

## The Royal Norwegian Ministry of Petroleum and Energy

### *Fact Sheet: Carbon Capture and Geological Storage*

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#### **Carbon Dioxide Capture and Storage in Norway**

Being an energy rich nation with a strong focus on challenges of climate change, Norway aims to make carbon capture and storage (CCS) a reality. Today three major CCS projects are progressing: The Norwegian government and Statoil are collaborating on the **Mongstad CCS project**. The government is planning a retrofit CO<sub>2</sub> capture facility at the **Kårstø** gas-fired power plant. Furthermore, Shell and Statoil have signed an agreement to work towards developing the world's largest project using carbon dioxide for enhanced oil recovery offshore, the **Halten CO<sub>2</sub> Project**. All projects require government incentives if they are to progress. Consequently, EU state aid guidelines need to be clarified regarding CCS.

#### **The Mongstad CCS Project**

The Norwegian government and Statoil have undertaken an agreement to establish a full-scale CO<sub>2</sub> capture and storage project at Mongstad. In order to reduce technical and financial risk the project will progress in two stages. The first stage covers the Mongstad CO<sub>2</sub> capture testing facility which will be operational at the same time as the cogeneration plant starts operation in 2010. The testing facility/pilot plant will have the capacity to capture at least 100,000 tonnes of CO<sub>2</sub> per year. The second stage, i.e. full-scale capturing of approximately 1.5 million tonnes of CO<sub>2</sub> per year, will be in place by the end of 2014.



The technology development phase of the project is currently progressing according to the project execution plan. The main objective for the pilot is to develop more cost-effective technology for CO<sub>2</sub> capture for a wider international application, i.e. to develop, test, verify and demonstrate technology that would allow construction of full scale CO<sub>2</sub> capture plants with reduced costs and reduced technical and financial risks.

A technology company will be set up to construct and operate the capture pilot, CO<sub>2</sub> Test Centre Mongstad. The government is currently in the process of inviting companies to participate in the technology company. The invited companies are potential users of CO<sub>2</sub> technologies and the aim is to establish a group of participants in May 2007. Several technological solutions will be tested in parallel in the project. This approach should ensure that technological developments in Norway could have broad international relevance. With the Mongstad CCS project we move from the research/small scale phase to actual construction of a full scale CO<sub>2</sub> capture facility.

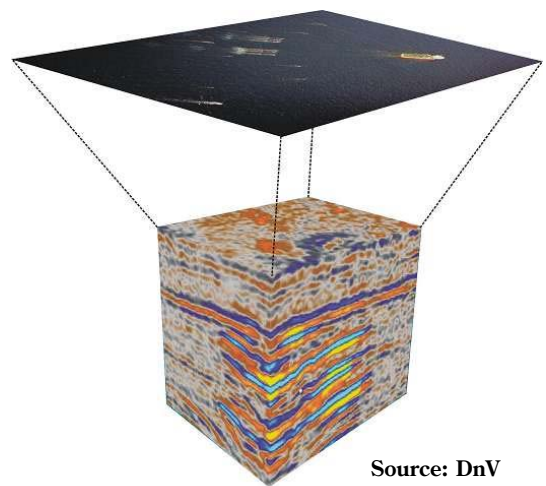
### **Establishment of a state-owned company responsible for CCS projects**

The Norwegian government has taken an active approach to the development of CCS technologies and the deployment of such technologies. In a parliamentary bill proposed 2 March 2007, the government announced the establishment of a state-owned company that will safeguard state interests in the Mongstad CCS project and other projects concerning CO<sub>2</sub> capture, transport and storage. The company will constitute an efficient tool to plan and execute CCS projects in co-operation with industrial partners.

### **Extensive experience in storing CO<sub>2</sub> in geological structures**

Norway has extensive experience in storing CO<sub>2</sub> in geological structures. Since 1996, one million tonnes of CO<sub>2</sub> per year have been separated from gas production on the Sleipner Vest field in the North Sea for storage in Utsira, a geological formation 1,000 metres below the seabed. Storing CO<sub>2</sub> in the Utsira formation is unique. This is the only facility in the world where large quantities of CO<sub>2</sub> are stored in a geological formation under the seabed. In 2007, production of natural gas, NGL and condensate will commence from the Snøhvit field in the Barents Sea. 700,000 tonnes of CO<sub>2</sub> will be separated annually from the natural gas and re-injected and stored in a formation 2,600 metres under the seabed.

Monitoring of the behaviour of the CO<sub>2</sub> storage facility is necessary. Statoil initiated and organized a multinational and multidisciplinary research project named **Saline Aquifer CO<sub>2</sub> Storage (SACS)**. The project collected relevant data, modelled and verified the distribution of the CO<sub>2</sub> in the Utsira Formation for three years, and developed and demonstrated prediction methods for the movement of the CO<sub>2</sub> for many years into the future. Time-lapse 3D seismic data were acquired in 1994, prior to injection, and again in 1999, 2001 and 2002 with, respectively about 2.3, 4.3 and 5.0 million tonnes of CO<sub>2</sub> in the reservoir. The data shows the precise subsurface location of the CO<sub>2</sub> plume and confirms that the CO<sub>2</sub> is confined securely within the storage reservoir.



Source: DnV

The SACS program has been ended, but the **CO2STORE** research project will investigate how lessons learned from other previous projects on this matter (like SACS, GESTCO, NASCENT) can be implemented on other aquifers in Europe, not only offshore, but also under land. CO2STORE is a research project within the 5th framework of the EU. The funding of the project is roughly equally shared by the participants and the EU.

The Utsira Formation is by no means an unusual geological formation in terms of its storage potential, and the Sleipner operation represents just one of many subsurface storage scenarios.

In accordance with the Petroleum Act and the Pollution Control Act, Statoil has been required to monitor the CO<sub>2</sub> storage in the Utsira reservoir and to report to the Norwegian Pollution Control Authority annually.