Northern Lights CCS Project
Experiences and lessons learned from Offshore EPCI

30th October 2024

Presentation Overview

- Who are Subsea7
- Northern Lights project
- Offshore scope and experience

MAKE POSSIBLE

subsea 7

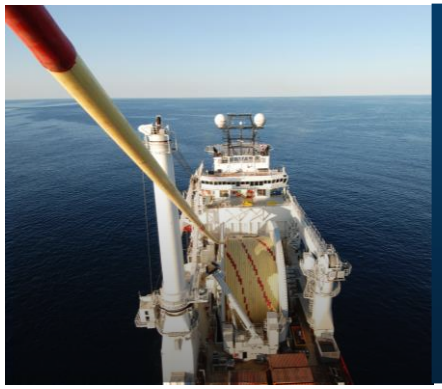
WHO WE ARE

Subsea7 is a global leader in the delivery of offshore projects and services for the energy industry.

We make offshore energy transition possible through the continuous evolution of lower-carbon oil and gas and by enabling the growth of renewables and emerging energy.

At a glance

13,000
people



1,000+
projects delivered worldwide

A fleet of
38
vessels

Operating in **30** plus countries

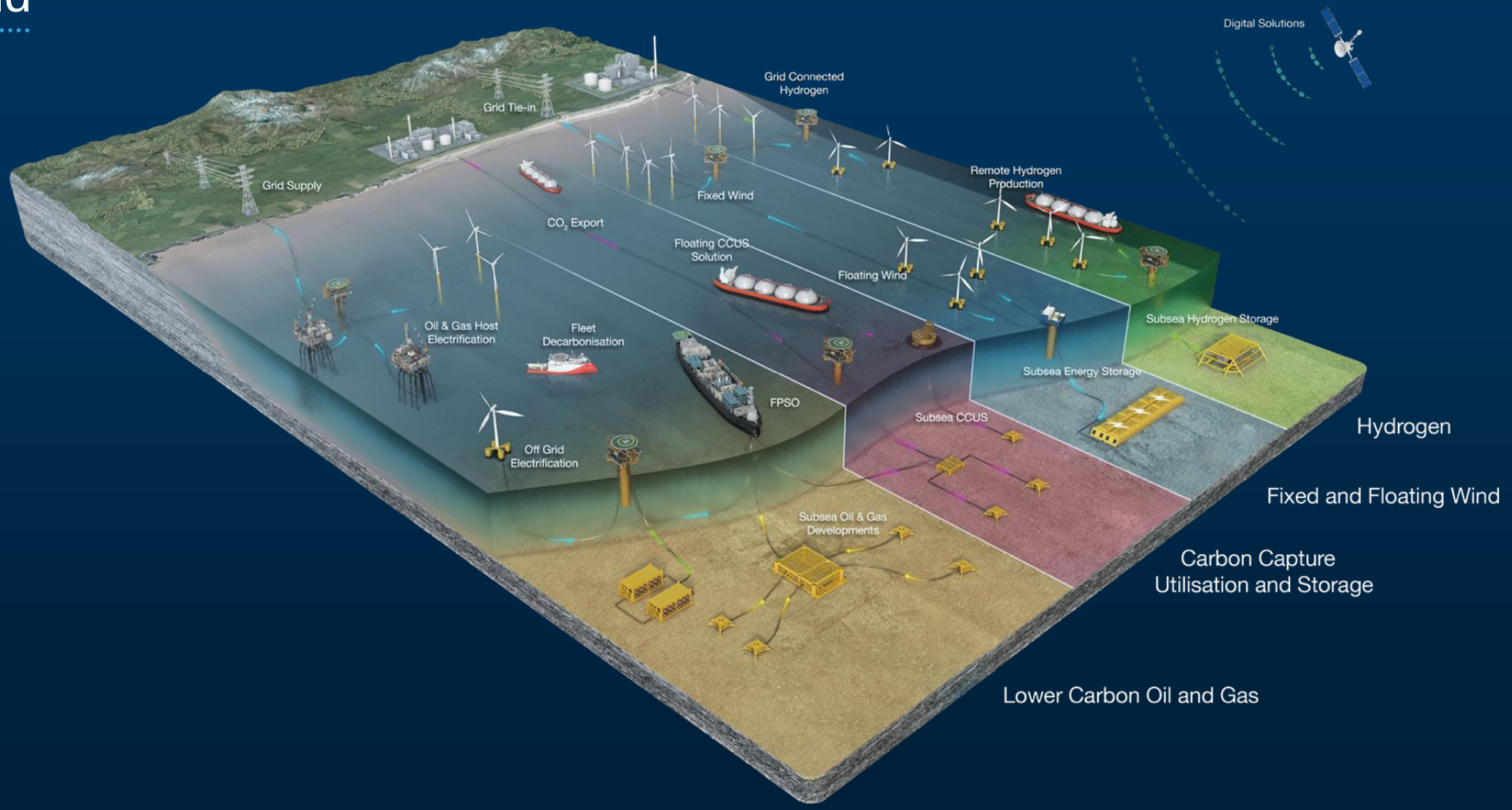
Large supplier network of
7,000+

Pipeline spoolbases, fabrication and support yards

MAKE POSSIBLE

subsea 7

Our world




Northern
Lights

Partnership Construct

- Northern Lights was born from the Norwegian State's **Longship project**

- **A demonstration of large-scale, end-to-end CCS value chain** consisting of:
  - Cement manufacturing plant
  - Waste-to-energy facility
  - Northern Lights CO2 transportation and storage
  - Longship has co-financed Northern Lights Phase 1 with a capacity of **1.5 million tons** of CO2 per year (80% state)
  - State participation critical to de-risk initial investment and operation period

- 2021: Northern Lights JV DA established
  - NL JV is a Shared Liability (DA) company owned by 1/3 each by Equinor, Shell and TotalEnergies.
  - Northern Lights JV DA operator of Norway's first CO2 injection license (Aurora)

CO_2 transport & storage at scale - Longship

Northern Lights

NORTHERN LIGHTS SCOPE

CO_2 capture

Capture from industrial plants.
Liquefaction and temporary storage.

Transport

Liquid CO_2 transported by ship.

Receiving terminal

Intermediate onshore storage.
Pipeline transport to offshore storage location.

Permanent storage

CO_2 is injected into a saline aquifer.

Heidelberg Materials

Hafslund Oslo Celsio

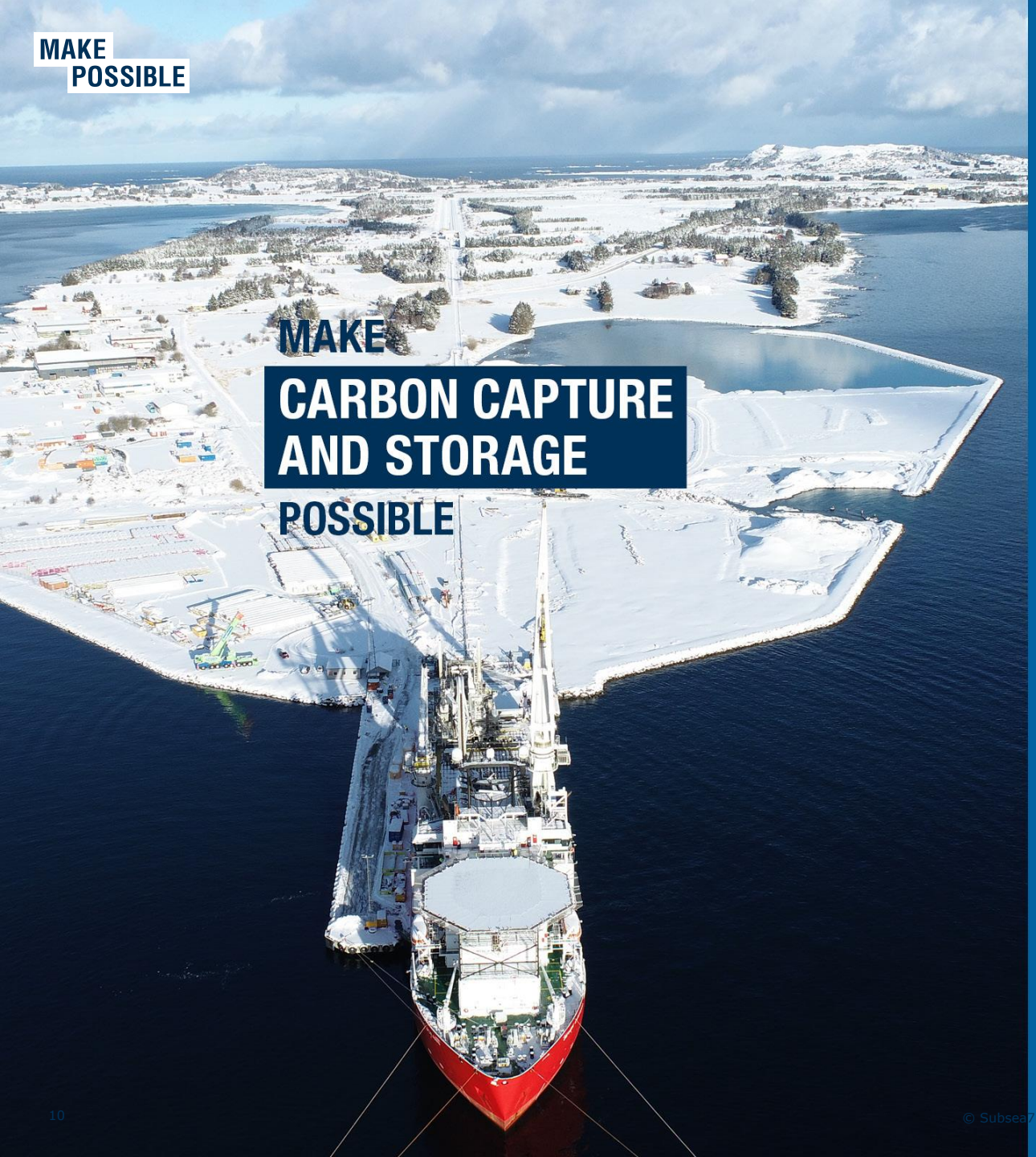
Phase 1: 1.5 MTPA, 80% state funded

Establishing a CCS market

- Northern Lights is the first to commercialise CO2 transport and storage as a service
- Significant interest and demand for our services from industrial emitters
- Strong faith in the commercial viability of a CCS market

Challenges

- De-risking investments in infrastructure development on capture and storage side
- Establishing first of its kind contracts for transport and storage
- Streamlining and adapting regulatory framework
- Establishing bilateral agreements for cross-border CO2 transport
- Changing geopolitical situation: energy security vs. climate targets



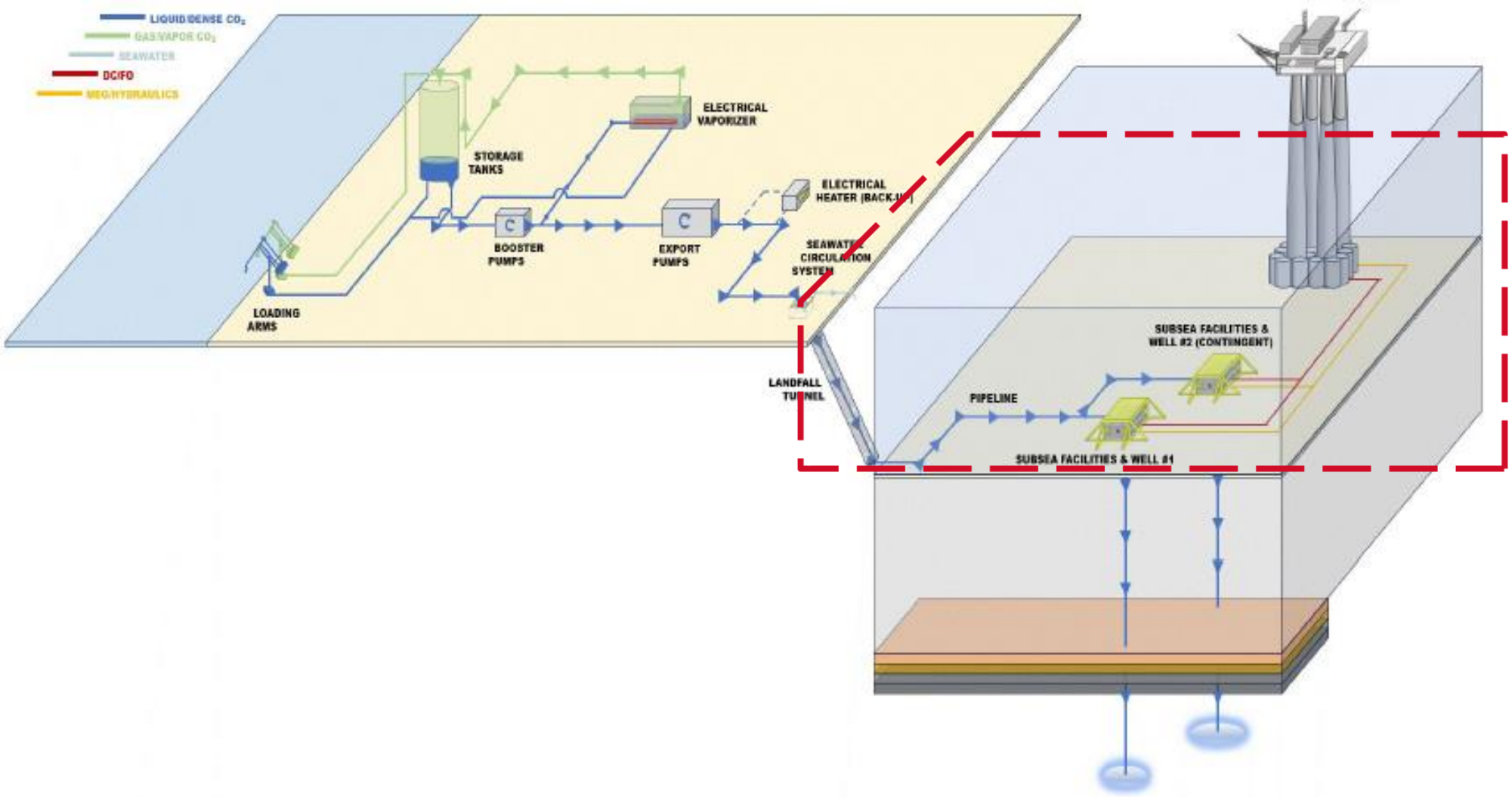
CCS in Norway

- High focus from Government
  - Open door policy
  - 11 licenses awarded
- Regulated by the Norwegian Offshore Directorate and Ocean Industry Authority
- Significant risk mitigation and financial support for demonstrator project
- Bi-lateral agreements in place with Denmark, Belgium, Netherlands and Sweden

Northern Lights phase 1 Project

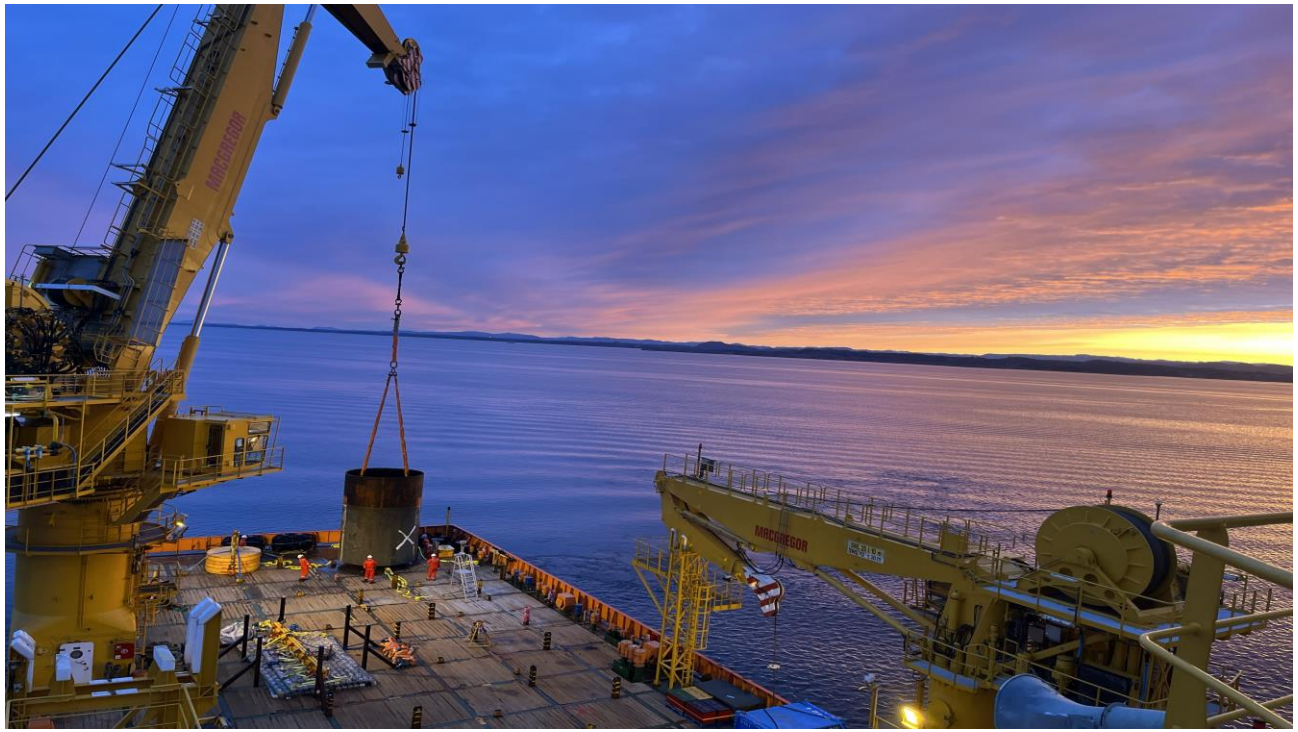
Receiving Terminal and Future Expansion

Offshore EPCI scope delivered by Subsea7

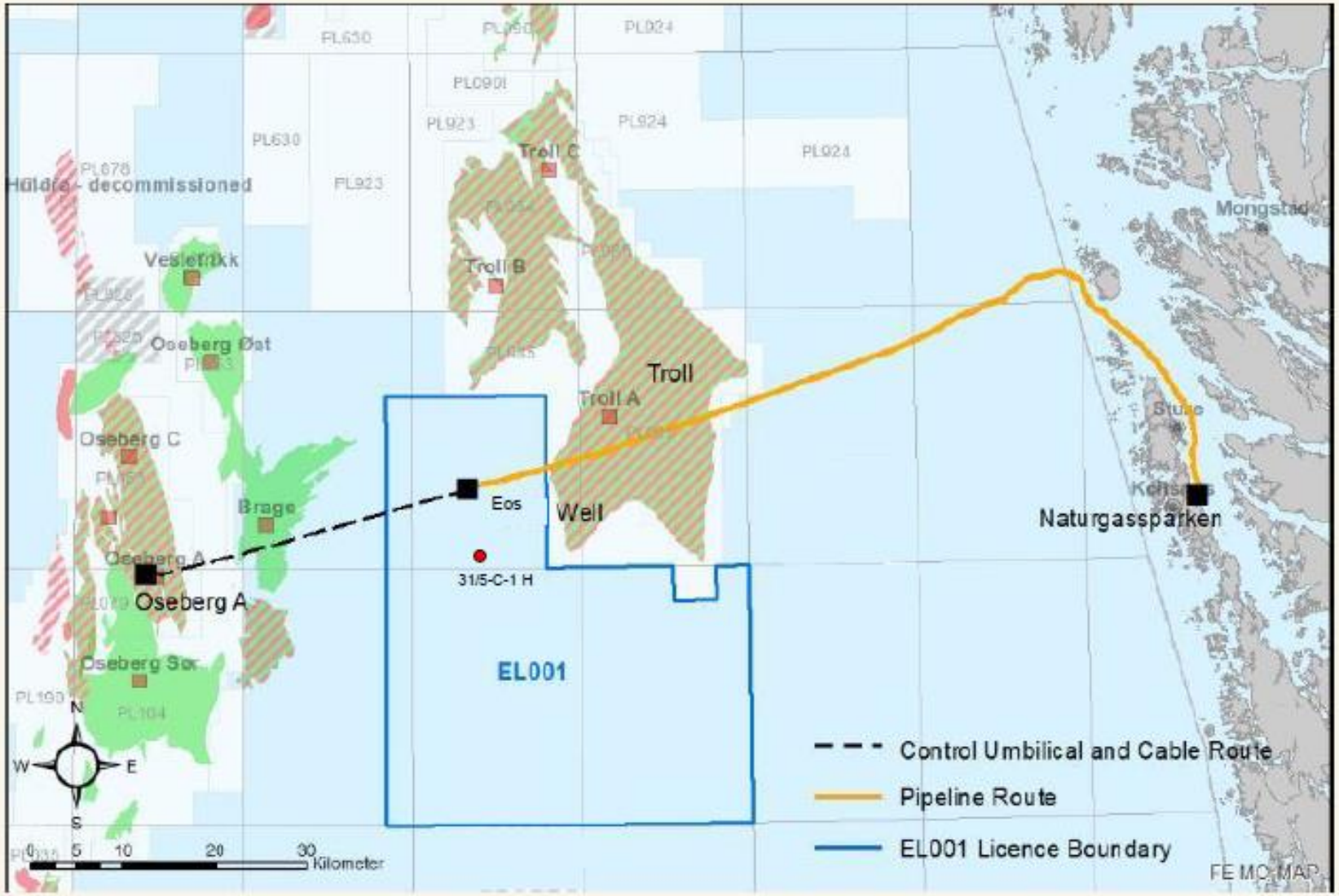


Lessons from the first offshore open-source CCS project

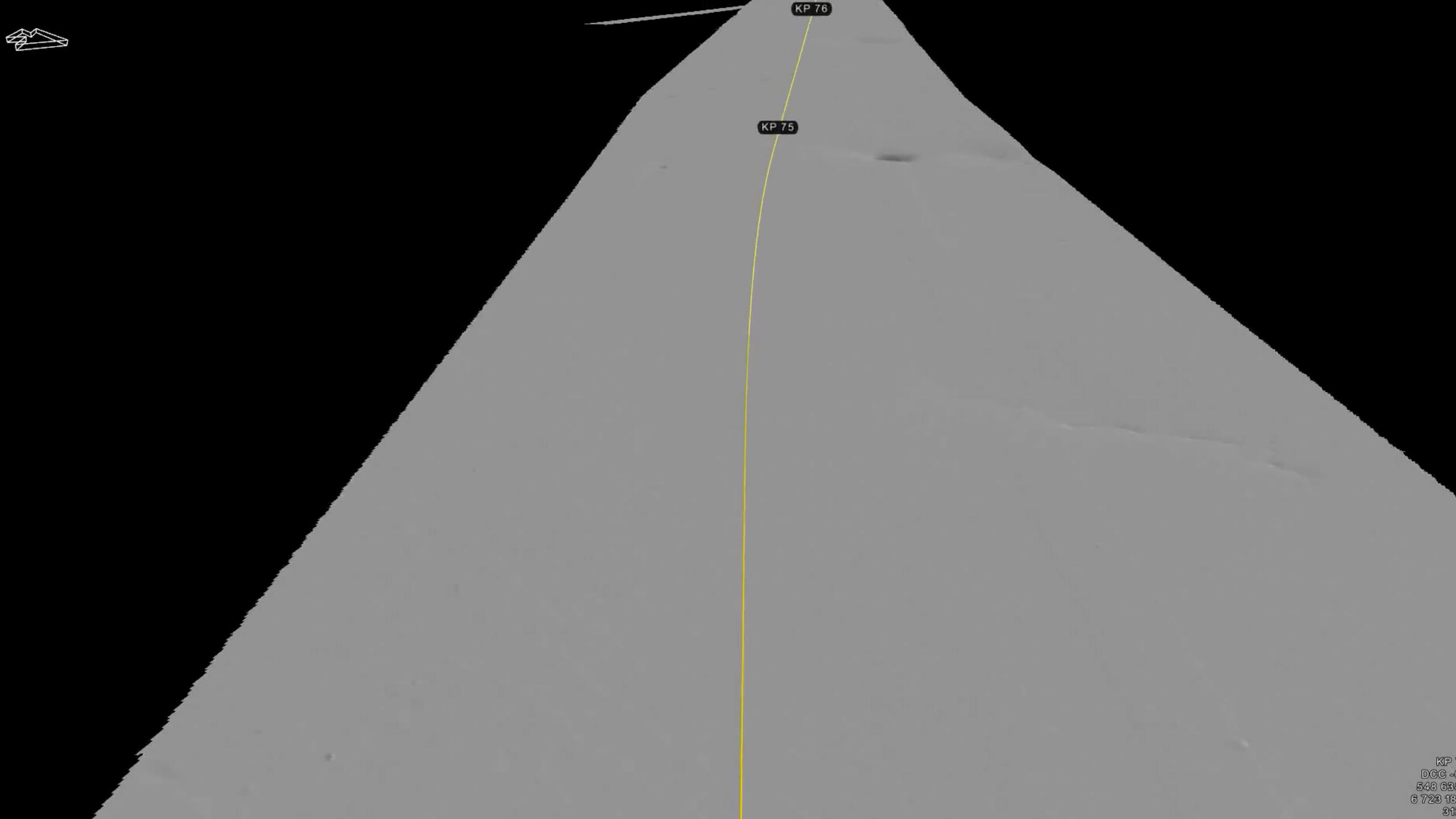
- NL may at first glance look like just another oil and gas project but has subtle but very important differences.
  - Challenging shore approach and landfall
  - Temperature and flow assurance challenges
  - Materials and corrosion
  - Structure design – ensure dryness of gas at all times
  - Pre-commissioning – Driving dewatering train with CO2



Subsea Facilities and Wells



Pipeline fabrication and installation


KP 76
KP 75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SMG:0.49
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KP 24


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Task: As-Laid Survey - CO2 Flowline Trip 2/3


KB
298
TARE WT
2550 KG
PAYLOAD

Carbon Capture and Storage is happening, but support still needed

- CCS is necessary to achieve emission targets
- Technical solutions are known for both capture, transport and store
- Challenging economics
- Governmental support and funding required
- Regulatory and legislative requirements need progress
- International collaboration and cross-border agreements needed

ANY QUESTIONS?

CONTACT US