# The Norwegian Full-scale CCS project

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FULLSKALA

#### Gassnova



Advise the Ministry of Petroleum and Energy



Manage the State's full-scale CCS project



Contribute to technology development and knowledge-sharing



## A European CCS value chain to drive CCS development and industrial success

The Northern Lights Project of Common Interest (PCI) is a CO2 cross-border transport connection project where CO2 captured from industrial sites in Europe will be collected by ship and transported to the Norwegian Continental Shelf for permanent storage subsea, resulting in a full-scale CCS value chain. Equinor, Shell and Total announced on 15 May 2020 that they have decided to invest in the Northern Lights transport and storage solution. The investment decision is subject to final investment decision by Norwegian authorities and approval from EFTA Surveillance Authority (ESA).

#### The development of a European CCS ecosystem

can be a powerful driver for carbon capture in Europe and globally



equinor

**Equinor, Total and Shell ('Northern Lights')** Planning the transportation and storage of CO<sub>2</sub> in the North Sea.





**Reception Terminal** for CO<sub>2</sub> at Øygarden, Hordaland.

- Onshore terminal with storage buffer, pump and heating of CO<sub>2</sub>.
- 110 km pipeline, 12 inches
- One injection well



Norcem AS, Brevik Cement factory



- Transport: 2 ships
- Distance: 700 km
- Level: Liquid (15 barg, -26°C)

Fortum Oslo Varme AS Energy recovery plant



- Capture 400 kt CO<sub>2</sub>/year from Norcem and Fortum Oslo Varme respectively.
- Amino technology
- Includes CO<sub>2</sub> cleaning, condensation and storage buffer (4 days)

#### Pipeline and umbilical routes



#### 3D view of onshore terminal on west coast of Norway



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## CCS value chain in operation 2023/2024



## External quality assurance

In Norway, public projects above USD 100 millions are required to pass external quality assurance:

- Independent consultant company appointed by the government (in this case Atkins in collaboration with Oslo Economics).
- Quality assurance performed in several stages along the project development, with a concluding review before final investment decision (called KS2).
- The review is based on examination of project documentation and interviews/workshops with project owners, the relevant industrial companies, chosen engineering contractors, etc.
- The KS2-report was published on June 24th, with main focus on costs & uncertainties, as well as the planned project governance.

#### Cost of the CCS-chain



- Total CAPEX of 1860 USD Million (both capture plants included)
- Annual OPEX is around 4-5% of CAPEX for each part of the chain.
- Biggest contributions to OPEX are cost of electricity and manning, for the capture plants and transport/storage facilities, respectively.
- Uncertainty in the «market development» (suppliers and materials) is the major contribution to overall cost uncertainty of +/-20% at the end of FEED

## State support – CAPEX sharing



• Similar sharing mechanism for OPEX (state support for 10 years of operation)

#### Net present cost per ton stored



- 25 years of operations
- Discount rate 4%
- The future net present cost per ton is estimated based on:
  - Larger storage terminal & injection pipeline
  - Larger capture plants (at least 1 Mtpa)
  - Replace ships with pipelines
  - Further cost reduction in line with experience from similiar industries