996
 - Snøhvit, 700 000 tonnes annually, starting in 2007
- Both projects in connection with:
 - extraction of petroleum from NCS - CO₂ extracted from gas-stream
 - injection of CO₂ into a sub-seabed geological structure
 - injection into another reservoir than the producing one, not for EOR
- The first gas fired power station in Norway is under construction – start up in 2007.

Realisation of CCS in Norway

Implementing the CO₂-chain



Seller

Sources of CO₂:
Gas fired power stations
Other industry



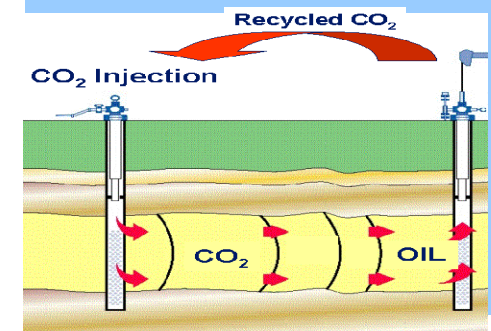
Transport



Buyer



CO₂ for EOR
Storage



CCS potentially important to mitigate climate change and increase oil recovery – but a very challenging task

Ambitious Goals to Realize CC

- **The Government has ambitious goals regarding capture, use and storage of carbon dioxide with a demanding timetable**
- The aims are to:
 - cooperate with industry on realizing capture of carbon dioxide at gas fired power plants as soon as possible – the state will contribute financially.
 - make sure that the process to realize a carbon dioxide capture-facility at the Kårstø gas fired power plant within 2009 is started – the state will contribute financially
 - a state corporation will be given the task of establishing a value chain for transportation and injection of CO₂ - the state will contribute financially

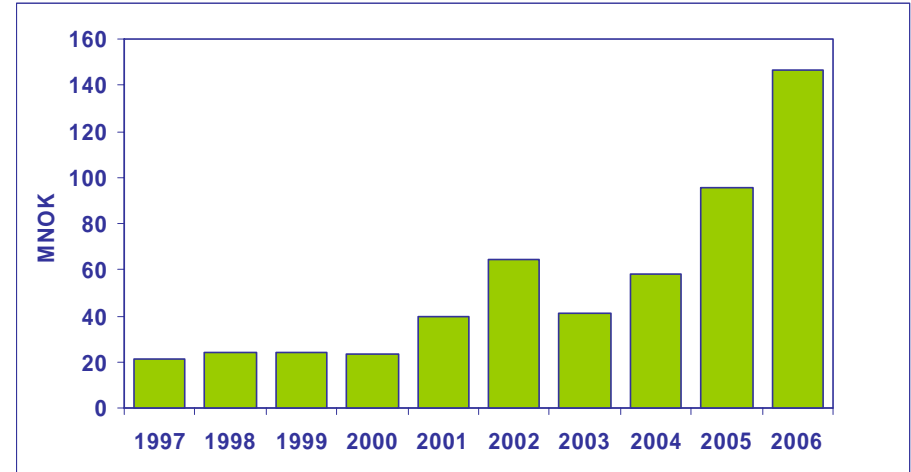
...and the Work has Started

Work is now carried out through projects in the following areas:

1. Process led by Gassco is initiated between the commercial actors to verify costs in all parts of the CO₂-chain – first results mid-2006.
2. Detailed planning of capture of carbon dioxide at the Kårstø gas fired power plant. The project will provide clarifications on costs and timetables.
3. Decisions on the best organisation of state involvement, will depend on thorough assessments of e.g. economic and legal issues, including state aid regulations. Clarifications of these aspects is highly prioritized in 2006.

Policy for Realization of Gas-Fired Power Plants with Carbon Capture and Storage

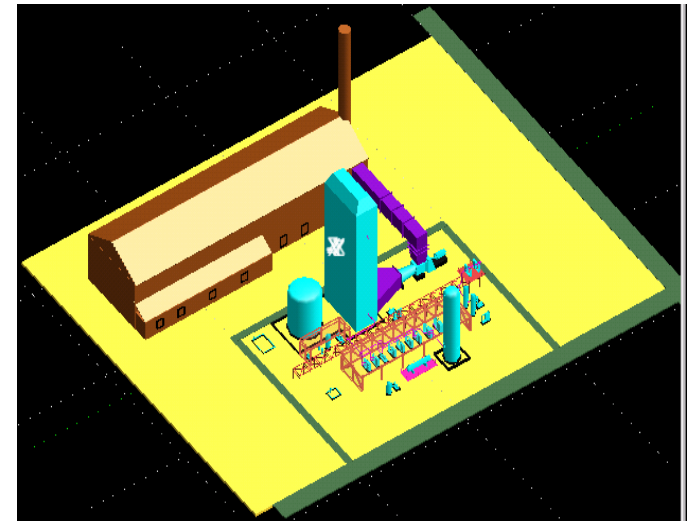
- Increased commitments to RD&D on gas-fired power plants with carbon capture and storage.
- Accelerated realisation of carbon capture at Norwegian gas-fired power stations.
- Combination of State aid and policy measures.



Public support to R&D on CCS related to gas-fired power stations

RD&D Activities on CCS Technologies

- The public agency Gassnova is supporting technology development and pilot projects.
- Together Gassnova and the Research Council of Norway administers about €18 million annually to support RD&D
- "Just Catch" - Collaboration between Gassnova and Aker Kværner on development and pilot testing of capture technology.



Just Catch™

AKER KVÆRNER™

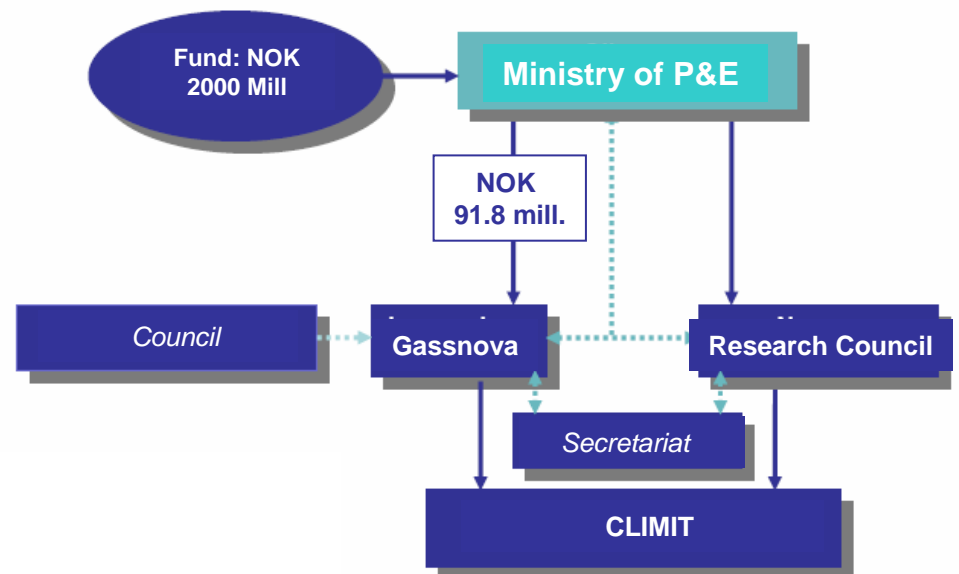


GASSNOVA

CLIMIT

Development of Technologies for Carbon Capture and Storage

- A public programme aimed at supporting sustainable technologies for carbon capture and storage.
- Jointly administered by the Research Council of Norway and Gassnova.
- CLIMIT focuses on research, development and demonstration of technologies related to gas-fired power plants with carbon capture and storage.
- The programme will support activities in all phases of development and commercialisation of new solutions.



International Co-operation - a Key Factor

- EU RD &D



- IEA



- CSLF

- Energy Dialogue, Norway-EU Commission



CO2 Capture Project

- Joint Statement between Norwegian and UK Energy Minister on CCS, including establishment of a North Sea Basin Task Force



- Bilateral Co-operation with the US

- Industry Lead Co-operation

Legal and Regulatory Issues

- Important to establish a common basis for the regulation of stored CO₂.
- Legal and regulatory issues are now discussed under several international conventions: i.e OSPAR, London, UNFCCC.
- Guidelines or a framework for the assessment of potential storage sites would be useful.
- CDM could be an important vehicle in bringing carbon capture and storage forward also in developing countries



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