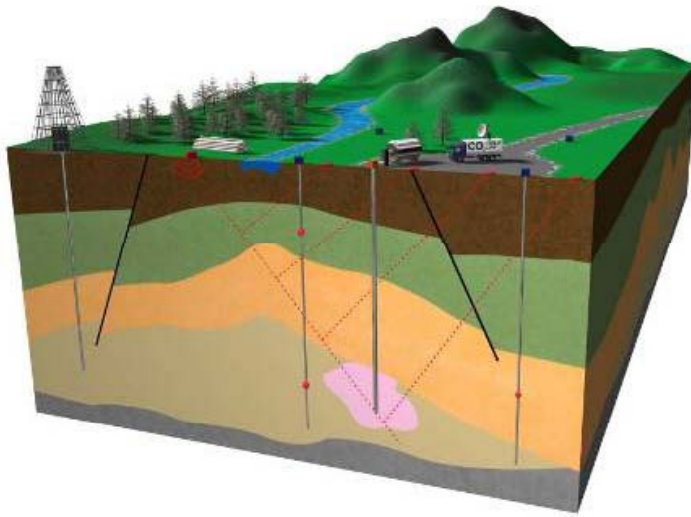


CO₂ Field Lab

Monitoring technologies to assess the integrity of
CO₂ underground storage



TCCS-6

Trondheim

15 June 2011

Agenda

- Objective
- Overview
- Progress

Motivation:

Robust strategy for storage

- up-front site **characterisation** and
 - **monitoring** during injection
 - **detection** of any (source of) leakage **early enough**
 - **remediation plans**
- measures (upon defects)
 - **stop** the injection and continue the injection somewhere else
 - **produce** the injected CO₂ from the storage site and re-inject

Objective:

Controlled CO₂ injection (unique)

- **CO₂ injection**
 - **shallow** (10-30 m)
 - **deep** (100 – 300 m)
- determine the **sensitivity** of monitoring systems by detecting shallow CO₂ **migration** and surface **leakage**
- **test** and **calibrate** migration **models** in well controlled conditions
- **upscale** results to assess monitoring systems and requirements
- prepare a **monitoring protocol**

Location: Field laboratory

- Svelvikryggen; midway Drammensfjord, 50 km SW of Oslo, Norway



Pre-history

- several **pre-phases**; feasibility (2006-2009)
- project approved by **EUROGIA+** board (June 2009)
- project approved by **French Ministry** (July 2009)
- project approved by **Climit** board (September 2009)

Phases - overview

- Phase 1
 - site **characterization**
- Phase 2
 - **CO₂ injection** (shallow & deep)
 - monitoring **protocol**



Milestones – Phase 1

- characterization
 - resistivity measurements
 - ground penetration radar survey
 - seismic survey
 - drilling/logging exploration well (333 m TVD)
 - hydrodynamic survey
- protocol: 1st version
- CSLF-recognized project

Drilling: exploration well



Milestones – Phase 2

- fall 2011
 - shallow injection
 - deep injectivity & VSP
- 2012
 - deep injection
- 2013
 - modelling & evaluation
 - monitoring protocol
 - abandonment (or continuation?)

Monitoring CO₂ (not exhaustive)

Geophysical surface measurements	Monitoring well measurements	Soil / surface / atmospheric
<ul style="list-style-type: none"> ➤ ERT ➤ SPT ➤ CSEM ➤ passive/active seismics 	<ul style="list-style-type: none"> ➤ ERT ➤ fluid sampling ➤ pressure ➤ temperature ➤ logging (neutron, sonic) 	<ul style="list-style-type: none"> ➤ soil & surface gas ➤ CO₂ flux ➤ bacterial activity



Modelling: History matching

WEB

➤ www.sintef.no/projectweb/co2fieldlab/

Participants

France

Schlumberger



Acknowledgments
for financial support:

- Gassnova/CLIMIT (NO)
- DGCIS (FR)

Norway



Great Britain



Summary

- **CO₂FieldLab** is a 4 years CO₂ storage related project to
 - characterize **site**
 - **inject**
 - **monitor** migration/leakage
 - **assess** risks/methods
 - **disseminate**
 - prepare **protocol**