Ormen Lange Fase 3 - Undervannskompresjon

OD Teknologidag – 2022-06-07

Jan-Olav Hallset, A/S Norske Shell

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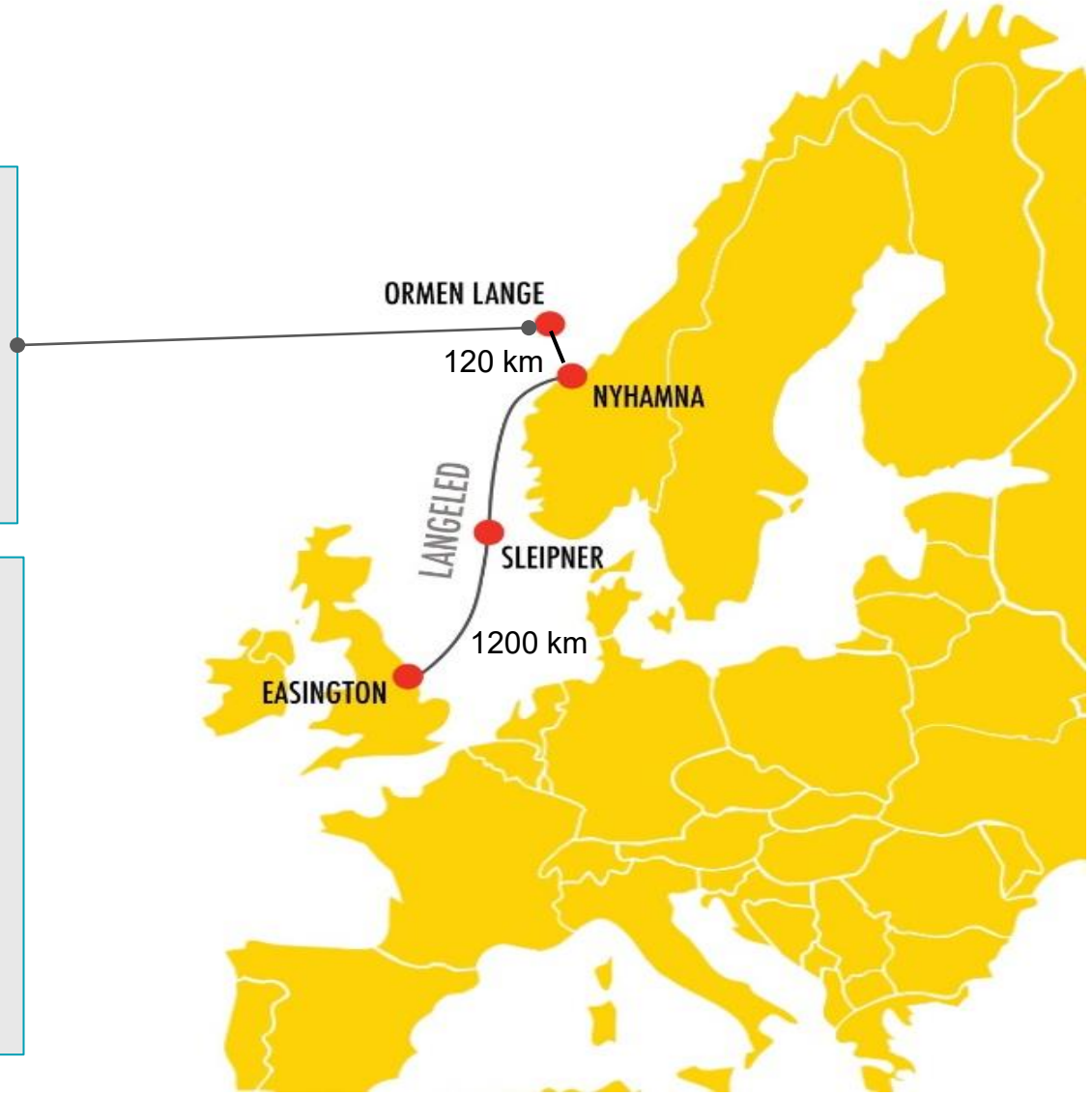
Ormen Lange Gas Field

Ormen Lange phase 1&2 (EXISTING)

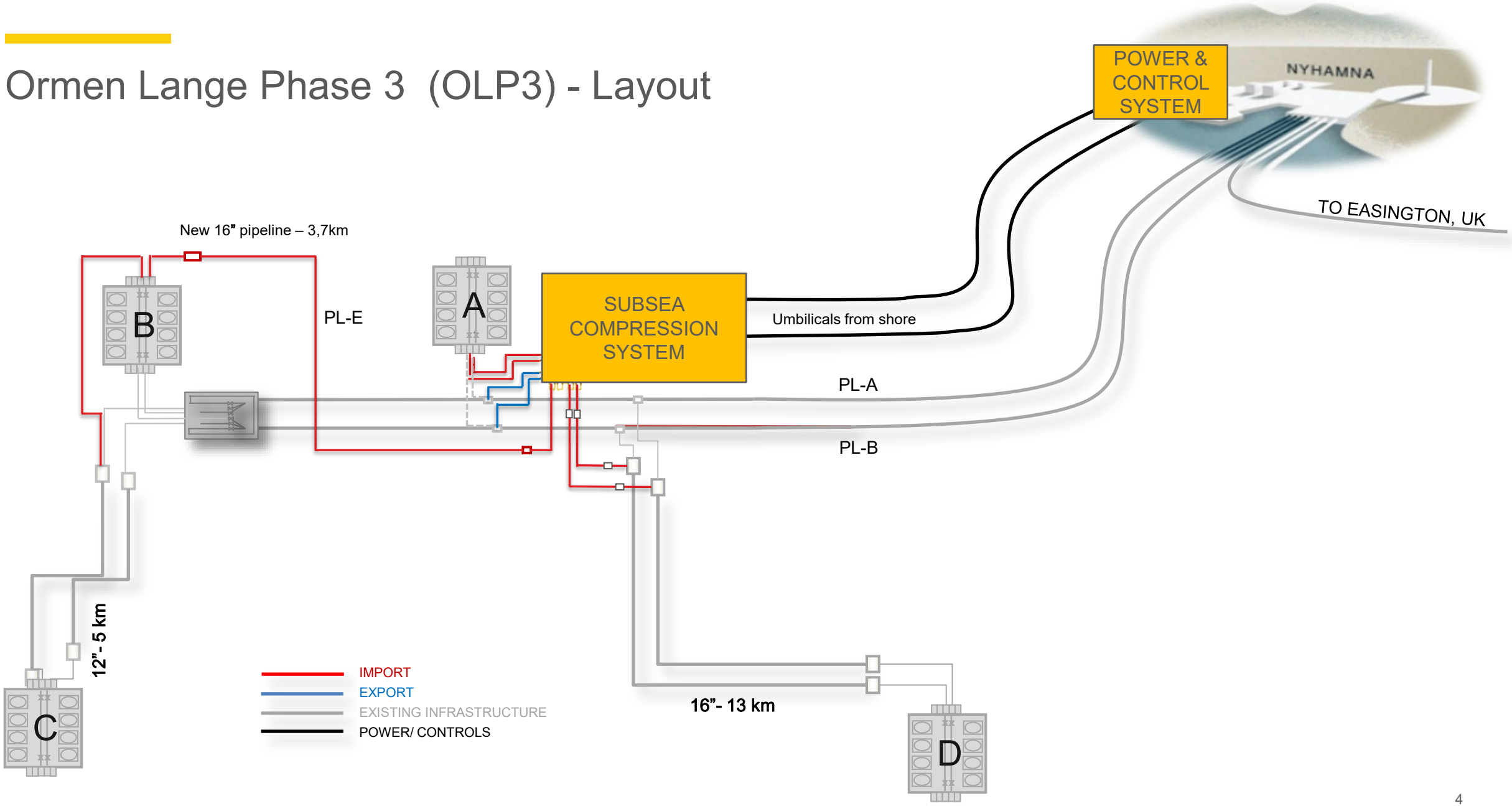
- 4-off subsea templates
- Producing via 2x30” pipelines to Nyhamna (120 km)
- Controlled by umbilicals from Nyhamna (120 km)
- Export via Langeled to Easington (1200 km)

Timeline

- 1997: Discovery
- 2004-07: Field development
- 2007-14: More wells and plateau production
- 2006-15: Subsea compression pilot
- 2014-18: Added onshore compression
- **2018-25: Add subsea compression (phase 3)**

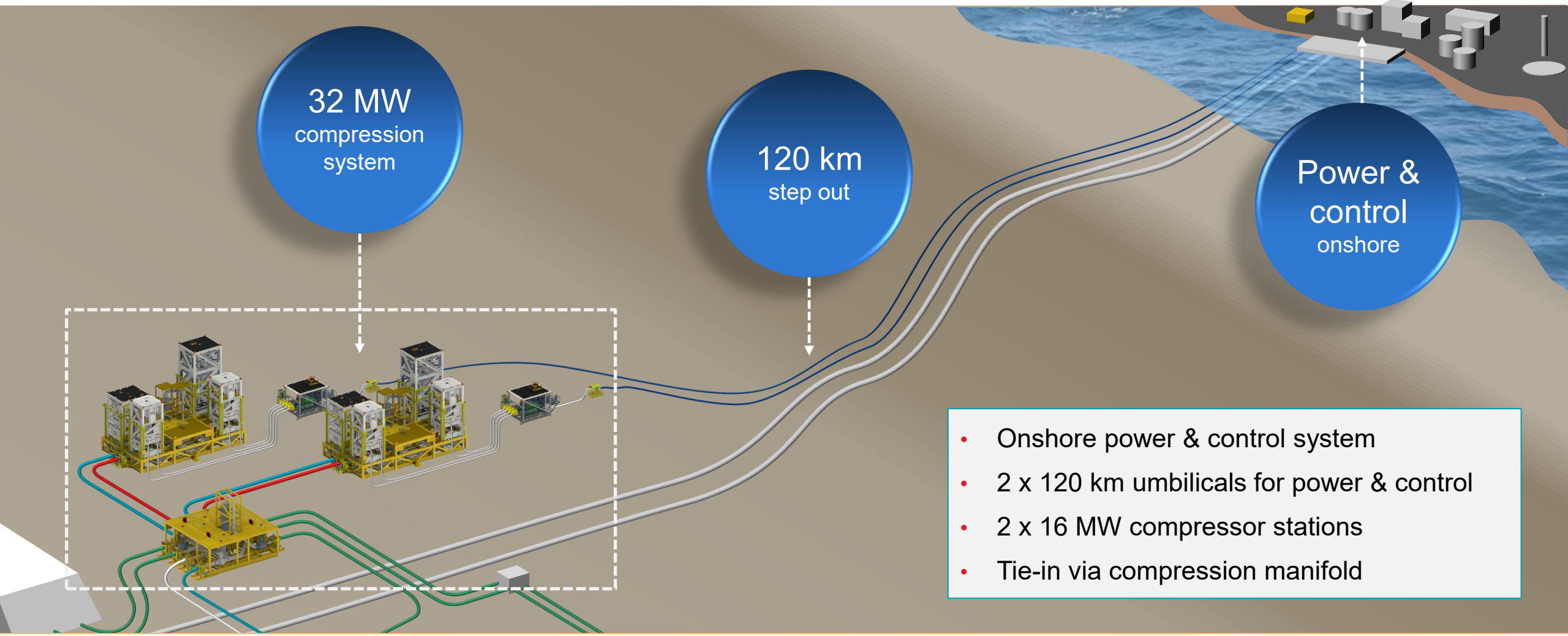


Ormen Lange Phase 3 (OLP3) - Layout



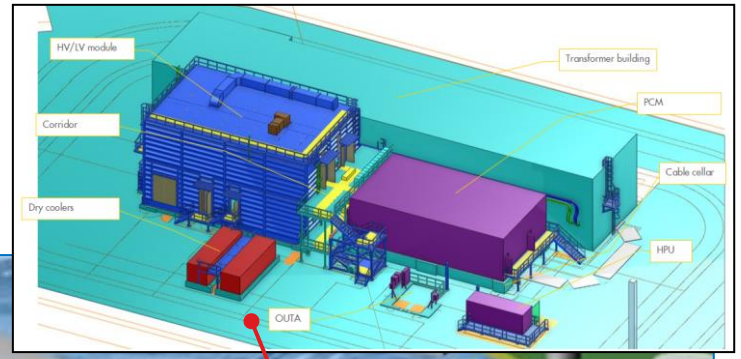
OLP3 Subsea Compression System - Overview

+30-50 BCM
Increase gas recovery factor to 85%



- Onshore power & control system
- 2 x 120 km umbilicals for power & control
- 2 x 16 MW compressor stations
- Tie-in via compression manifold

OLP3 Technology – Building on Solutions in Use



Compressor Unit (performance)

Power transformers, connectors & penetrators (rating)

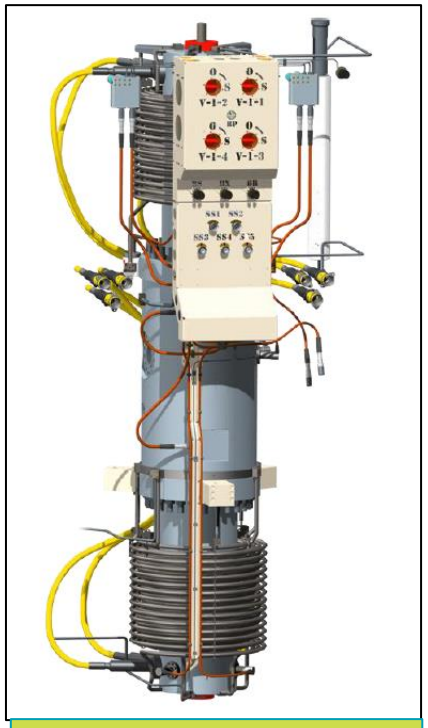
2 x 120 km umbilicals

Onshore Power System (120 km step-out)

Technology selected & de-risked by:

- Close vendor engagement
- Leveraging technologies (Gullfaks, Åsgard)
- Extensive testing to confirm a robust design

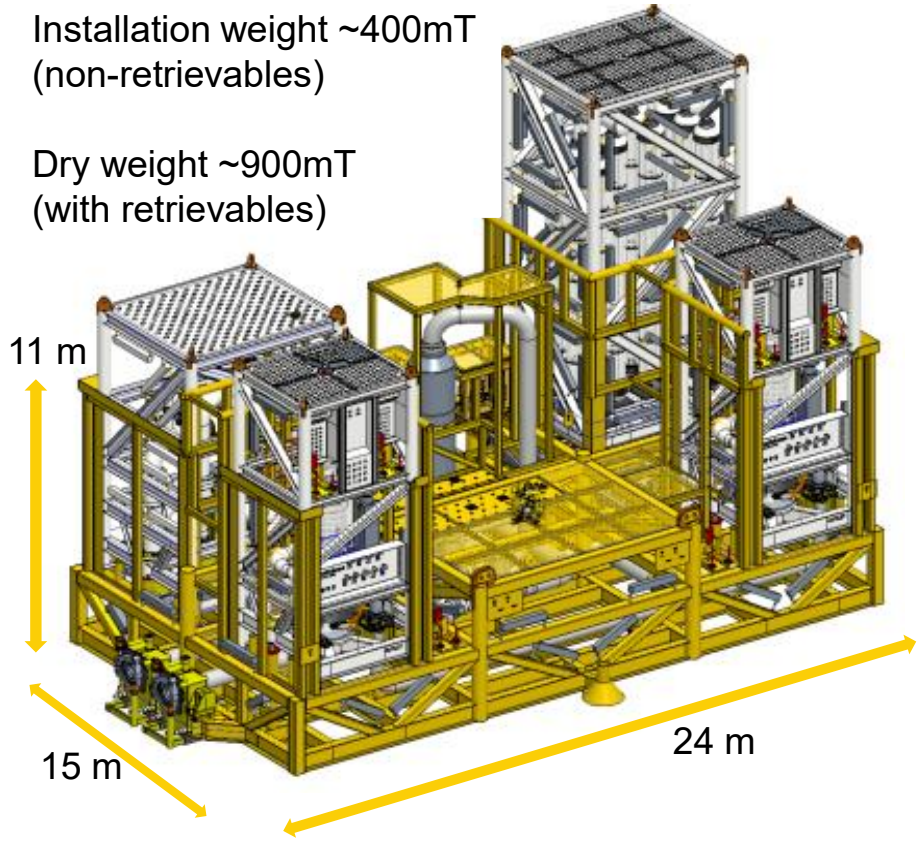
Key Equipment subject to Qualification Testing



Compressor unit

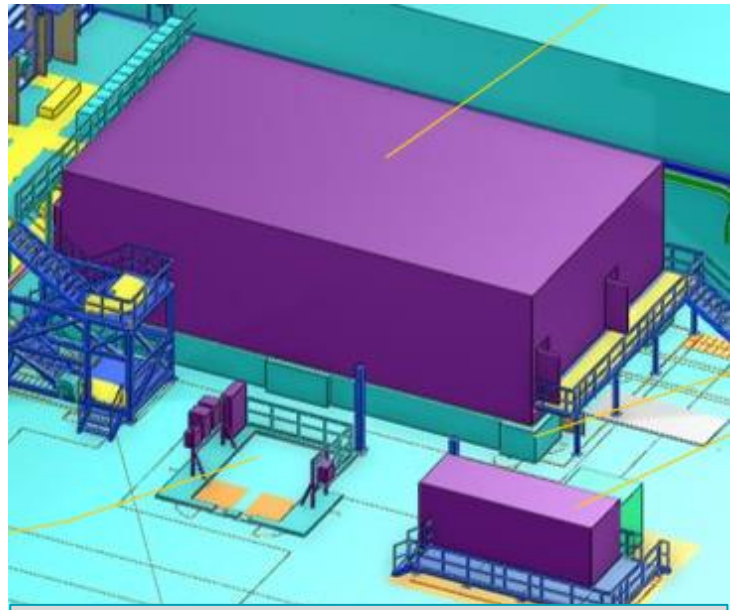
Installation weight ~400mT
(non-retrievables)

Dry weight ~900mT
(with retrievables)



Compressor station with 2 x compressors

120 km step-out with VSDs
(Variable Speed Drives)



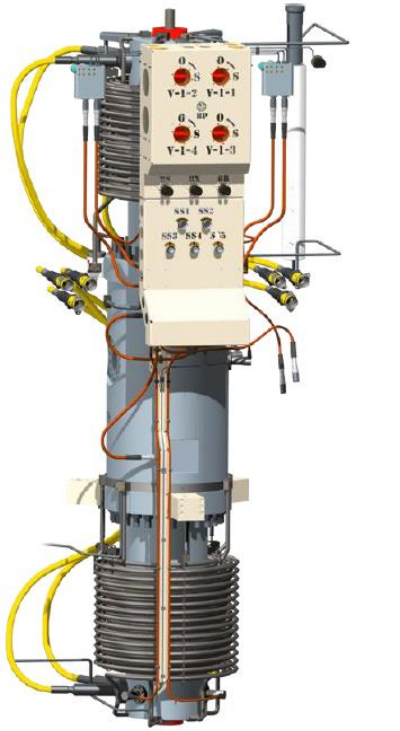
Power Control Module (PCM)
with VSDs

Testing at OneSubsea – A Key to Success

Unique test facilities at Horsøy allowing de-risking of technology by extensive testing of key components:

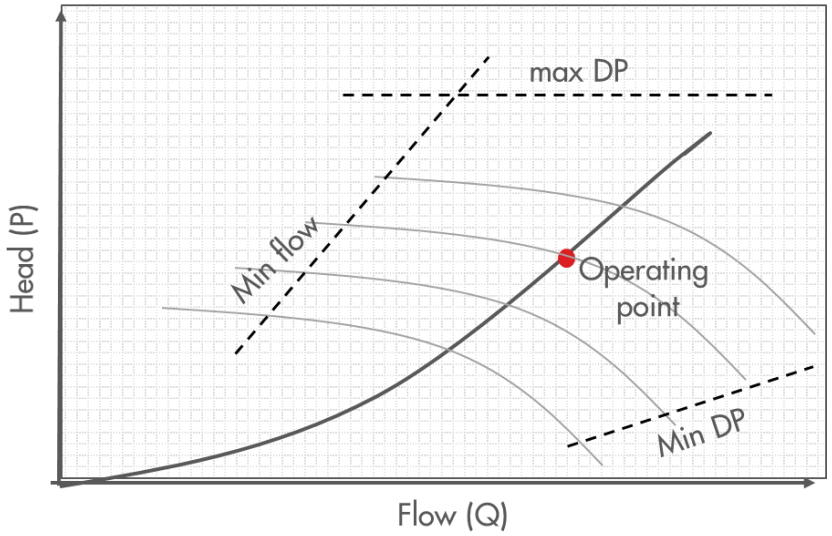
- Compressors units
- Power system with umbilical simulator
- System integration testing prior to deployment

Compressor Unit: Successful Performance Testing in 2021



Compressor unit

Performance testing with test fluid



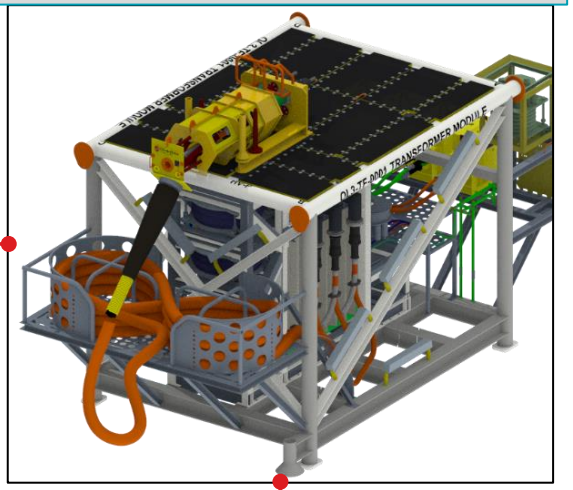
Map to performance with actual fluid (illustration only)

Power System: Full Load Test in Q4-22

Variable Speed Drives (VSD)

Umbilical Simulator

Subsea transformer in test pit



Compressor in test loop

PURPOSE: Confirm that the VSD and its software can control a compressor pair at full load over 120km*, by:

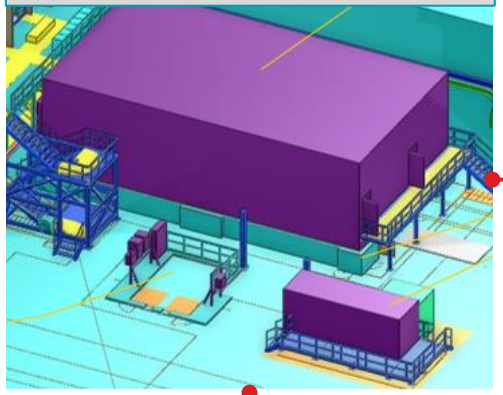
- Testing a complete power train at full load.
- Testing the power train with actual delivery equipment

*) Feasibility tested in 2021, with a 30% load over 120 km

SAS*: Safety and Automation System

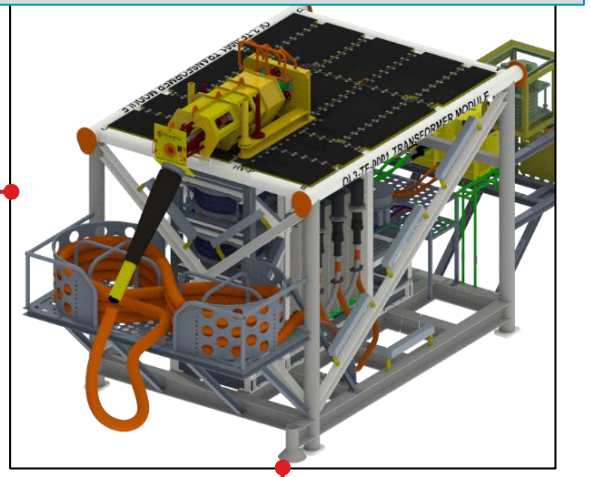
Verification by System Integration Testing in 2023

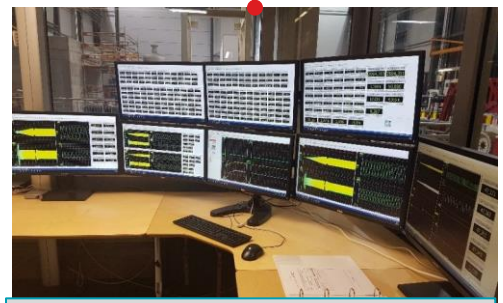
Power Control Module (PCM) with VSDs



Umbilical Simulator

Subsea transformer in test pit





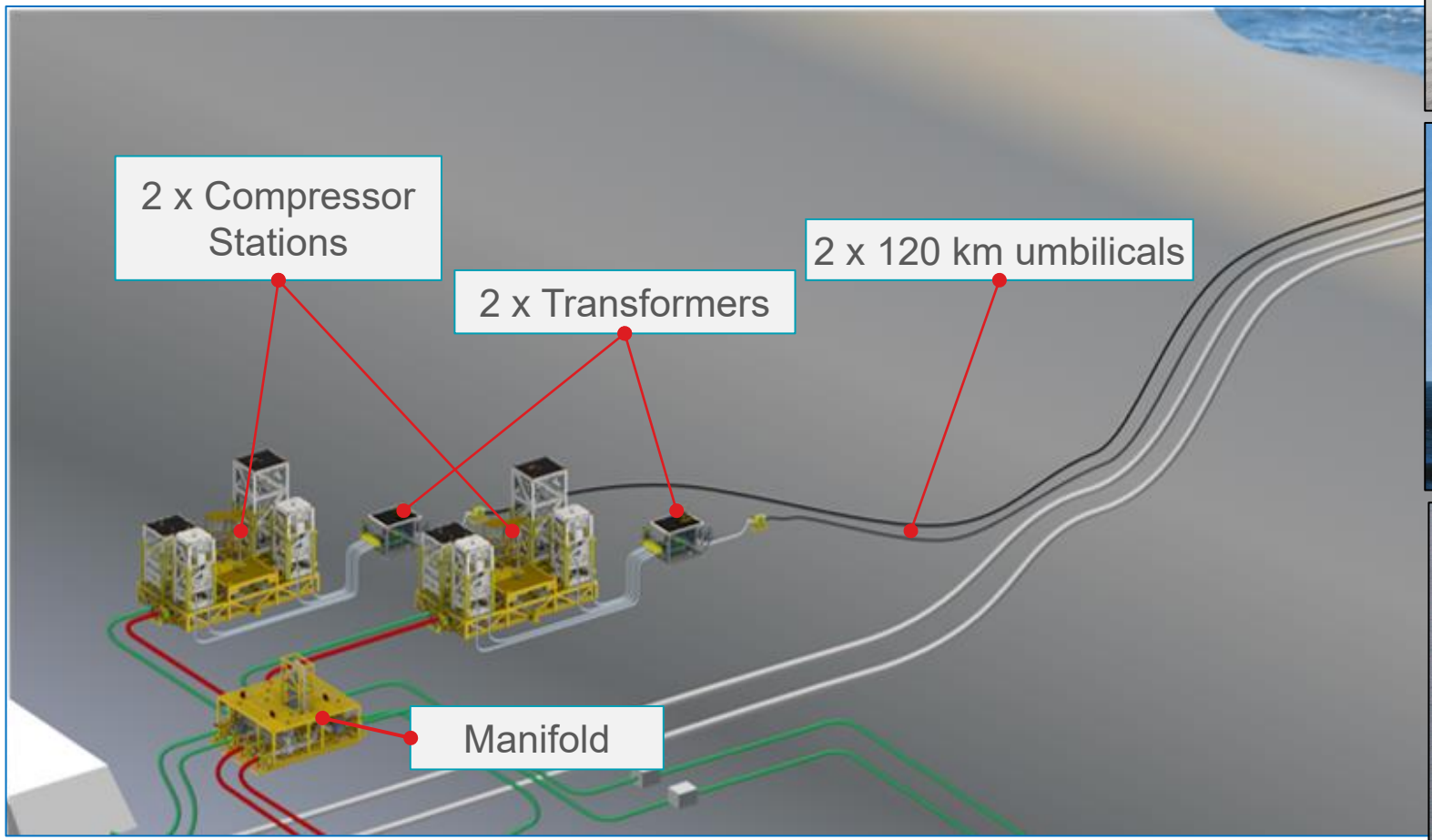
Control including SAS* interface

PURPOSE: Confirm operability and safeguarding of compressors over 120km, by:

- Testing a complete integrated compressor train with actual delivery equipment

Compressor station in test pit

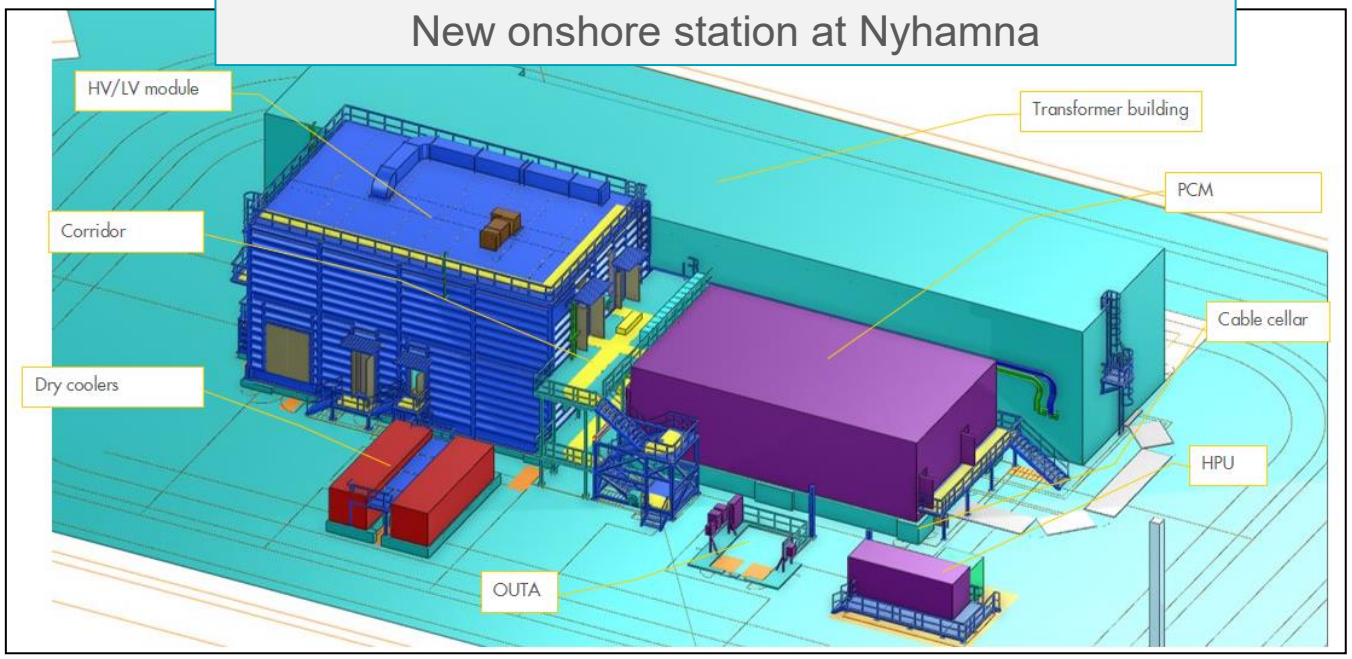
Subsea Installation @ Ormen Lange



Onshore Integration @ Nyhamna

- Establish umbilical landfall & onshore station
- Pull in two umbilicals to the new onshore station
- Connect the onshore station to the rest of Nyhamna (SAS + Power)
- Commissioning and Start-Up

New onshore station at Nyhamna



Nyhamna Gas Processing Plant, new station (yellow)

Ongoing civil works at Nyhamna

OLP3 – Delivery and start-up by 2025 with our partners

Operator

JV Partners

petoro

vår energi

PGNiG UPSTREAM NORWAY

equinor

Subsea System

OneSubsea
A Schlumberger Company

subsea 7

Nexans

Seabed Rock

Van Oord
Marine ingenuity

SS Field Layout

REINERTSEN NEW ENERGY

Onshore

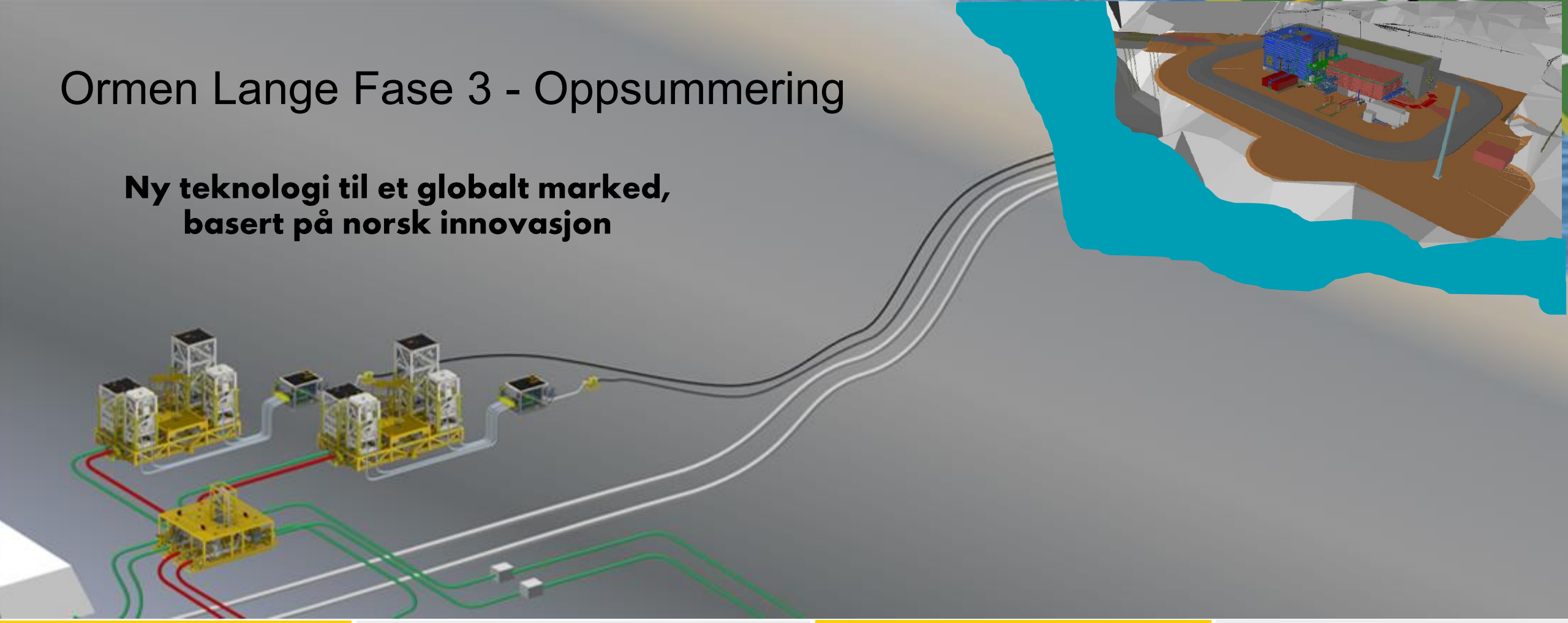
AkerSolutions

Multiconsult

ODD SMÅGE AS
MASKINENTREPRENØR
- strekker seg enda litt lengre

Ormen Lange Fase 3 - Oppsummering

Ny teknologi til et globalt marked, basert på norsk innovasjon



78%
Norwegian content

Technology developed in-country

+40 BNOK
Extra income to Norway Inc

120 km
World's longest subsea compression power step-out

8000
Work years 2020-27

+30-50 BCM
Increase gas recovery to 85%

CO_2
Ormen Lange is one of the production facilities in Norway with the lowest carbon intensity