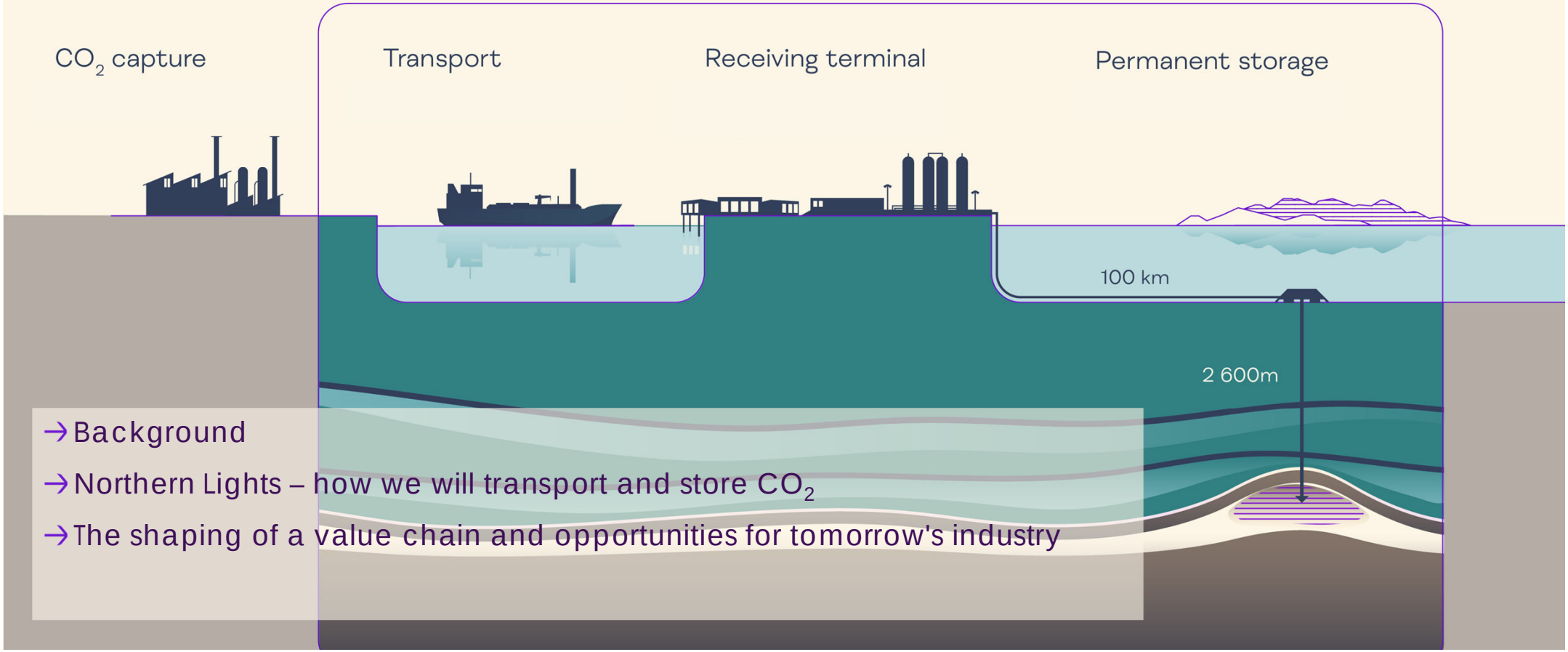
Northern Lights
CO_2 transport and storage project

The Northern Lights Project - transport and storage of CO_2



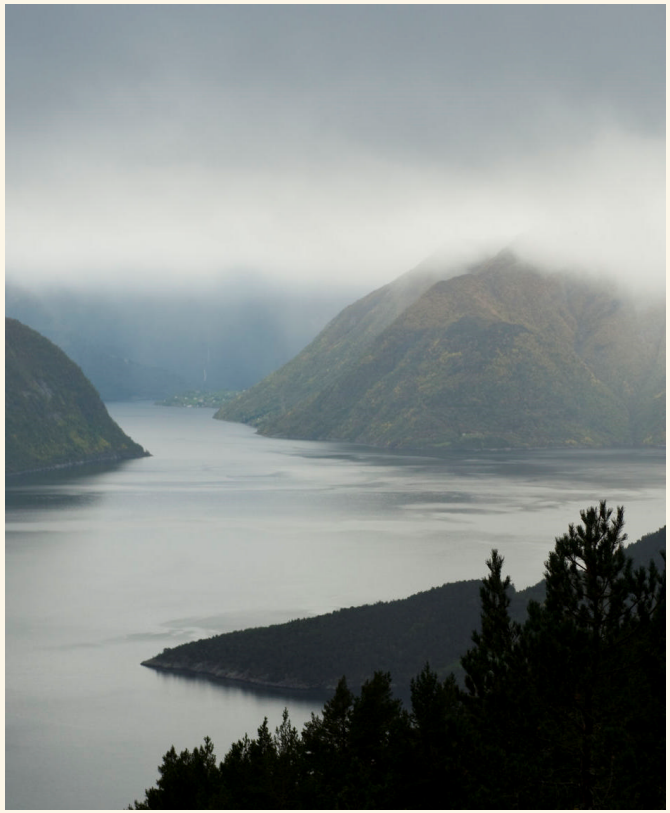
→ Background

→ Northern Lights – how we will transport and store CO_2

→ The shaping of a value chain and opportunities for tomorrow's industry

CC in a global context

- → CO_2 emissions are too high
- → Renewable energy is key for reducing emissions, but the growth rate is not high enough
- → Carbon Capture and Storage can help bridge this gap
- → Currently there is no effective infrastructure or market in place for capturing and storing CO_2

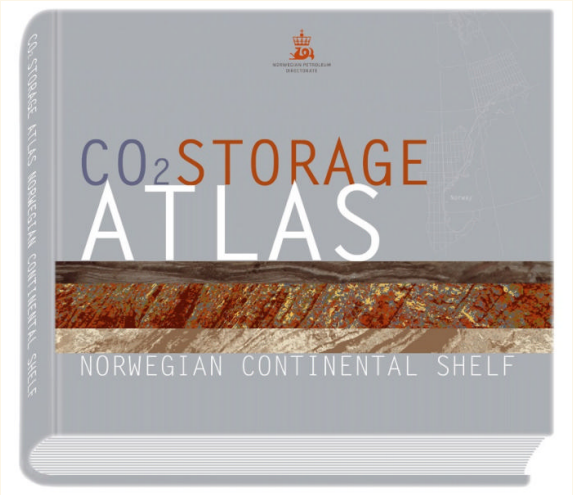


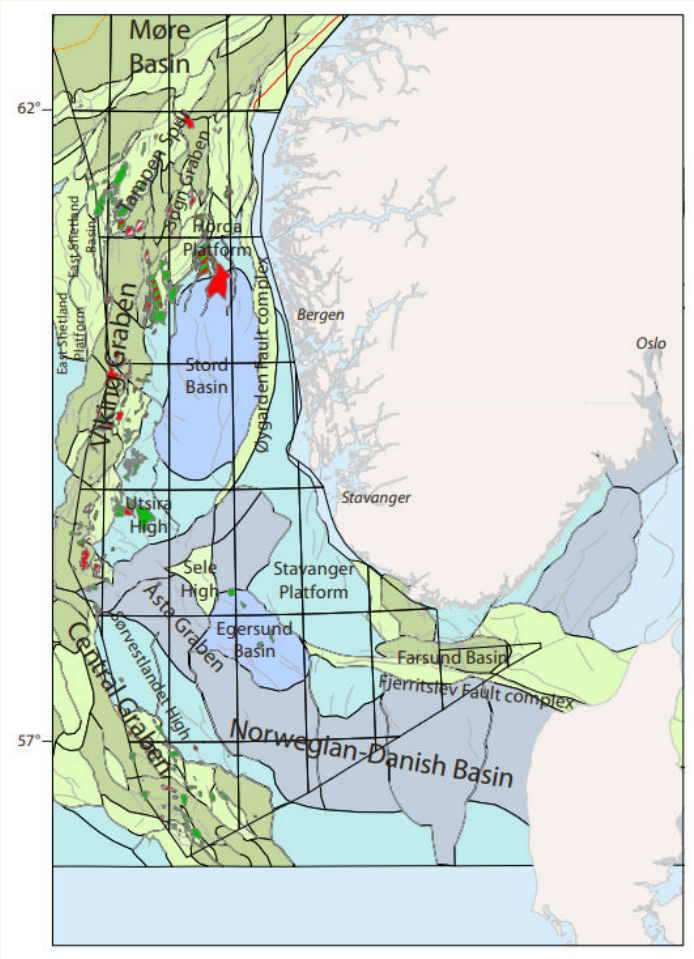
CCS in Norway

→ Digital storage atlas published in 2015 by NPD

→ Need a good seal

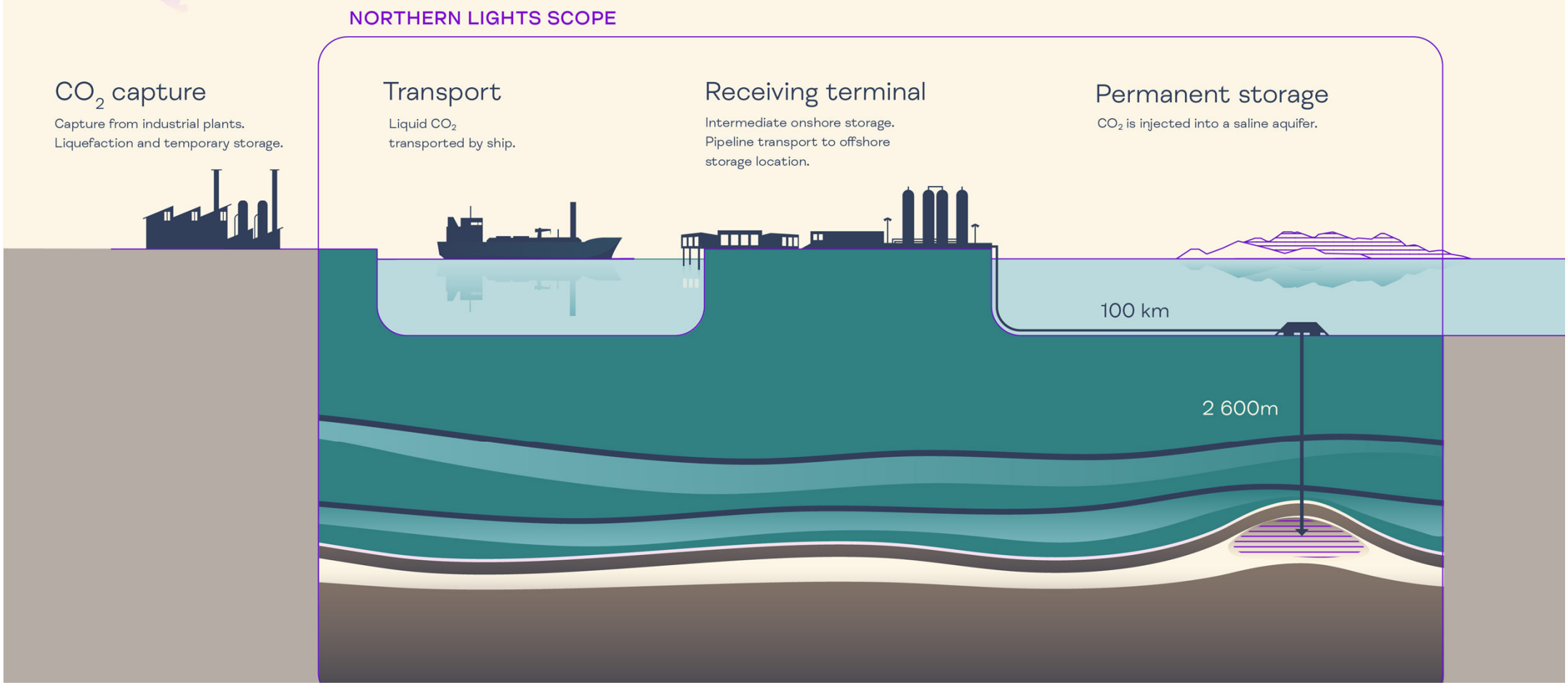
→ Need to be able to inject in supercritical phase



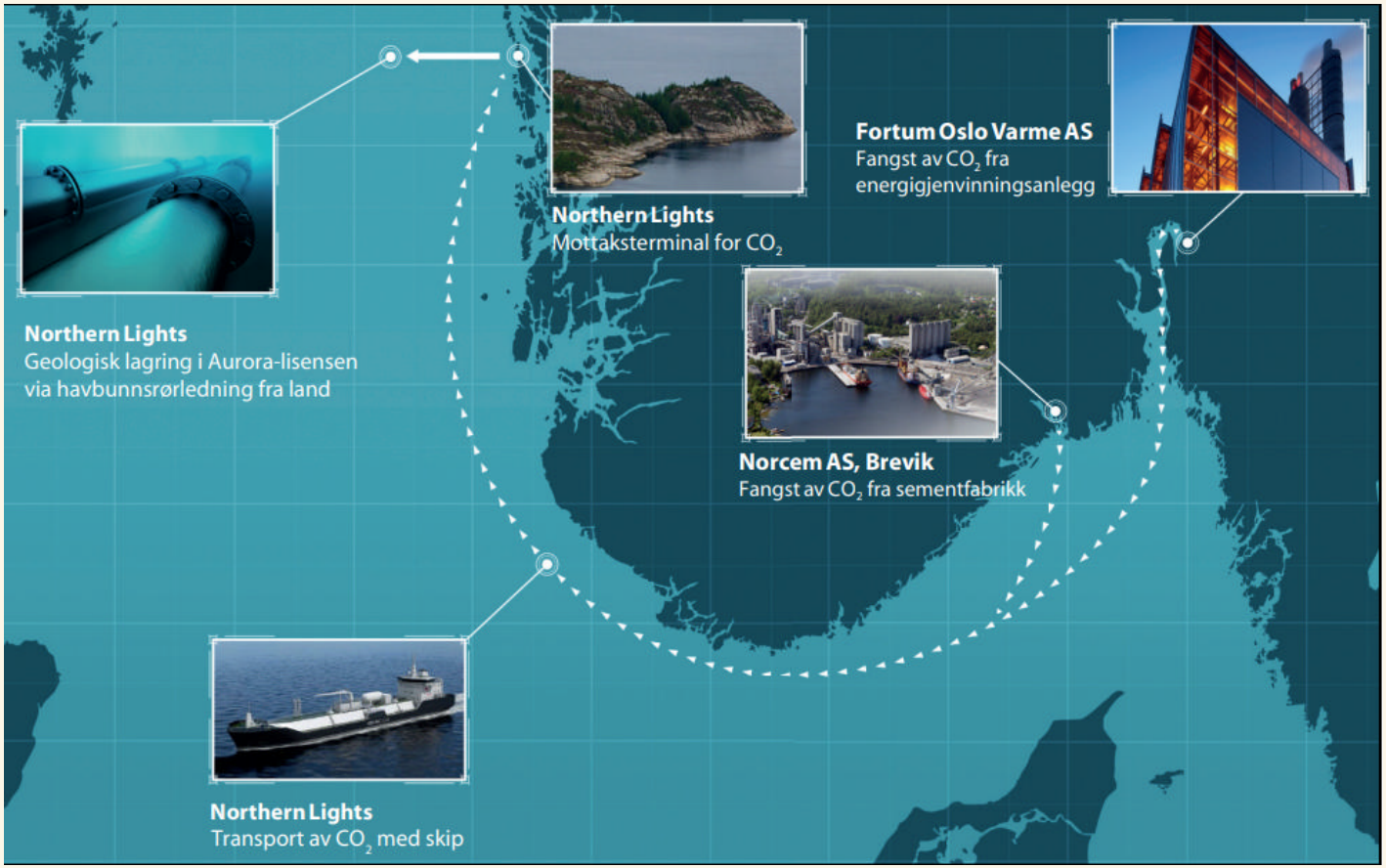


Long ship - Northern Lights scope

Northern Lights

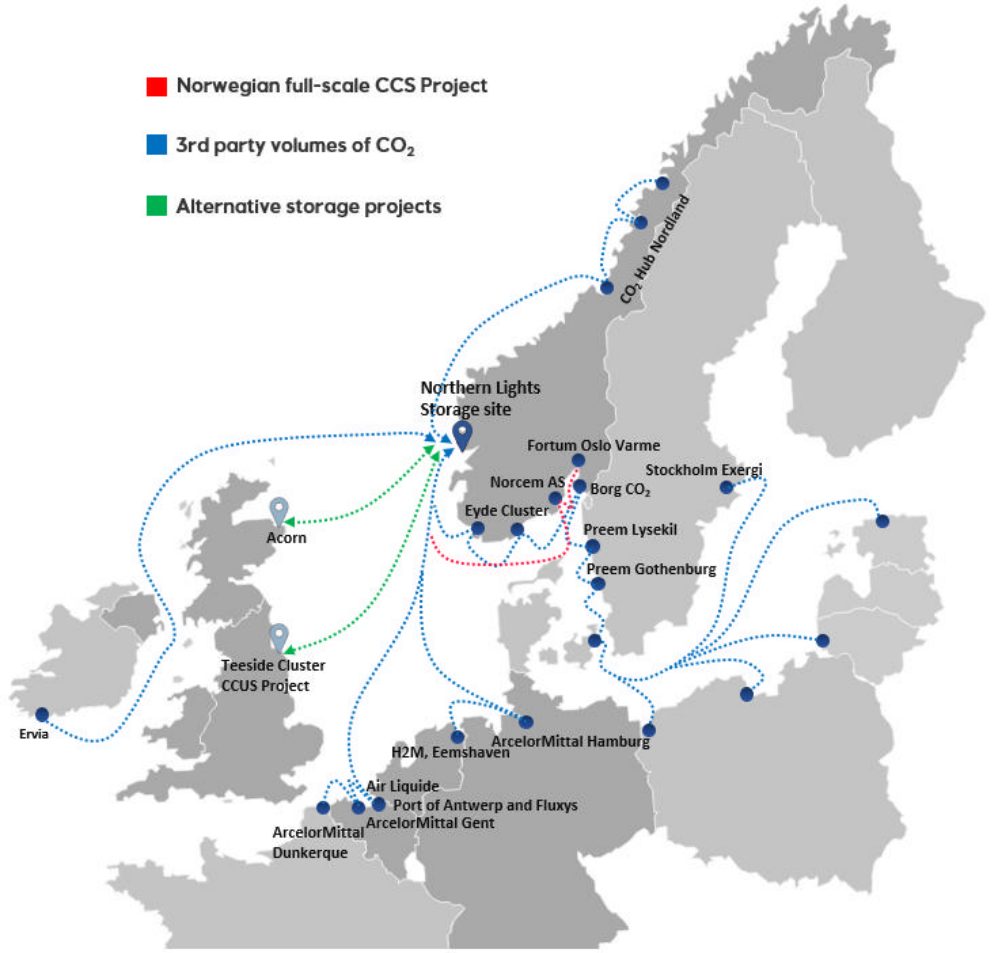


Longship in short



CO_2 transport by ship

- → Cargo Systems for CO_2
- → 'LPG standard' design
- → Initially two ships
  - Transport capacity scalable with number of ships
- → A fleet is required for the planned scale-up – perfect for driving ship technology and fuels development

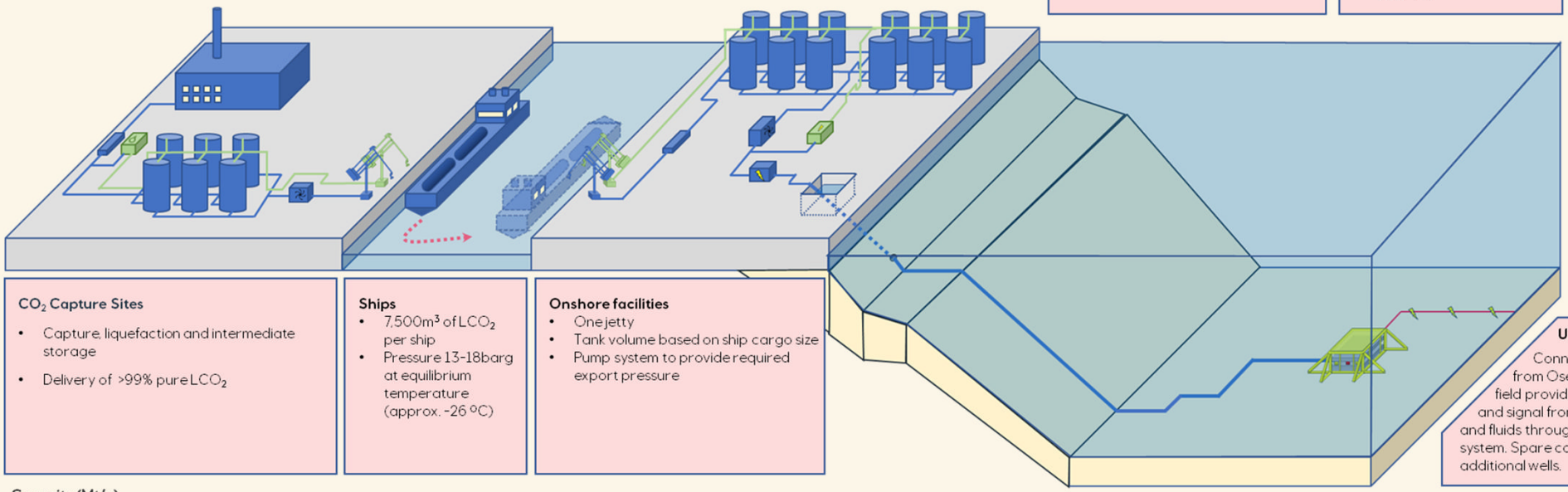


Northern Lights – concept overview

Northern Lights

Pipeline
- 100km un-insulated pipeline
- 12 ¾ inch
- Single phase (liquid) CO_2

Subsea facilities
- Connecting pipeline, umbilical and well(s)
- Water depth ~300m
- Connection for future step-out



Subsea injection well
- Injection of CO_2 into reservoir at ~2700m depth
- Pressure in reservoir ~270bar
- Temperature in reservoir ~107°C

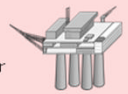
CO_2 Capture Sites
- Capture, liquefaction and intermediate storage
- Delivery of >99% pure LCO_2

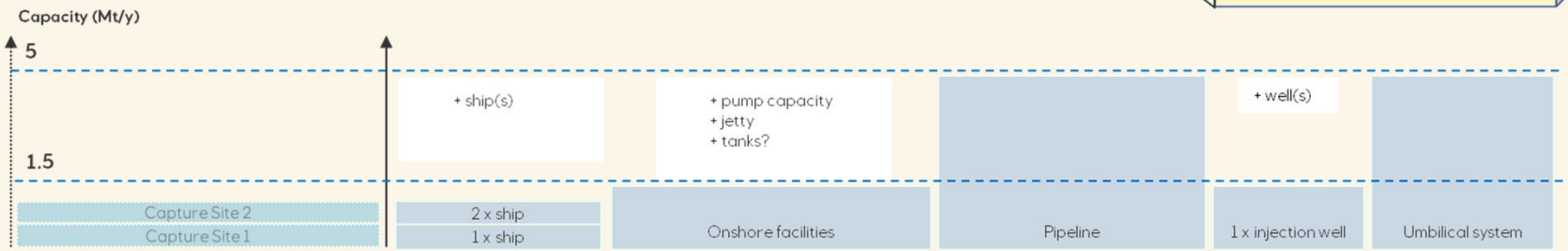
Ships
- 7,500m³ of LCO_2 per ship
- Pressure 13-18barg at equilibrium temperature (approx. -26 °C)

Onshore facilities
- One jetty
- Tank volume based on ship cargo size
- Pump system to provide required export pressure

Umbilical

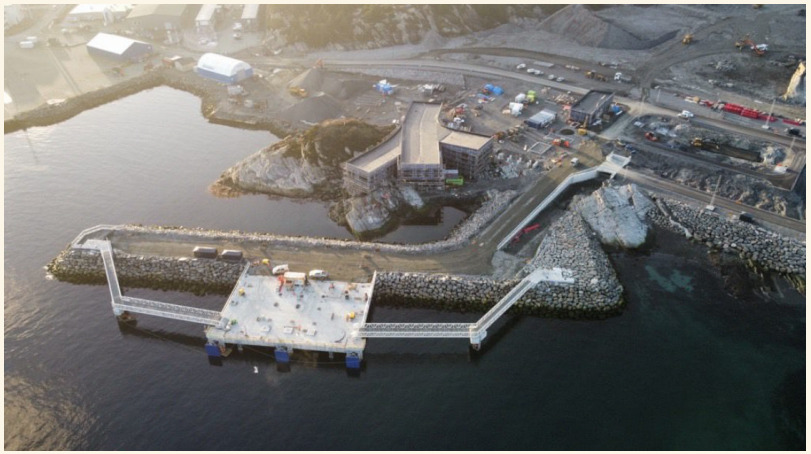
Connection from Oseberg-field providing power and signal from DC/FO and fluids through umbilical system. Spare capacity for additional wells.





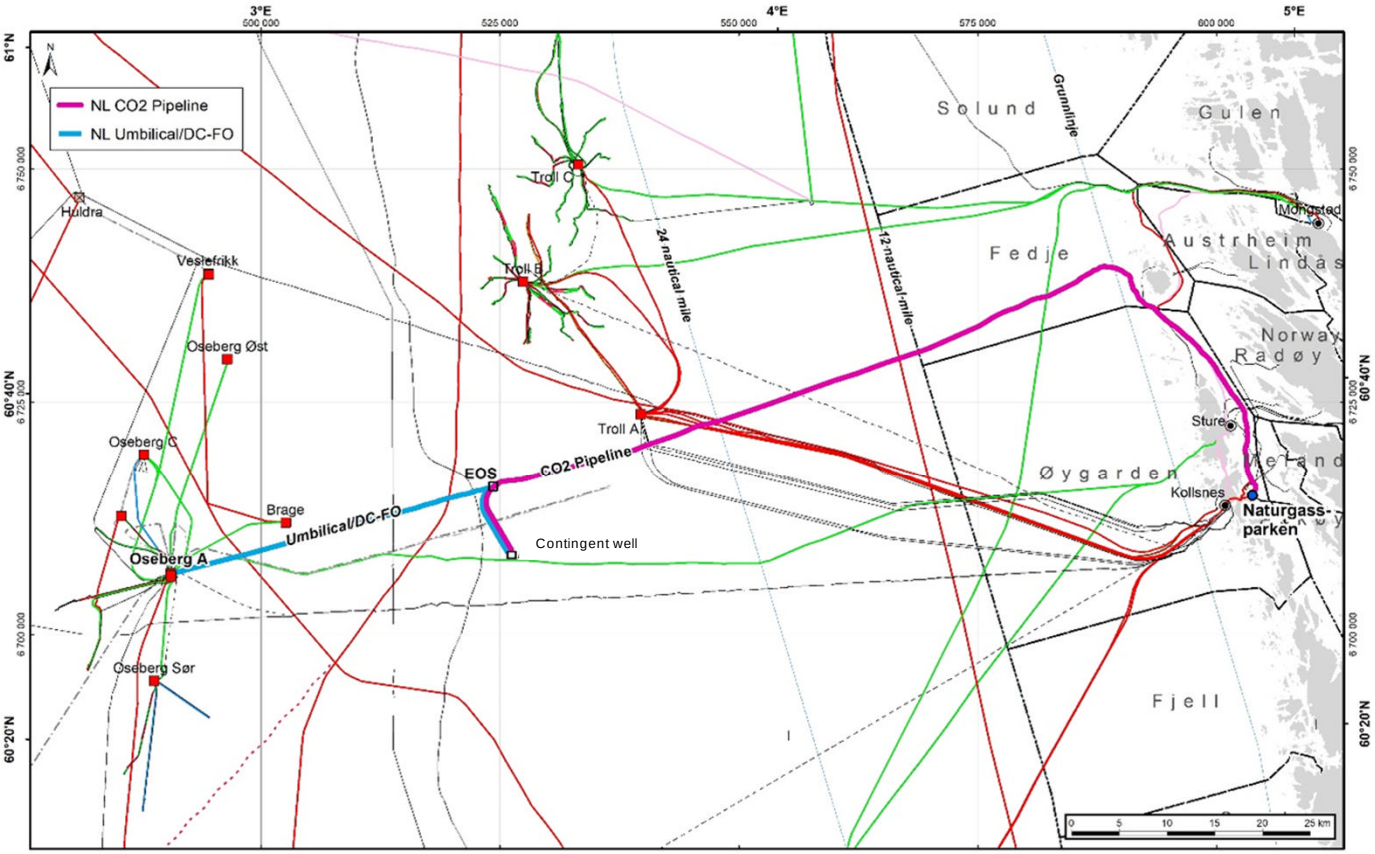
Onshore plant

- → Civil works completed winter 2022
- → Import jetty construction ongoing
- → Fabrication and installation of plant started spring 2022
- → Project office and visitor centre in in place
- → Additional area for expansion included



March 2022

Pipeline and subsea facilities



Pipeline and subsea facilities

Northern Lights

→ Eos template installed in 2019, well 31/5-7 drilled in 2020

→ 2022

- Installation of template for contingent well
- Drilling and completion of Eos and contingent well
- Installation of umbilical-DC/FO

→ 2023

- Pipeline installation
- Installation of flow base and Christmas trees, subsea nodes, tie-in and hook-up

→ 2024

- CO_2 filling

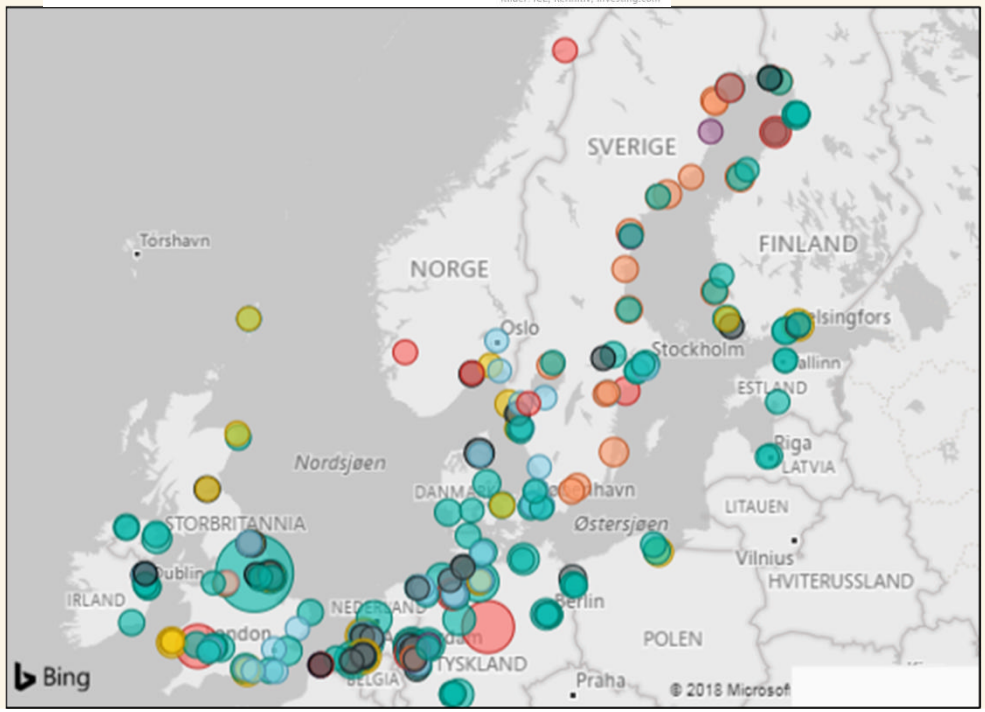
AkerSolutions PetrolValves Tenaris aibel ALCATEL SUBMARINE NETWORKS TechnipFMC subsea 7

Market Context

→ Large potential with long-life sectors:

- Waste incineration
- Cement
- Steel and other metal
- Refinery
- Fertilisers, ammonia, power from natural gas
- Biomass and biofuel
- Direct Air Capture (DAC)

→ Northern Lights is relevant and within reach for about 350 large scale emitters in Europe



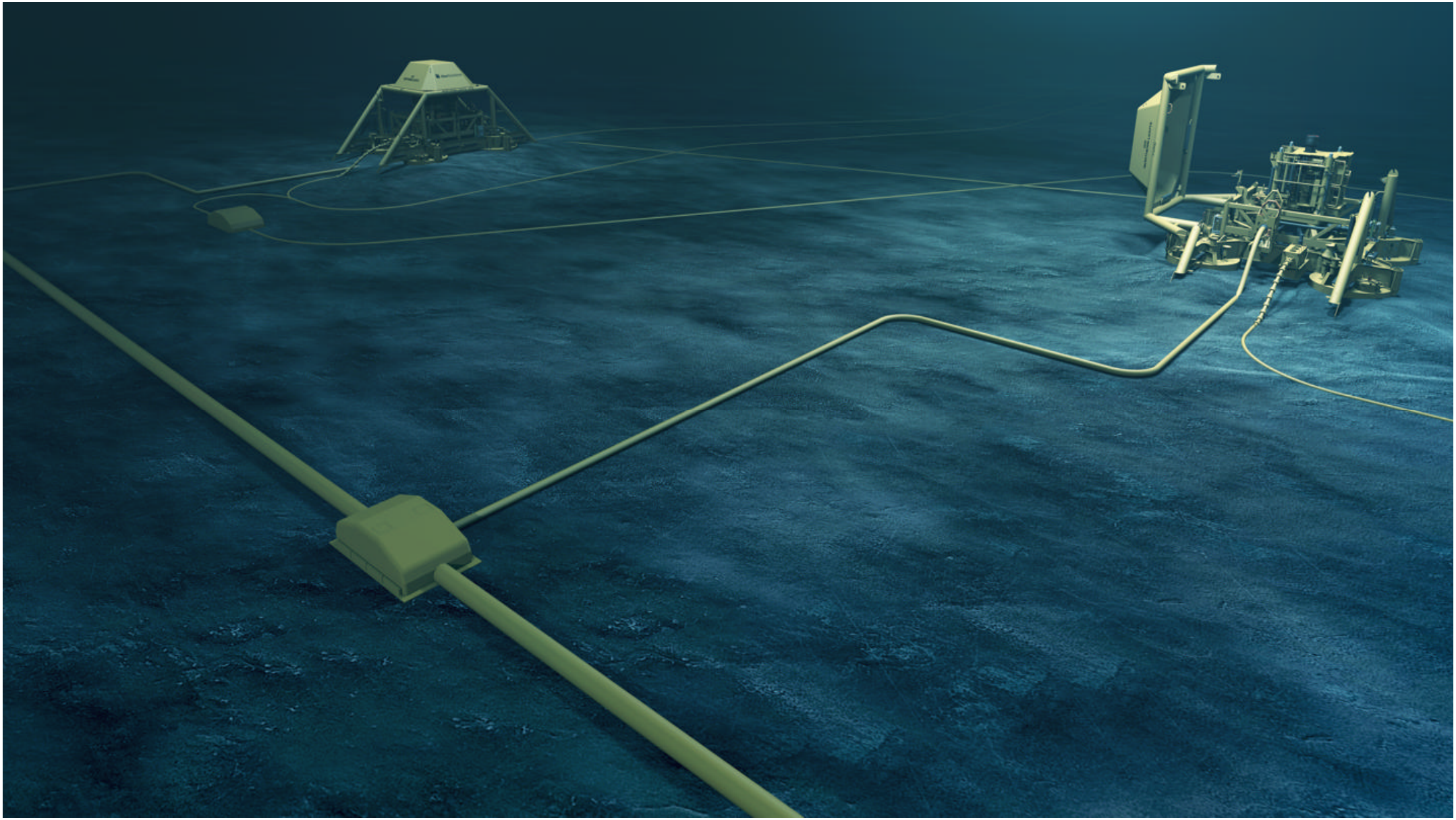
Northern Lights future phases

NEWS | 26 January 2022 | Brussels | Energy

EU invests over € 1 billion in energy infrastructure in support of the Green Deal

Northern Lights Phase II (€4 million)

This study looks into the expansion of the CO2 transport and temporary storage capacity in Norway, open to industrial clusters from across the EU, with the aim to accommodate additional demand.

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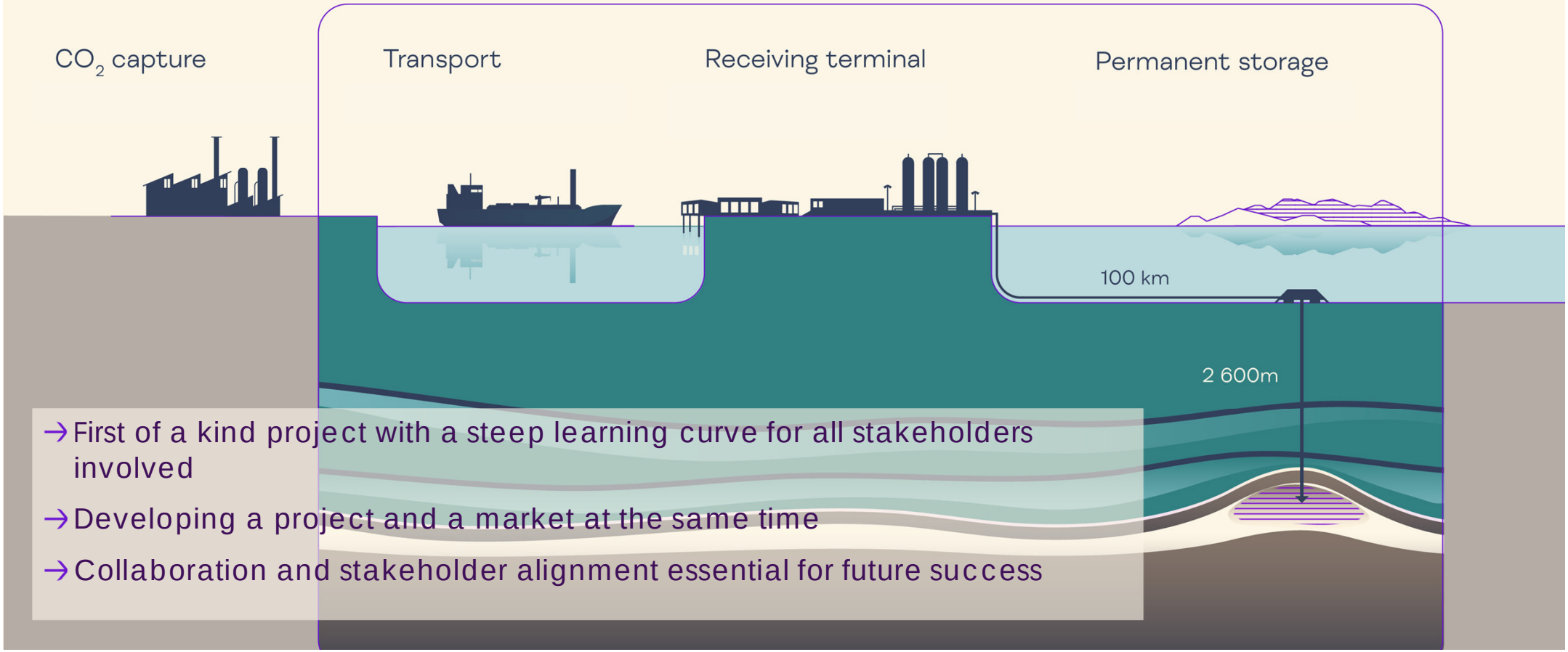
Summary

Northern Lights



- First of a kind project with a steep learning curve for all stakeholders involved
- Developing a project and a market at the same time
- Collaboration and stakeholder alignment essential for future success

Northern Lights