



**CLIMATE AND  
POLLUTION  
AGENCY**

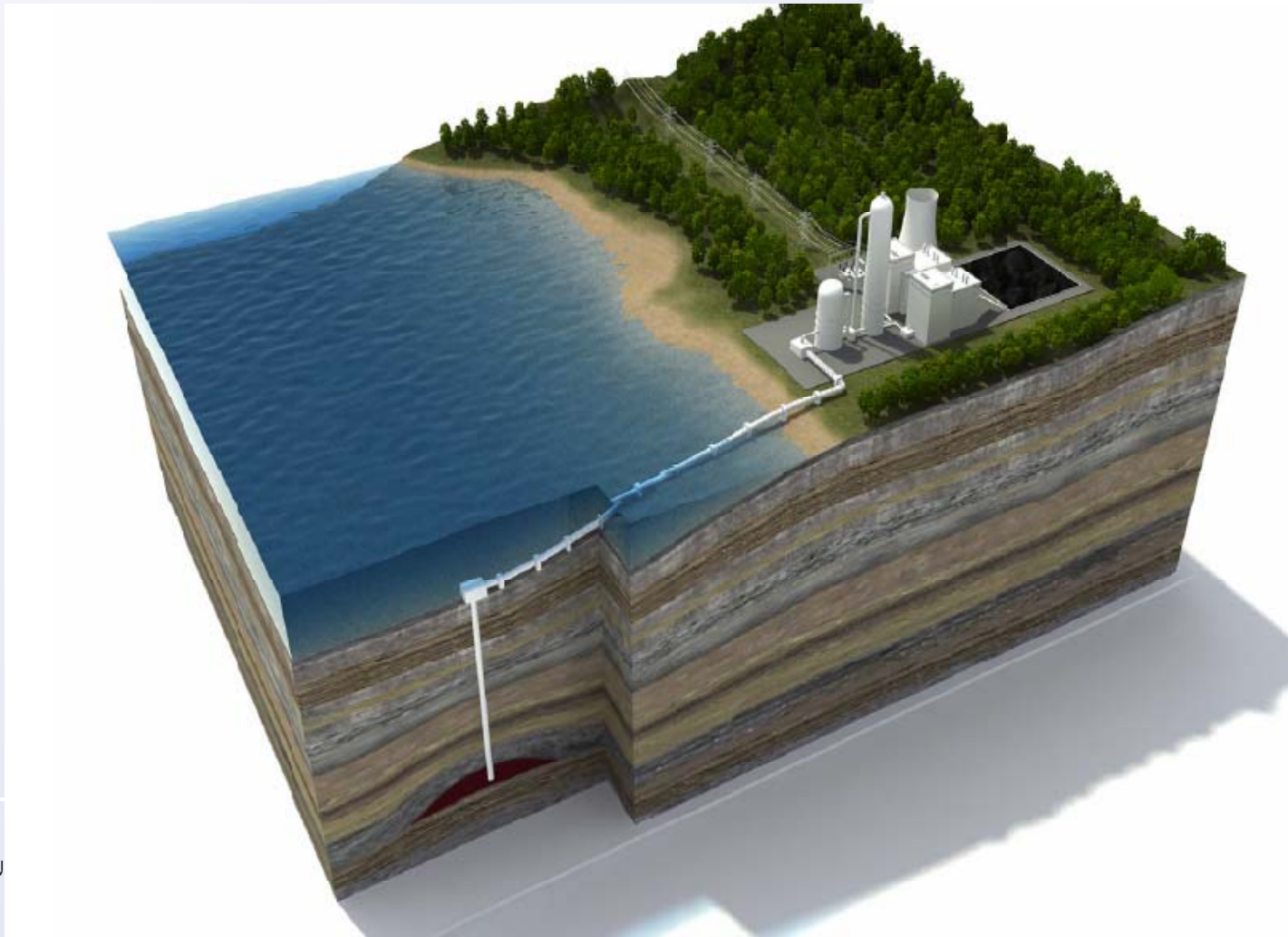
# CCS Regulations

---

Regulations in Norway, EU etc.

June 29, Phuket

Senior adviser Øyvind Christophersen  
Climate and Pollution Agency, Norway



Futu

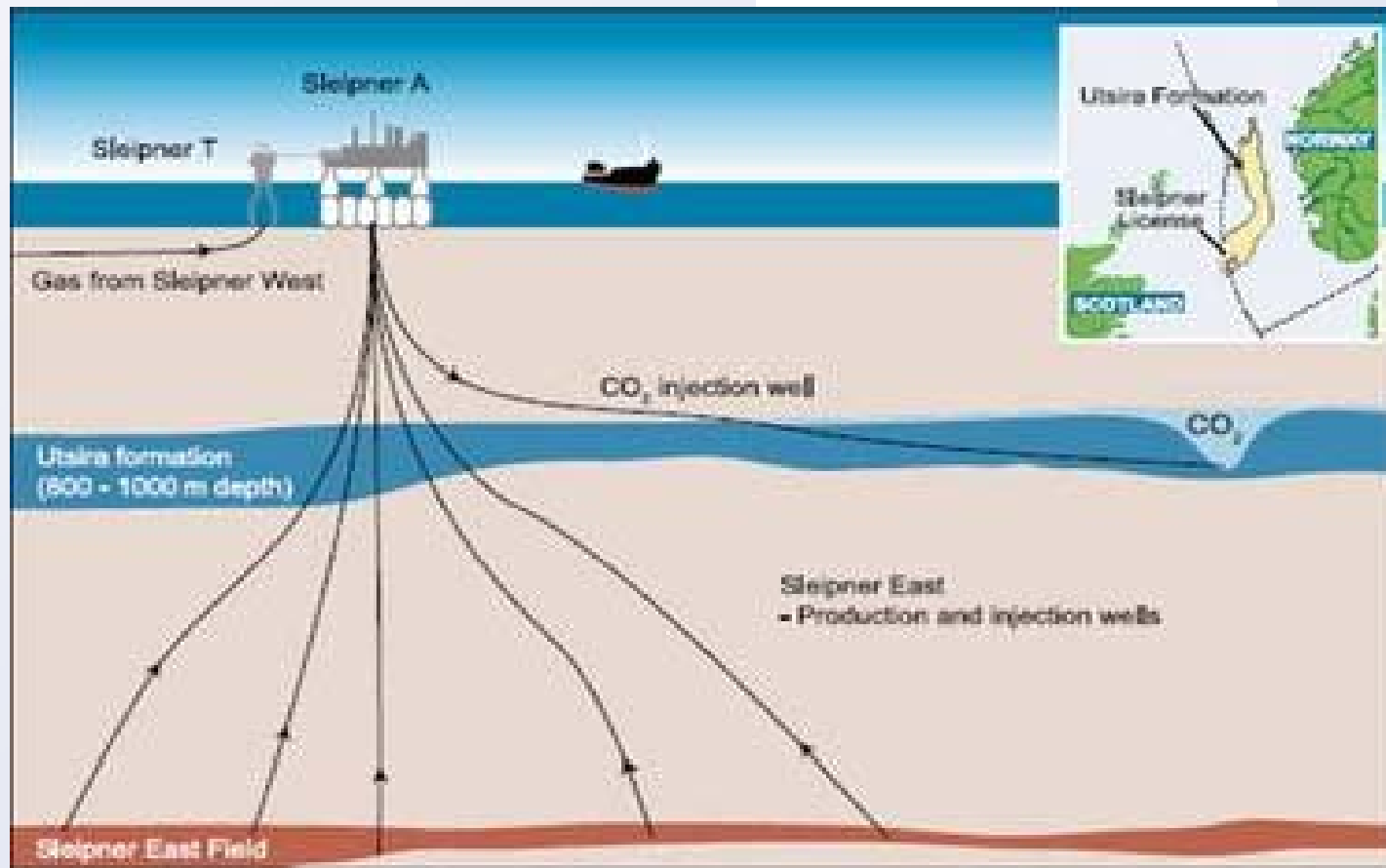
30.06.2010



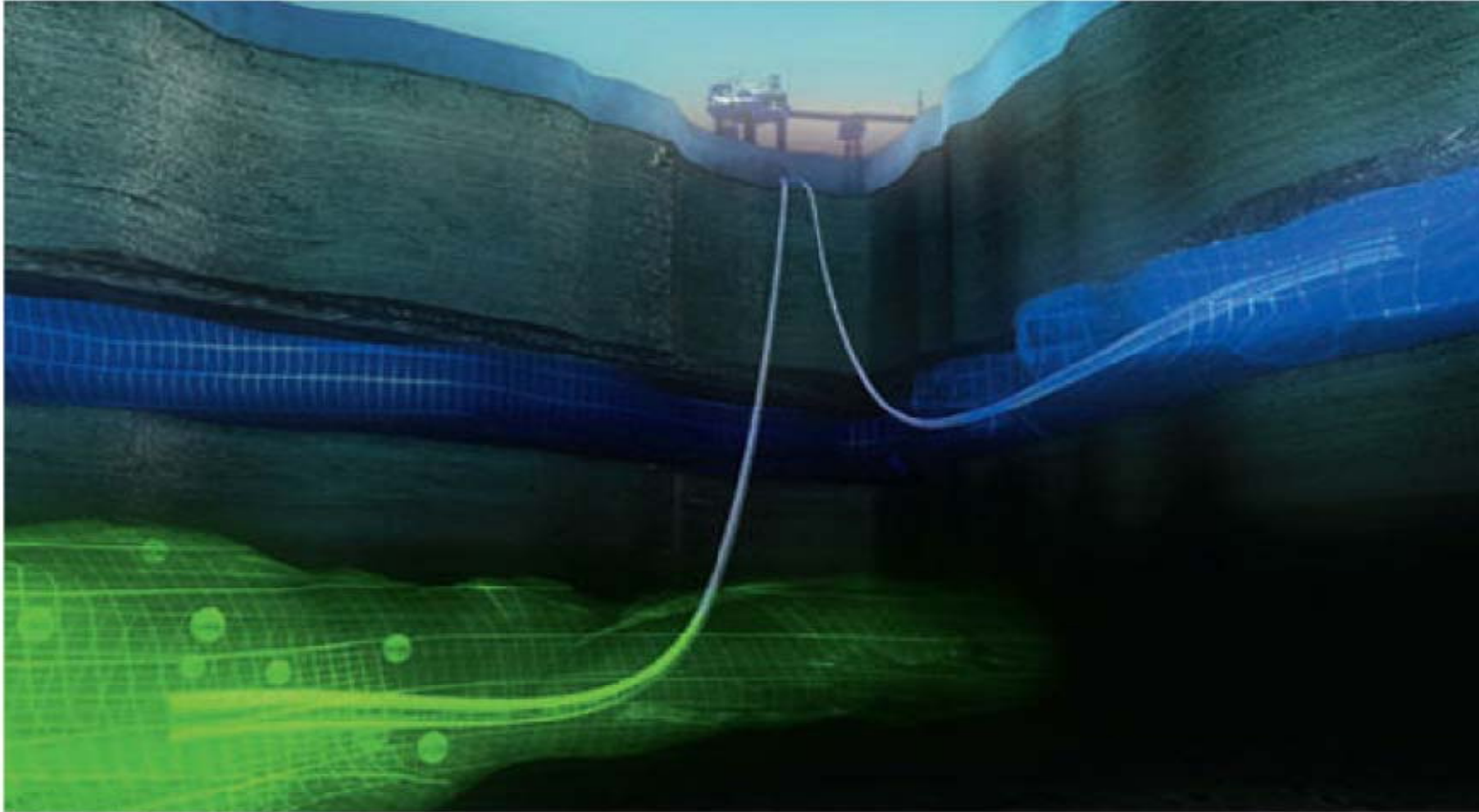
**CLIMATE AND  
POLLUTION  
AGENCY**

# CCS status in Norway

- **In operation: Sleipner (1996) and Snøhvit (2008)**
- **Test Center Mongstad (TCM)- capture pilot – 2011 (100 000 t CO<sub>2</sub>)**
- **Mongstad gas power plant- full scale CCS planed (1.2 Mt CO<sub>2</sub>)**
- **Kårstø- gas power plant , CCS was scheduled for 2014 now being postponed**
- **Government stated (again): no new gas power plant without CCS from start**
- **Regulatory work: transposing of storage directive pending on discussions between Ministry of Environment and Ministry of Oil and Energy on responsibilities**



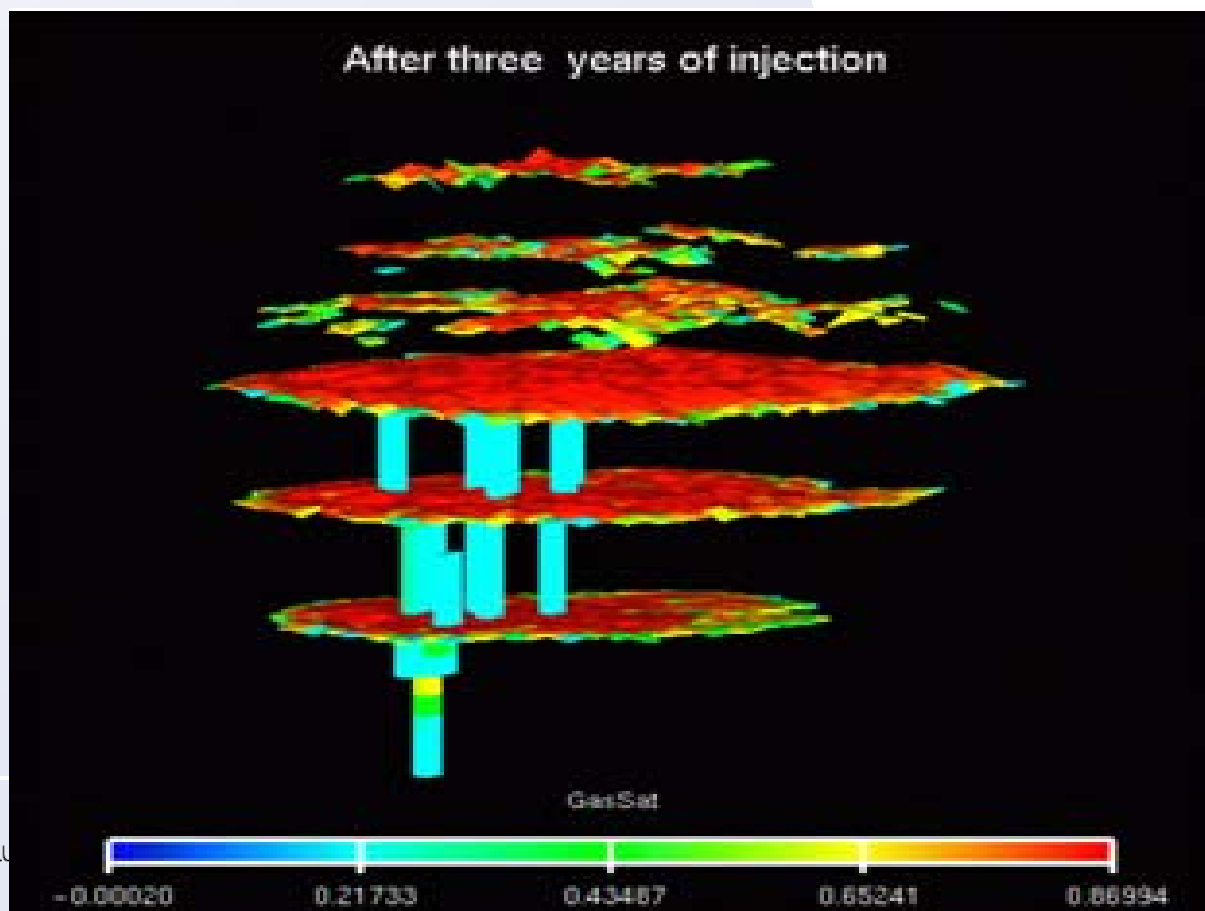
# Sleipner A -injection of CO2 (blue) separated from natural gas (green)



Illustrasjon StatoilHydro

CLIMATE AND  
EMISSION  
REDUCTION  
AGENCY

# Monitoring of Sleipner CO2-storage



Future without poll

30.06.2010



**CLIMATE AND  
POLLUTION  
AGENCY**

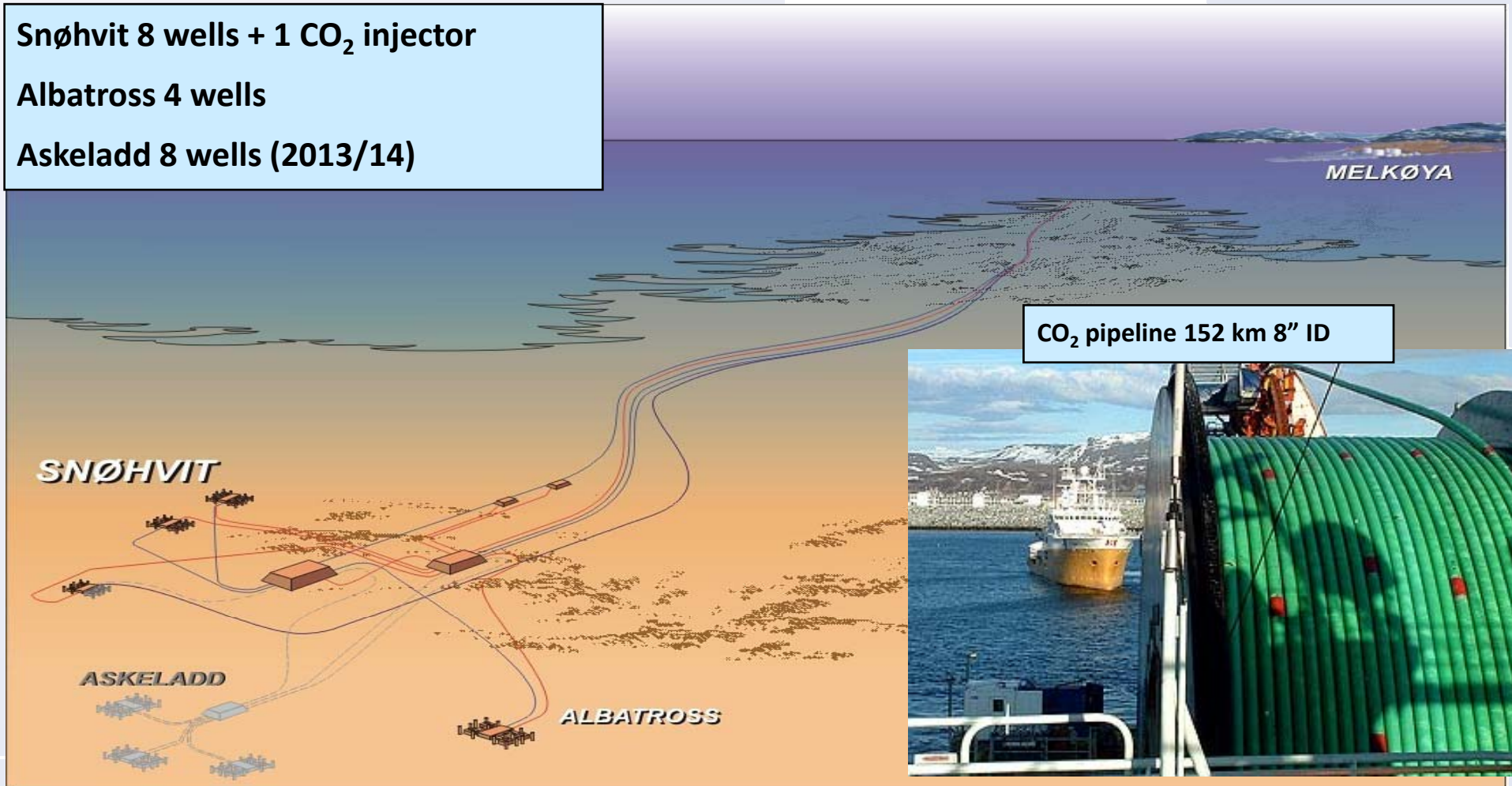
Side 6



**Snøhvit 8 wells + 1 CO<sub>2</sub> injector**

**Albatross 4 wells**

**Askeladd 8 wells (2013/14)**



MELKØYA

CO<sub>2</sub> pipeline 152 km 8" ID

SNØHVIT

ASKELADD

ALBATROSS

Future without pollution



**CLIMATE AND  
POLLUTION  
AGENCY**

# Environmental impact of the emissions to air from separation unit

- **Health effects (ground level concentrations of NO<sub>x</sub> ammonia and amines): not likely**
- **Environmental impact due to deposition of N: very little contribution**
- **Reaction products and photochemical degradation of amines: need to be further investigated based on specification of amines in the actual solvent**



# Kårstø (photo by StatoilHydro)

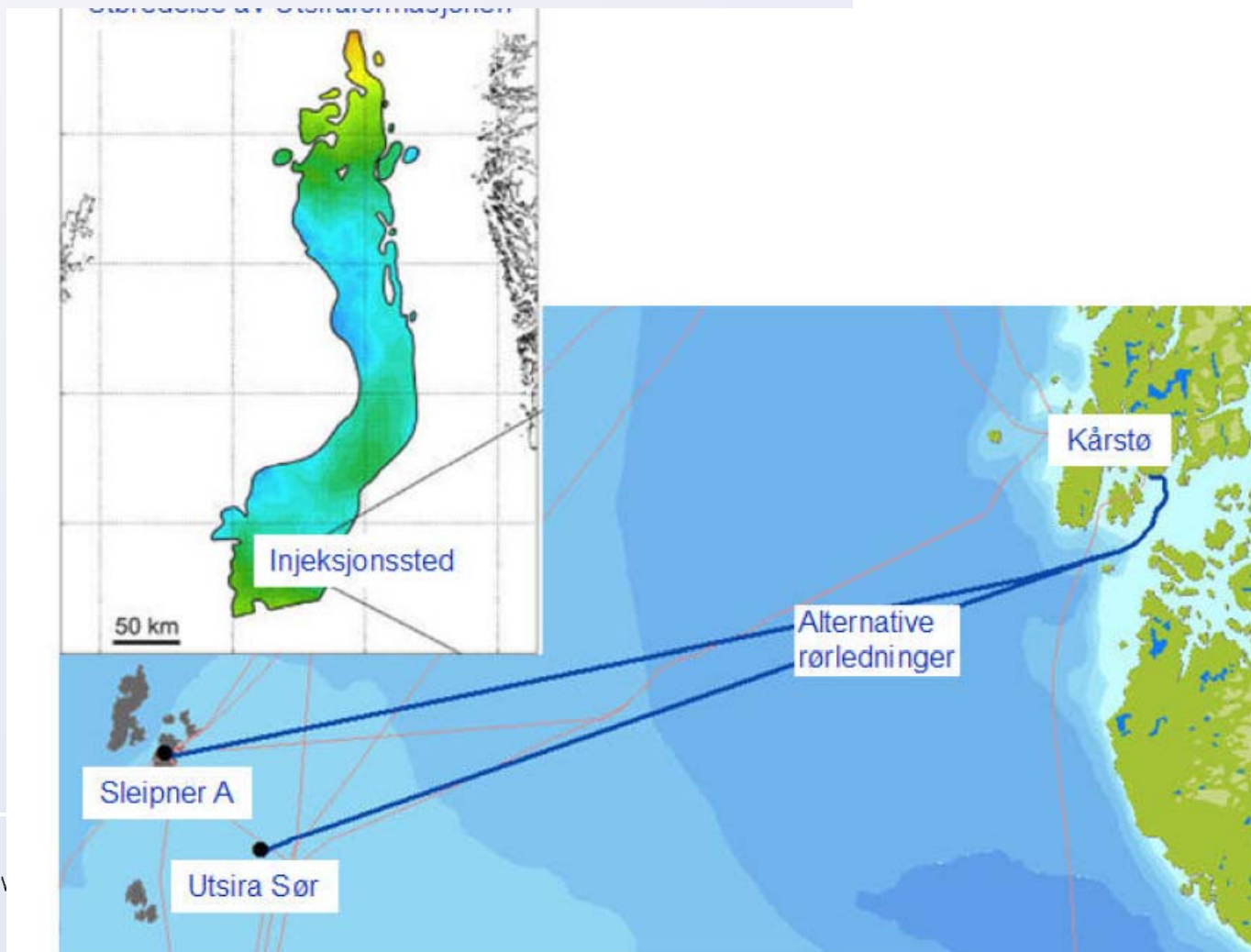


30.06.2010



**CLIMATE AND  
POLLUTION  
AGENCY**

# Alternative pipelines



Future v



# Risk assessment-storage site Kårstø

Risk for long-term releases of CO<sub>2</sub>:

- Risk assessment concludes (preliminary) that the risks connected to faults and to depleted wells (cement) need further investigation
- Risks to be reduced by selection of location for endpoint of injection well



# Storage technology and methodology

- Geological CO<sub>2</sub> -storage uses many of the same technologies and methodologies that have been developed by the oil and gas industry and have been proven to be economically feasible under specific conditions for oil and gas fields and saline formations.



# CCS assessed in several international organisations

## - IPCC, London Convention/London, IEA, EU

- Their conclusions are to a great extent consistent
- CCS as part of a portfolio of climate change mitigation options
- safe storage for carefully selected well designed and monitored geological storage formations
- need for guidelines and regulations



# Regulations and guidelines

- IPCC, LP and OSPAR have developed guidelines for CCS which is in line with the proposed regulations in the EU CO<sub>2</sub>-storage directive
- The CO<sub>2</sub> storage directive and changes in other directives will be important for facilitation of CCS
- Development of Monitoring and Reporting Guidelines for CCS under the European Trading Scheme





# Key issues for CCS projects

- Selection of a suitable site, including simulation of the reservoir's ability to absorb the CO<sub>2</sub> and keep it stored
- Project design
- Monitoring
- Reporting and verification



# Some important questions

- Flexibility related to technology development; separation, transport, monitoring methodologies
- CO<sub>2</sub> stream - composition
- Site selection and permit to store
- Monitoring requirements (level of detail, flexibility regarding methodology)
- How to deal with existing CCS projects

# Norwegian Pollution Control Act

- Application for an emission permit:
- Characteristics of the storage site
- Characterisation of the CO<sub>2</sub> -stream
- Documentation of the geological formation's suitability for CO<sub>2</sub> -storage, consequence assessment, risk assessment.
- Injection project design and operation
- Monitoring plan



- **Thank you!**

