Critical infrastructure for a net zero Europe

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Northern Lights site - Øygarden

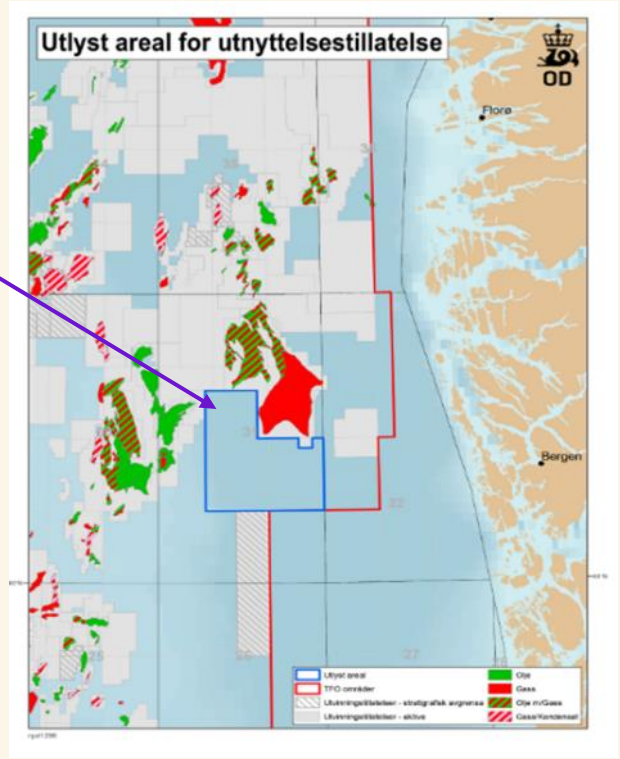
April 2022

Northern Lights

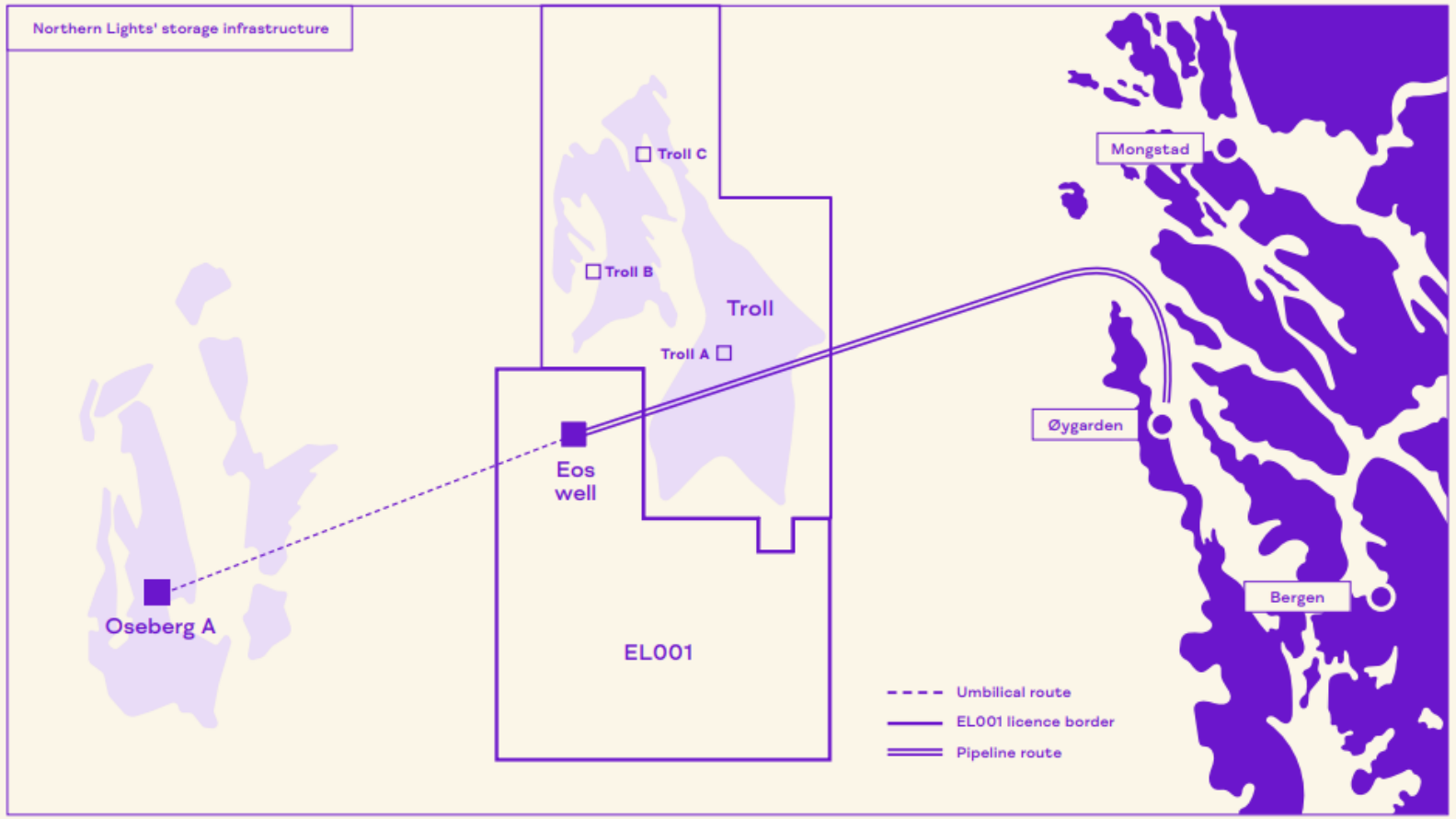
Words into action
Theory into practise

Proven technology
building on 25 yrs of experience

Northern Lights storage concept - saline aquifer no previous oil or gas production



All data (83 GB) from well made public



Norwegian fuel mix is already GREEN
CCS a new business for the future

Northern Lights very successful

Public ambitions with Longship

✓ **Contribute to a new industrial opportunity**

- Foresight of a sink created massive momentum at industrial capture sites to reduce emissions before 2030 and
- Carbon removal (BECCS/DAC) gained momentum and recognised as a needed solution before 2050 further strengthening the CCS value proposition

✓ **Give learnings to regulations and incentivise CCS**

- CCS on political agenda's across Europe and EU to facilitate CCS and embed it (potentially) in climate policies

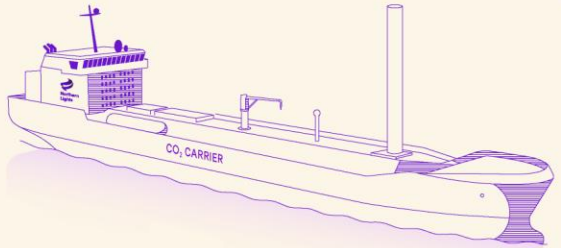
✓ **Reduce costs from learnings and economies of scale**

- EU support to capture sites and Northern Lights

✓ **Demonstrate CCS is feasible and safe**

- On track to start operations in 2024 and start first commercial customer Jan 2025

Overwhelming demand for CCS insufficient storage capacity being developed

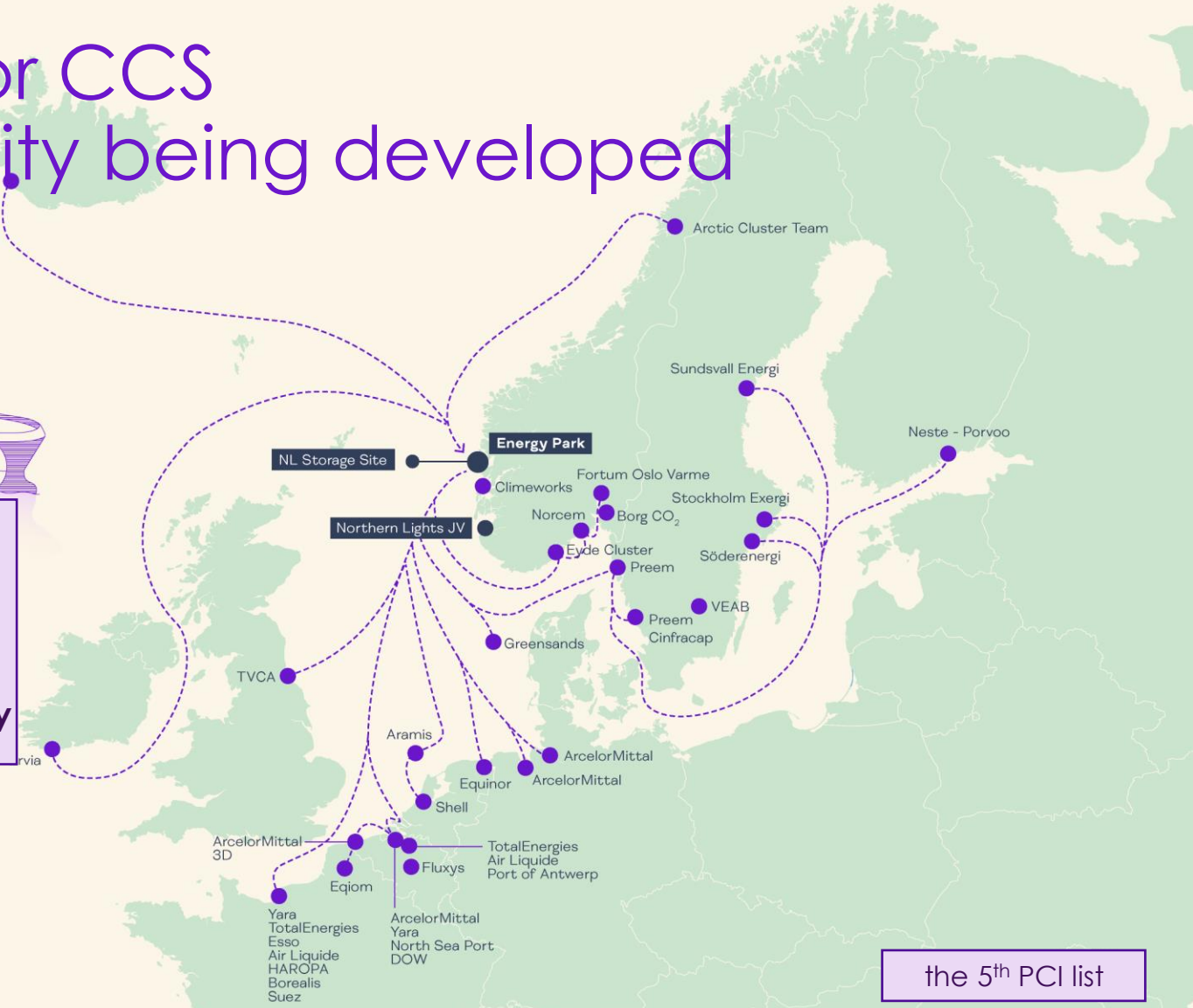


Northern Lights has been accepted to the 5th list with 18 promoters and 22 affiliates

- **Capture potential of ~32 Mtpa in 2030**
- **Compatibility and standardisation across the North Sea key**

Customer type differs per geography

- Cement
- Waste incineration
- Chemical (including clusters)
- Refineries
- Fertilizer industry
- Steel
- DAC
- BioCCS

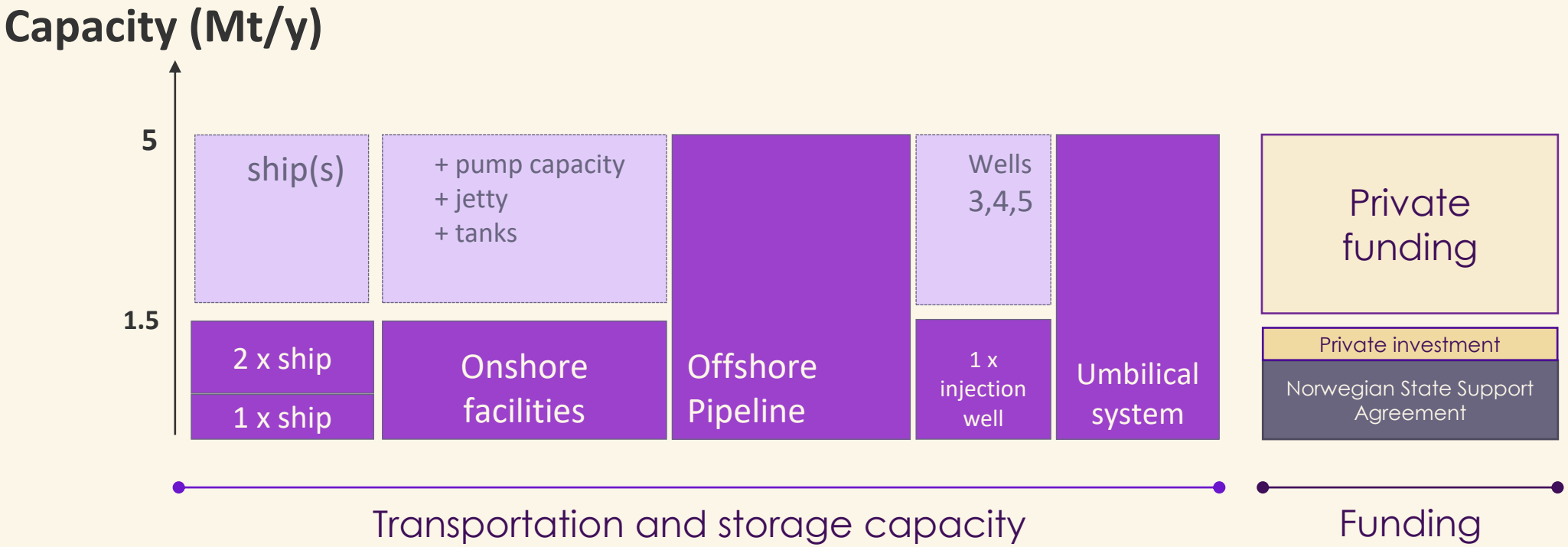


the 5th PCI list

NL JV awarded for funding 4.25 MEUR under the 4th list for Studies

Northern Lights expansion plans

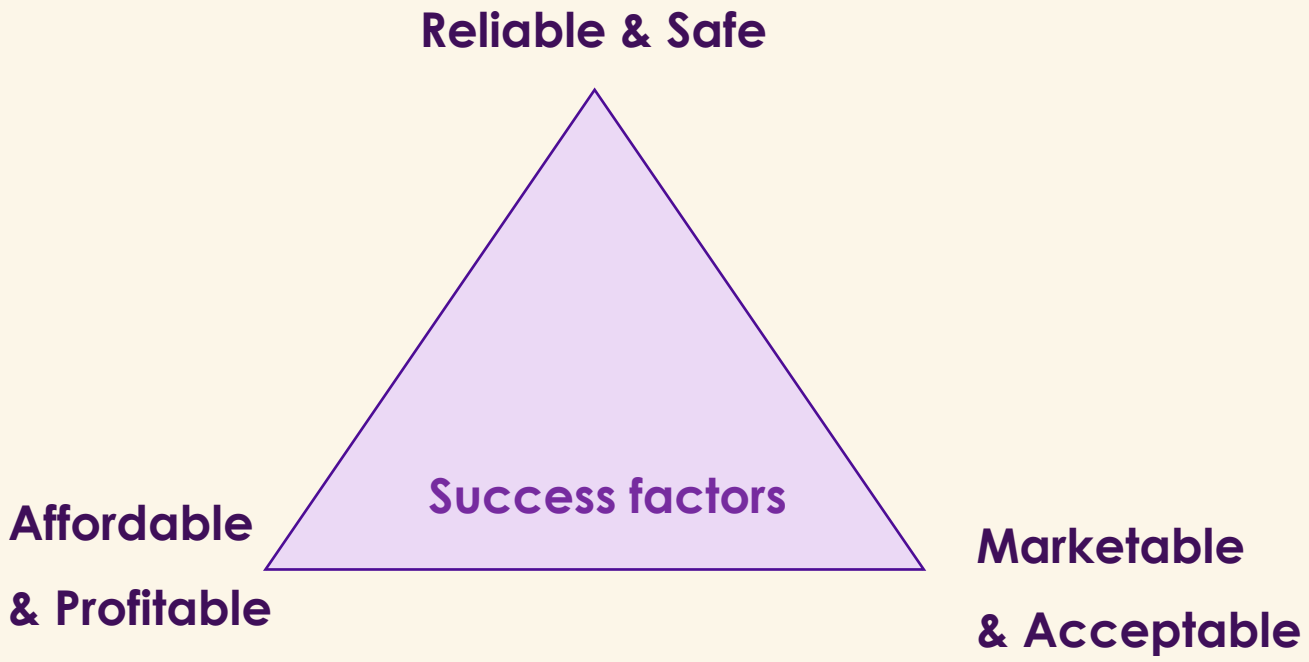
- **FEED Phase 2 scheduled ready Oct/Nov 2022**
- **FID planned Q4 2022/Q1 2023 and subject to a.o. customer commitments**
- **Expected operational early 2026**



CCS challenges and success factors

Overcoming challenges:

- Proven technology – yet value chain is new
- First contracts of this type
- LCO_2 ships are new
- Little/no operational experience
- Risks management
- Costs
- De-risking subsurface is expensive
- Regulatory requirements – many firsts
- Northern Lights – Test Pilots
- **Timing and mindset**

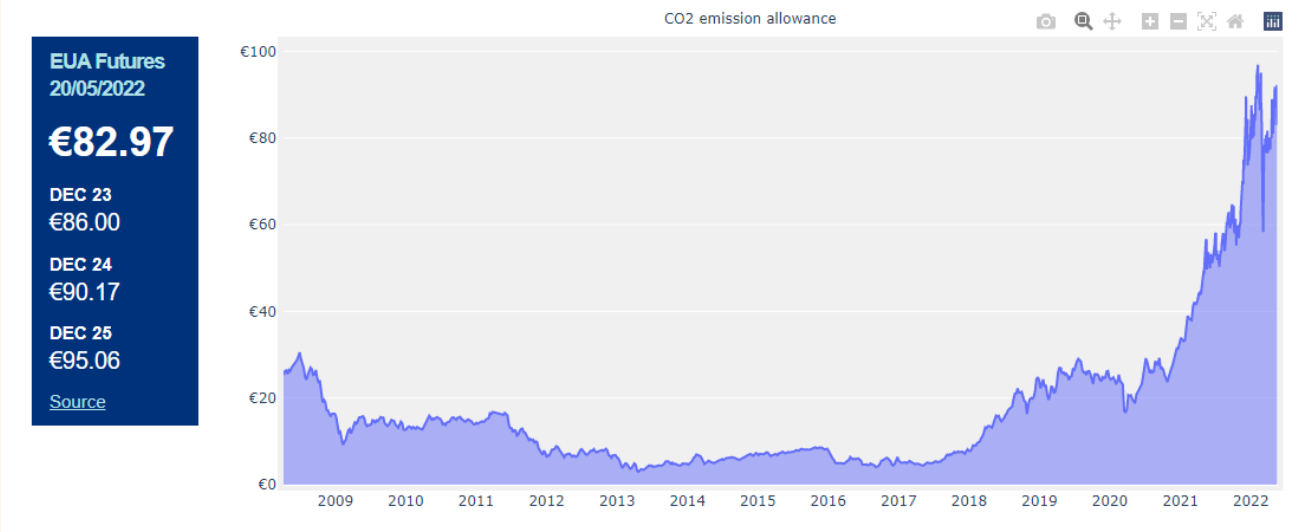


Emitting still cheaper than CCS

EU ETS important

- The high CO_2 price helps put CCS on the agenda but it is too early to say if it is triggering investment decisions.
- We are experiencing high interest from industrial companies in countries with CO_2 taxation schemes on top of ETS. Typically these countries also offer support mechanisms for realisation of industrial climate change mitigation initiatives.

EU ETS 20. May 2022



Source: https://sandbag.be/index.php/carbon-price-viewer/

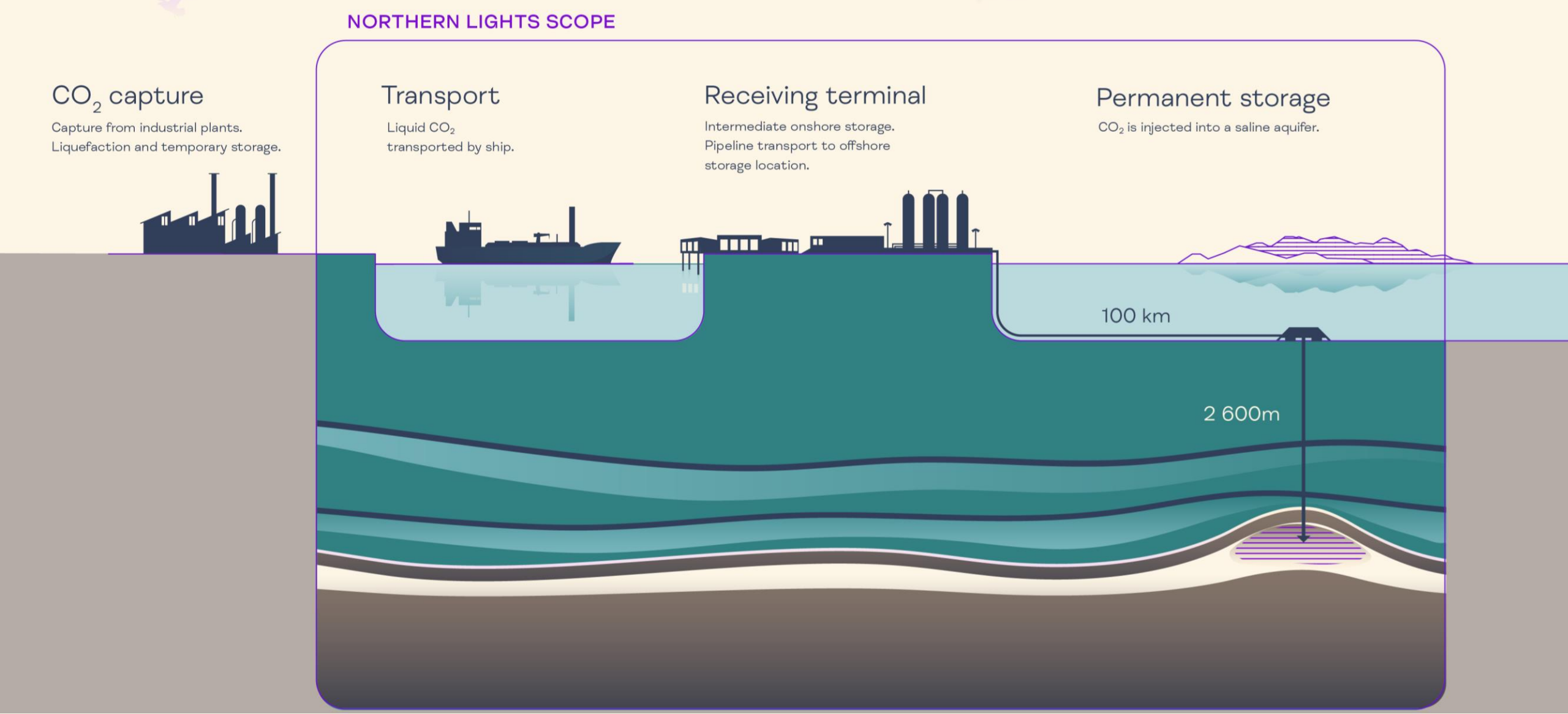
Northern Lights JV DA

June 2022

Back up

Northern Lights: CO_2 transport & storage at scale

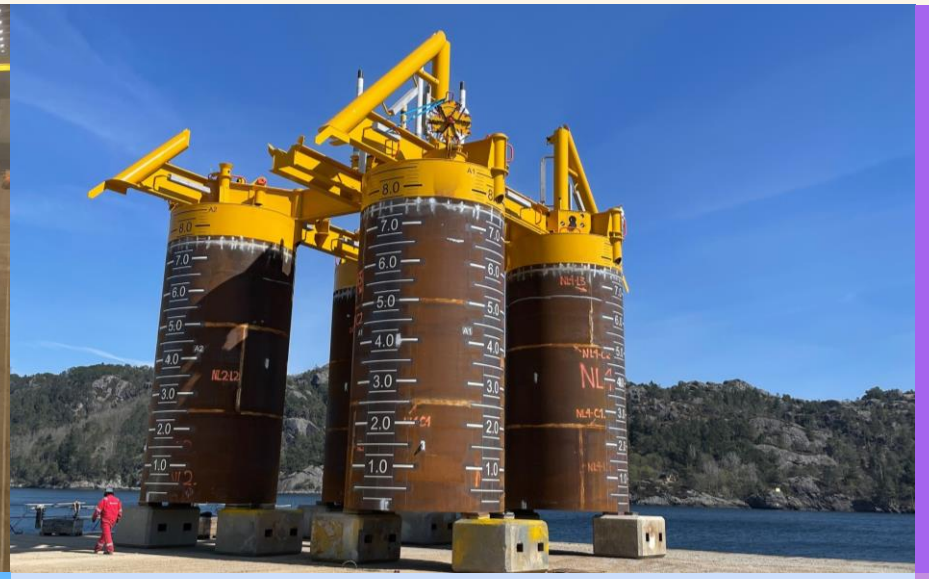
Northern Lights



Realisation of CCS; current fabrication activities

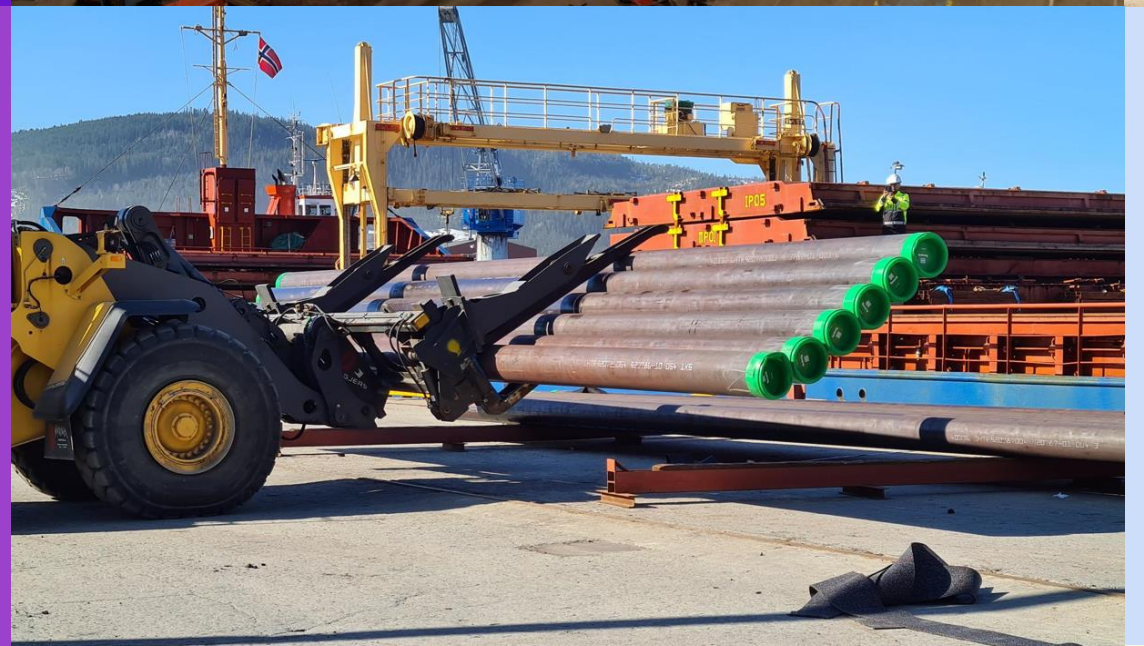
Northern Lights

Fabrication of storage tanks by Idesa, Spain



Fabrication of subsea satellite by Aker Solutions, Egersund.

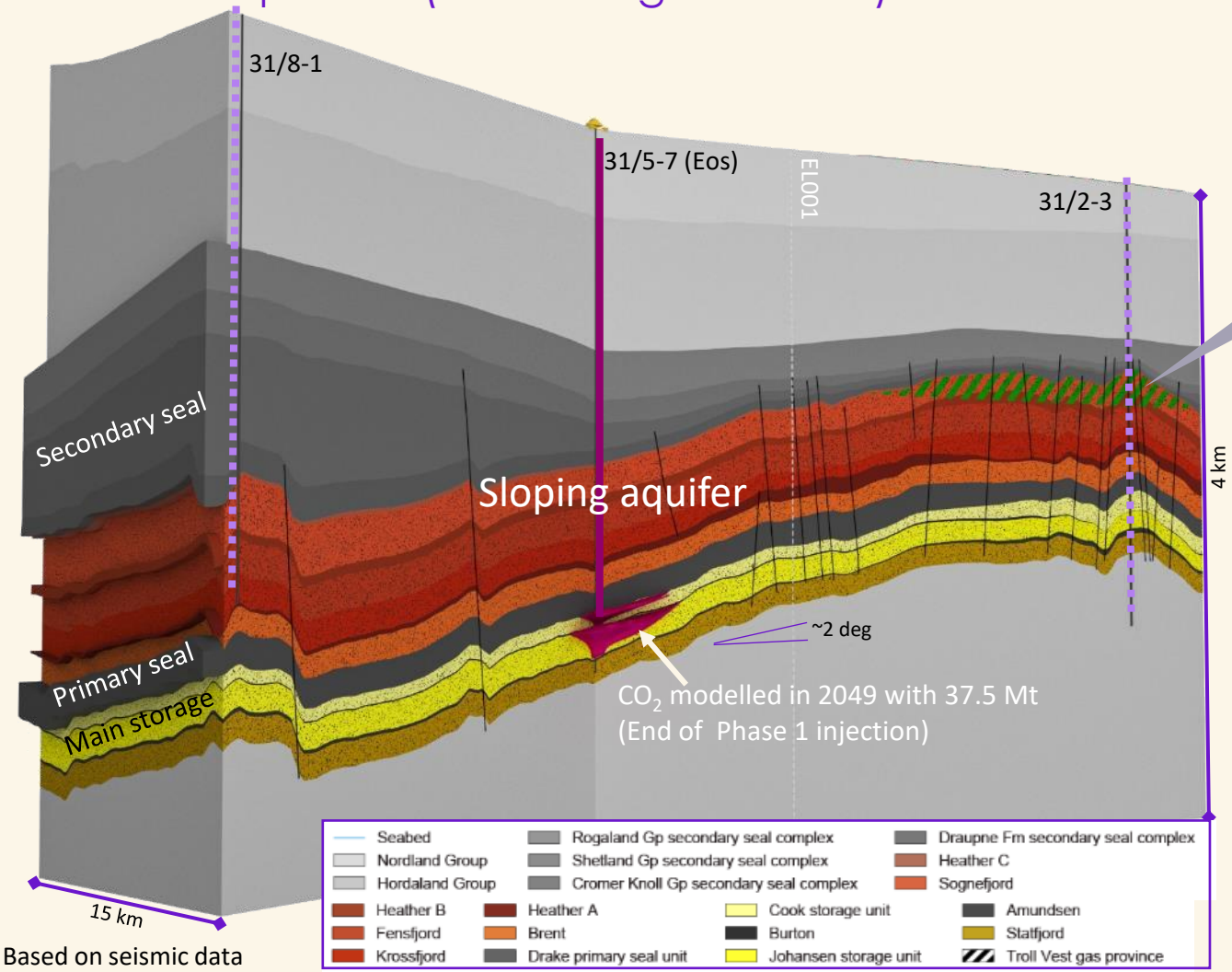
Fabrication of linepipe by Tenaris, Italy. Coating by Shawcor, Orkanger.



Detailed engineering ongoing (STASCO/Dalian, China).

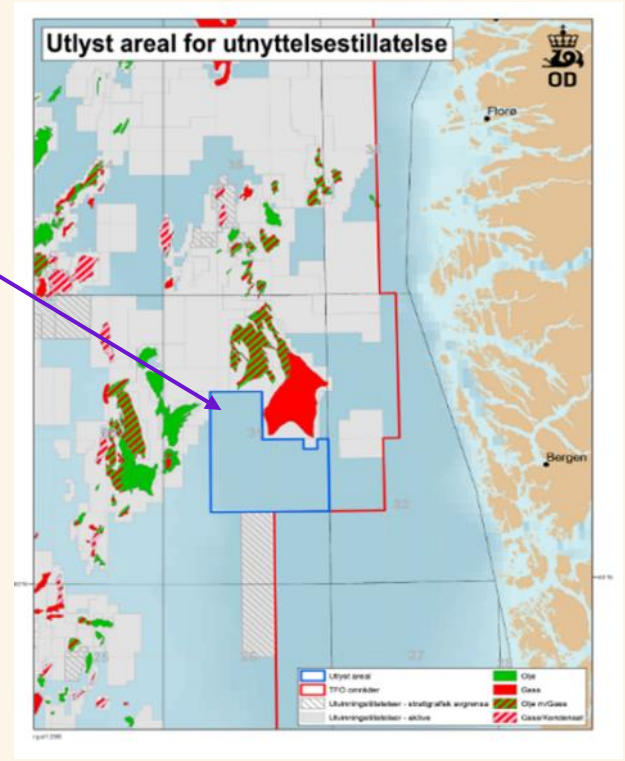
Northern Lights storage concept

- A dedicated license with no previous oil/gas operations - Saline aquifer
- 3D seismic aquisition (monitoring base-line) almost finished



Based on seismic data from CGG

Troll oil and gass field



All data (83 GB) from well made public

Northern Lights shipping solution

Limited own emissions
Larger scale vessels 12.000 m3 for Phase 2

Ship building contracts awarded October 2021 (two vessels); ready for delivery by mid 2024

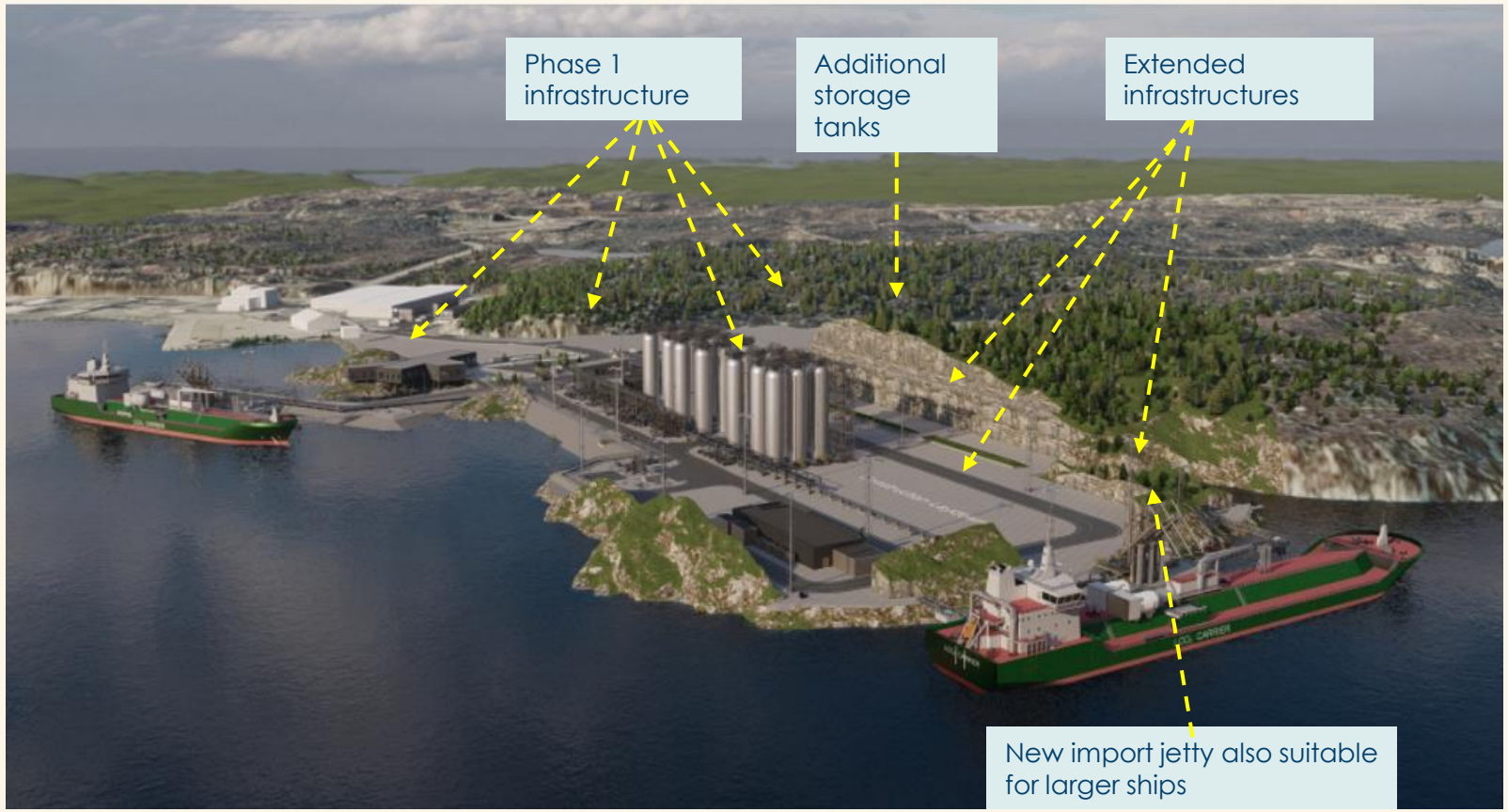
- Cargo size: 7,500 m3 (8000 tones CO_2) ; length: 130m
- Medium Pressure cargo containment (C. 15 barg and -26°C)
- Purpose-built pressurised cargo tanks
- Primary fuel: LNG
- Wind assisted propulsion system and air lubrication installed to reduce carbon intensity by around 34% compared to conventional systems

To be registered in Norway (NOR)

Phase 2: 12.000m3 ship solution

Phase 2 – scope of work

- → **Additional (temporary) storage tanks**
- → **New pumping unit**
- → **New/extended utilities**
- → **New jetty**
- → **SURF expansion (additional structures for additional wells)**
- → **Drilling & completion wells 3,4,5**



Co-financed by the Connecting Europe Facility of the European Union

Key customer sectors demanding CCS services

Northern Lights

Strong potential - different levels of experience and maturity

- Cement
- Chemicals/ refineries
- Waste incineration
- Biofuels/bioenergy
- Direct air capture
- Steel

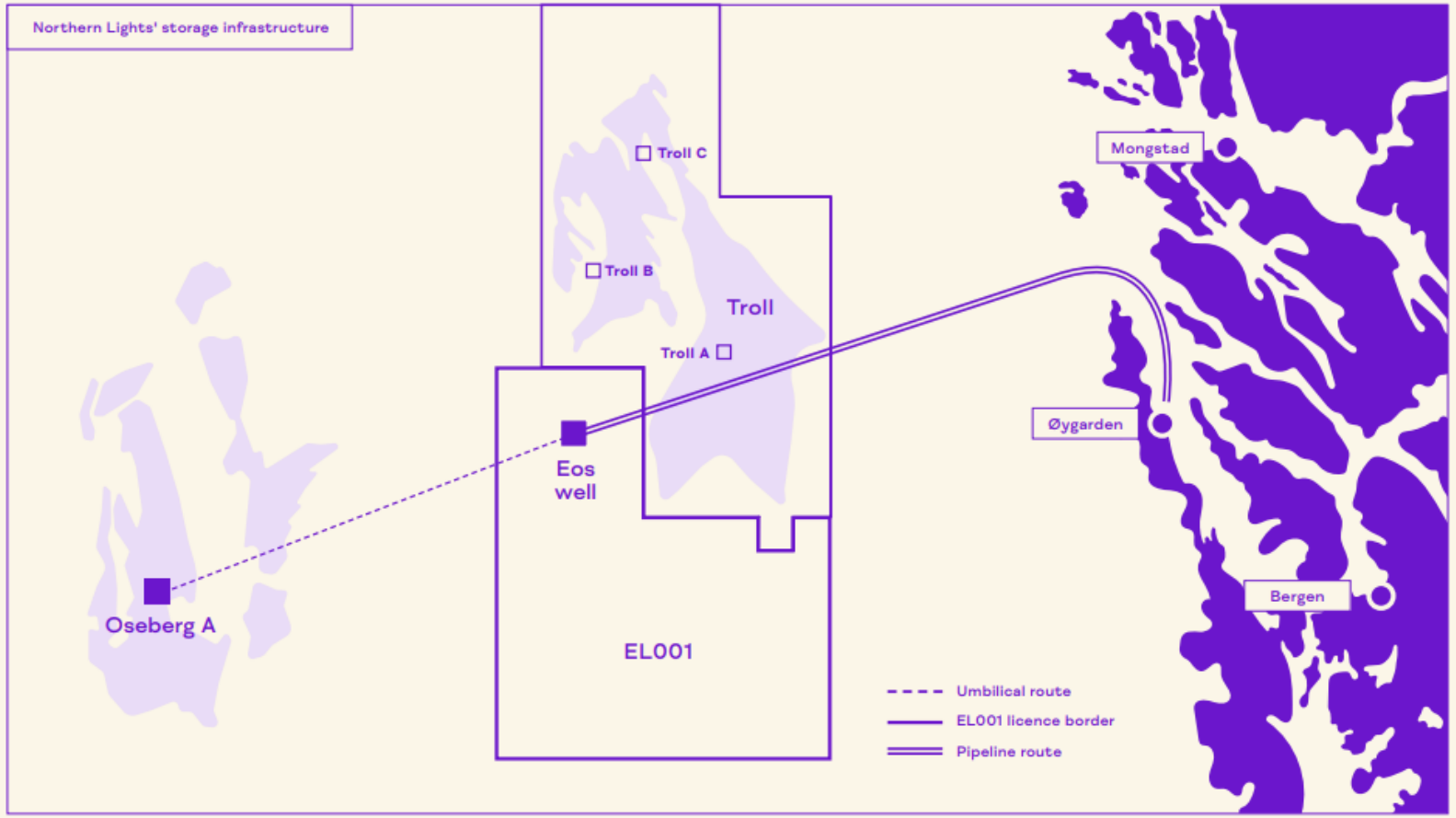
First movers motivated by; corporate strategy with mature energy/decarbonisation plans, financial pain from emitting (ETS plus taxations), low carbon new market opportunities

How to accelerate CCS

Northern Lights

These are five significant lessons that are already transforming the discussion over how to accelerate the commercialisation of CCS in Europe and globally:

1. Temporary government support can overcome the chicken-and-egg problem
2. Large-scale demonstration projects facilitate learning by doing and remove hurdles
3. Shipping redefines the whole concept of access to CO_2 storage
4. CO_2 storage is an enabler for a net zero ecosystem beyond CCS
5. CCS value chains can be a cost-effective decarbonisation solution



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