

The CLIMIT programme provides financial support for development of CCS technology.

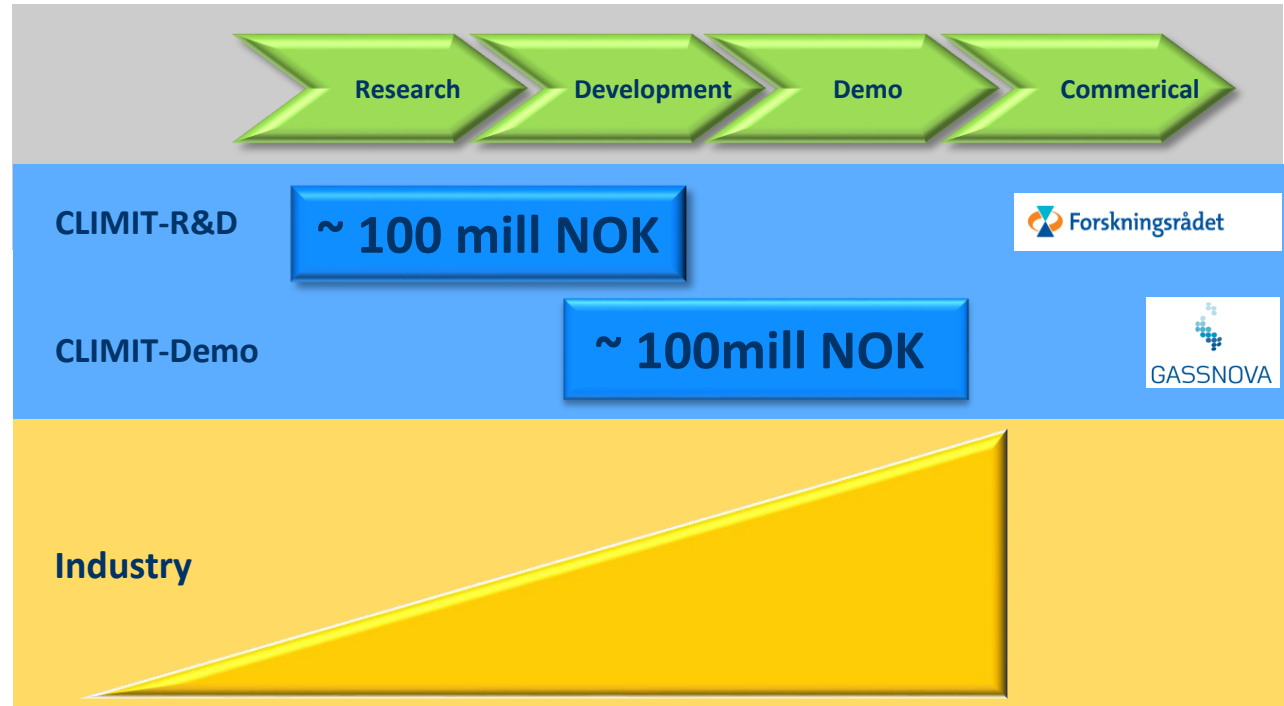
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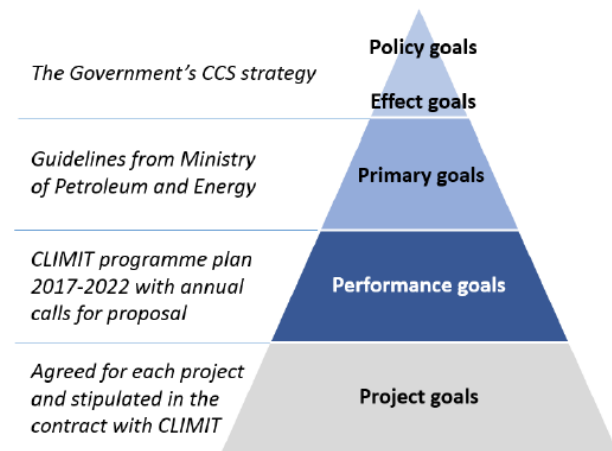
CLIMIT: National programme for CCS technology development

- **Mandate**
 - 2005: Gasfired power-generation with CCS
 - 2008: Generalized to deal with emissions from all fossil fuels.....
 - 2010: also including industry CO2 emissions
- More than 300 projects have received support
 - Approx. NOK 1.7 billion NOK/ 220 bill \$ in funding since 2005
- Taken Norway to the forefront of international research and technology development



Programplan

- Reflects
 - Government ambitions
 - Industry needs
 - R&D challenges



“The CLIMIT Programme Plan for 2017-2022 describes how the programme is organised, focus areas for new R&D ..and what is expected of applicants that are awarded support from the programme”

Focus areas CO2 storage: climit programme plan

- The next offshore CO2 storage sites will mainly be developed using current petroleum technologies. Costs and risks can be reduced by looking at simplifications, standardisation and optimisation of technology elements that are used in wells, subsea templates and other installations.
- **Reduce uncertainty;**
 - New or improved experimental analyses and calculation methods can increase our understanding of storage capacity, injectivity, sealing and flow properties. This will reduce the uncertainty of an investment decision for a CO2 storage site.
 - Improved methods will also provide more assurance that a storage site can be operated without negative environmental impact.
- **Reduce cost**
 - There is a need for cost-effective solutions for evaluating, building and operating CO2 storage sites with associated injection wells and subsea installations. Simulation tools are particularly important during the evaluation phase, the injection phase, as well as after injection is completed.
 - **Methods for monitoring reservoirs, cap-rocks and the marine environment** should be developed further for a more cost-effective real time monitoring of the most critical parameters.
 - There will be a need to develop improved methods, procedures and tools for securing and de-commissioning storage sites, and for monitoring after injection is completed. Procedures for quantifying the risk associated with undesirable incidents in a lifecycle perspective are important in this context.
 - It is also important to develop methods to prevent or mitigate undesirable incidents. Methods for assessing and mitigating problems related to legacy wells are of particular interest in this connection.
- **“CO2-use”**
 - Projects that examine use of **CO2 for enhanced oil recovery in combination with long-term storage**, will qualify for support. This could increase the commercial value of the CCS projects now, as well as provide useful experience for subsequent storage facilities.

SIMCO2; simulation of CO2 injection in connection with EOR and storage

OPM
The Open Porous Media Initiative

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OPEN POROUS MEDIA

The Open Porous Media (OPM) initiative encourages open innovation and reproducible research for modeling and simulation of porous media processes.

3D visualization of simulation results in Eclipse restart format.

OPM coordinates collaborative software development, maintains and distributes open-source software and open data sets, and seeks to ensure that these are available under a free license in a long-term perspective.

Current development is focused on CO₂ sequestration and improved and enhanced oil recovery, but contributions aimed at different scientific or industrial fields in which flow in porous media play an important role are always welcome. More detailed information on [how to contribute](#) is available.

OPM software

Flow is a reservoir simulator for three-phase black-oil problems using a fully-implicit formulation. There are also specialized variants for solvent and polymer problems. Flow can read and write standard industry formats. [More information.](#)

The [Upscaling](#) module contains programs that can do flow-based permeability upscaling as well as upscaling of relative permeability and capillary curves, using a steady-state approach. [More information.](#)

RECENT OPM NEWS

OPM release 2017.04
April 26, 2017

Upcoming release 2017.04
April 11, 2017

New tutorial: running Norne
December 19, 2016

Opn release 2016.10
November 1, 2016

Slides from the OPM meeting available
June 9, 2016

ALL OPM NEWS

The OPM news archive.

- Project led by IRIS in cooperation with Sintef and Statoil
- Open-source software
 - Code available through OPM for other to build on: testing, improvements etc
 - Broad user and development platform

Offshore monitoring - storage locations

- Norwegian Geotechnical institute
 - Leakage detections
- Norsar
 - Microseismic monitoring- background, measurement network
- OCTIO geophysical
 - Seabottom sensor network

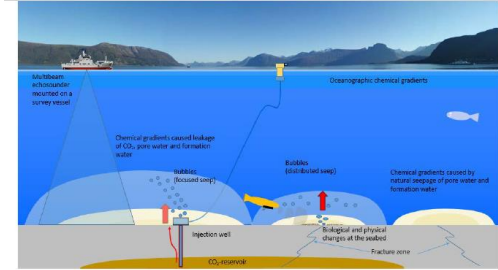


Figure 2 - Illustration of a OCS monitoring scenario with CO₂ leakage through an injection well and a fracture zone. Note that the illustration is out of scale, a CO₂ reservoir will be much deeper (kilometers) beneath the seabed.

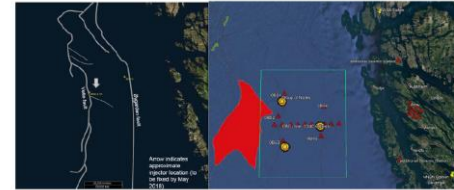
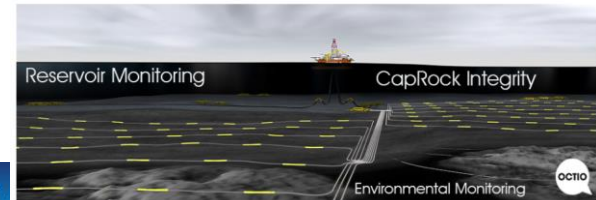
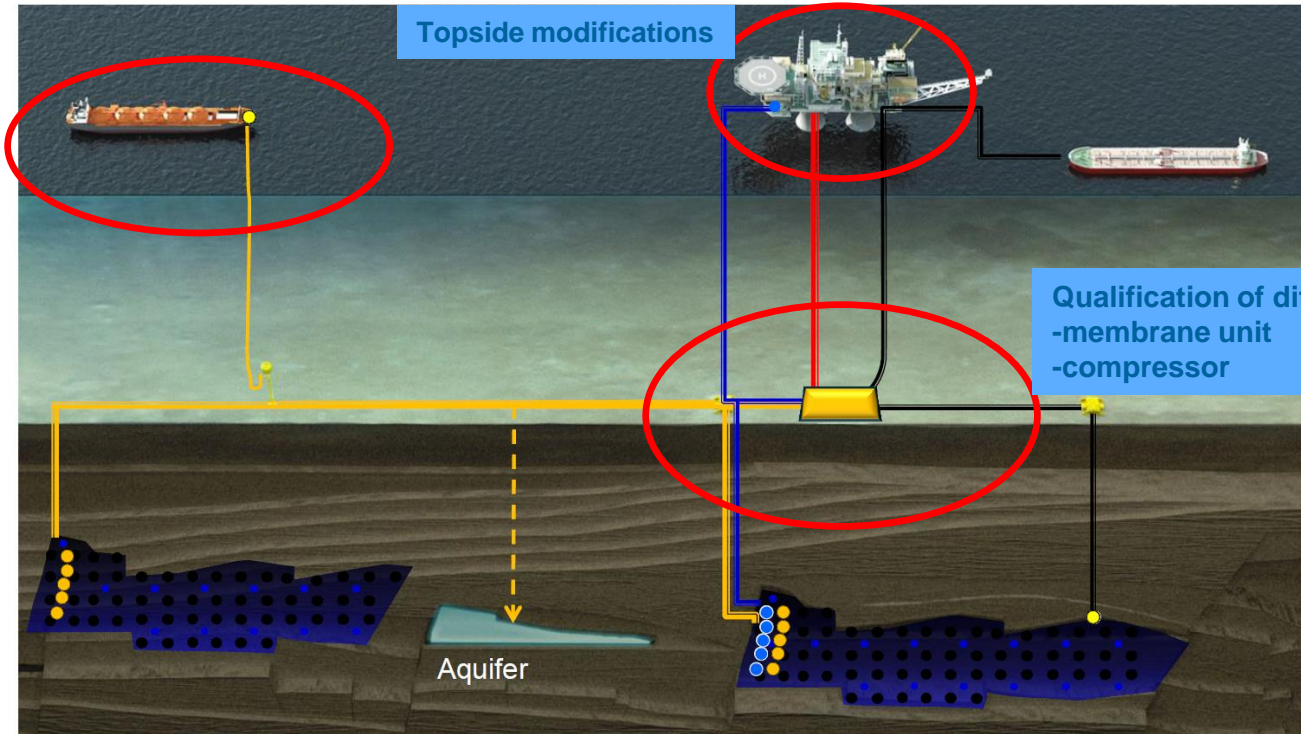


Figure3: The map to the left shows the main faults within the Smeaheia region, including the Vette and Slygarden faults and the arrow indicates the potential injection location. Right: map showing the larger Smeaheia region including the Troll field outlines to the West and the Norwegian mainland. The conceptual positions of additional seismometers, either placed in an array-configuration and single sensors onshore, or in different configurations such as a line, or in groups offshore. The yellow suns offshore represent a group or array of sensors.



Aker's CO2-EOR concept, Climit support



Compact membrane packing

- Onshore stacking not feasible subsea
- Compact packing arrangement developed by AKSO

Qualification of different technology elements
 -membrane unit
 -compressor

Compression System

2010 – 2015 Asgard:

- 21 MSm³/d flow rate
- 2 x 11.5 MW compressor power
- 300 m water depth
- 40 km step-out distance
- Topside Variable Speed Drives, Circuit breakers and UPS
- Delivered by Aker Solutions

Funding opportunities

- CLIMIT-R&D annual call for R&D projects
- CLIMIT-demo : open call for D&D projects
- Cooperation with EU
 - ACT, H2020
- Bilateral cooperation
 - US (co-financing)
 - NL (CATO-2: joint call in 2015)

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