

Carbon Capture and Storage in Climate Change Mitigation

- a Norwegian perspective

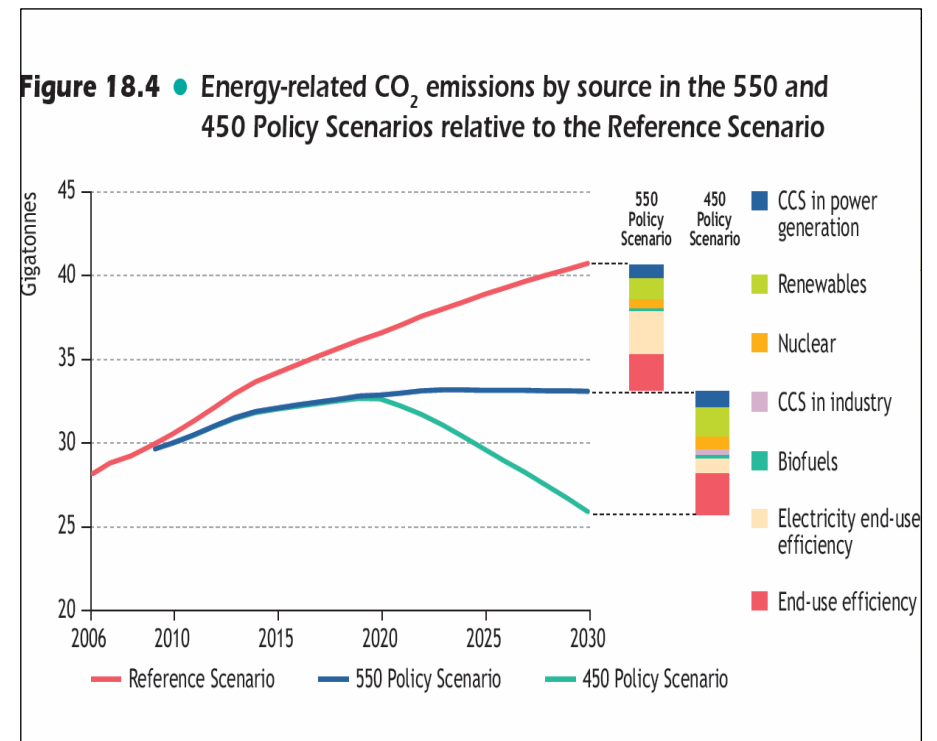
3 March 2009

Tone Skogen

**Deputy Director General
Norwegian Ministry of Petroleum and Energy**

IEA: Global economic growth requires increased energy supply

- Global energy demand will increase by 45% by 2030.
80 % fossil fuels in 2030 – and increased demand for coal.
- On current trend, energy related CO₂ emissions will rise inexorably, pushing up global temperature by 6 °C.
- Limiting CO₂ emissions from energy generation is key to reducing emissions of greenhouse gases.
- **CCS is part of the solution**



Source: IEA

The advantage of CCS: securing energy supply and simultaneously mitigating climate change

- It is necessary to develop clean-energy technologies, and implement sustainable energy systems
 - CCS is part of the solution
 - in addition to other measures such as energy efficiency and increased use of renewable energy sources



Implementing CCS: Major challenges

- **Costs**

- > Establish commercial incentives
- > Stimulate development, deployment and dissemination of CCS technology
- > Public funding will be important in an early CCS-demonstration phase

- **Legal and regulatory frameworks**

- > Issues of safe storage, liability, transport etc.

- **Public acceptance**



Norwegian CCS policy

- CCS is necessary to mitigate climate change, in combination with renewables and energy efficiency
- **The Norwegian Government:**
 - has ambitious goals for wide-spread use of CCS
 - cooperates closely with industrial actors
 - provides public funding
- **Norwegian projects in progress:**
 - Large Scale Facility Kårstø
 - Technology Centre Mongstad
 - Large Scale Facility Mongstad
 - CO2 transport and storage solutions



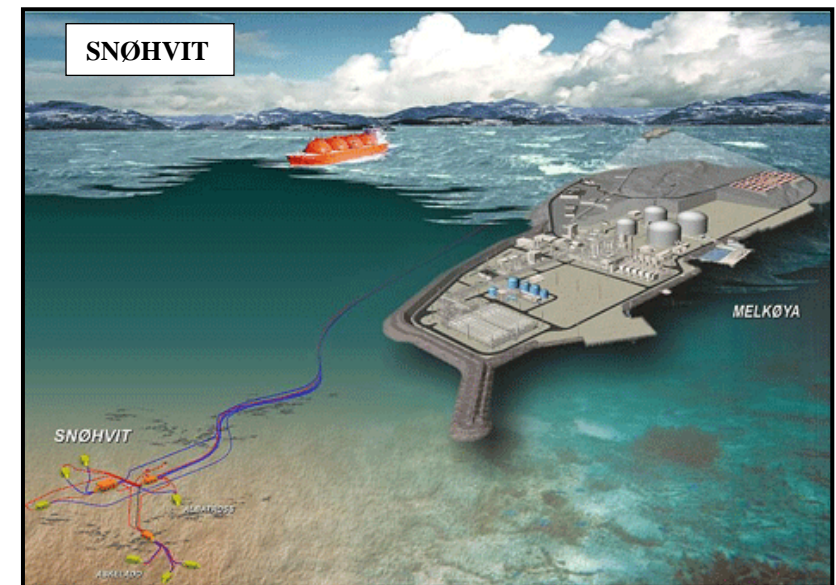
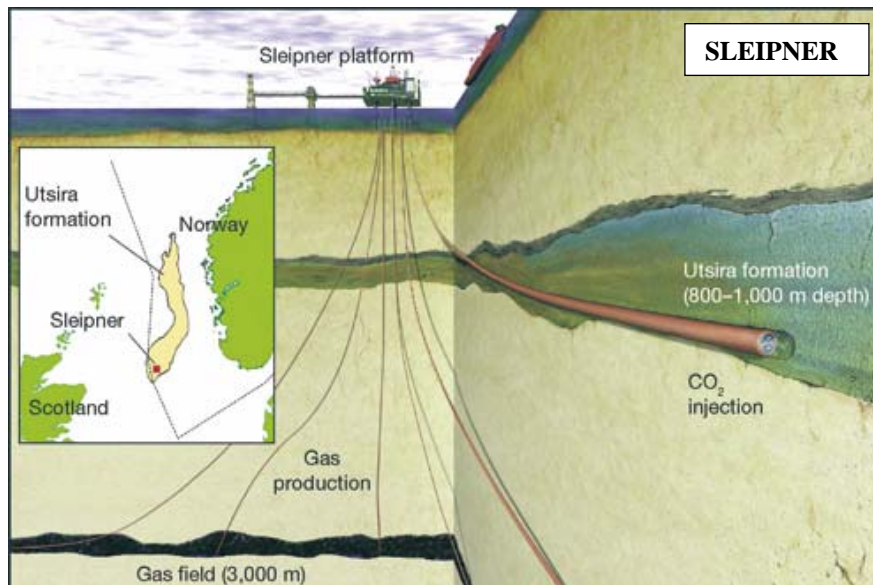
Kårstø and Mongstad

- **Kårstø:** The government is to finance a full scale capture plant
 - Will reduce CO₂-emissions by 1 million tons CO₂ annually.
A scale-up of existing technology by a factor of 10.
- **Mongstad:**
 - Stage 1** – carbon capture Technology Centre
 - Industrial cooperation. Partners cover costs proportional to ownership share. (100.000 tons CO₂)
 - Stage 2** – full scale carbon capture facility
 - Will capture 1,2 million tons CO₂ annually
 - investment and operation costs financed by the government
 - StatoilHydro cover costs equal to their alternative costs of CO₂
 - The government will finance transport and storage



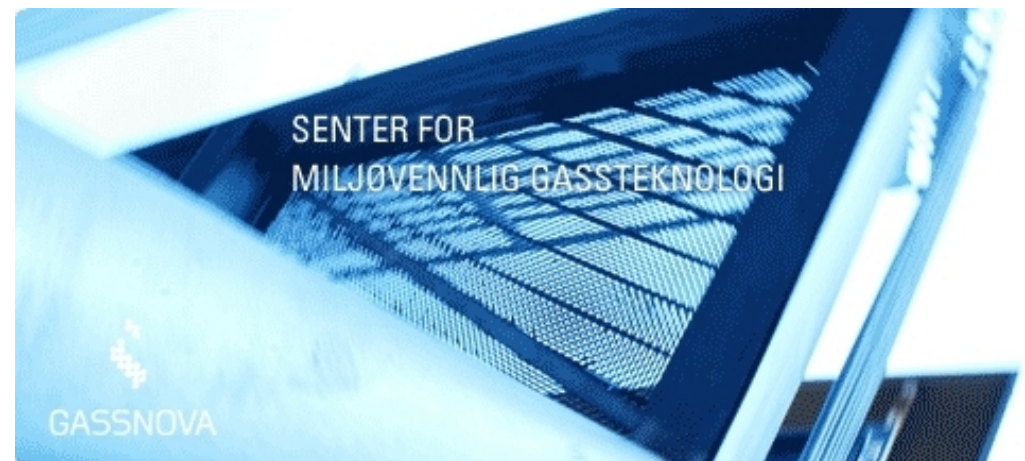
Norway's unique CO2 storage experience

- Since 1996 a total amount of 10 million tonnes of CO2 has been stored in a geological formation above the Sleipner field in the North Sea. Monitoring shows no leakage of CO2.
- The Snøhvit Field in the Barents Sea provides gas to the world's first LNG plant with CCS. In April 2008, the first amount of CO2 from this field was injected and stored in a geological formation.



A state-owned CCS Company

- In order to administer the Government's participation in the CCS-projects, a state-owned company dedicated to CCS, Gassnova SF, has been established.
- The company constitutes an efficient tool in planning and executing CCS projects in co-operation with industrial partners.



Research & Development

- **R&D-areas:**

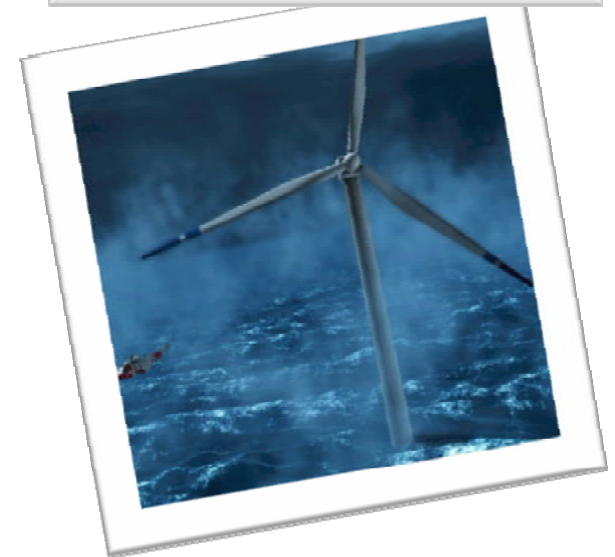
- petroleum, e.g. EOR
- carbon capture and storage
- clean energy systems, e.g. offshore wind

- **R&D specifically on CCS:**

- Research Centres for Eco-friendly Energy (FMEs) Two out of eight are dedicated to CCS
- The CLIMIT programme – substantial funding

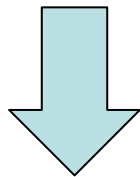
- **Goals:**

- value creation
- develop human capital
- environmental sustainability



International cooperation on CCS is imperative

- Cooperating on research and demonstration plants
- Sharing information and experiences
- Creating commercial incentives and regulatory frameworks



In order to...

- Make the technology commercially viable
- Gain public understanding and acceptance of CCS
- Make widespread use of CCS a global reality

The EU and Norway: Common views and ambitions

- **The EU and Norway have corresponding views regarding the energy and climate challenge:**
 - The importance of securing energy supply. CCS the single most promising technology to decarbonise the use of fossil fuels
 - Limit global temperature increase to 2 °C, to avoid dangerous climate change
- **Norway supports the EUs ambitions and efforts on CCS – close cooperation**
 - The EU Climate & Energy Package. Target: 10-12 CCS demo plants by 2015
 - The EU Directive on geological storage of CO₂
 - The EU Zero Emissions Platform (ZEP)
 - CO₂-infrastructure and safety: London protocol and OSPAR



To conclude:

- CCS will be a major tool for mitigating climate change.
- Through widespread use of CCS, we can secure energy supply and simultaneously mitigate climate change.
A co-ordinated international effort is required.
- The EU and Norway share ambitious goals on CCS, and cooperates closely.
- Challenges to be met – knowledge sharing and cooperation is crucial.