

Ormen Lange Phase 3 Subsea Compression Development and deployment of Technology

Unlocking sustainable value while enabling a low-carbon future

Andrew Stroud , Project Manager OLP3 compression system





120 km step out

900 meters
water depth

32 MW
compression
system



78%

Norway content

Technology developed
in-country



+70 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 factor to 85%



CO₂

Ormen Lange represents among the lowest carbon intensity
production in Norway

Ormen Lange Gas Field - Operated by AS Norske Shell

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 to Easington through Langeled (1200 km)

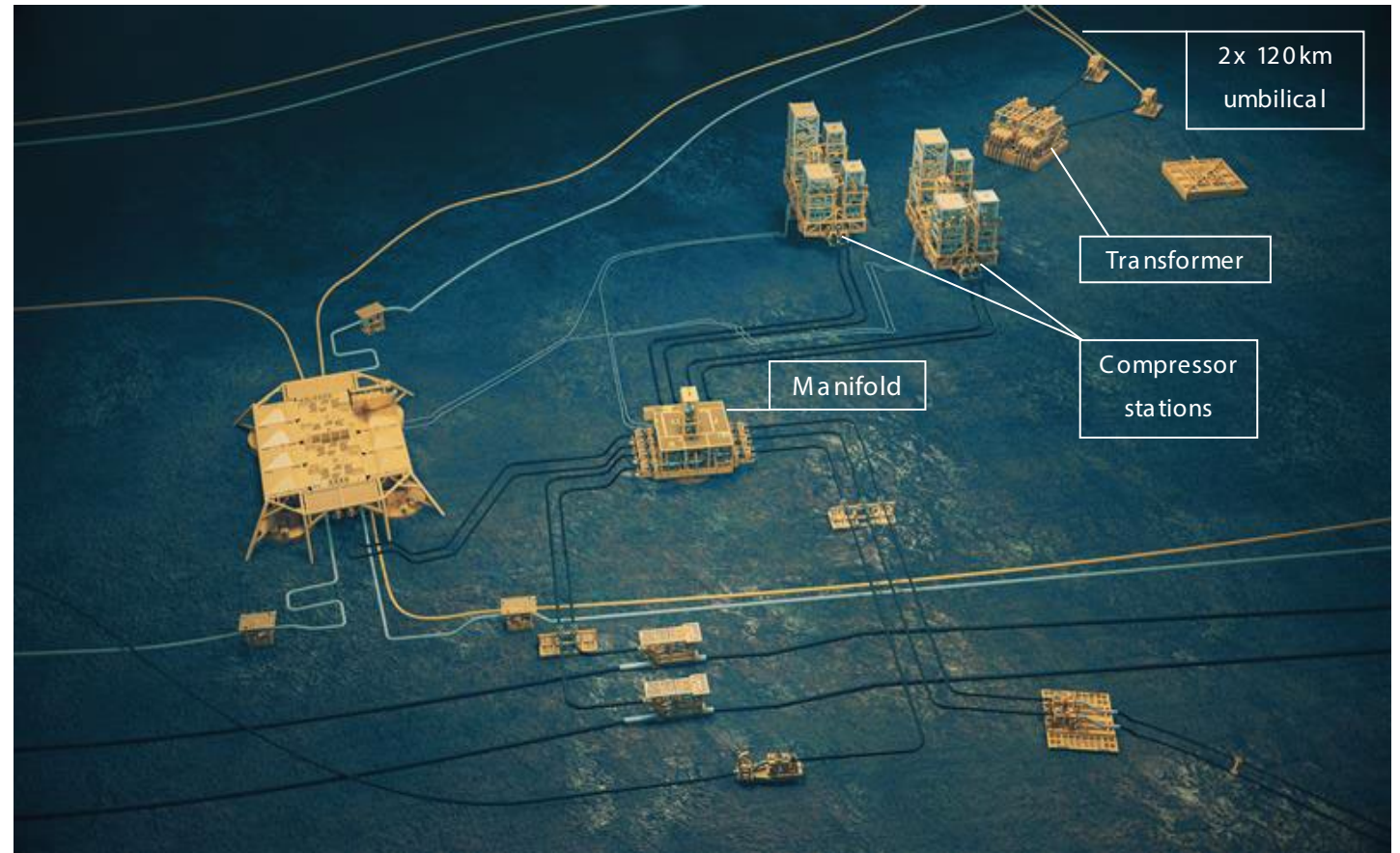
Timeline

- 1997: Discovery
- 2004-07: Field development with **compression in late life**
- 2007-14: More wells and plateau production
- 2006-15: **Subsea compression pilot**
- 2014-18: Added onshore compression
- 2016-18: Re-evaluation of late life concepts
- **2019-25: Select and add subsea compression (phase 3)**



Ormen Lange subsea multiphase compression

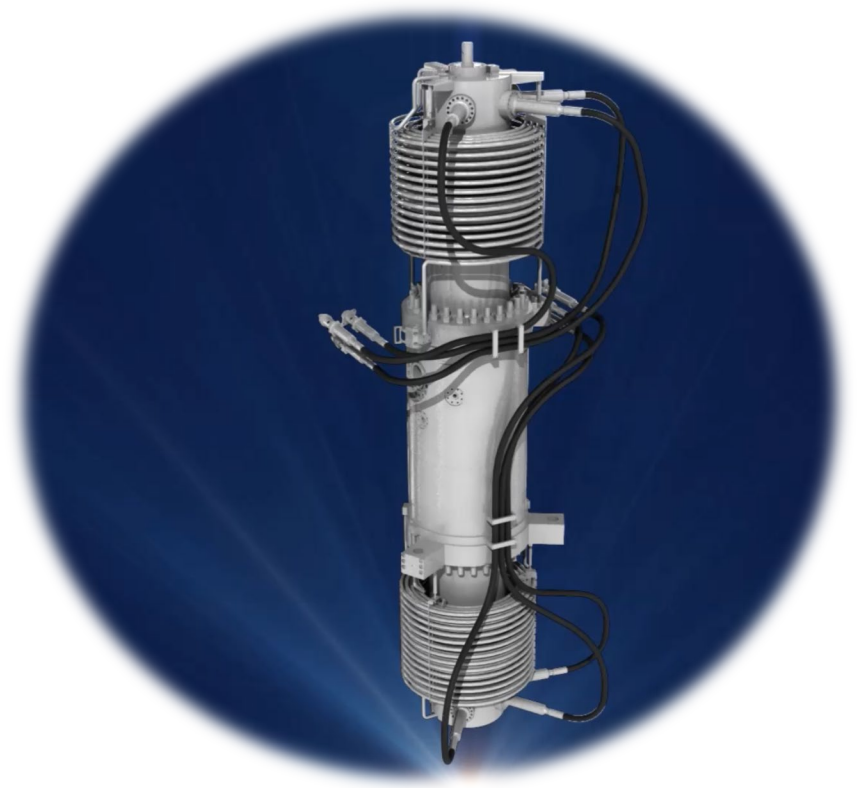
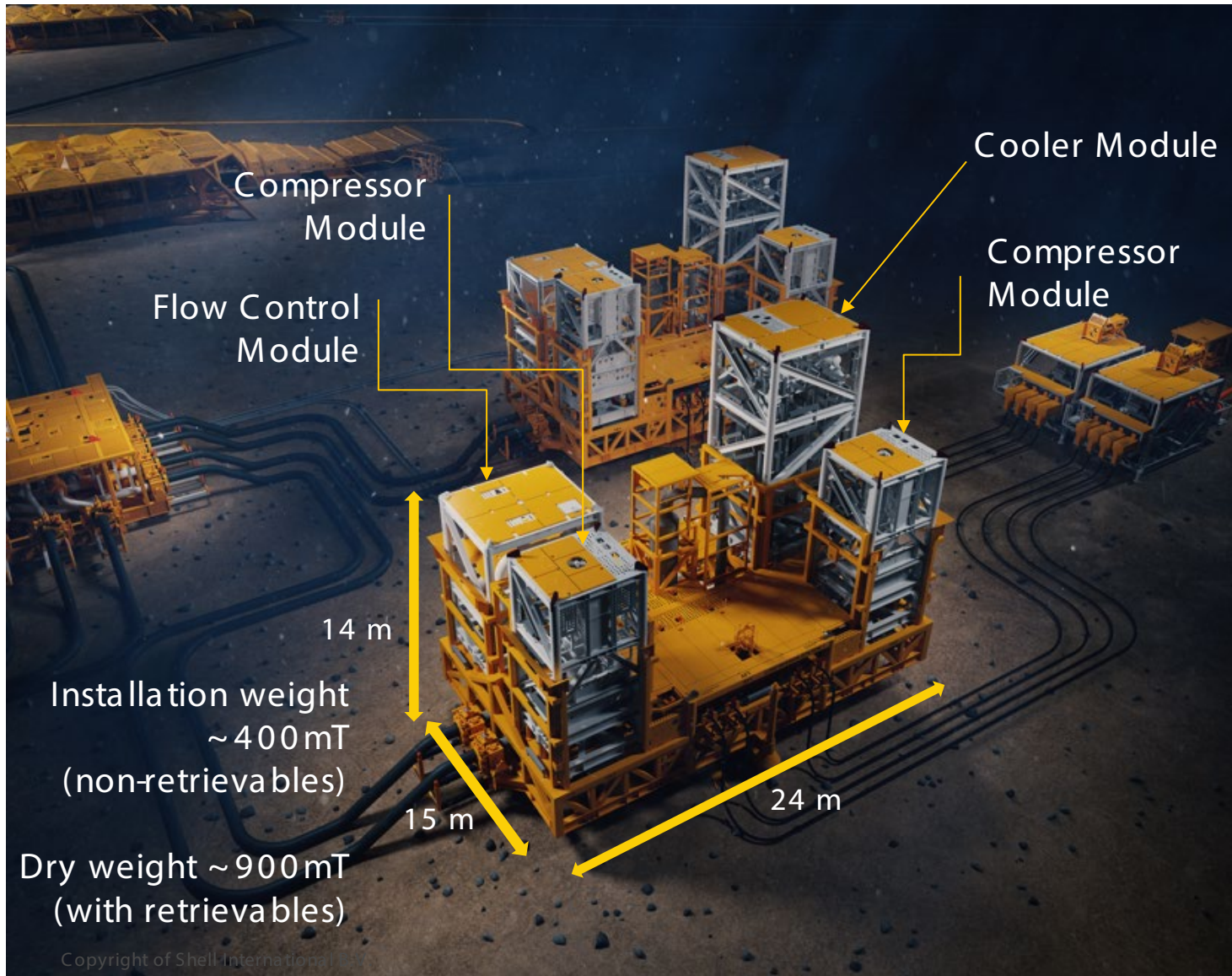
- 120 km step-out & 900m water depth
- Two existing 30" flowlines to shore
- Two identical subsea compression stations, each with two multiphase compressors in parallel
- One VSD for each subsea compression station, i.e. one VSD for each pair of compressors (4 motors)
- VSD's and other topside utilities located onshore
- Total installed subsea shaft power 32 MW
- 30-50 billion standard cubic meters additional gas
- Increased recovery from 75 to 85%



OLP3 – Key success factors

- Key decisions taken at concept select based on technology maturity and risk vs predictable execution
- Technology qualification programme executed in parallel with FEED and execution
- Early Supplier Engagement - moving to supplier led solutions
- Highly structured Technology Qualification and Verification plan
- Closely integrated with the supplier in early phase - de-risking of critical technologies working concise risk based functional requirements
- Creating a psychologically safe working environment across the contracts – enabling the good conversations on HSSE, quality and care for the team
- Local established flexible supply chain for engineering fabrication and testing –
- Highly capable base of suppliers in the local region

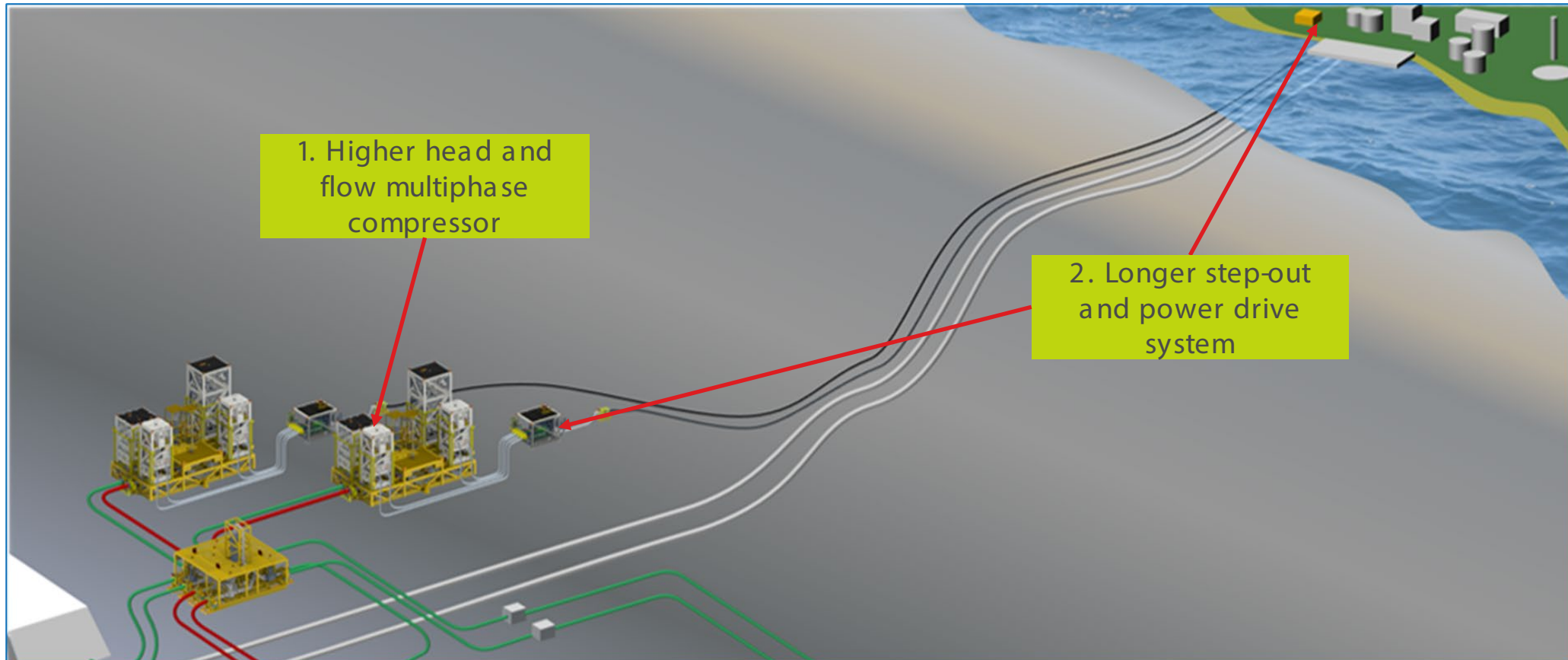
Subsea Multiphase Compression



INTERNAL

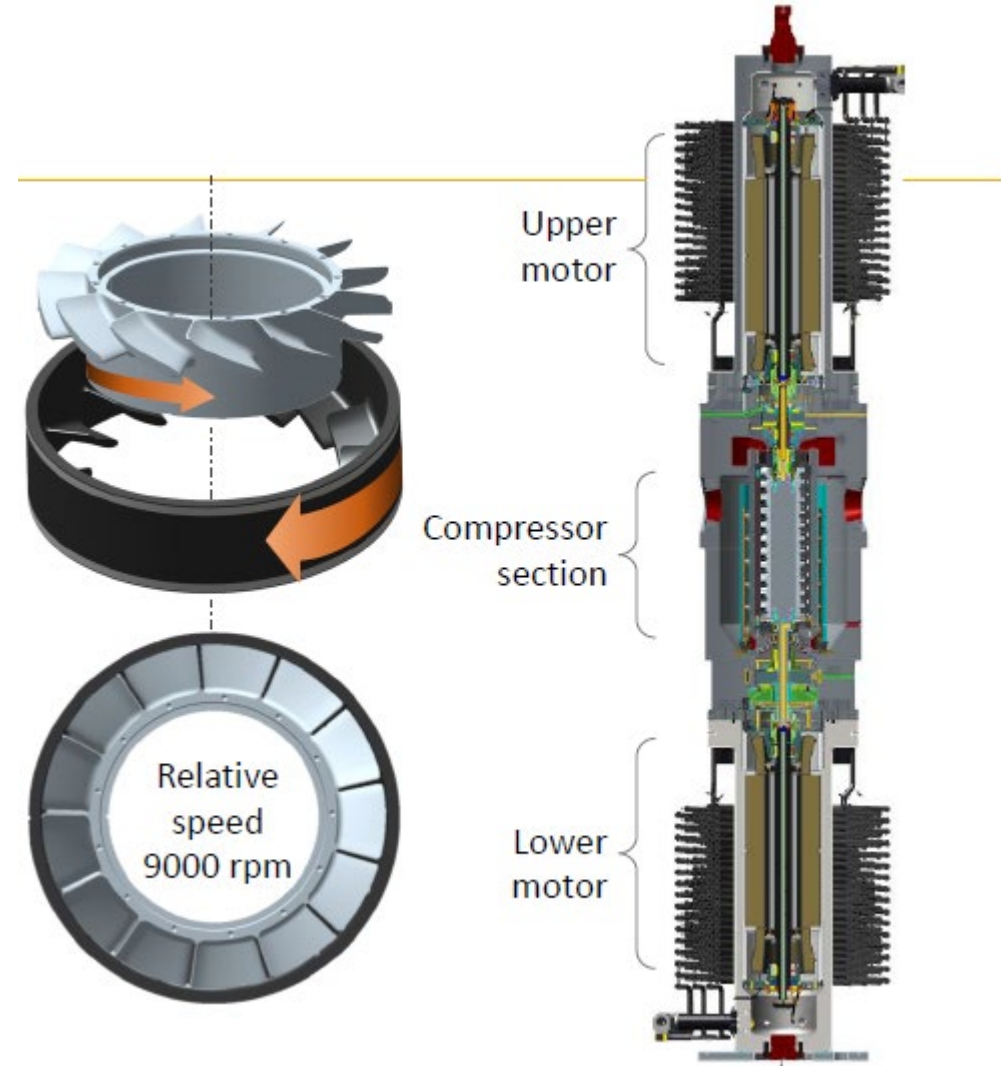
Technology Validation program

- Two main technology gaps:



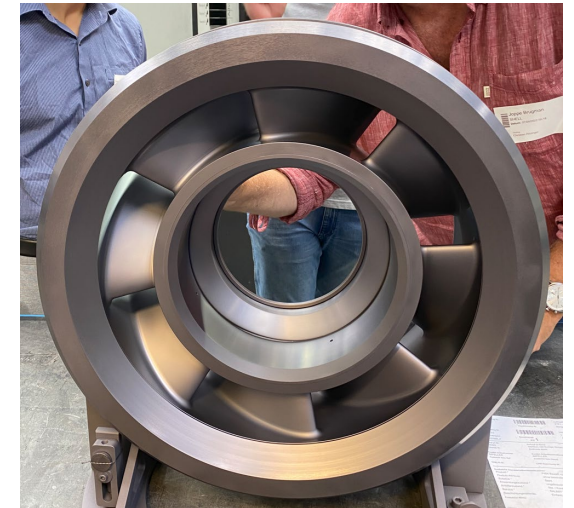
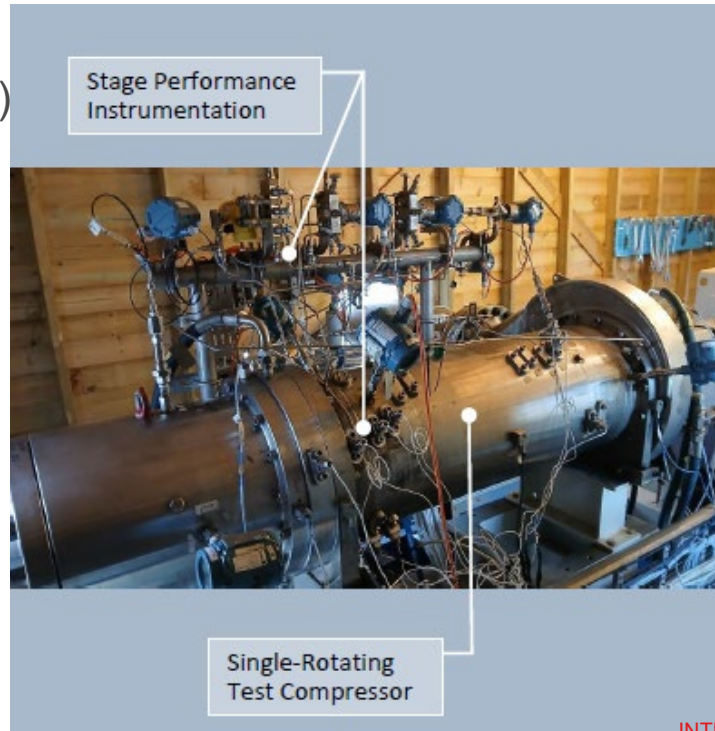
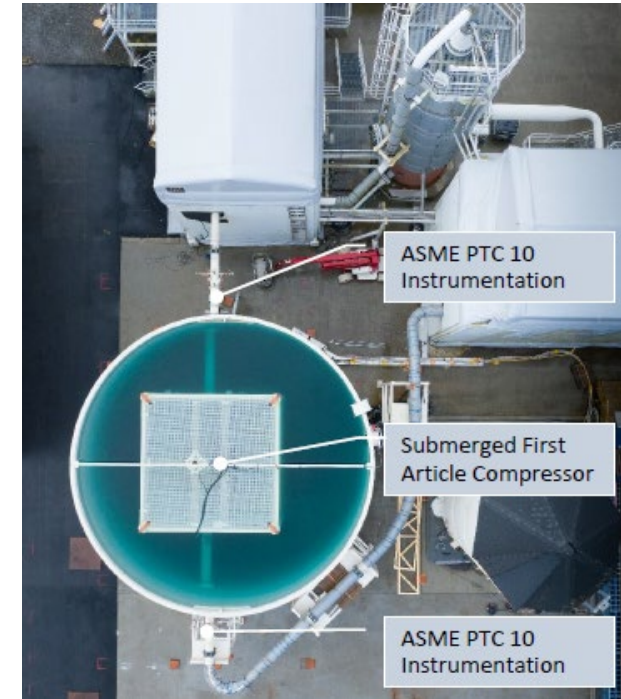
Subsea Multiphase Compression

- Two liquid filled electric motors, upper and lower. Both motors are run by same VSD
- Every second impeller is linked to either upper (outer) or lower (inner) motor
- Contra-rotation benefits
 - Improved multiphase mixing
 - No diffuser/ stator losses
 - Relatively Short shaft / rotordynamic robust
 - Relatively low speed allowing longer step-outs

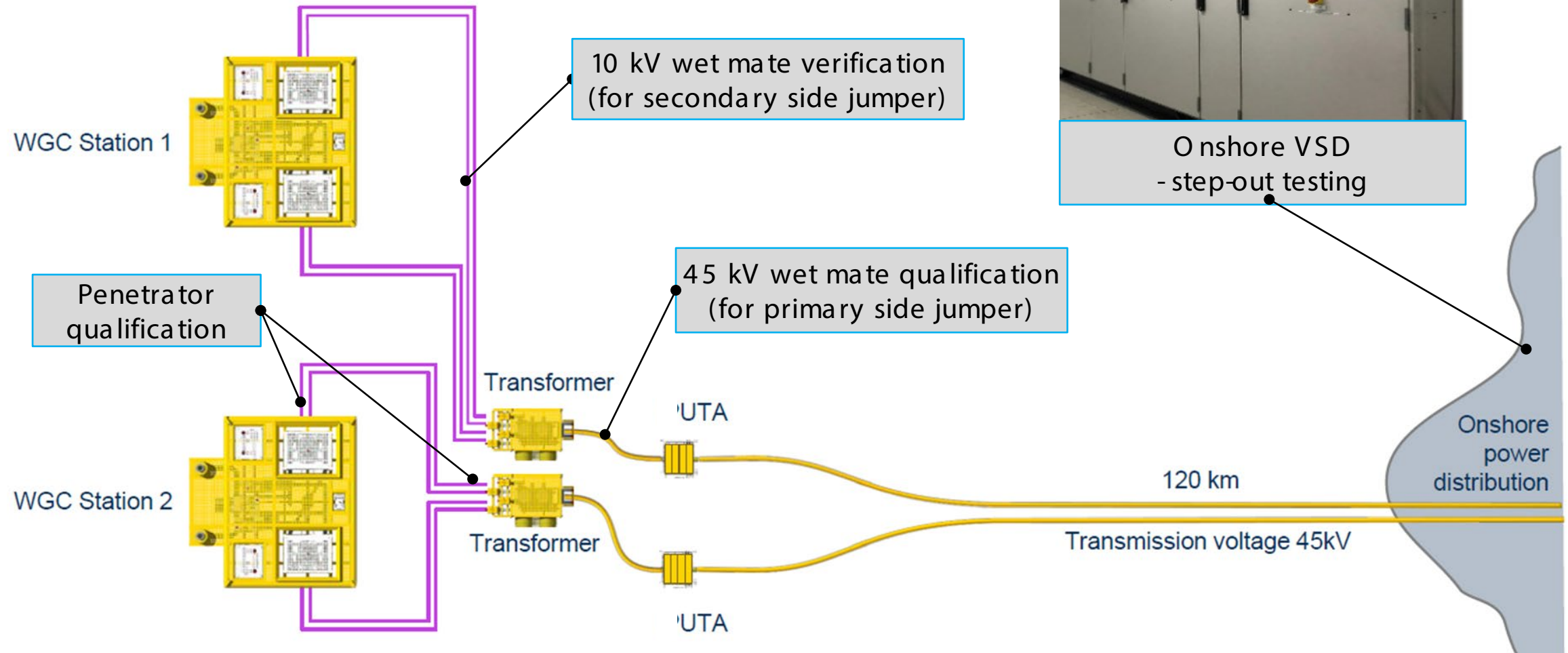


Multiphase compressor

- Where do you start?
 - Close collaboration between Company and Contractor for definition of compressor performance requirements through integrated production simulations.
- You're gonna need a bigger "boat"! Leveraging previous qualified technologies (Gullfaks, Åsgard)
- Detailed technology gap and risk assessments for component qualification status executed jointly to benefit from the OneTeam combined experience
- Validation program in brief:
 - Single-rotating impeller test
 - Contra-rotating impeller test
 - Manufacturing technologies (3DP AM)
 - First Article compressor unit test



TQ 2: Power System



Dynamic Full Load Test

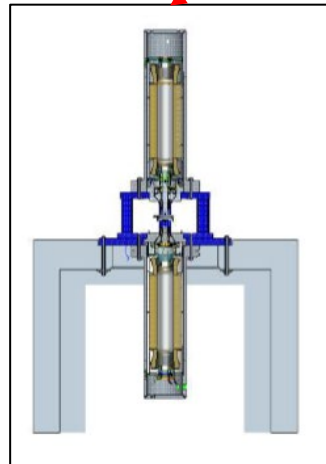
Umbilical Simulator



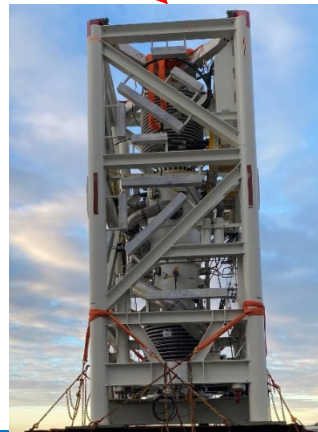
Subsea Step-down transformer in test pit



VSD input & Output transformers & VSD



2 x B2B: Compressor simulator



Compressor in HC test loop

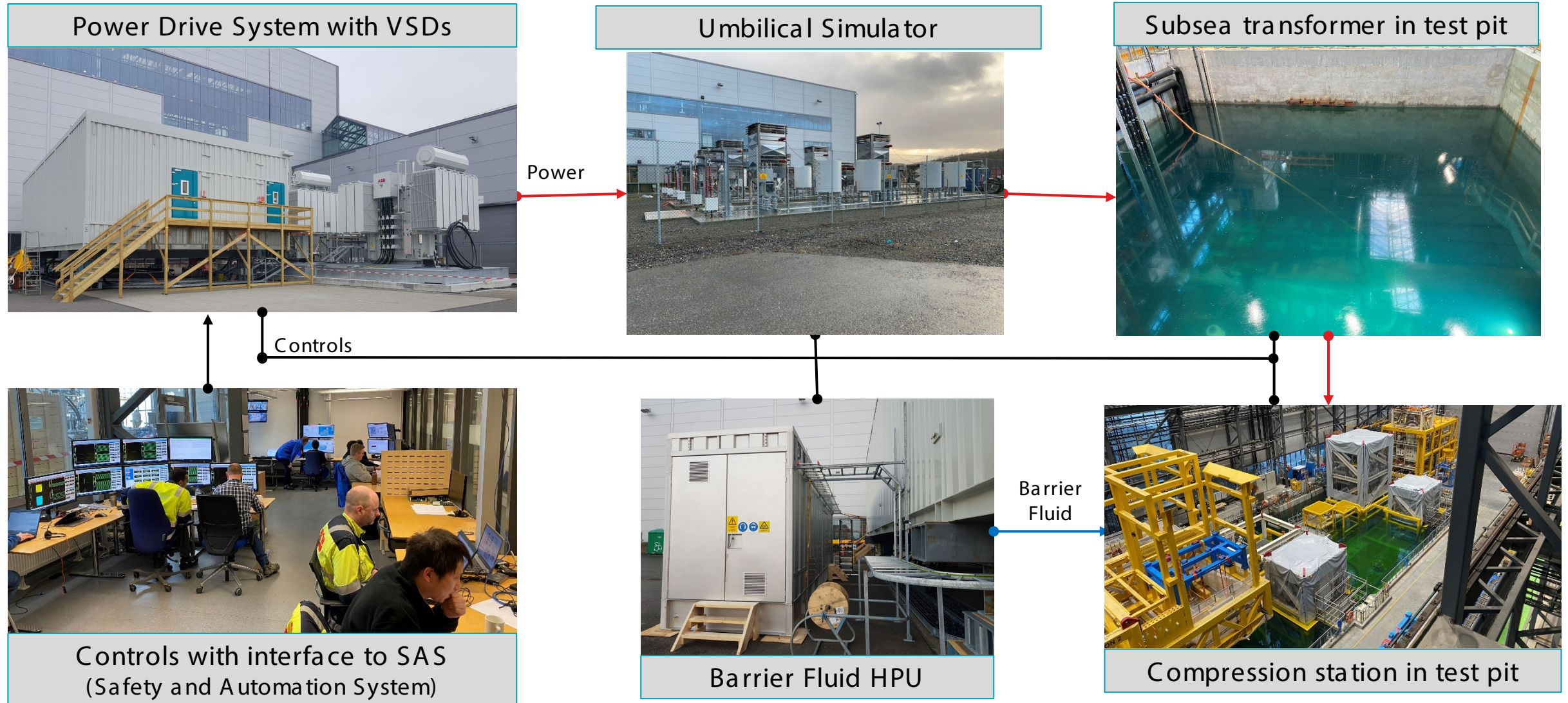
❑ Test with Actual OLP3 /

Similar equipment:

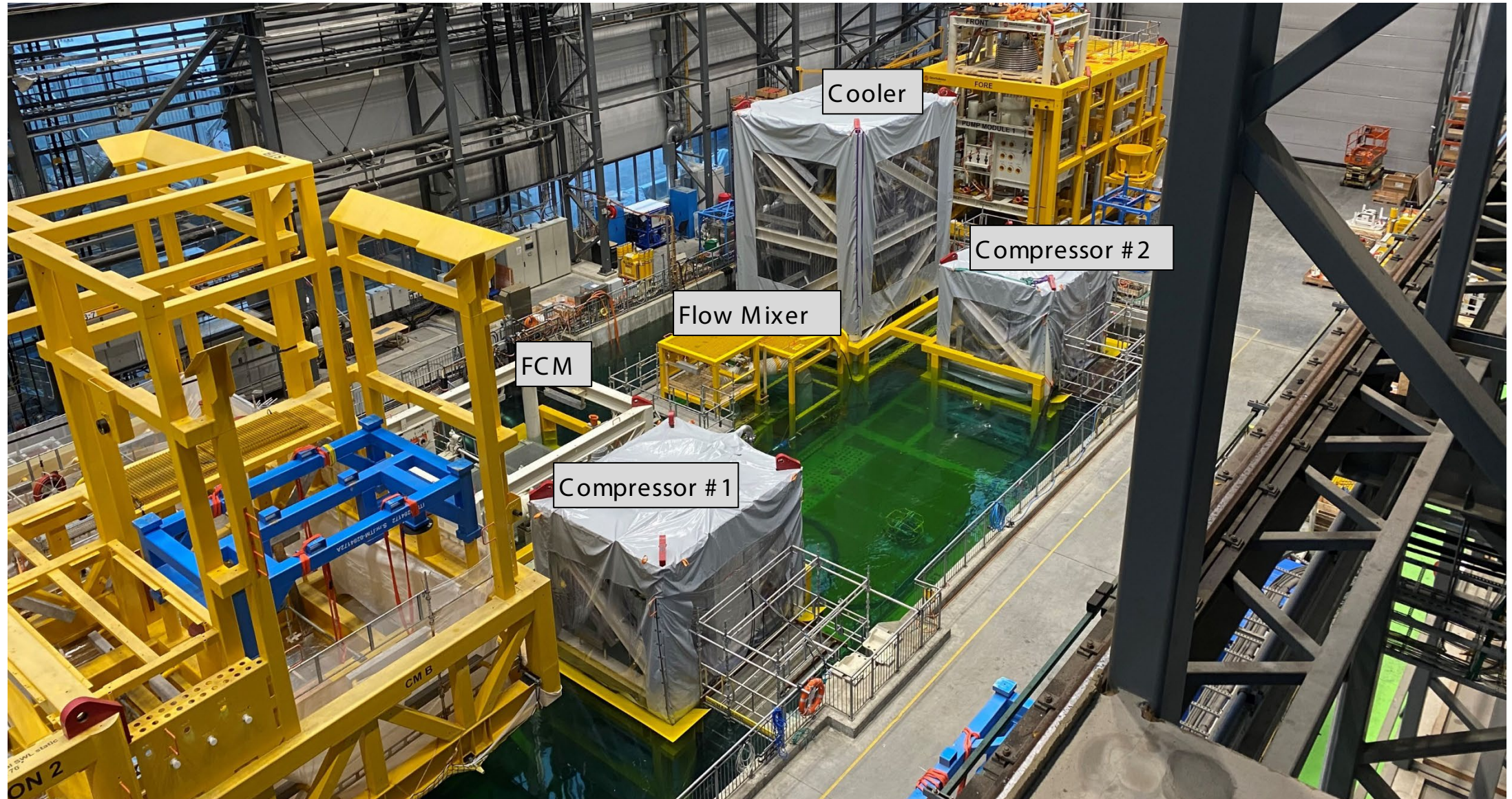
- ❑ VSD Input Transformer
- ❑ VSD
- ❑ VSD Output Transformer
- ❑ Umbilical Simulator
- ❑ Main Subsea Step-Down Transformer
- ❑ One Compressor (2 Motors)
- ❑ 2 Motors from (Connected to two Generators and VSD/ transformers feeding back)

PURPOSE: Verify operability and safe-guarding of compressors over 120km, by testing a complete integrated compressor train

System Operation Testing (SOT) – 2023



Compression Station – In test Pit



OLP3 commissioning and start up

OLP3

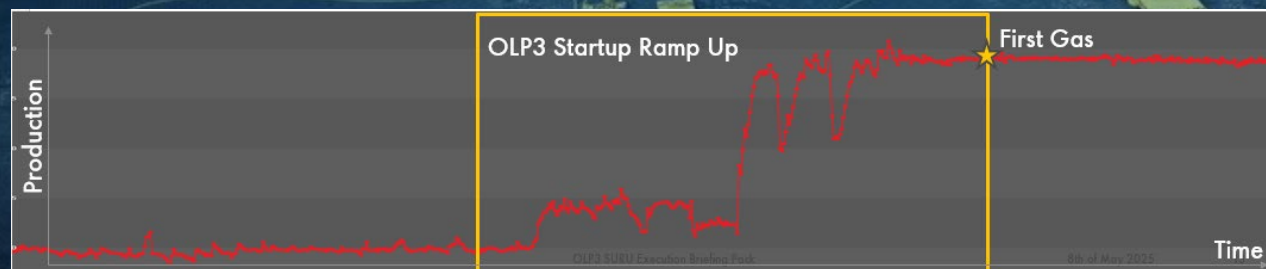
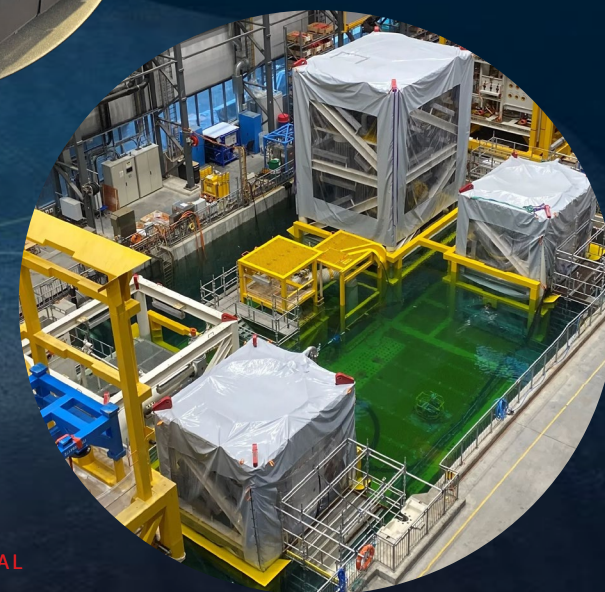


The Startup Success

- Safely achieved SURU in 20 days setting **a new benchmark**
- Seamless **collaboration** across OLP3 Project, asset teams, contractors, and subcontractors co-located at Nyhamna and operating as **One Team** from the control room
- Conducted **extensive System Integration Testing and verifications** to systematically de-risk startup
- **Detailed planning** and continued use of **Plan-B thinking** and **Proactive Risk Management** to develop robust contingencies enabling fast deployment of solutions to potential startup challenges

'World's longest subsea to beach compression project'

First Gas June 2025



June 2025 Start CS1

Q & A