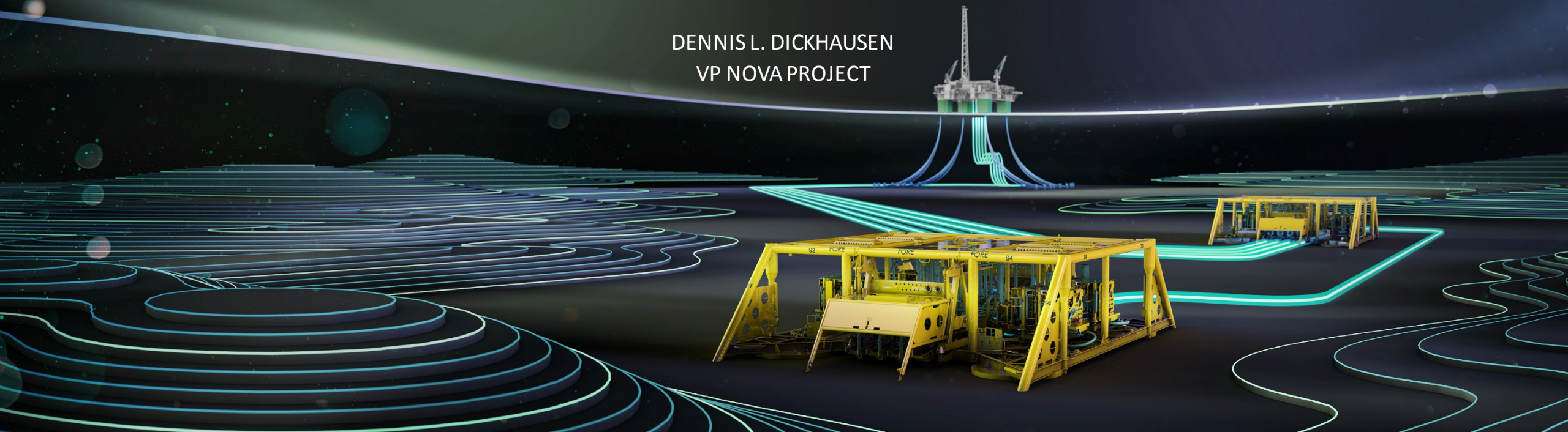


wintershall dea

THE NOVA FIELD DEVELOPMENT

SPE STAVANGER 15.01.2020

DENNIS L. DICKHAUSEN
VP NOVA PROJECT



WINTERSHALL DEA

GROWING PROFITABLY TOGETHER

- Merger completed on May 1, 2019
- Europe's leading independent natural gas and oil company
- Headquarters in Kassel and Hamburg
- More than 120 years of experience as operator and project partner
- Plans to increase average daily production from about 590,000 boe in 2018 to about 750,000 boe by 2023
- Around 4,000 people worldwide from over 60 nations



WINTERSHALL DEA

A STRONG GLOBAL PORTFOLIO

EUROPE

Norway, Germany, Denmark, the Netherlands and the UK

MIDSTREAM

Nord Stream 1 & 2 and German onshore transport subsidiaries

LATIN AMERICA

Argentina, Mexico and Brazil

RUSSIA

Natural gas production linked to Europe with gas pipelines

MENA

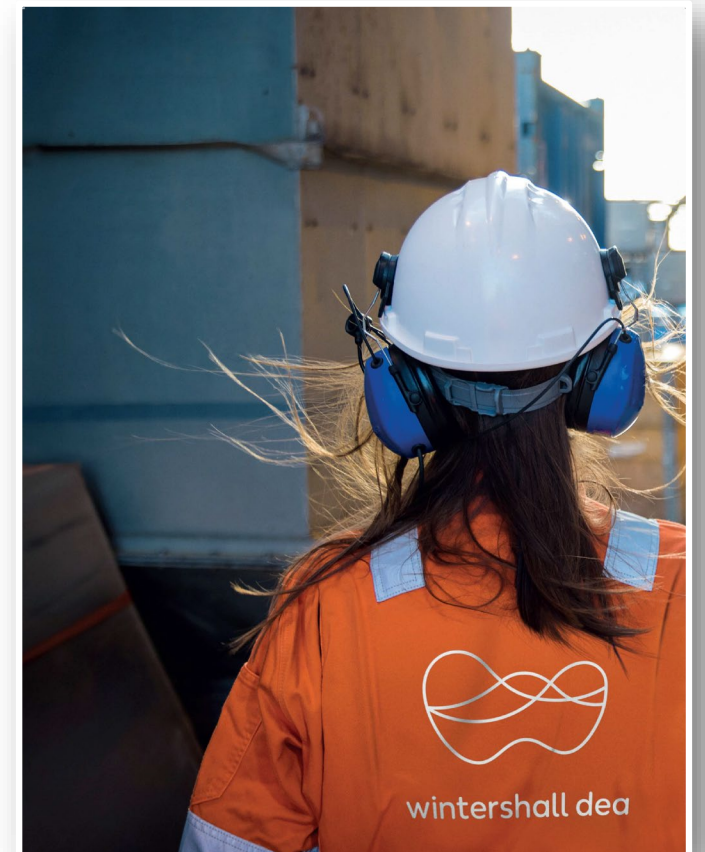
Egypt, Libya, Algeria, Abu Dhabi



NORWAY

WINTERSHALL DEA IN NORWAY

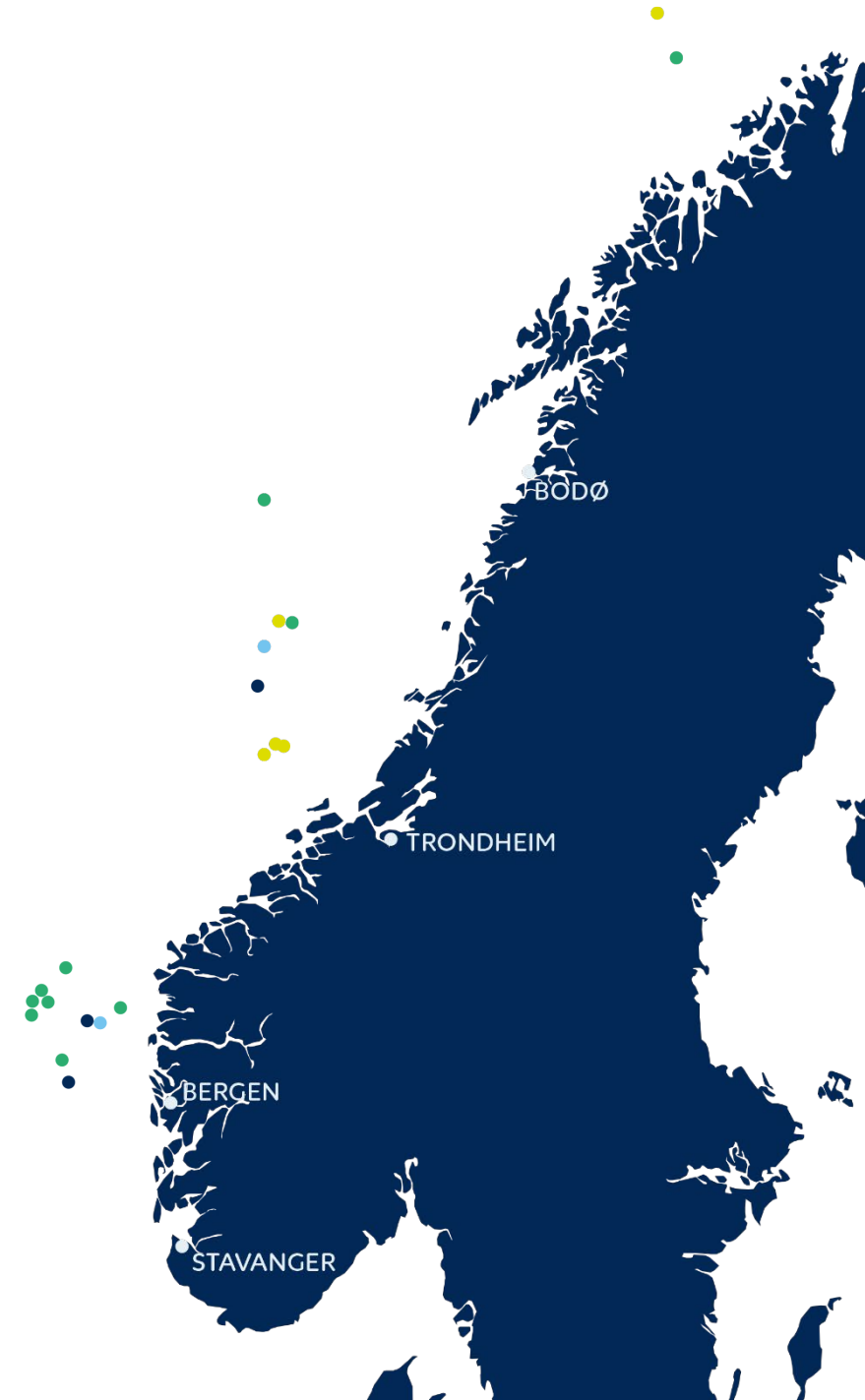
- Among the largest gas and oil companies on the NCS
- Around 500 employees in Stavanger, Bergen and offshore
- Production operatorships: Brage, Vega and Maria
- Development operatorships: Nova, Dvalin
- Partner in Skarv, Aasta Hansteen, Njord, Gjøa, Snorre, Edvard Grieg
- Active in exploration activities
- More than 100 licenses



PRODUCTION AND DEVELOPMENT

DIVERSIFIED PORTFOLIO

-  Operated development
-  Non-operated development
-  Operated production
-  Non-operated production



NORTH SEA

DIVERSIFIED PORTFOLIO



NORWEGIAN SEA

DIVERSIFIED PORTFOLIO

-  Operated development
-  Non-operated development
-  Operated production
-  Non-operated production

Aasta Hansteen

Ærfugl Skarv

Dvalin

Maria

Bauge Hyme

Njord

BODØ

TRONDHEIM

BARENTS SEA

DIVERSIFIED PORTFOLIO

-  Operated development
-  Non-operated development
-  Operated production
-  Non-operated production



Alta

Snøhvit

BODØ

NOVA

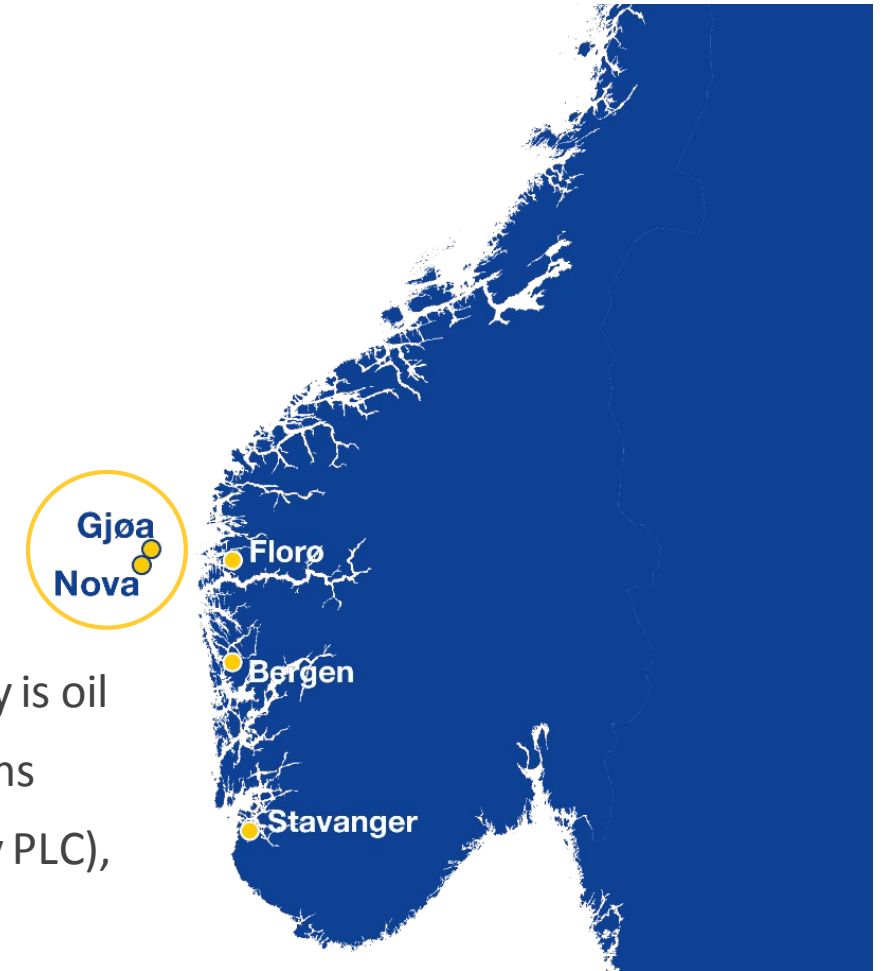
THE NOVA FIELD DEVELOPMENT

INTRODUCTION

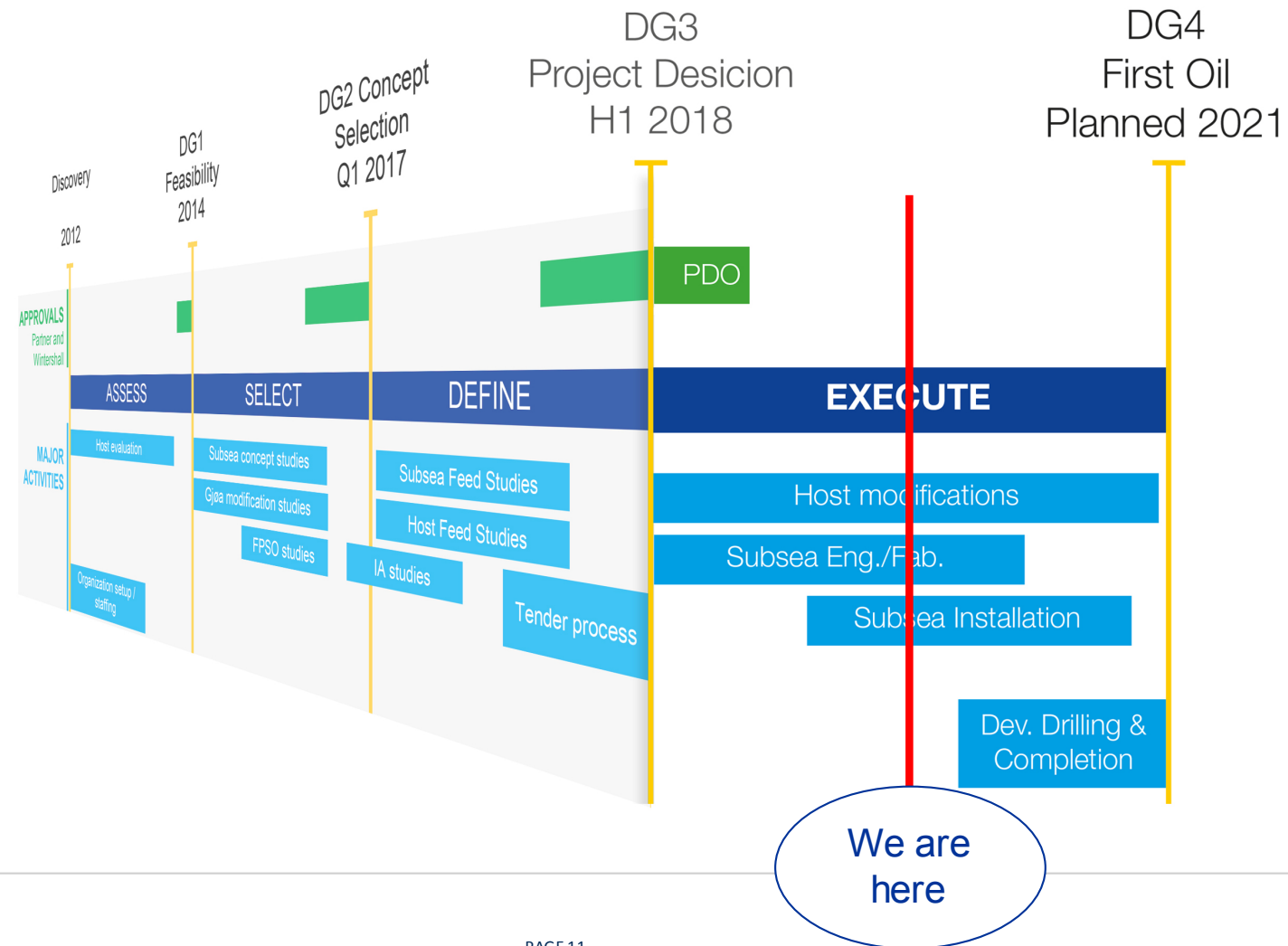
NOVA FIELD DEVELOPMENT

NOVA

- Discovered in **2012**
- Located in the northeastern North Sea, 45 km from shore and 17 km from the Gjøa platform
- Water depth approximately **370 m**
- PDO approved in **2018**
- Planned production start in **2021**
- Recoverable volumes of **80 million** barrels of oil equivalent - majority is oil
- Around **9,900 man-years** of work for project execution and operations
- Partners: Capricorn Norge AS (fully owned subsidiary of Cairn Energy PLC), One Dyas Norway, Spirit Energy Norge AS and Edison Norge AS



NOVA FIELD DEVELOPMENT TIMELINE

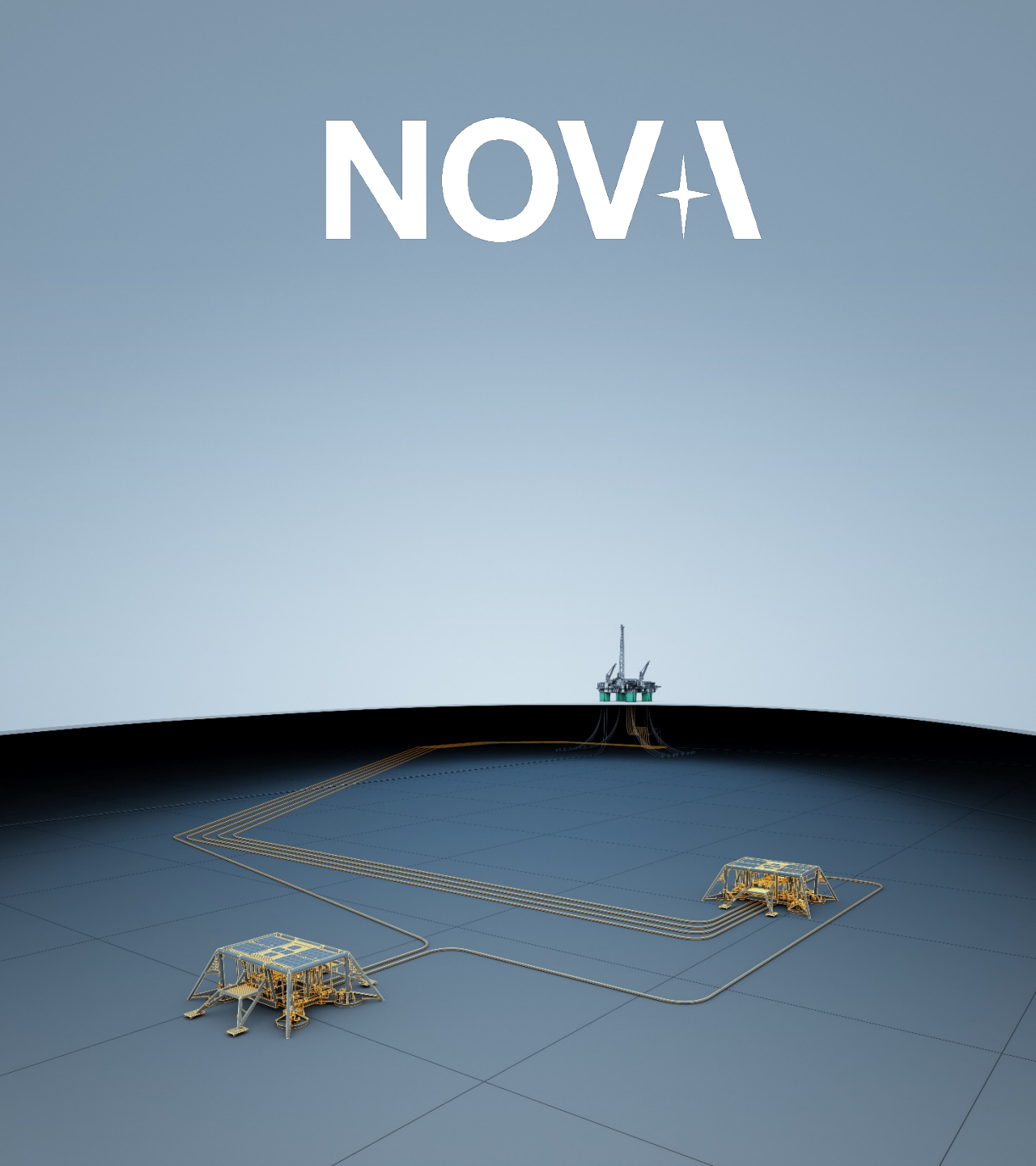


NOVA



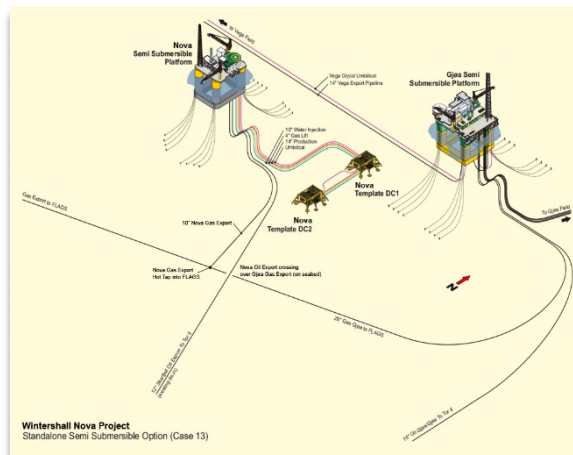
THE NOVA FIELD DEVELOPMENT

CONCEPT SELECTION

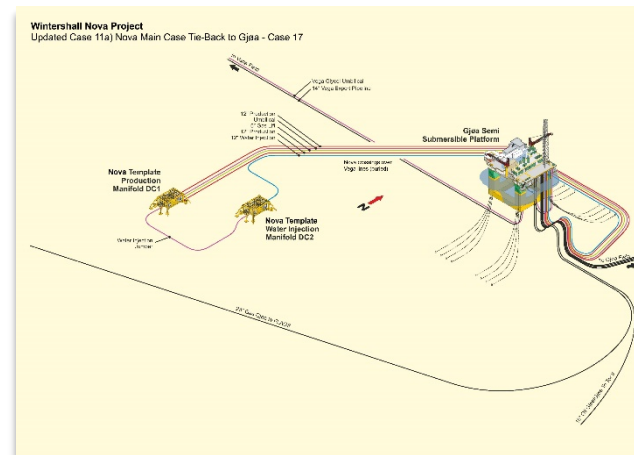


NOVA FIELD DEVELOPMENT

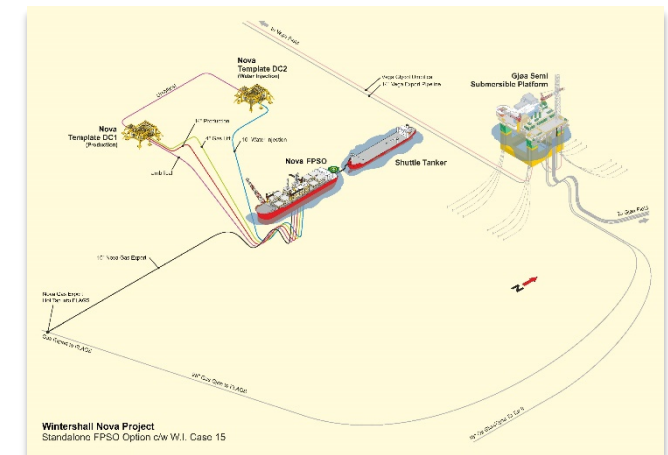
TIE-BACK OR STAND ALONE?



New build semi-sub



Tie-back to Gjøa

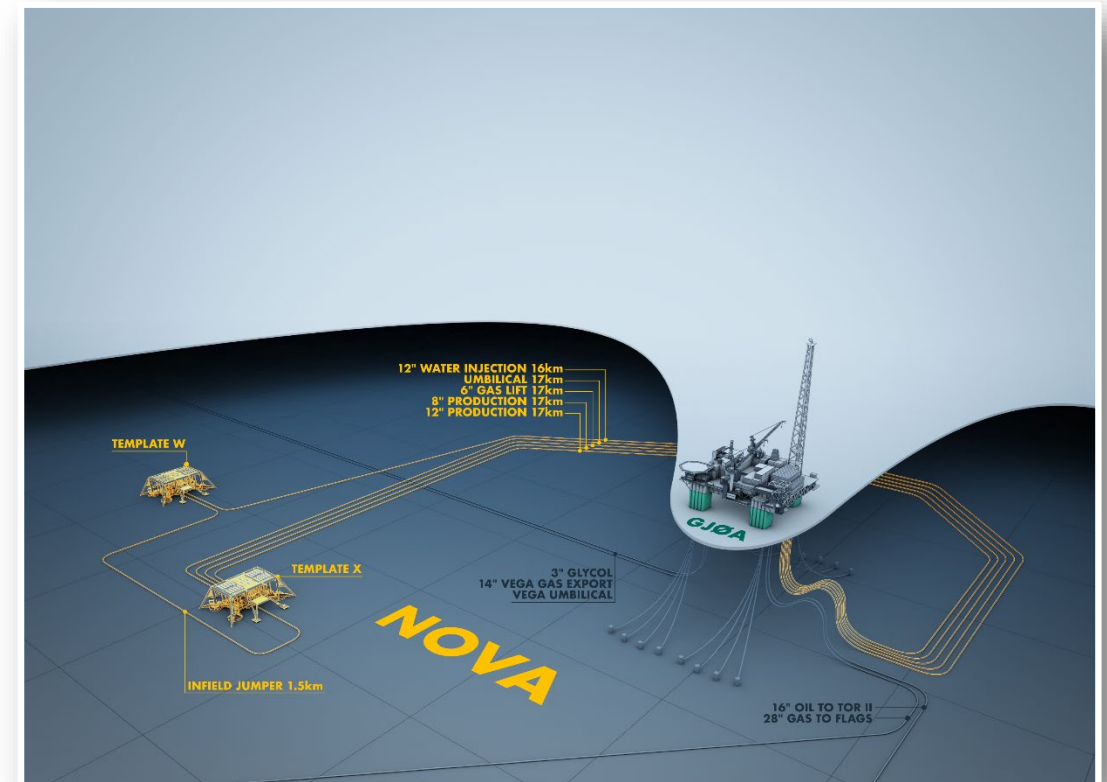


Re-deployed FPSO

NOVA FIELD DEVELOPMENT

SELECTED CONCEPT: SUBSEA TIE-BACK TO GJØA

- Two 4-slot templates, one dedicated for production wells and one for water injection wells
- 12" and 8" insulated production pipelines
- 12" water injection pipeline
- 6" gas lift pipeline
- Integrated service umbilical
- Distance between templates 1 km, pipelines length ~16 km
- Neptune operated Gjøa host platform for processing, services and export including newbuilt module



NOVA FIELD DEVELOPMENT

OPPORTUNITIES & CHALLENGES

Opportunities

- Contribute to extended lifetime of existing infrastructure
- Power from shore
- Unlocking possibility for future tie-ins of discoveries in the area

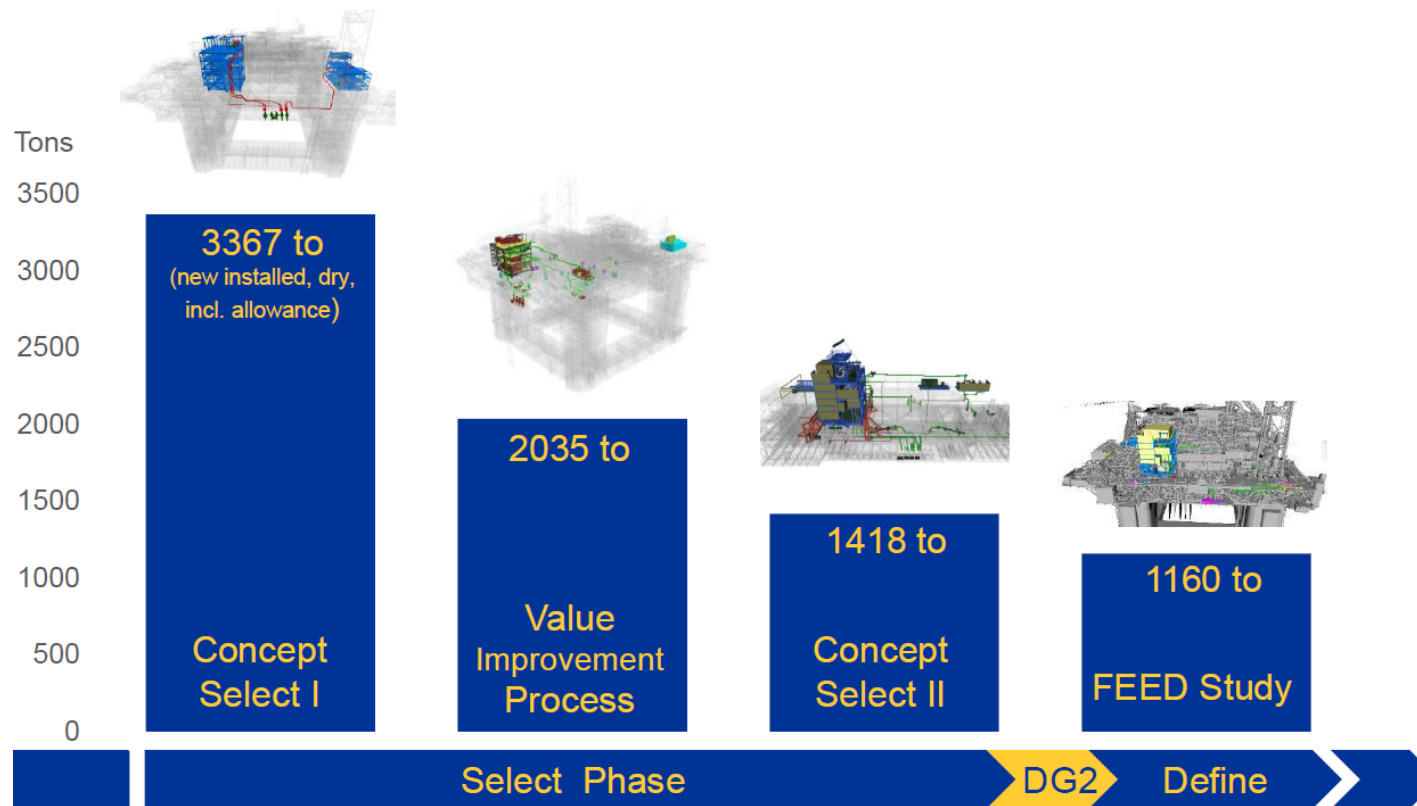
Challenges

- Weight and placement limitations on Gjøa
- No existing water injection facilities on Gjøa
- Cost reduction to make project robust



NOVA FIELD DEVELOPMENT

MAKING THE PROJECT ROBUST - TOPSIDE



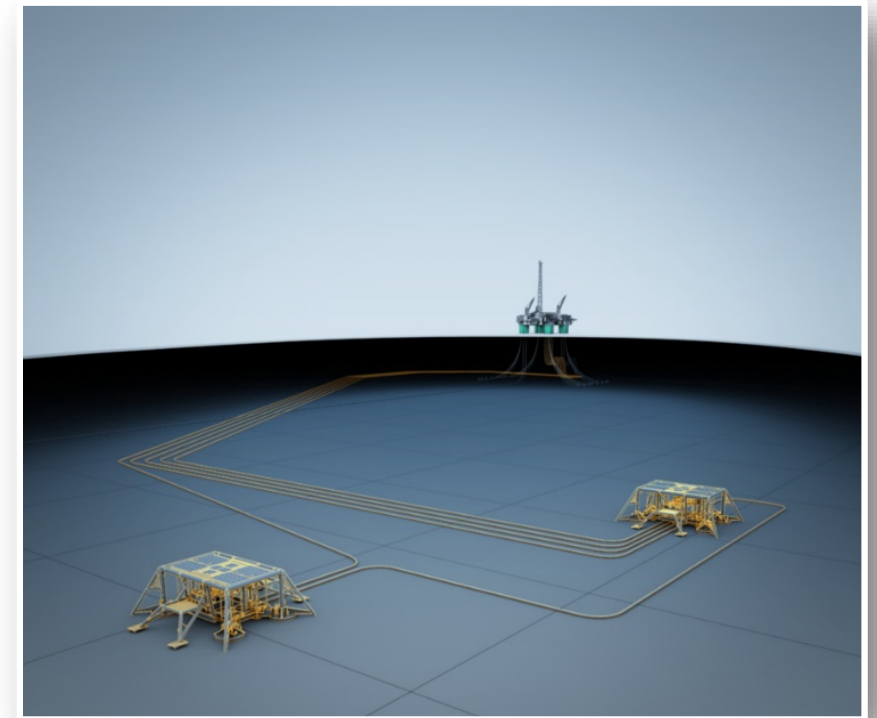
- Significant reduction in:
 - weight
 - man-hours
 - cost
 - footprint
- Alternatives to dedicated Nova separator, sulfate reduction and deaeration units were developed

NOVA FIELD DEVELOPMENT

SUBSEA – SMART VALUE CREATION

- Standardization and “fit for purpose”
- FEED competition leading to high level of maturity for tendering
- Aligned expectation on “lean project execution”
- Strong interaction between SPS and SURF contractors during FEED
- Separate contracts and combined / alliance models considered

Significant reduction of cost from Decision to Continue (BOV) to PDO

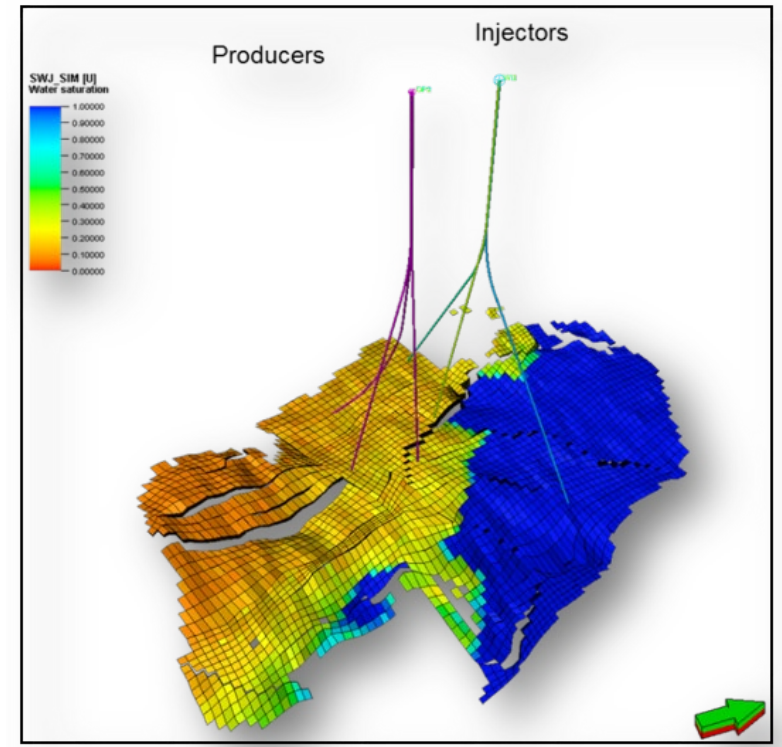


NOVA FIELD DEVELOPMENT

THE RESERVOIR

Reservoir:

- 2,570 metres depth
- High quality reservoir with light oil and gas cap
- Lift gas to enable well flow/start-up as pressure declines and water cut increases
- Water injection for pressure support and optimized reserve recovery





THE NOVA FIELD DEVELOPMENT

PROJECT EXECUTION

NOVA FIELD DEVELOPMENT

ONE TEAM

- Delivering excellent HSE performance together
- Open, supportive and trustful co-operation with authorities, license partners, and suppliers
- Alignment on common goals with a strong emphasis on Health, Safety and the Environment
- Selection of experienced suppliers familiar with projects on the Norwegian Continental Shelf
- Close follow-up of key suppliers on progress and quality



SUPPLIERS' LOCATIONS

NOVA

NOVA



FJORDBASE
FLORØ



SUBSEA 7
VIGRA





AKER
SOLUTIONS
BERGEN



9900
årsverk
66%
norsk innhold



CCB
BERGEN

ROSENBERG
STAVANGER



SUBSEA 7
STAVANGER



NIRAS
BØ



AKER
SOLUTIONS
MOSS

AKER
SOLUTIONS
EGERSUND



AKER
SOLUTIONS
FORNEBU

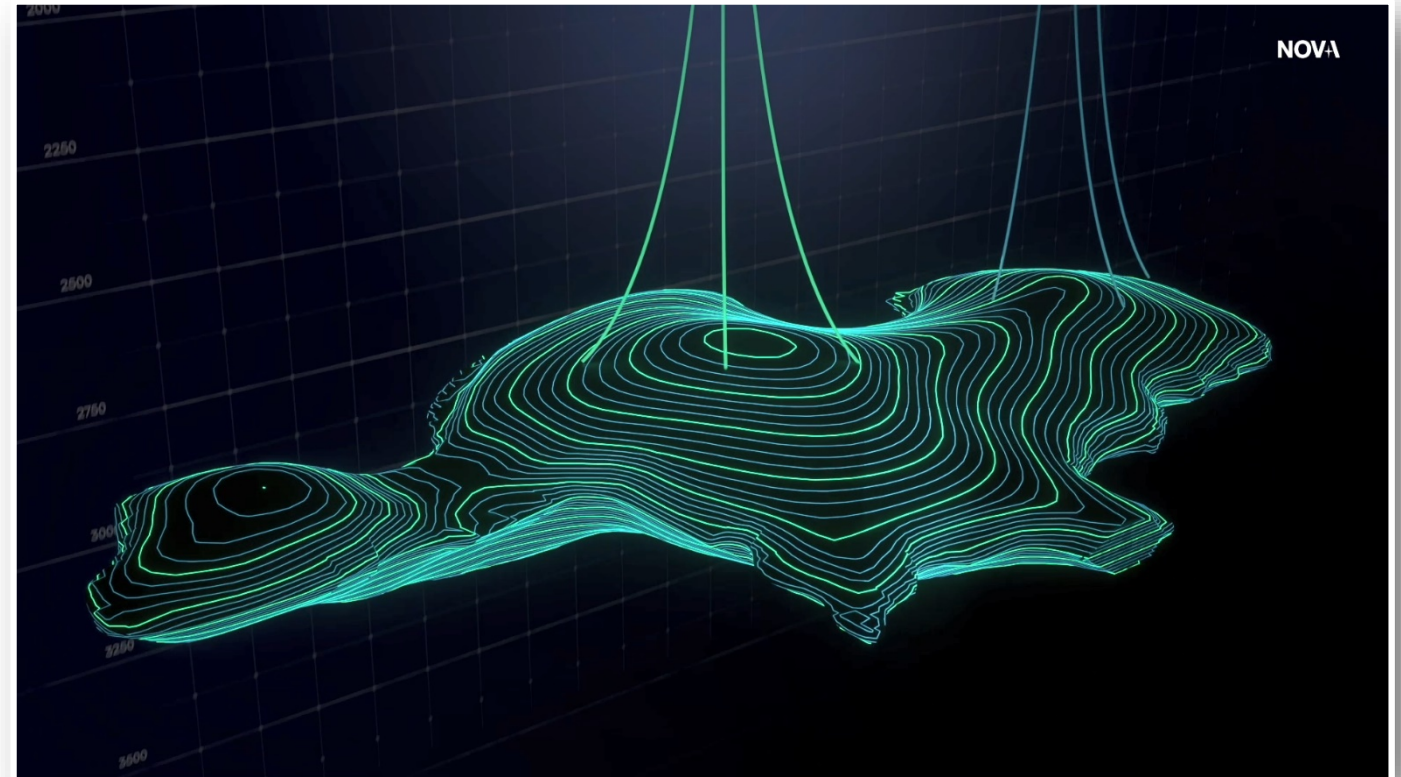


NOVA FIELD DEVELOPMENT

WELL PLANNING

Execution phase work scope:

- Detailed well planning
- Optimise well locations to maximise oil recovery and ensure initial and long-term productivity



NOVA FIELD DEVELOPMENT

SUBSEA COMPONENTS AND INSTALLATION

- Subsea Production System delivery by **Aker Solutions**
- Pipeline system deliveries and subsea installation performed by **Subsea 7**

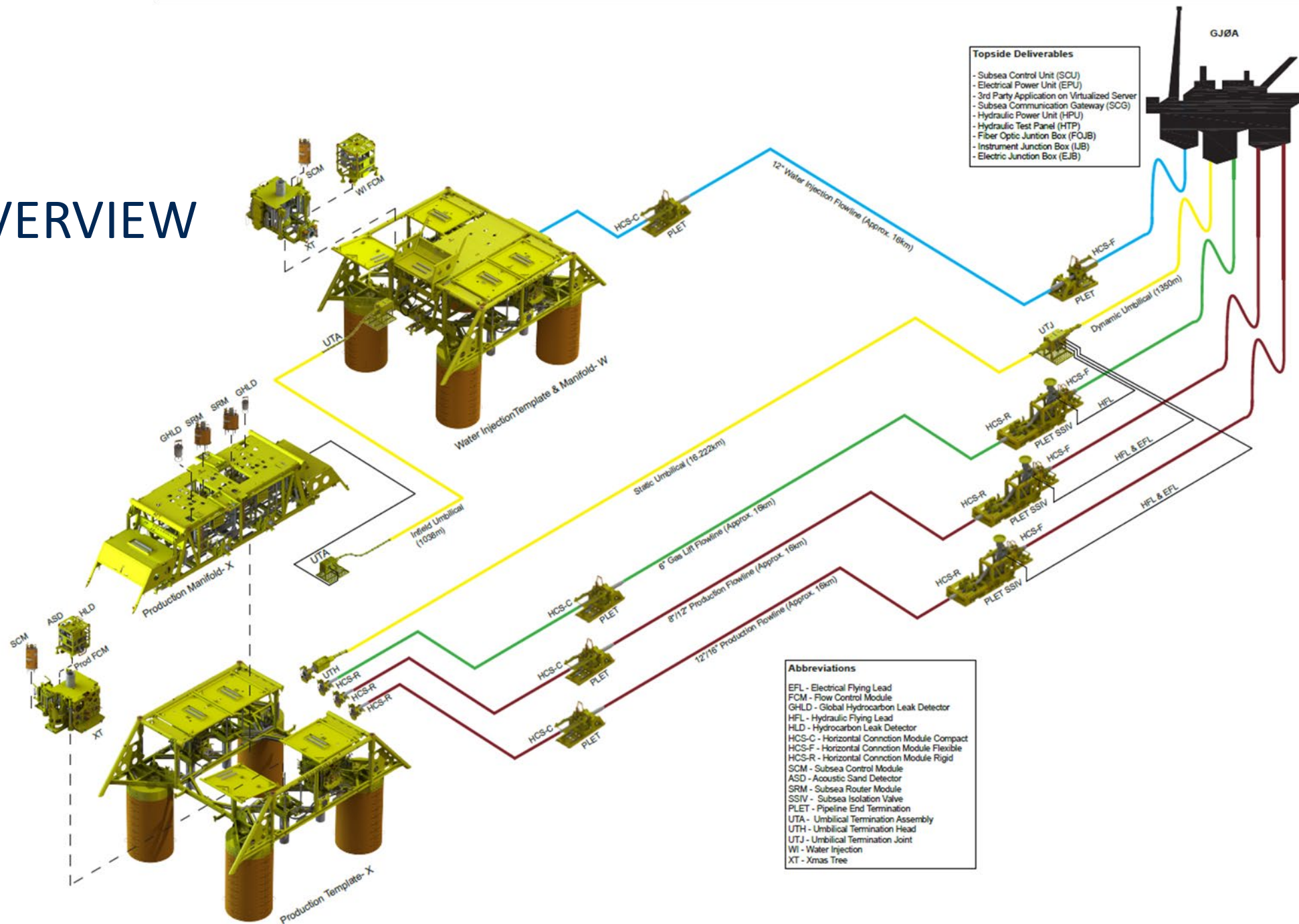
Execution phase work scope:

- Two subsea templates and manifold systems
- Control system and umbilical
- X-mas tree systems
- 65 km of pipelines and flexible risers



NOVA FIELD DEVELOPMENT

SUBSEA OVERVIEW



NOVA FIELD DEVELOPMENT

VIDEO PIPELINE & UMBILICAL INSTALLATION



https://youtu.be/_4kH6MwS9xc
(click on the link to play the video)

NOVA FIELD DEVELOPMENT

TOPSIDE MODULE AND HOST MODIFICATIONS

- Topside project managed by **Neptune Energy**
- Topside module and integration work by **Rosenberg Worley**
- Heavy lift by **Heerema's** Heavy Lift Vessel "**Sleipnir**"

Execution phase work scope:

- Topside module
- Heavy lift
- Hook-up and integration



NOVA FIELD DEVELOPMENT

TOPSIDE MODULE SCOPE

Main equipment:

- Riser balcony for 4 risers and one umbilical
- Production inlet facilities
- Water injection system
- Gas lift system
- Chemical injection facilities
- Local equipment room
- Subsea control
- Integration scope



NOVA FIELD DEVELOPMENT

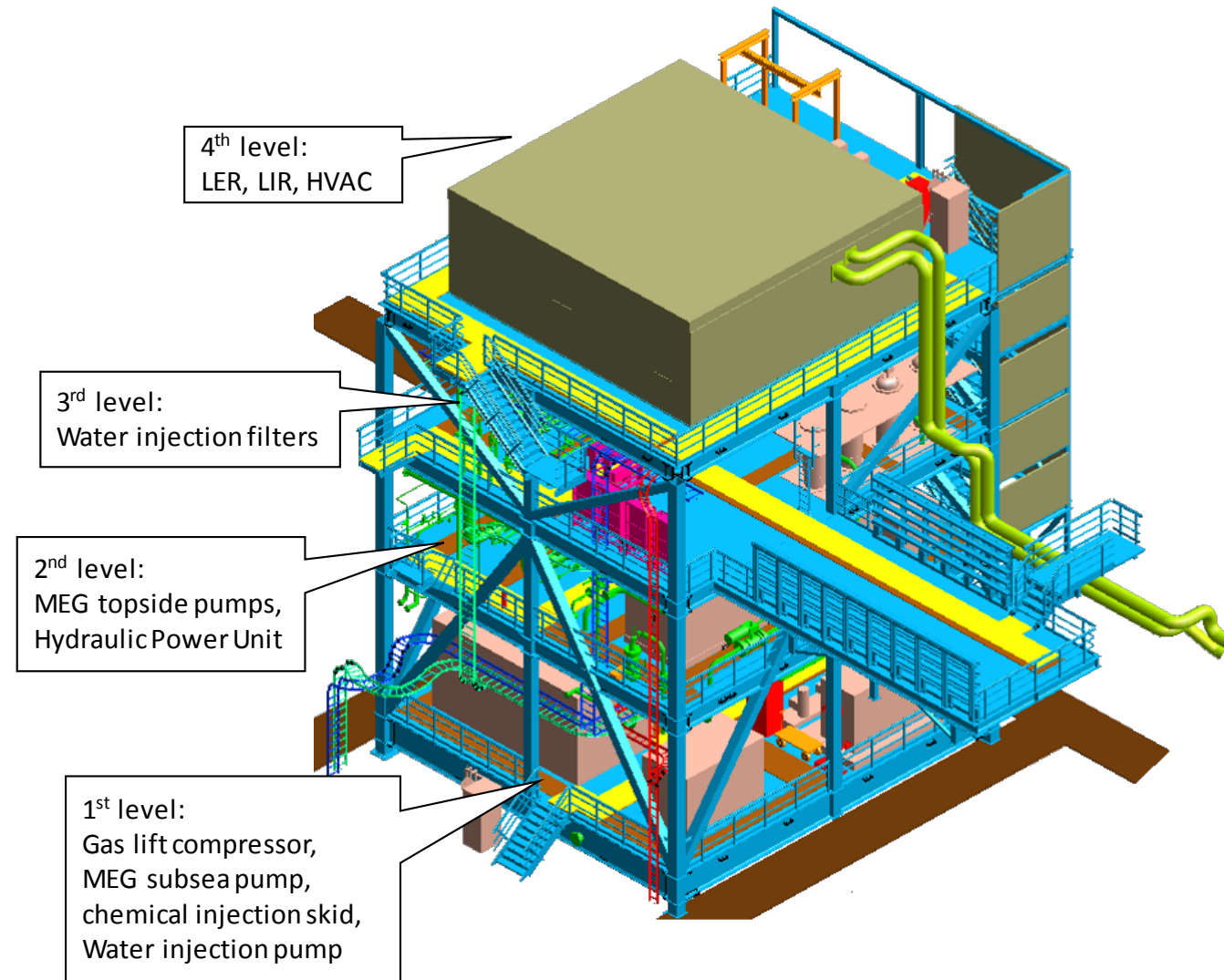
TOPSIDE MODULE

- Sizes: length 18m, width 13m, height 21m
- Total lifting weight: 750 tonnes



Main milestones:

- Module Ready for sail-away April 2020
- Heavy lift operation May 2020
- Hook up of module during shutdown July/August 2020
- Ready for start-up September 2021



NOVA FIELD DEVELOPMENT

DRILLING OPERATIONS

- West Mira drilling rig from **Seadrill**
- On long term contract for Wintershall Dea in November 2019 to drill minimum 10 wells
- Start drilling Nova wells in 2020
- Drill and complete three production wells and three water injection wells



NOVA FIELD DEVELOPMENT

WEST MIRA DRILLING RIG

- Newly built, sixth generation semi-submersible rig
- High capacity rig designed for all weather conditions and well operations
- Wintershall Dea requested the rig was equipped with new technology to minimize diesel consumption and emissions
- Rig upgraded to one of the most environmentally friendly and technologically advanced drilling rigs in the North Sea



NOVA FIELD DEVELOPMENT

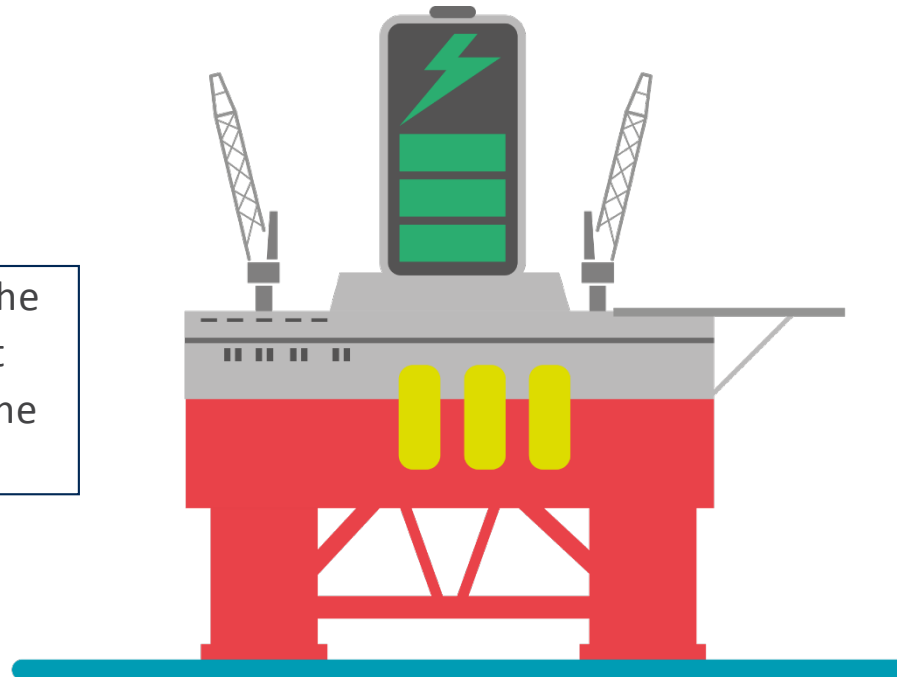
WEST MIRA – GREENER OPERATIONS

HYBRID BATTERY SOLUTION
FOR RIG

HYBRID BATTERY SOLUTION
FOR SUPPLY VESSELS

DOPELESS CASING

One of the
greenest
rigs on the
NCS



- Annual reductions
 - 42% running of diesel engines
 - 12% fuel
 - 15% CO₂
 - 12% NO_x
- Annual savings
 - ~ 18 mill NOK fuel cost
 - ~2.5 mill NOK NO_x tax

NOVA FIELD DEVELOPMENT

WEST MIRA - DIGITALISATION INITIATIVES



AUTOMATED DRILLING
SEQUENCES



DIGITAL TWIN – WELL
PROTECTION



WELL PROTECTION SQUAD



WIRED DRILLPIPE



QUICK REPORT



DATA LAKE

One of the most
advanced rigs in
North Sea

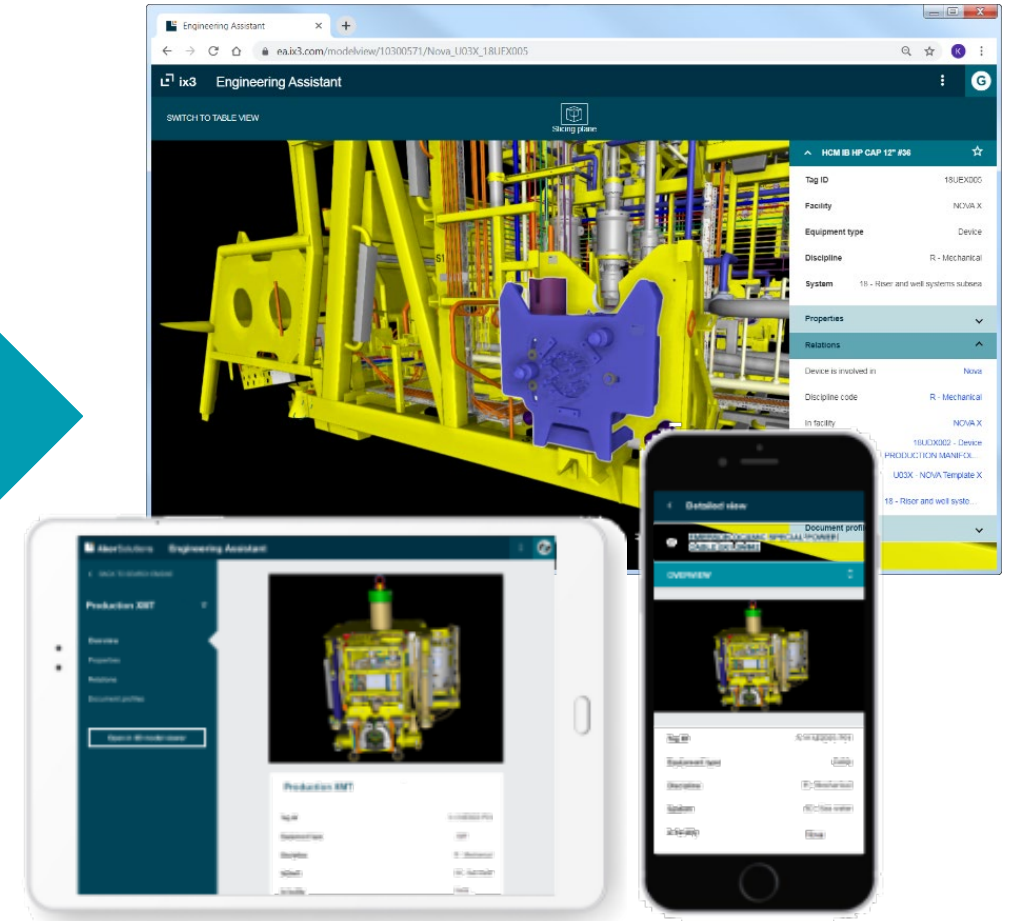


NOVA FIELD DEVELOPMENT

DIGITAL HANDBOOK



From traditional paper-based handbooks and equipment documentation



Fully interactive digital replica of the subsea production system
Relevant engineering data in a single, interactive and searchable solution
Easy access on all platforms to vital and up to date information

NOVA FIELD DEVELOPMENT

SMART DEVELOPMENT - SUMMARY

- Thorough concept selection phase to make project robust
- Experienced suppliers for construction, installation and drilling
- Utilizing existing infrastructure
- New technology for greener and more efficient operations
- **One Team** with license partners, host operator, suppliers







wintershall dea

NOVA