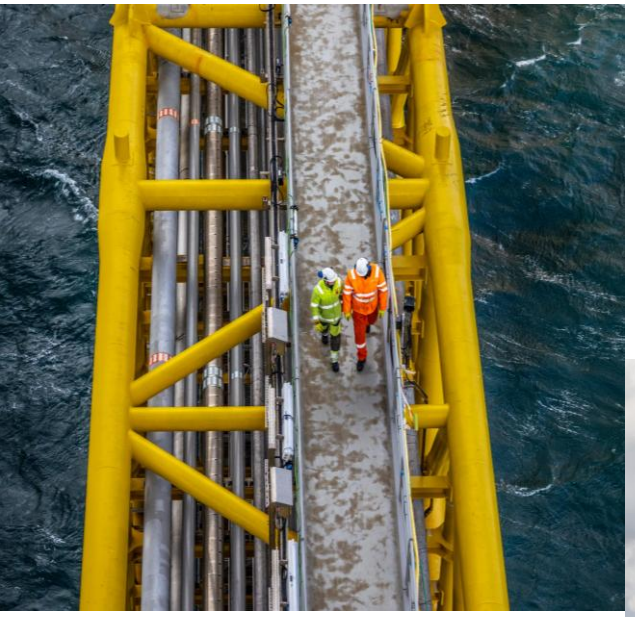
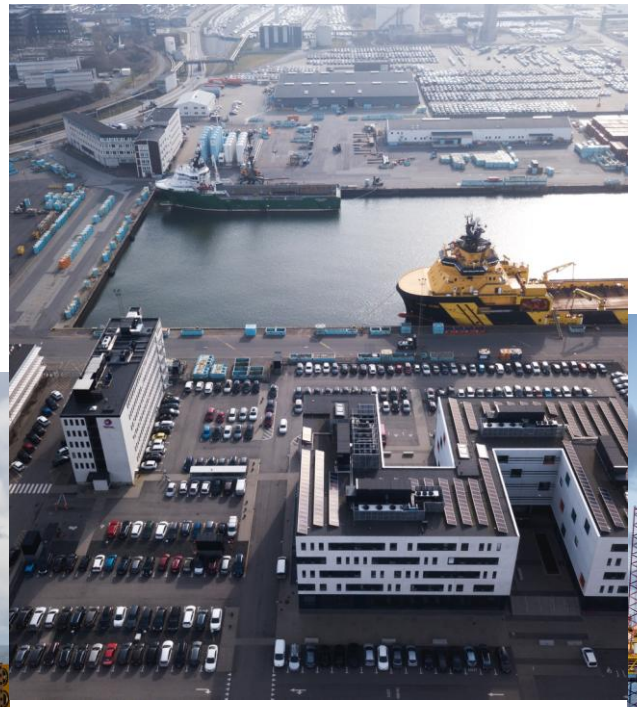




TotalEnergies EP Denmark

25 March 2026

Harald East Middle Jurassic - From Prospect to Production

Today’s agenda

HEMJ prospect evolution from inception to drilling and production

Niels Hauberg Schødt
Team Lead Southern Fields Reservoir Management, TEPDK

Drilling of HEMJ

René Pedersen
Decommissioning Manager, TEPDK

Q&A

TotalEnergies

HEMJ prospect evolution from inception to drilling and production

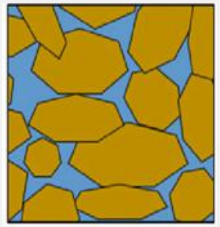
Niels Hauberg Schødt
Team Lead Southern Fields Reservoir Management TEPDK

Fundamentals of oil and gas accumulations

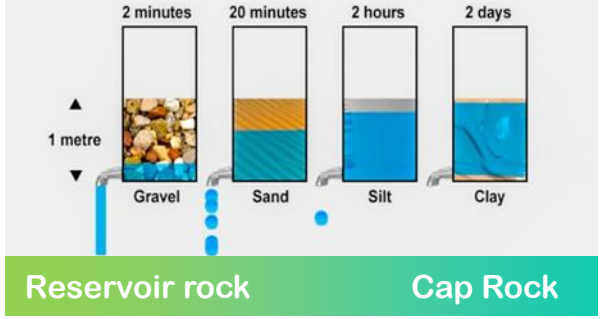
Be economic: (1) big enough to be discovered (in the exploration phase) or later
(2) big enough to be readied for production (in the development phase)

Key parameters of Sedimentary Rocks:

Porosity



Permeability

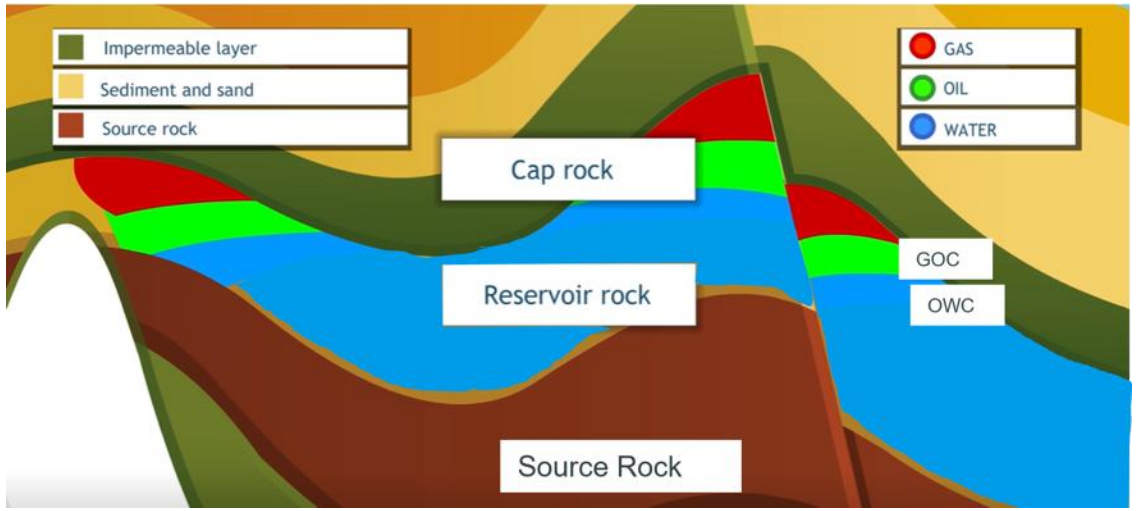


For Oil & Gas to accumulate in the subsurface 3 rock types need to be present. The third rock type is the Source Rock.

Also, these rock types need to be laid down in the right sequence, **and then undergo some structuration to form a Trap**

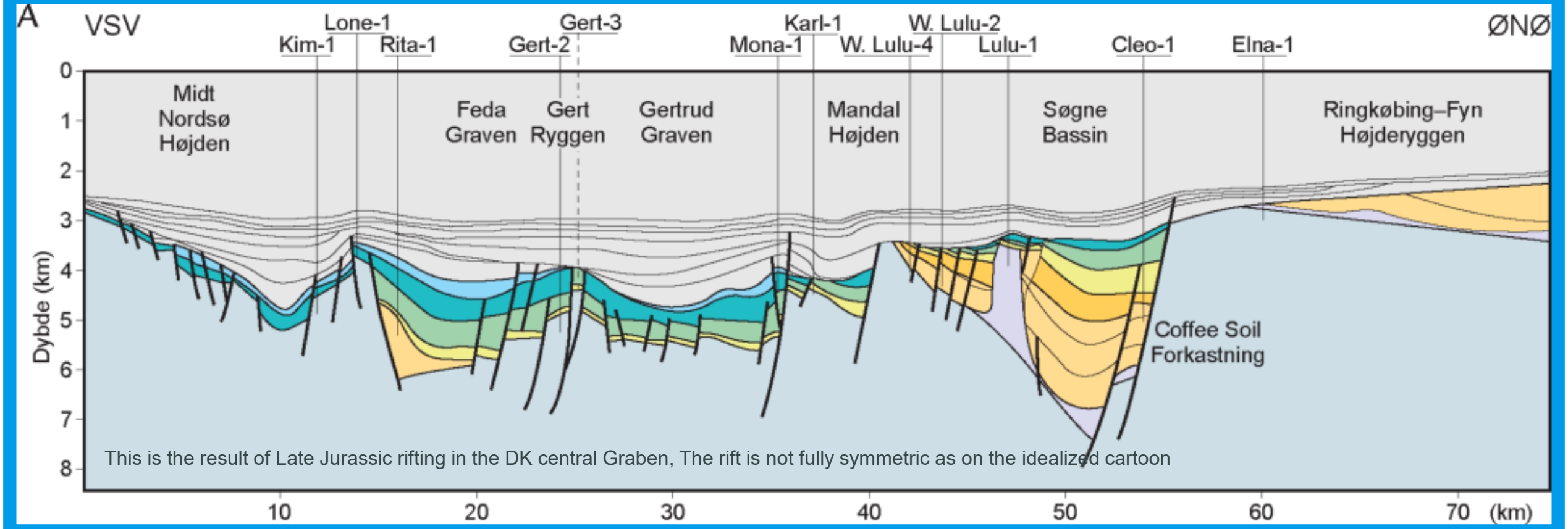
1) Sealing (Cap) rocks are impermeable and with low porosity
2) Reservoir rocks are both permeable and porous
3) Source rocks are organic-rich, and need to be buried deep enough to expel hydrocarbons (HC)

The size of the prize?
Size of the reservoir container and the vertical position of the contacts are the main drivers

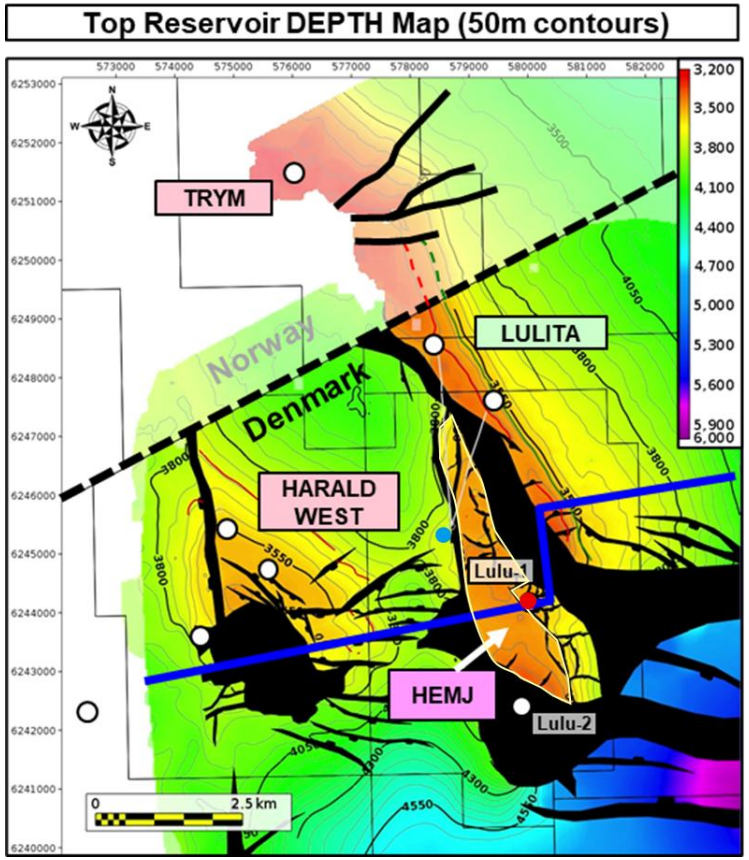


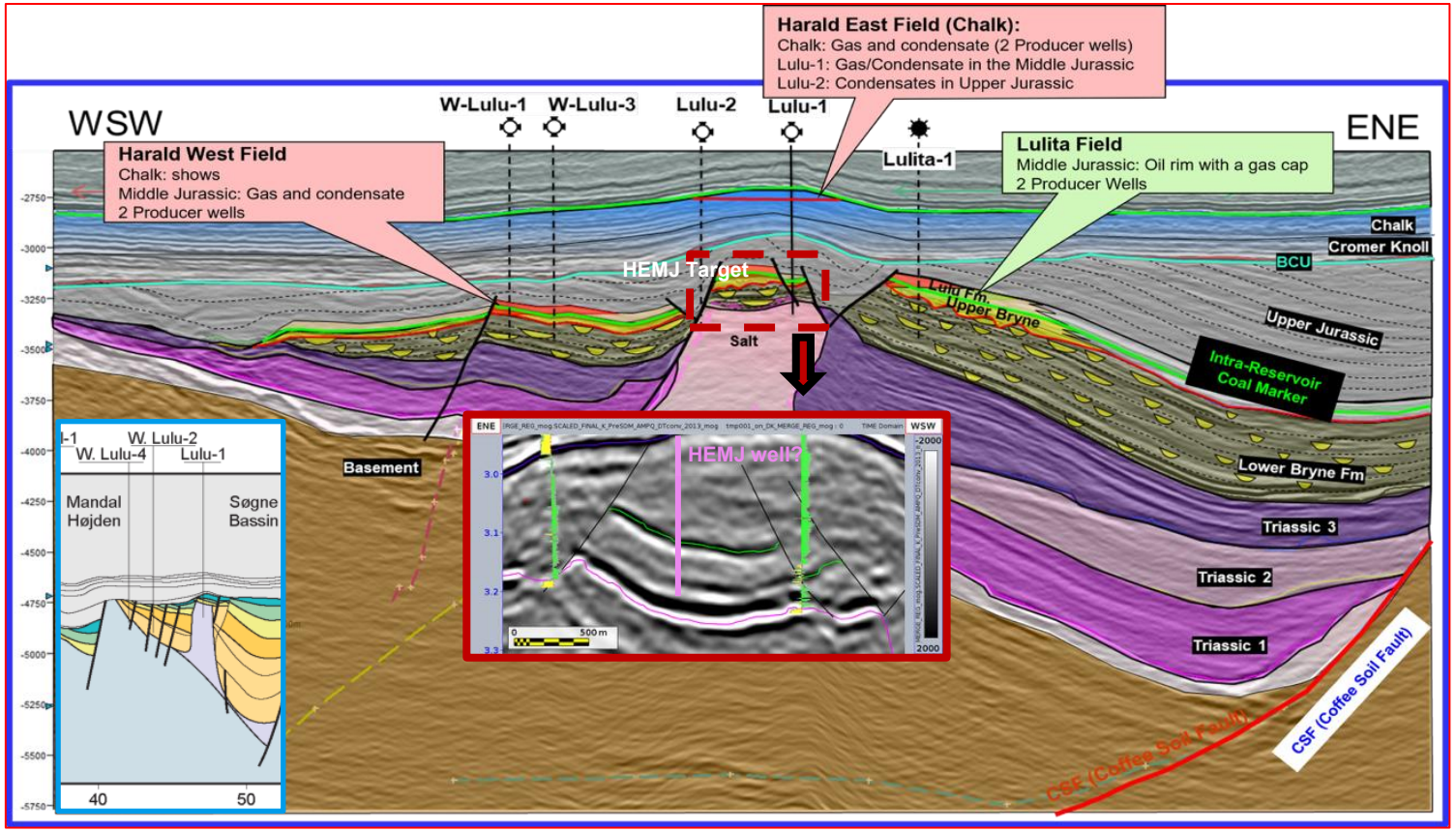
Geological introduction – From Plate Tectonics to Oil in the North Sea

- The Crust, the outer layer of the Earth, consists of large plates, that move in relation to each other.
- There are two types – continental plates and thinner oceanic plates.
- The plates ”float” on a soft, partially molten layer of the Mantle.
- The plate movements are caused by thermal currents in the Mantle.
- Plate Movements are of the order of 2-15 cm/year ~ 0.2 mm a day: slow but 75 km in a million years



Harald Area: E&P history and pre-drill prospect overview





The results from Lulu-1 have significantly influenced our evaluation of the HEMJ Prospect.
The decision on whether to drill HEMJ has been a topic of debate since 2000.

Evaluation history until decisive 2021 version

Since the first evaluations around 2005, the inconclusive results from Lulu-1 have caused HEMJ to shift between Exploration and Development stages.

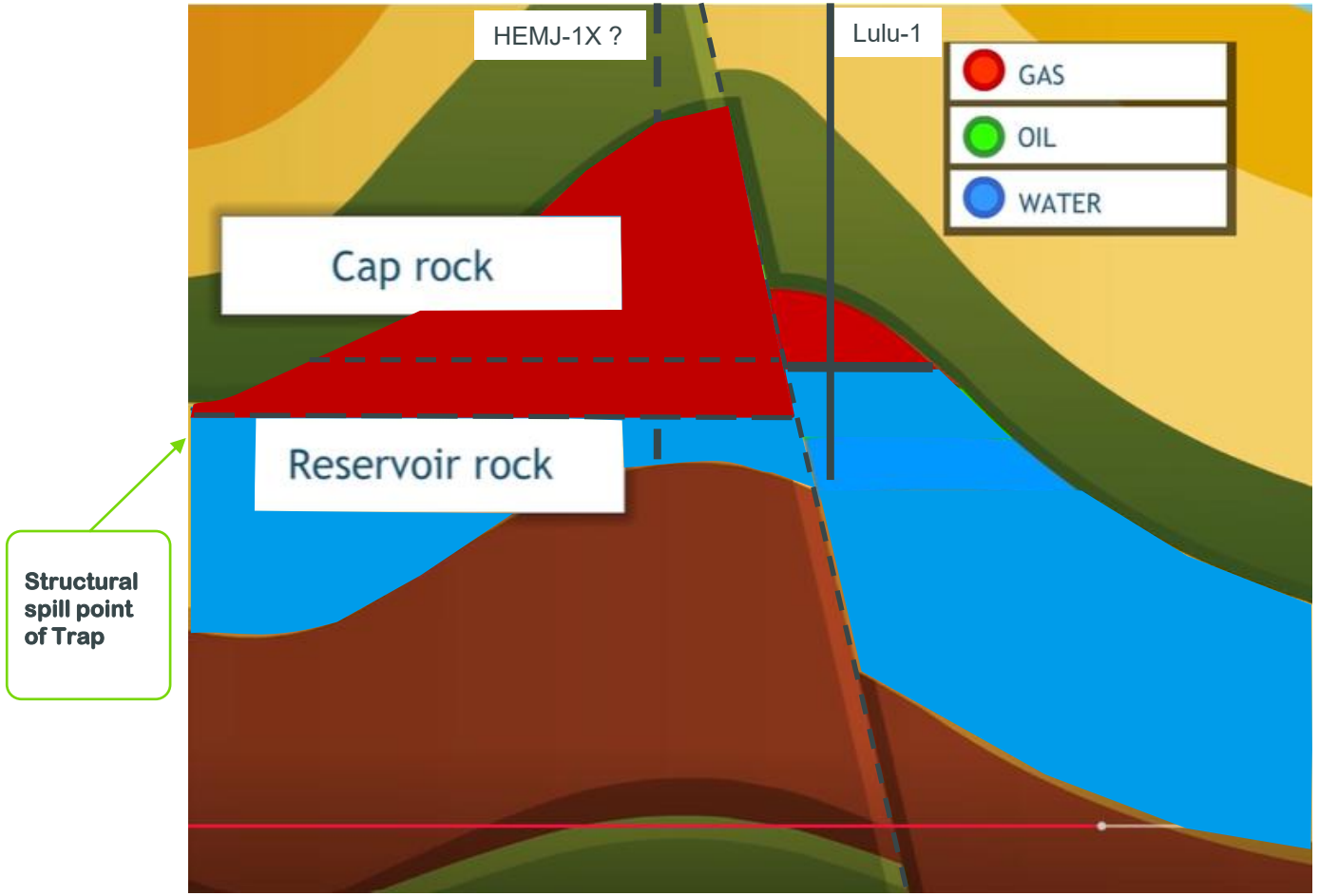
1. If we trust the Lulu-1 contact, we can move to Development and calculate volumes with little uncertainty.
2. If we don't fully trust the Lulu-1 contact, we need more information and remain in Exploration with two outcomes:

a) Uncertainty about the contact and volumes.

b) Risk of not finding any hydrocarbons (HCs) at all.

In 2021, we finalized the evaluation with HEMJ-1X in the Exploration Portfolio:

- The contact was pushed to the structural spill for the high case.
- The mid-case contact was at the Lulu-1 contact level
- The risk of not finding hydrocarbons was assessed to be 30%.



2024 well results

Well data collection

- Cuttings: Rock chips from the well
- Mud gas data
- Measurements (**Logs**) from sensors while drilling
- No Drill Stem Test (Production test)

- The Gas-Water Contact (GWS) was found close to the expected depth, a little shallower than Lulu-1

- Hydrocarbons are **gas condensate**
    - Logs indicated a possible **oil rim**, but this is not supported by production data

- Reservoir quality is better than expected when compared to data from nearby wells (Harald West, Lulu and Lulita)

Drilling the HEMJ Well

Pushing the Limits of Drilling in Denmark

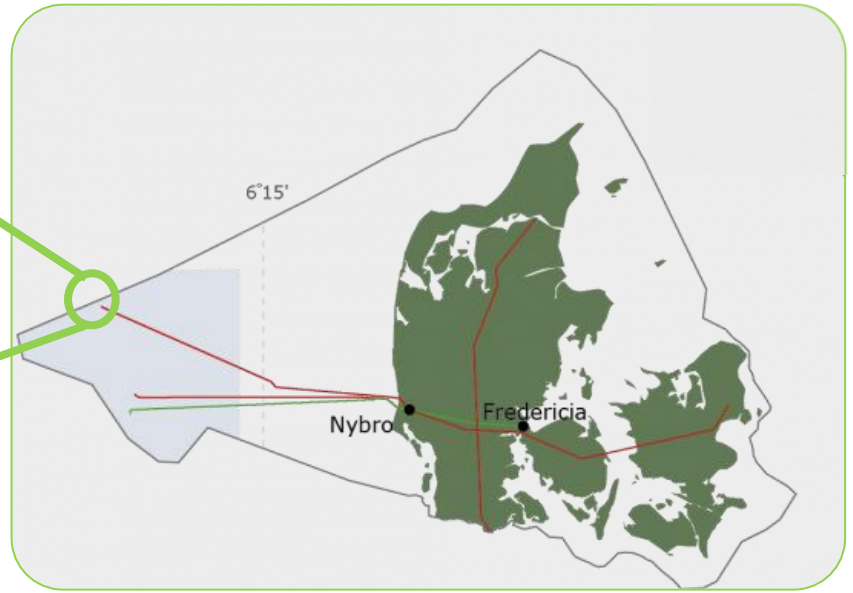
René Siggaard Pedersen
Decommissioning Manager, TEPDK

Harald Platform – Operating Context

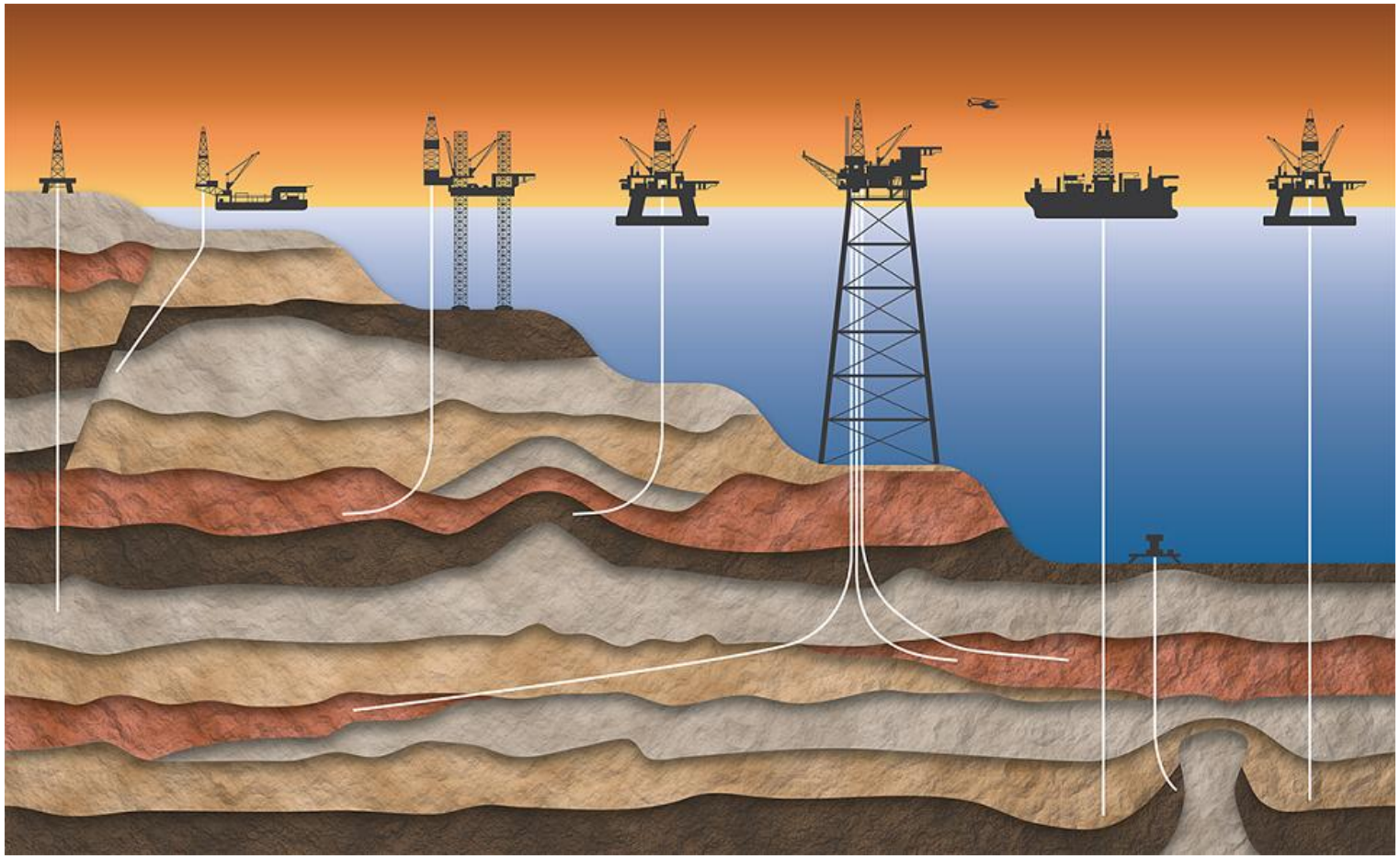
- Danish Sector – border to Norway
- Installed: 1997
- Water depth: 65 m
- Distance to shore: 250 km
- Wells: 7
- Typical POB: 16

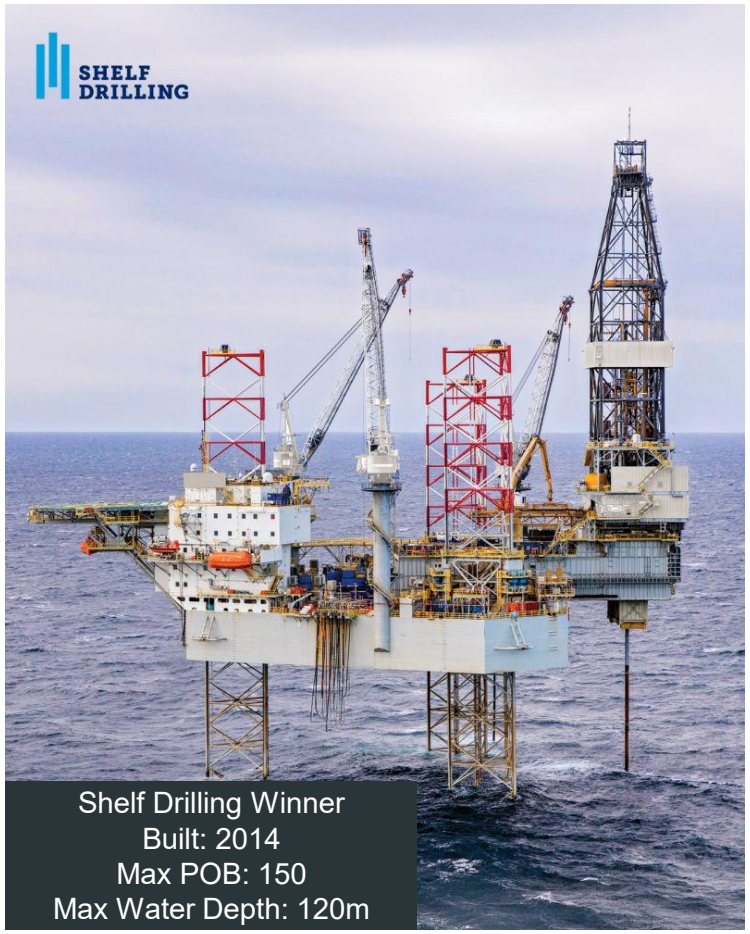
Key implications for HEMJ drilling

- Drilled from a mature, congested platform
- Tight slot availability below the jacket
- Interaction with depleted Chalk reservoir
- No option for new surface location

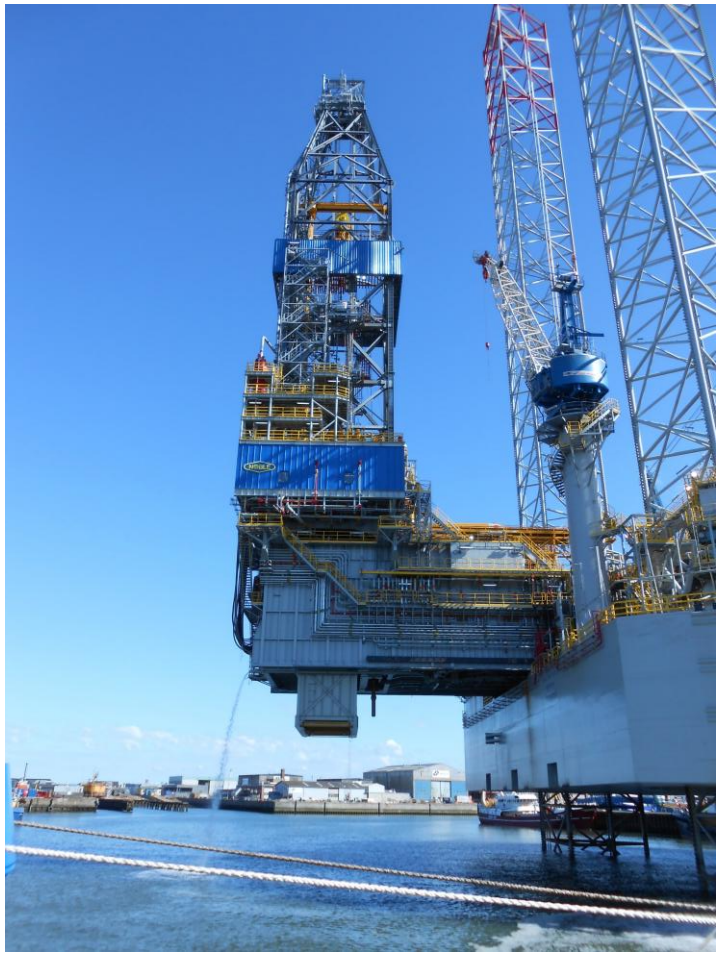


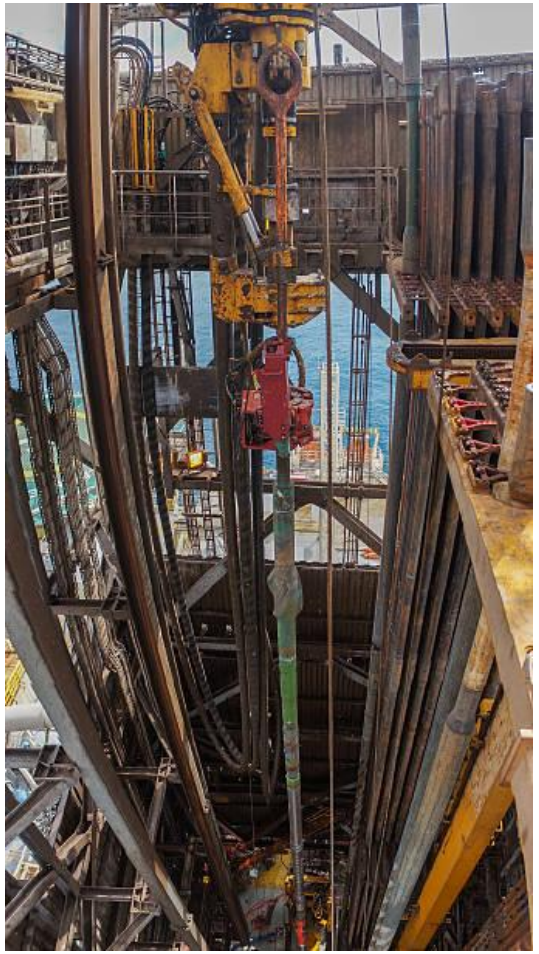
The Rig – Fit for a High-Complexity Well



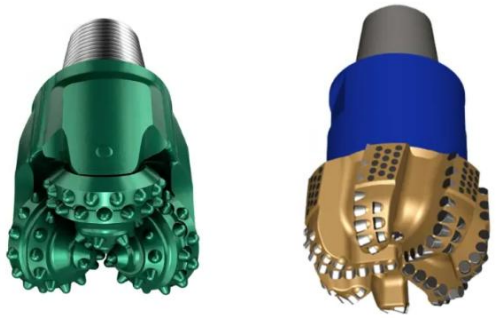


Drill String – Steering and Precision

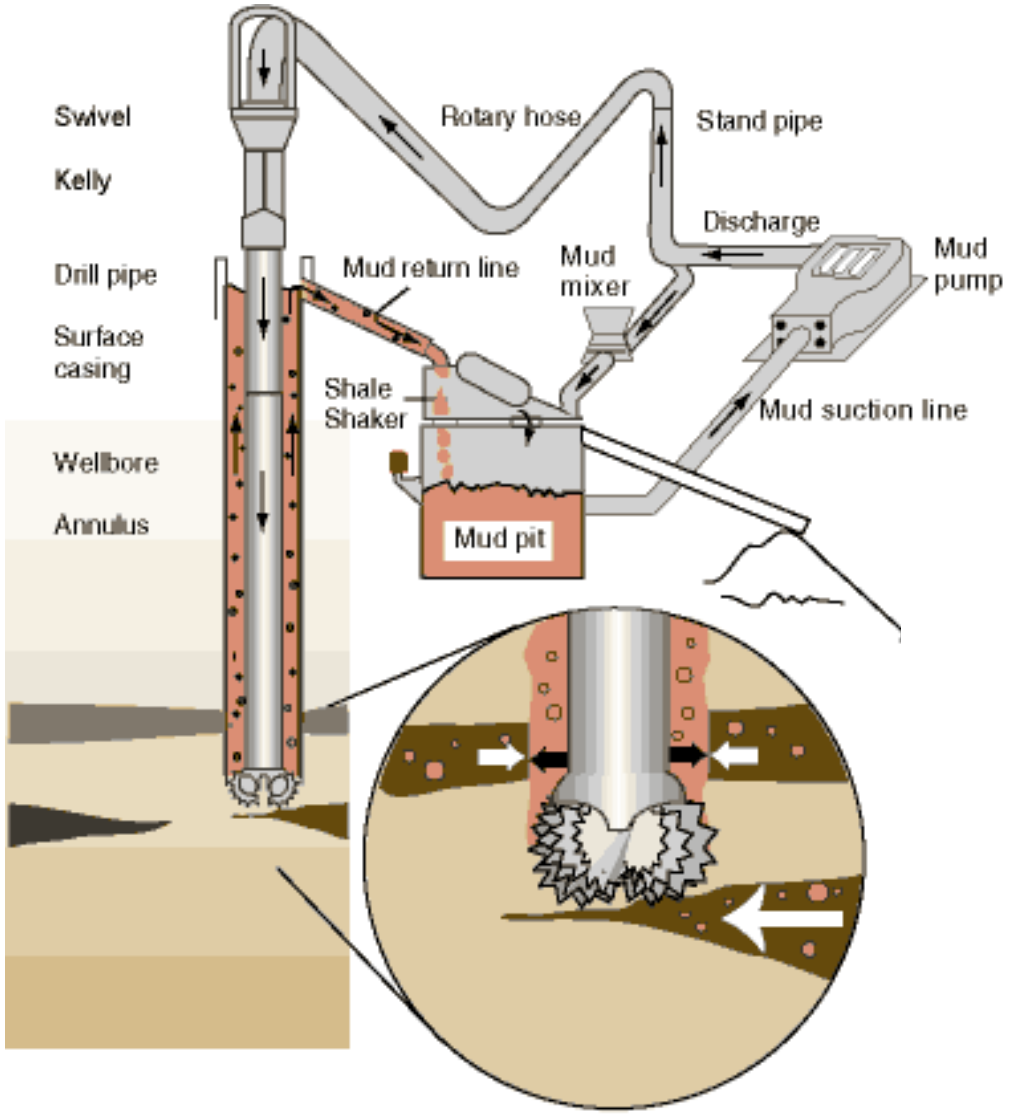




Directional drilling and rotary steerable systems were critical to hit the HEMJ target while avoiding existing wells and depleted areas.

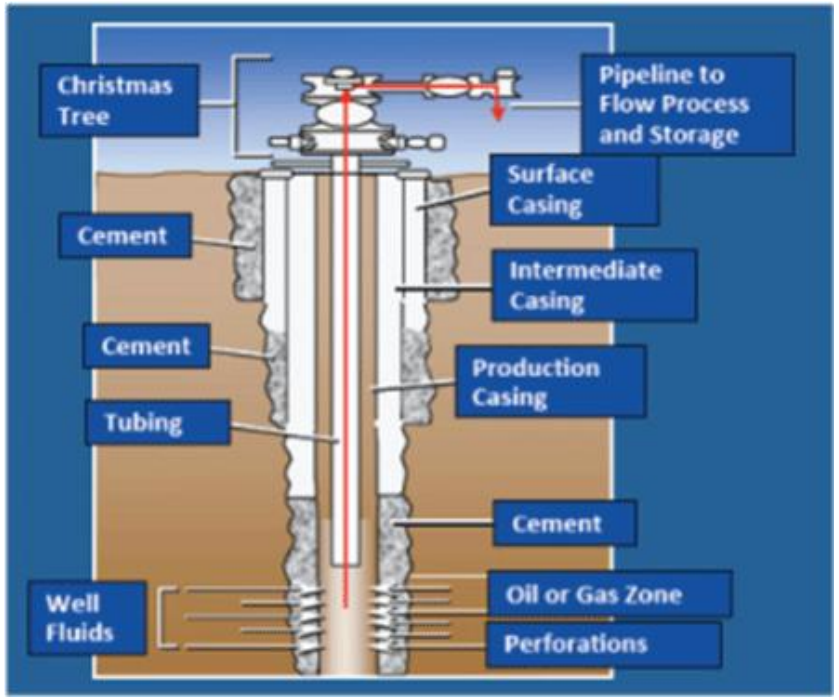


Drilling Fluids – Managing Stability and Pressure



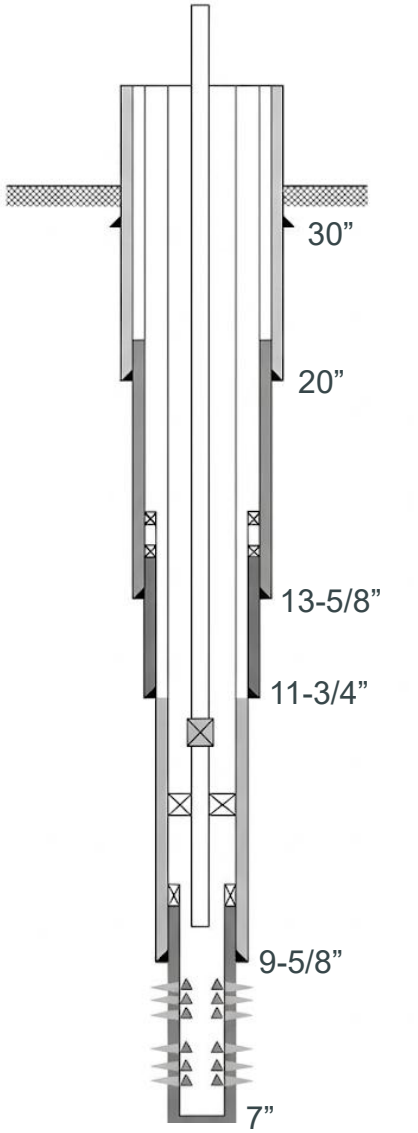
- Tailored fluid system required to drill depleted Chalk
- Balanced stability, pressure control, and tool performance

Casing and Cement – Building the Well Barrier System

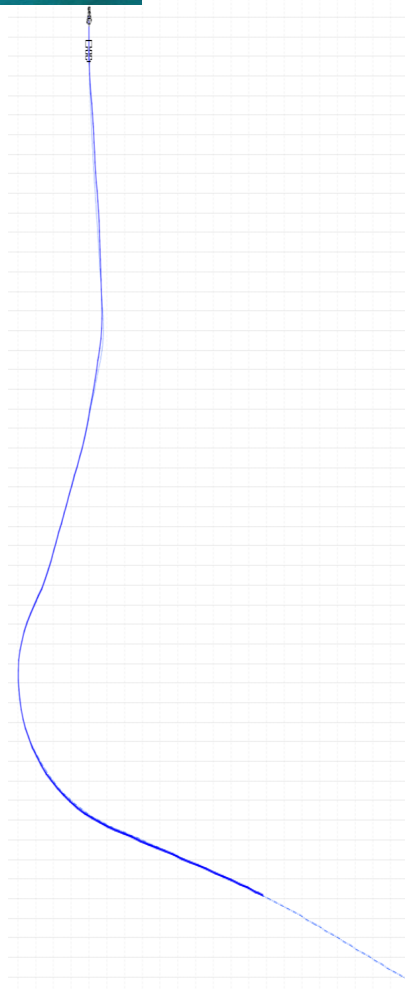


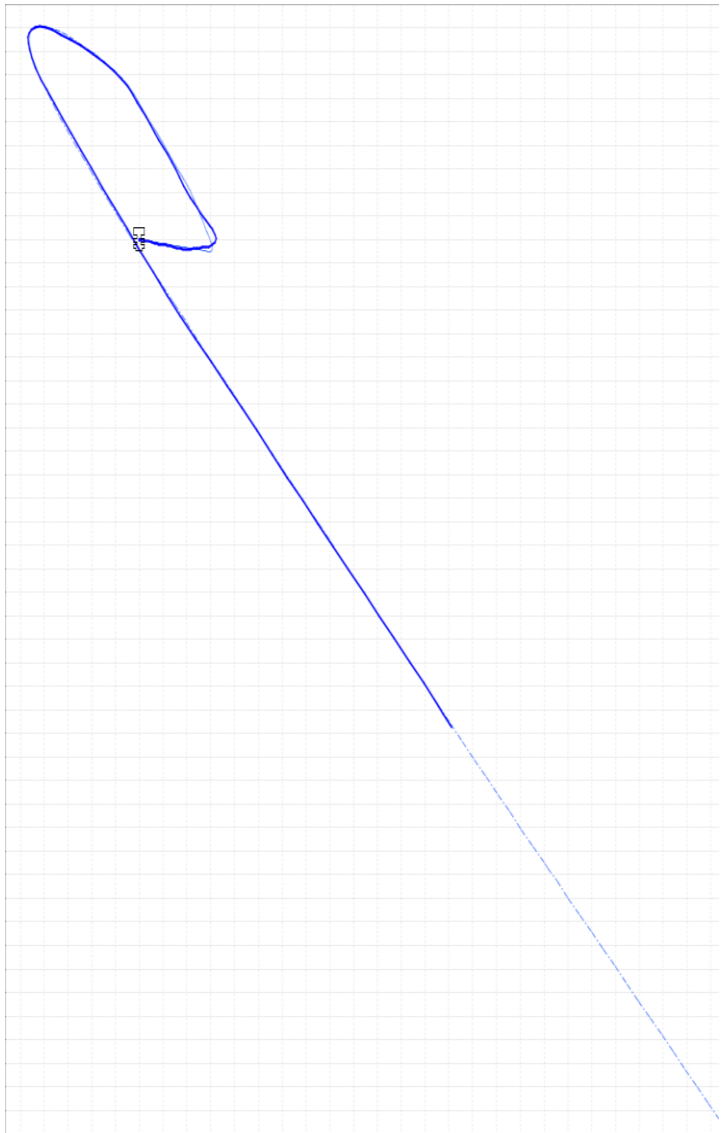
- Multiple casing strings required due to pressure uncertainty
- Cementing critical for well integrity across depleted and high-pressure zones

Well Design – Managing Complexity from Top to Bottom



4.7 km
6 casing strings





Well design

30” Conductor
Tight anticollision

20” Casing

13-5/8” Casing
Challenging trajectory
500-ton weight = 1 Boeing 747 plane

11-3/4” liner
Depleted Chalk
Designer mud

9-5/8” casing
High uncertainty on pressure

7” liner
High temperature and pressure

View Looking from the side

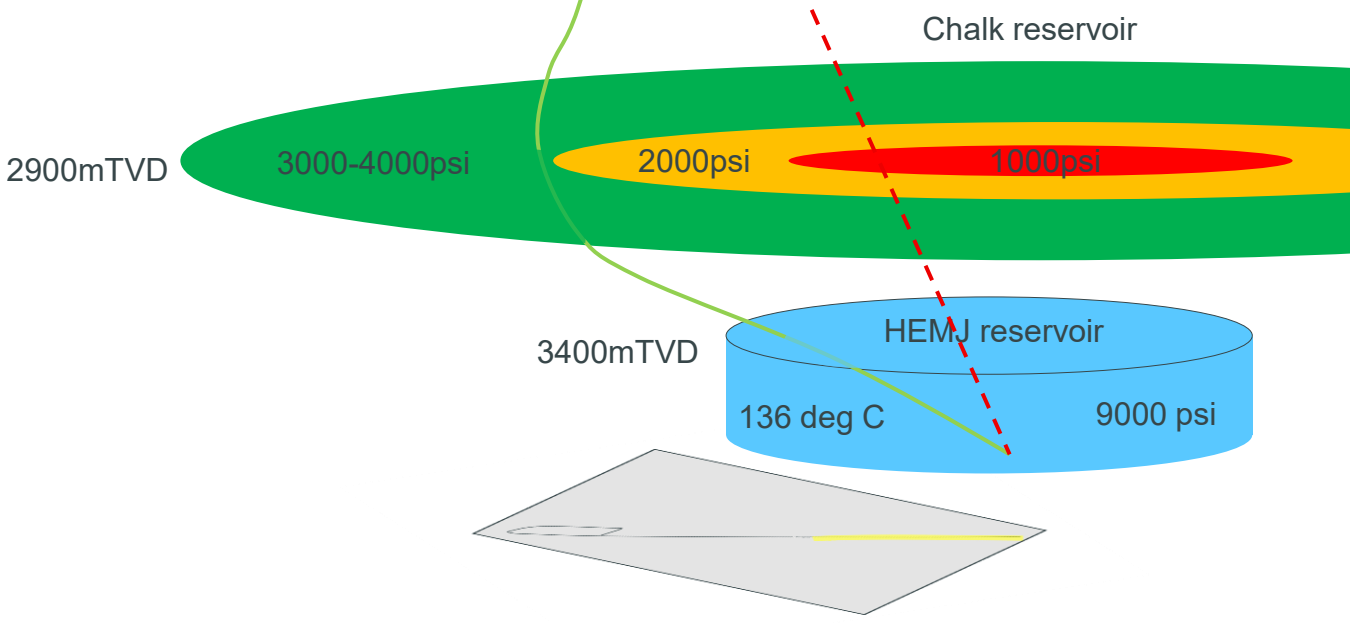
View Looking down

The HEMJ well
- why it was exceptionally challenging

Challenges:

1. Very tight space between wells below the platform
2. Large uncertainly on pressures and depths hence 6 strings were needed and MPD
   - 30”, 20”, 13-5/8”, 11-3/4”, 9-5/8”, 7”
3. The HEMJ reservoir is below the depleted chalk reservoir
4. Unable to drill directly, hence the 13-5/8” turn 180deg
5. Designer fluid is needed to drill the Chalk
6. High pressure and temperature in the HEMJ reservoir

Total length: 4.7 km



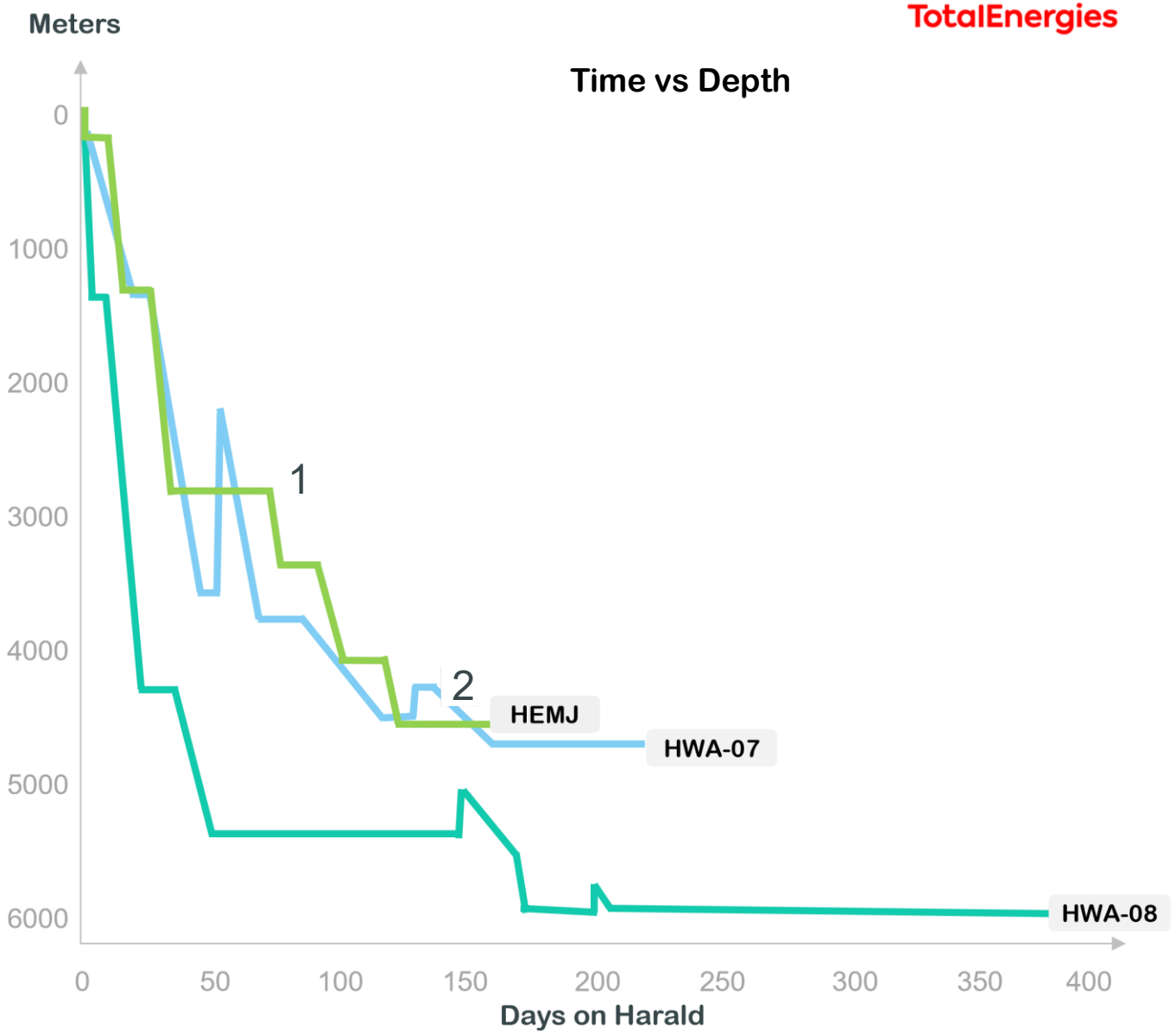
The well

Main Challenges:

1. The 13-5/8” casing installation around the 180° turn took significantly longer than planned.
2. Drilling tools had difficulty transmitting signals through the designer mud.

Drilling on Harald:

- HWA-07 took 221
- HWA-08 took 387 days
- HEMJ was sanctioned at 100 days
- Delivered in 166 days



Timeline

22/10/24
Completion decision

06/12
Start-up

07/12 – 09/12
Fluid sampling

June
Fluid experiments in Lab

August
Fluid model update

Production overview:

- Well rate: represents approximately 13% of TEPDK's total production

Field management:

- Continuous monitoring in place
- Subsurface model regularly updated to reflect latest data

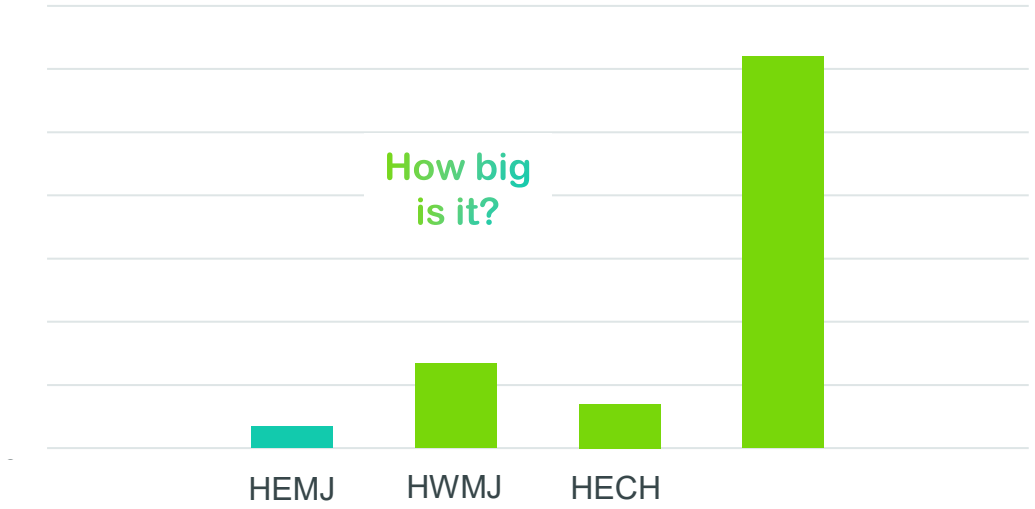
Fluid – more info?

- No significant Wax issues expected. Fluid type very similar to Harald West

Sample at 1 deg C, no wax inhibitor

How HEMJ might impact Harald's future?

Initial volume of gas (GIIP) in TEPDK's gas fields



- HEMJ volumes are small but can be developed by one well with good deliverability – from existing platform.
- With HEMJ success and the production from HEA-04 the platform's COP can be pushed out

Challenges and delays:

- HEMJ faced delays due to inconclusive results from Lulu-1, causing shifts between exploration and development.
- Although not a large prospect, it has good economics.
- Drilling was deferred while the overlying chalk was being depleted, making it difficult to plan a suitable well trajectory.

From uncertainty to success:

- Challenges were overcome through good cooperation between Exploration and TEPDK Subsurface, Drilling and Wells, Engineering and Construction, and our many contractors.
- The focus was on acquiring only the most relevant data in a cost-effective way.
- So far, a very good well – with good production.

Harald Oil&Gas Production data from DEA 2025

- How did the well produce during its first year

- Harald Field Production, publicly available via the DEA website*, is combined reporting of the old Fields: HW-MJ, HE-CH and the new Field HE-MJ

- Harald Field reported oil production 2025: ~ 1.2 Mbbl
  - Harald Field average daily oil production 2025: **~3.3 Kbbl/d**

- Harald Field reported gas production 2025: ~26,7 Bscf
  - Harald average daily gas production 2025: **~73.2 Mscf/d**

Taking into account the 2025 production from HW-MJ these numbers need some reduction, but still the HEMJ well is a very good producer – producing well over 10.000 boepd during 2025

A very good well, with some work ongoing on further de-bottlenecking

*https://ens.dk/en/energy-sources/monthly-and-yearly-production

HEMJ: From 30 Years of Uncertainty to Successful Delivery

- Extreme subsurface and mechanical complexity from a mature, congested platform
- Advanced drilling technologies applied across the full well profile
- Safely delivered, within +20% of budget, and performing well

An exceptional team effort across disciplines and partners


SHELF DRILLING
WINNER
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Time for your questions