Northern Lights

A European CO₂ transport and storage network

Workshop on Hydrogen Production with CCS, Paris, 6.11.19
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https://northernlightsccs.eu/
Northern Lights is part of Norwegian full scale CCS demonstration project

Ship-based transport & storage solution which enables industrial decarbonisation in Europe, first phase with 1.5 MTPA capacity, second phase 5 MTPA capacity
Timeline for Northern Lights phase 1

2019
- Technical studies
- Confirmation well

2020
- Tendering
- Company decisions
- Pre-execution
- Parliament

2021 - 2023
- State decision
- Execution
- Start-up
- Commercial model
- Parliament
- Company decisions
- Pre-execution

Parliament

Pre-execution

Company decisions

Commercial model

Start-up

2019

2020

2021 - 2023
Visualisation of CO₂ storage hub
Pipeline
Subsea

• Early well → Integrated Satellite Structure & Wellhead System

• Tie-in (umbilical) to the Oseberg Field Centre

• Subsea Facility components
  • Subsea structure
  • Wellhead
  • Christmas tree
  • Control module
  • Protection structure
  • Control system
  • Umbilical/power cable (power, hydraulic, chemicals, signal)
Egersund Norway 8 October 2019
Drilling and Well

• Data acquisition – Eos well
  • Coring
  • Logging
  • Stress testing
  • Well test

• Keeper well
  • Temporary plug and abandon well in 2020
  • Re-entry, sidetrack and completion in 2022 or 2023
Enables "open source" offer for CO₂ emitters to establish capture

Large potential with long-life sectors:

- Hydrogen and power from natural gas
- Waste incineration
- Cement
- Biomass and biofuel
- Steel
- Refinery

- Northern Lights is relevant and within reach for about 350 facilities and 300 MTPA of these "most attractive candidates"
Northern Lights PCI application is the beginning of our contribution to a European network for CO$_2$ removal

EU PCI application submitted 1.3.19

PCI is Project of Common Interest

15 partners from 7 countries

Included on fourth PCI list by EU Commission, October ’19, together with 4 other CCS projects:
Seven MoU’s signed at CCS Conference 5.9.19

COMPANIES
• Fortum Group; Finland
• Ervia, Ireland
• Air Liquide, Belgium
• Stockholm Exergi, Sweden
• ArcelorMittal, Luxembourg
• Preem, Sweden
• Heidelberg Group, Germany

TYPICAL CONTENT
• Logistics studies
• CO₂ specifications optimized across value chain
• Roadmap towards potential start of operations
• Joint advocacy for CCS and its importance for decarbonization of European industry
• Initiate dialogue with National and Norwegian Governments
Air Liquide: – Vi kan bidra med flere millioner tonn CO2 i året i et lager i Nordsjøen

Some regulatory amendments needed to make ship-based CCS happen

- **London Protocol** – to allow for cross-border transport of CO₂

- **CCS Directive** – to include ships in definition of CO₂ transport network

- **EU ETS Directive** – to include ships in definition of CO₂ transport network

- **TEN- E (CEF) Regulation** – to make ships eligible for funding

**The London Protocol:**
Together with the Netherlands, Norway submitted a resolution to the IMO/LP meeting 7-11 October 2019. The Northern Lights project also gave a presentation.

The resolution is based on Article 25 of the Vienna Convention on the Law of Treaties which states that if Parties to a treaty agree on something, they can act upon this agreement immediately pending administrative implementation in the treaty.

The resolution was approved 11.10.19, so ship transport of CO₂ between two countries that agree will now be allowed.
Early Norwegian investment decisions can enable early European capture projects

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Feasibility and Concept | FEED studies | Execution | Operation

06.11.2019
Development scenario: 1.5 MT per annum
Development scenario: 5.0 MT per annum
Development scenario: 20 MT per annum
Future Scenario for a European CCS Network
CCS as enabler for hydrogen production

CO₂ Capture
Capture from industrial plants. Compressed and temporarily stored.

Transport
Compressed CO₂ transported by ship.

Permanently stored
CO₂ received and temporarily stored. Export via pipeline offshore. Permanently stored in reservoir (1000-2000 meters below sea bed).

H₂ - Hydrogen
for power generation
for heat
for maritime transport

Climate roadmap, 2018, Equinor