Northern Lights
A European CO₂ transport and storage network

Presentation North Sea Commission. Florø 28.02.20

https://northernlightsccs.eu/
• Context
• Northern Lights concept overview.
• Opportunities, Project status & plan ahead.
Context

- Paris climate agreement signed by 175 countries in 2015
  - The Norwegian Government’s CCS strategy and ambition is to realise at least one full-scale CCS demonstration project in Norway:
  - «CCS demonstration project shall stimulate necessary development of CCS so that long-term climate targets in Norway and EU can be reached at a lowest possible cost»
• Part of the Norwegian full-scale CCS project

• The full-scale project is a result of the Norwegian government’s ambition to develop a full-scale CCS value chain in Norway by 2024

• The full-scale project includes:
  • capture of CO₂ from industrial sources in the Oslo-fjord region
  • shipping of liquid CO₂ from the capture sites to an onshore terminal on the Norwegian west coast
    • using ships from the CO₂ capture sites to the Northern Lights onshore site, is a unique solution and enables accommodating large CO₂ volumes from across Europe that would otherwise have been emitted
  • liquified CO₂ will be transported by pipeline to an offshore storage location subsea in the North Sea, for permanent storage
Norwegian full scale CCS demonstration project
- Enabling industrial decarbonisation -
Northern Lights concept overview

- **CO₂ Capture Sites**
- **Ship(s)**
- **Onshore facilities**

**Capacity (Mt/y)**
- **5**
- **1.5**

- **Capture Site 2**
- **Capture Site 1**

- **2 x ship**
- **1 x ship**

**+ ship(s)**

- **+ pump capacity**
- **+ heater capacity**
- **+ jetty**
- **+ tanks?**

**Storage complex**
- Planned in the Johansen formation south of Troll ("Aurora") with an expected capacity of at least 100 Mt of CO₂

**Pipeline**

**Subsea facilities**

**Subsea injection well**
Northern Lights onshore facility Øygarden
CO₂ transport.

• Cargo Systems for CO₂
  ➢ 2 ships x 7500 m³ capacity
  ➢ Tank Operating Condition: 15 barg, c.:-26°C
  ➢ Offloading @ max 800 m³/hr
• ‘LPG standard’ design
  ➢ Proven concept (based on food industry model)
  ➢ Battery Power ca. 45 minutes in/out of port
• 2 ships – flexible model - milking route ‘works’ for ports to Malmo
  ➢ Each ship completes trip in ~ 5/6 Days
CCS in Norway – 23 years of successful industrial experience

- Snøhvit CCS in operation 2008
- CO₂ test center (TCM) in operation 2012
- Full scale project (2016-2023)
- Sleipner CCS in operation 1996
- 23 years of experience
- Ca. 23 mill tons of CO₂ stored
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”
Seven MoUs signed at CCS Conference 05.09.19

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
Future Scenario for a European CCS Network – small ships, large ships, pipelines
Timeline for Northern Lights phase 1

- **2019**: Technical studies
- **2020**: Tendering
- **2021 - 2023**: Execution

Key Stages:
- Commercial model
- Parliament
- Pre-execution
- Company decisions
- State decision
- Start-up
- Confirmation well
Geir Grøttveit Equinor
Operations Manager Northern Lights.

© Equinor ASA

This presentation, including the contents and arrangement of the contents of each individual page or the collection of the pages, is owned by Equinor. Copyright to all material including, but not limited to, written material, photographs, drawings, images, tables and data remains the property of Equinor. All rights reserved. Any other use, reproduction, translation, adoption, arrangement, alteration, distribution or storage of this presentation, in whole or in part, without the prior written permission of Equinor is prohibited. The information contained in this presentation may not be accurate, up to date or applicable to the circumstances of any particular case, despite our efforts. Equinor cannot accept any liability for any inaccuracies or omissions.