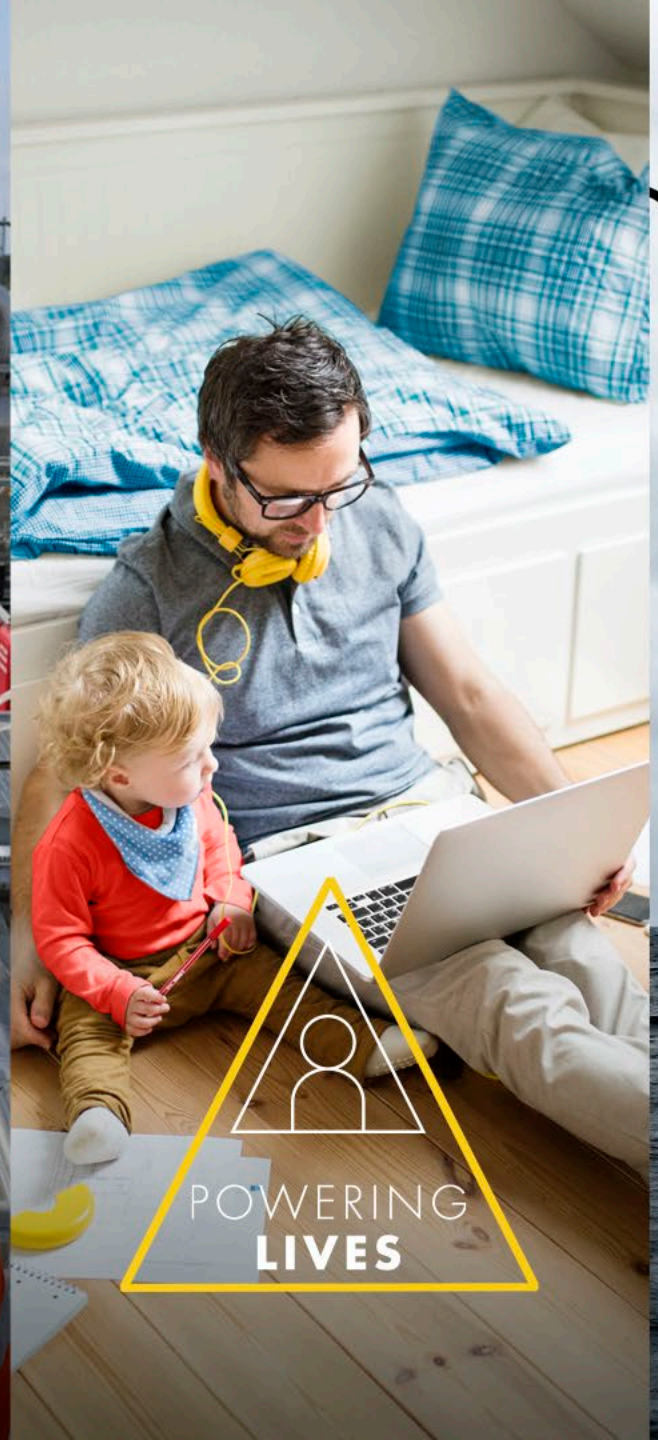
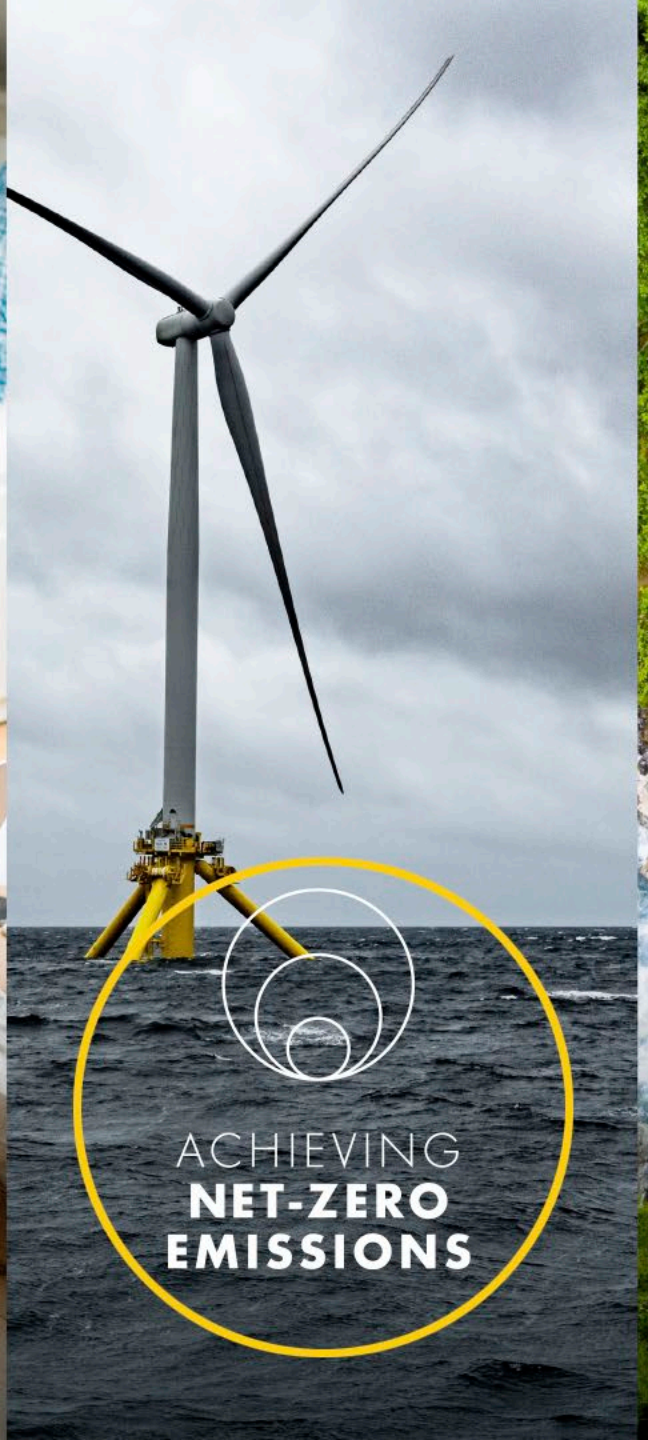
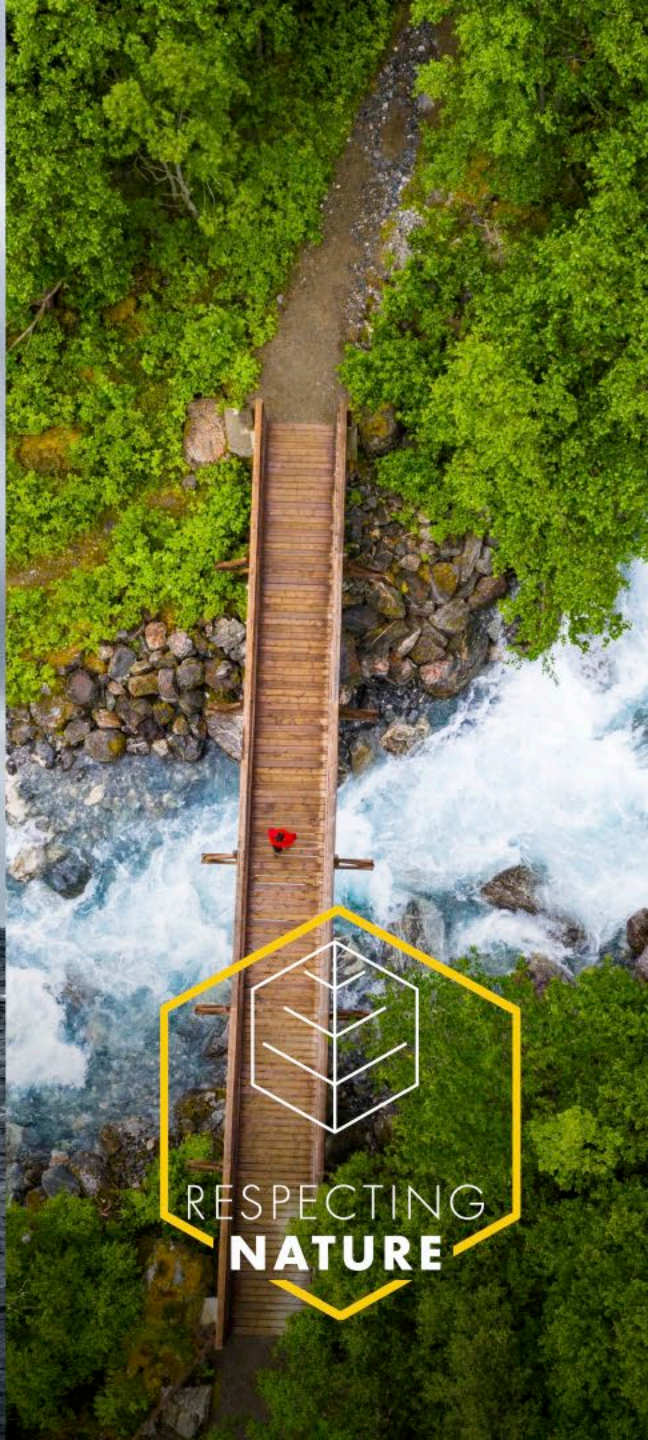
GENERATING
SHAREHOLDER
VALUE


POWERING
LIVES


ACHIEVING
NET-ZERO
EMISSIONS


RESPECTING
NATURE

Nyhamna & Ormen Lange Digital Twin

Implementation and opalization of a digital twin

Shell in Norway

>25 bln NOK
paid in taxes in 2022

>500 bln NOK
invested in zero or low carbon energy solutions in 2022

~ 80%
Norwegian content in the flagship project Ormen Lange Phase 3

87%
of Norske Shell's 2023 production is electrified

~90%
reduction in absolute carbon emissions* within 2023, compared with 2016 (Field divestments deducted)

97,5%
average uptime at Nyhamna gas facility last 5 years (Adjusted for planned TurnArounds)

168
apprentices have completed their certification at Nyhamna

60%
women in management team, 30% women in the wider organisation

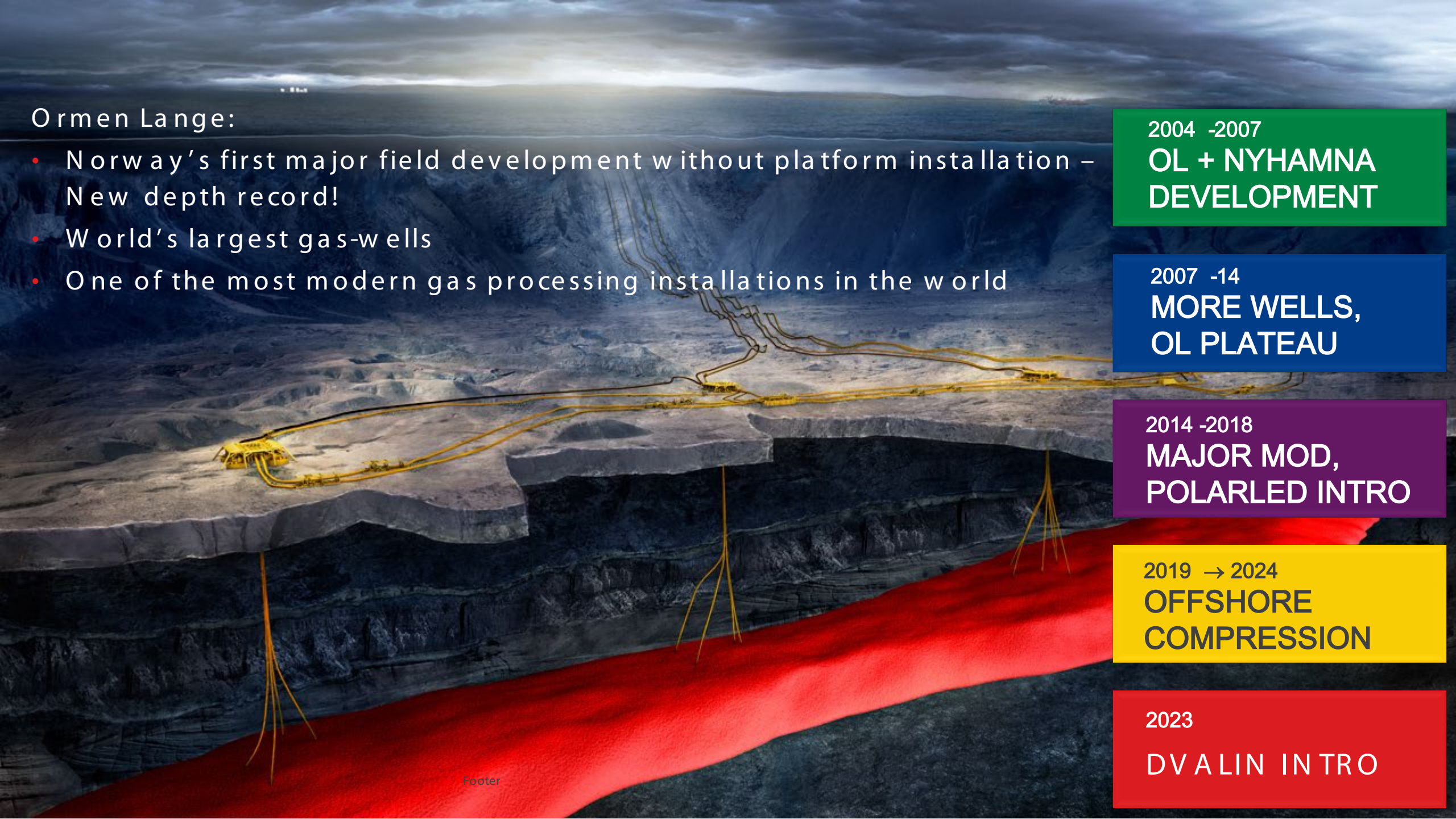
Norske Shell's activities have enabled export of Norwegian technology. Ex: Number of Norwegian vendors involved in the development of Prelude in Australia:
27

** Scope 1 og 2 emissions*

Foundation of competitive low carbon gas delivery

CCS as a service

Making use of competence & technology to transition to new and cleaner energy products



Ormen Lange:

- Norway's first major field development without platform installation – New depth record!
- World's largest gas-wells
- One of the most modern gas processing installations in the world

2004 -2007
OL + NYHAMNA DEVELOPMENT

2007 -14
MORE WELLS, OL PLATEAU

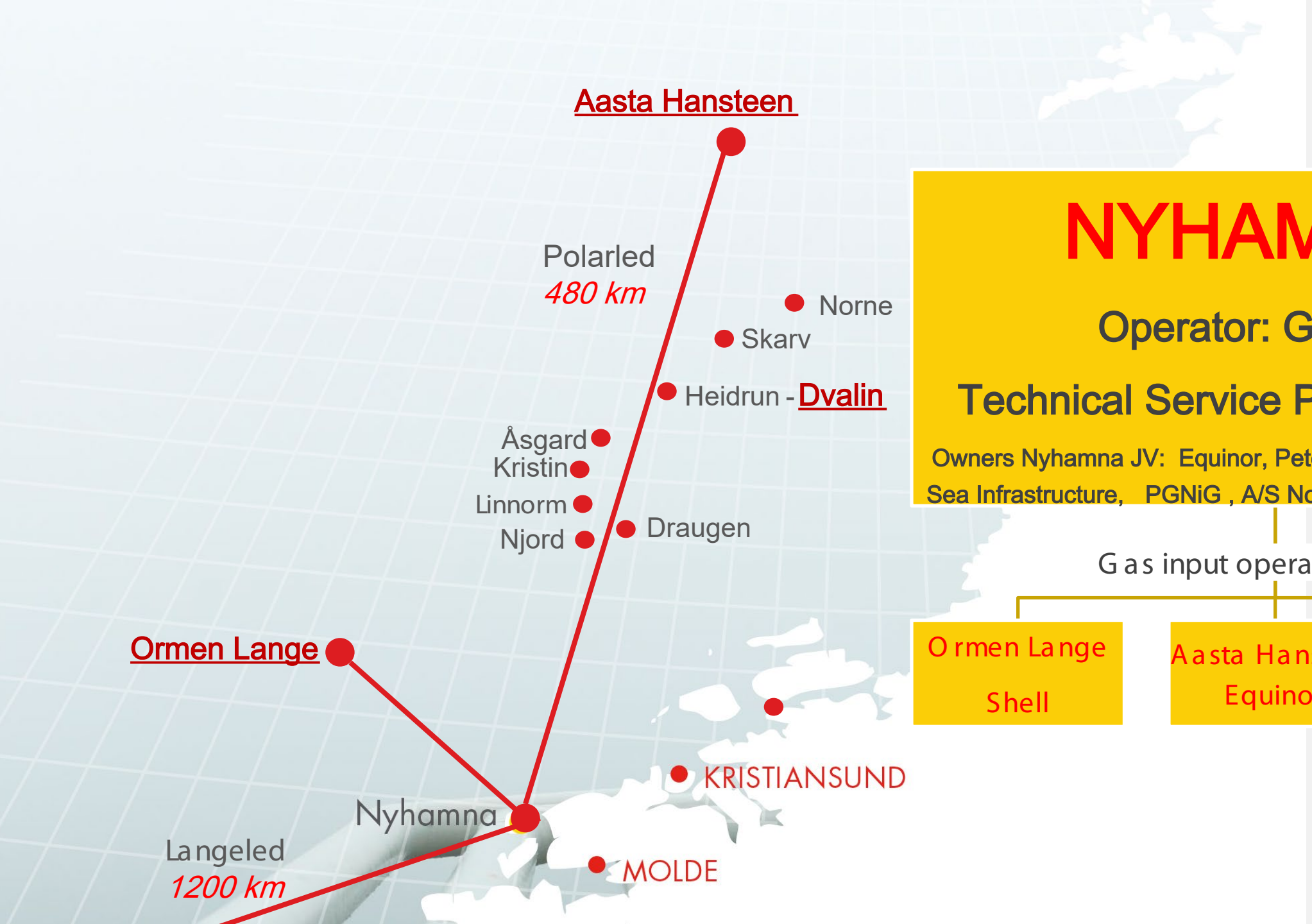
2014 -2018
MAJOR MOD, POLARLED INTRO

2019 → 2024
OFFSHORE COMPRESSION

2023
DVALIN INTRO

Nyhamna Quick facts:

- Daily throughput: 55 mln sm3
- 110 employees at site. Locally based = requirement
- Strong local and regional political support
- 168 apprenticeships since start up
- Reliability: +98%



NYHAMNA

Operator: Gassco

Technical Service Provider: Shell

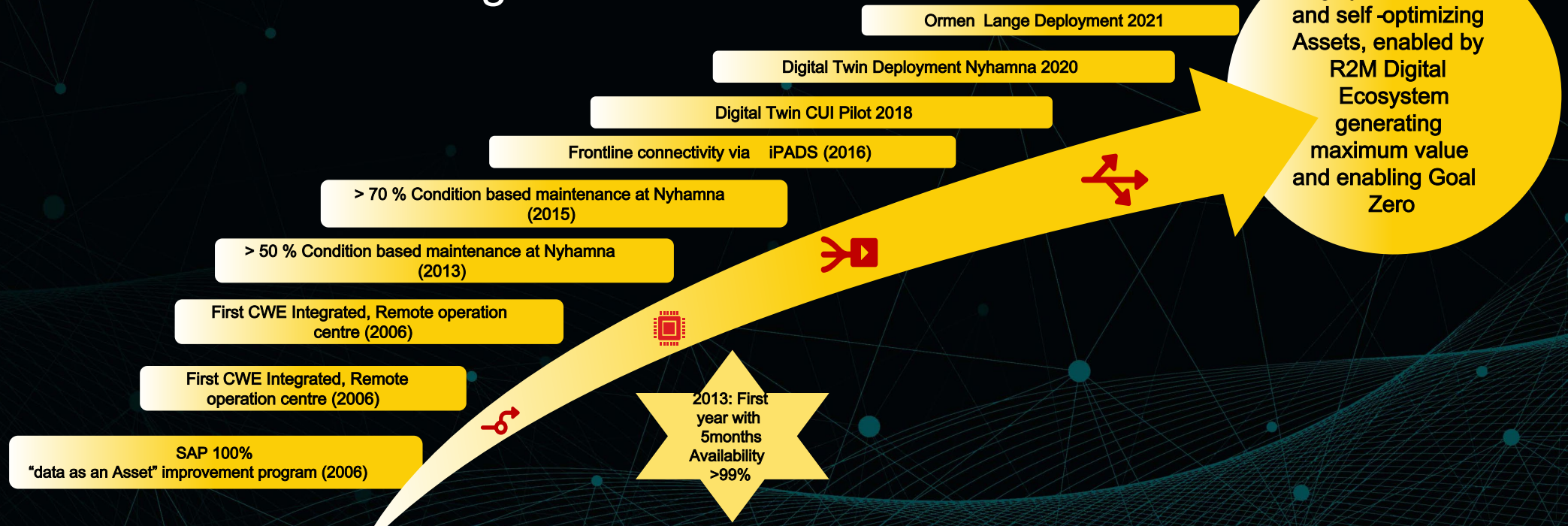
Owners Nyhamna JV: Equinor, Petoro, CapeOmega , North Sea Infrastructure, PGNiG , A/S Norske Shell, ConocoPhillips

Gas input operators:

- Ormen Lange — Shell
- Aasta Hansteen — Equinor
- Dvalin — Wintershall

Nyhamna & Ormen Lange Journey

Worlds first reservoir to market digital twin



«All disciplines and suppliers have integrated data from all systems easily accessible in the digital twin.

This has reduced travel and the need to enter the facility.

We save time that was previously used to retrieve drawings from various places for comparison, distribution and analysis, which we can now use for more intelligent and value -creating work »

Alexander Edvardsen, inspection engineer

VALUE DRIVERS

- Improved Collaboration & workflows , safer and more efficient maintenance planning and delivery
- Energy & Production Optimisation
- More data, less IT applications

DIGTITAL ASSET OF THE FUTURE
Nyhamna Journey

2022

Cumulative Risk View
MEG Optimiser & Well routing
Proactive Technical Monitoring

KNOWLEDGE

RISKMANAGEMENT

OPTIMISATION

RELIABILITY

MAINTENANCE & TURNAROUND

2023

Live Reliability RAM activated
Corrosion Under Isolation App
Automated Isolations Workflow

MAXIMISE PROFIT

PLANNING

PROBLEM SOLVING

ASSET OF THE FUTURE

2024 ++

Digital Field Worker Finalized
Live Reliability Automated Work Orders
Automated Workflows
Flow Assurance Integrated

Live Reliability

Full digital control of reservoir to market Production Availability and Reliability

LIVE RELIABILITY

1

All sensor data are used to visualise the condition of the plant and is connectet real time in the Dynamic Digital Twin

2

Operators, supervisor and engineers performes surveillance, based on the data in Live Reliability

3

Live Reliability utilizes Machine Learning models, based on historical, statistical and live data to predict potential failures.

CONNECTED EQUIPMENT

GATHERING & MONITORING DATA

COMBINED MACHINE LEARNING & PREDICTIVE ANALYSIS

PROACTIVE ALERTS

AUTOMATED WORK ORDERS

4

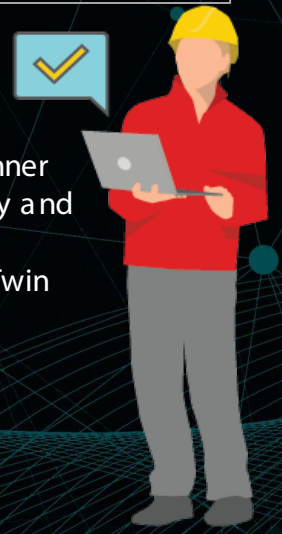
Live Reliability will then create alerts via the Dynamic Digital Twin if something is changing and makes proposals on how to react.

5

Work orders will be atomaticly generated, production and maintenance plans optimized based on the condition of the equipment and how the plant is run.

6

Production and maintenance planner only need to verify and approve in the Dynamic Digital Twin



7

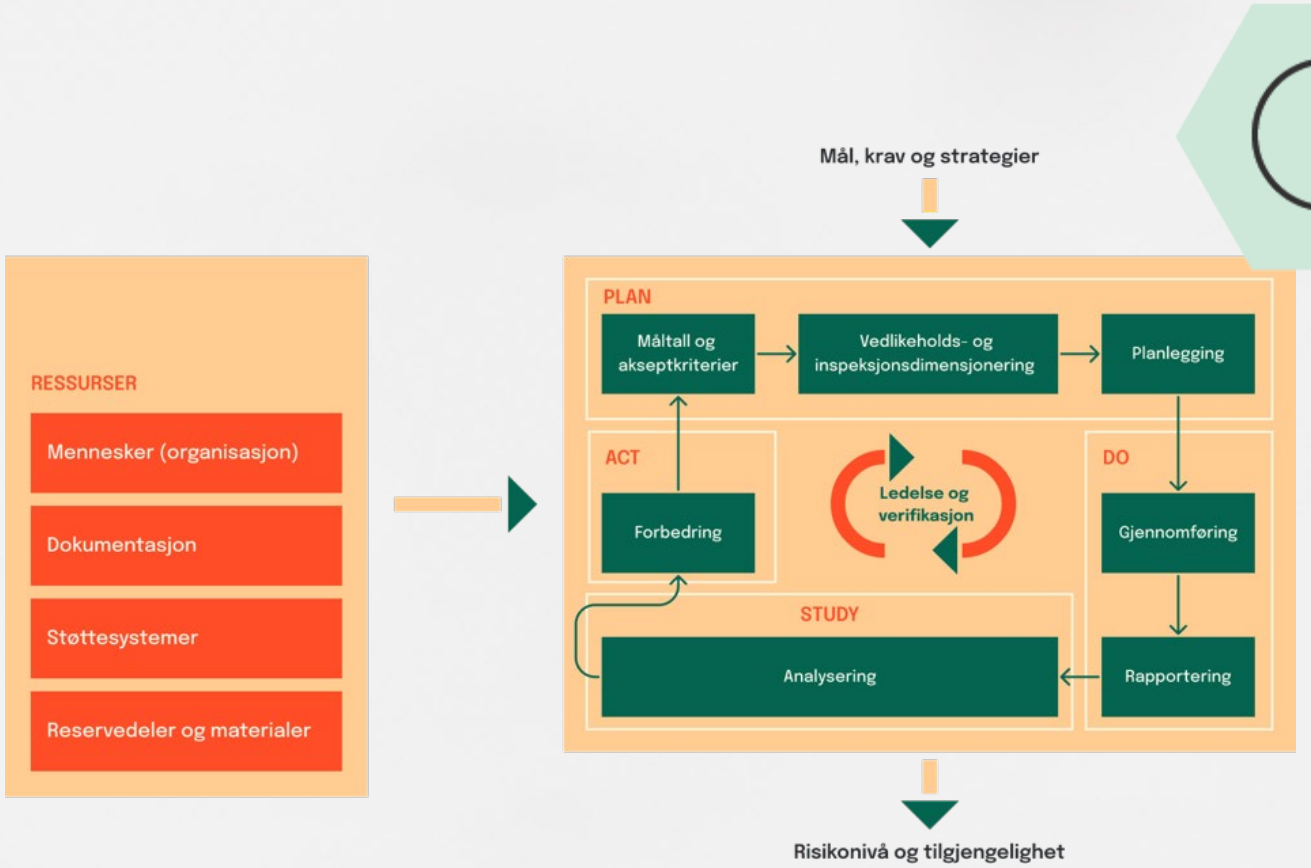
Result: We are in control of «Safety, Avaliability, Reliability and Cost»

RISK MANAGEMENT
RELIABILITY
THE FUTURE
OPTIMIZATION
KNOWLEDGE
MAINTENANCE &
TURNAROUND
MAXIMISE PROFIT
PROBLEM SOLVING
PLANNING

Back to the overview

The Future

- Focus on data quality must increase
- Require access to data and domain specific based models to gain deeper insight into our plants performance to support correct decision making based on real time relevant information, not only experience
- We must move from human processing of information to trust that the Digital Twin ("The Machine") provides the most accurate answers
- Capable and competent people today, Capable and competent people tomorrow!


Mål, krav og strategier
RESSURSER
Mennesker (organisasjon)
Dokumentasjon
Støttesystemer
Reservedeler og materialer
PLAN
Måltall og akseptkriterier
Vedlikeholds- og inspeksjonsdimensjonering
Planlegging
ACT
Forbedring
Ledelse og verifikasjon
DO
Gjennomføring
STUDY
Analysering
Rapportering
Risikonivå og tilgjengelighet

petoro equinor PGNiG vår energi

GASSCO

INEOS OMV CAPE OMEGA wintershall dea TOTAL

RESTRICTED