



Surrender Report for **License PL662**

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1. History of the production licence

The PL662 license (Figure 1) was awarded in February 2013 (APA 2012) to Total (op.) 60% and Statoil 40% with a commitment to reprocess 3D seismic, perform G&G studies to mature the prospect towards a DoD (drill or drop decision set on 8 February 2015).

PL662 license commitments and milestones were as follows:

- On 19/08/2014 Total requested a one year extension to the DoD to await the results of the nearby Julius prospect. The Julius well (2/4-23S) operated by Statoil (PL146/333, Total partner 22.2%) situated to the northwest of the North Ekofisk Farsund (NEF) basin is to be drilled in 2015 and the results would impact the PL662 North Ekofisk Farsund (NEF) prospect evaluation. The Norwegian authorities accepted the request, without any extra work commitment.
- A further extension of DoD to 2017 was requested on 30/11/2015 awaiting the development scenarios for the NEF prospect as a tie in candidate. This was granted.
- Beginning 2016 a new request was put forward to ask for an extension of DoD to 2019, to purchase new seismic and perform a new prospect evaluation. This request was partially accepted, with a DoD in 2018.

The license is surrendered because the size of the prospect does not qualify for a stand-alone development project. In addition, the possibility to develop a potential discovery is dependent on the development of King Lear and/or Tommeliten, which is pending the capacity of the Ekofisk platform to produce gas/condensate.

The following license meetings was held:

MC = Management Committee

EC = Exploration Committee

WM = Exploration Committee work meetings

Date	Meeting		
	EC	MC	WM
04.04.2013	x	x	
09.10.2013	x	x	
13.01.2014			x
02.04.2014	x	x	
17.11.2014			x
05.12.2014	x	x	
18.09.2015	x	x	
12.11.2015		x	
31.05.2016		x	
14.09.2016			x
24.11.2016		x	
07.06.2017	x	x	

Table 1 Overview of license meetings held

2. Database overviews

2.1 Seismic data

All the work performed on this license is based on several phases of seismic reprocessing of the VGCNS05 survey (DISKOS) (Figure 2):

- Statoil pre-SDM 2012
- COP pre-SDM 2010
- PSTM VGCNS05T11 for reprocessing by Sharp Reflections (see Chapter 3)

The PGS broadband 2015 covering the license has not been purchased.

2.2 Well data

Several wells in the vicinity of the PL662 have been used for calibrating seismic data (Figure 2). No exploration well is drilled on PL662. Key wells for the prospect evaluation of NEF are King Lear wells 2/4-14, 2/4-18R and 2/4-21&21A. The Julius well 2/4-23S was drilled in 2015 and aided in further understanding of the petroleum play. Well North Ekofisk 2/4-20 was drilled at the crest of the tilted fault block and increased the understanding of the seal capacity on the prospect.

Well	NPDID	TD
1/3-12S	6260	Trias
1/6-6	1839	Trias
1/6-7	1928	UJ Ula
2/1-1	249	UJ Ula
2/1-5	63	UJ Farsund
2/2-1	46	Zechstein
2/2-3	3	Trias
2/2-4	1188	Trias
2/2-5	1846	Zechstein
2/2-6	6346	UJ Farsund
2/4-10	254	UC Tor
2/4-11	255	UJ Ula
2/4-14*	1343	UJ Farsund
2/4-15*	1371	UJ Farsund
2/4-16	1702	Trias
2/4-17	1792	Rotliegend
2/4-18R	2253	UJ Farsund
2/4-20	5556	Rotliegend
2/4-21	6736	UJ Farsund
2/4-21A	6933	UJ Farsund
2/5-7	25	Trias
2/5-10A	2194	Trias
2/5-11	3084	UC Tor
2/5-12	4433	UJ Farsund
2/5-13	5948	Trias

Table 2 Well database approved 16 September 2013. The key wells are highlighted in bold, and displayed on Figure 2. *Not in common database as per 2013, but incorporated as key wells.

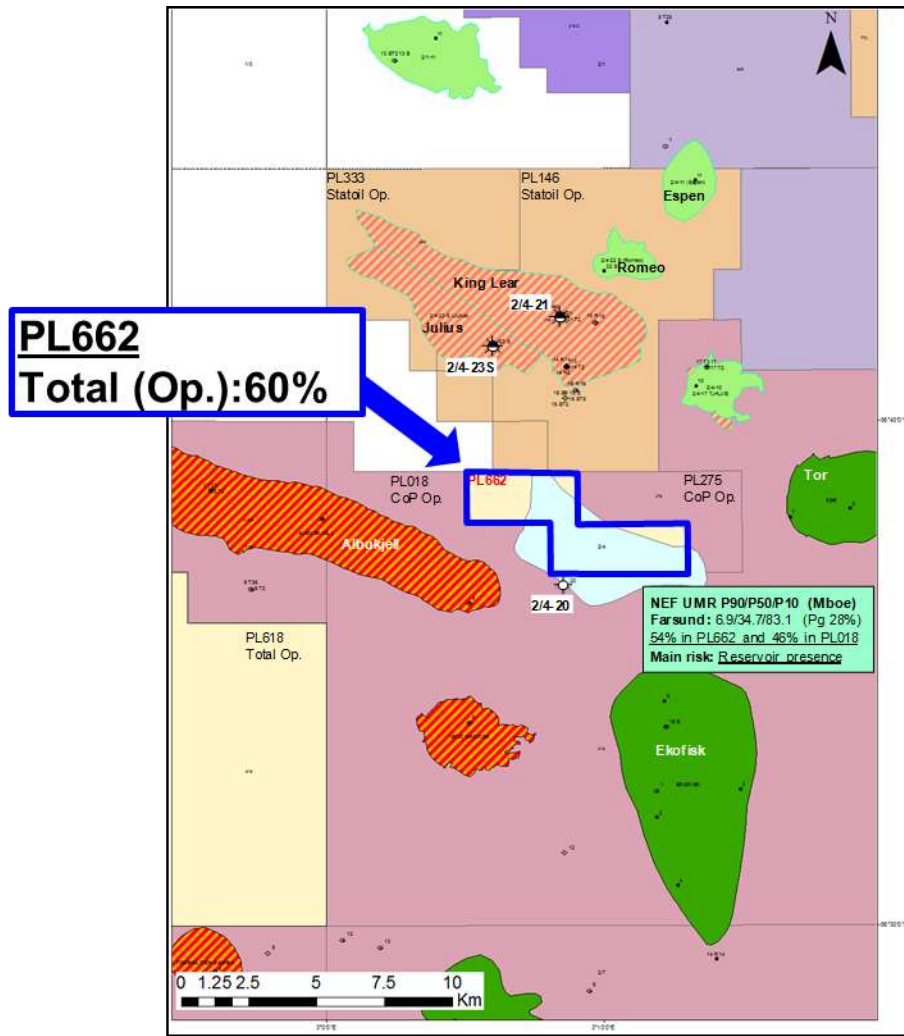


Figure 1 License location and prospect overview

**PL662 Outlines, Seismic Coverage and Wells in the Area
Partners Common Data Base (11 Wells TD in Last Fm.)**

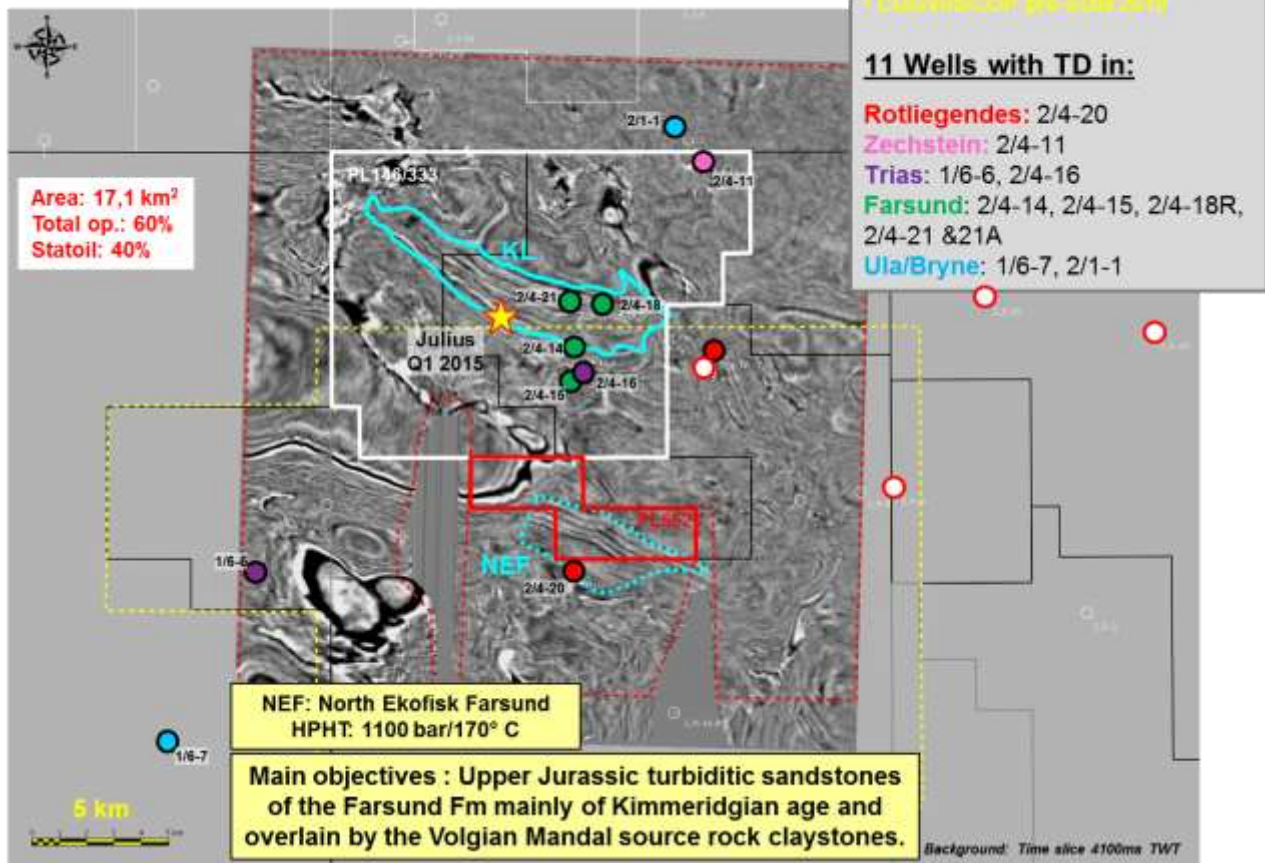


Figure 2 Seismic and key well database

3. Results from geological and geophysical studies

The Geological and Geophysical studies completed are the following (Table 2):

Date	Action or Study
02/2013	PL662 Award
04/2013	First license meeting
07/2013	Approval of work program by partnership
11/2013	Kick off Regional Study Chemostratigraphy, finalized 06/2014
02/2014	Inversion feasibility study in-house shared with Partner
03/2014	Kick off meeting with Sharp Reflections, presented to Partner in September 2014
03/2014	Kick off Regional Biostratigraphy and Geochemistry study By Robertson/CGG, finalized April 2015
09/2014	Kick off Regional Fluid Inclusion Study, finalized December 2014
03/2015	Spud Julius well 2/4-23S, completed October 2015
11/2016	Joint Central Graben Area PL044-PL018 development study, finalized June 2017

3.1 Inversion Study

Elastical inversion is needed to discriminate fluid effects. A fluid effect is present within King Lear, but uncertainties are related to noisy datasets. The PL662 NEF prospect is assumed to be thin and below tuning thickness, but on the seismic dataset the area is less noisy in comparison to the King Lear basin seismic coverage. Post processing was performed by Sharp Reflections focussing on removing multiples; residual move-out correction; and increase signal-to-noise ratio; by use of the PSTM dataset (VGCNS05T11)

The feasibility study showed that the inversion would not show a lithology separation and that it would be highly contaminated by multiples. The hydrocarbon elastic response is theoretically possible, but not likely due to general noise, multiples and low angle aperture.

3.2 Regional study on Upper Jurassic Turbidites in the Eastern Central Graben

A regional study for understanding of the turbiditic development within the eastern central graben has been performed on all data available and ideas shared with the partner.

The work consisted of detailed seismic interpretation and mapping, incorporation of core and well data. Regional studies on biostratigraphy, geochemistry, chemostratigraphy and fluid inclusion stratigraphy were performed on request of Total with CGG, Chemostrat Ltd. and Fluid Inclusion Technologies, Inc. in 2013 and 2014. The results aided in creating a good understanding of the paleogeography, timing and sand sourcing within the Upper Jurassic, including the risks associated with the prospect evaluation.

3.3 Results

The Central Graben formed following several rifting phases from the Triassic to Jurassic, by reactivation of the Permian (Rotliegendes) structural framework. The resulting variety of petroleum plays within this prolific graben is shown in Figure 3.

On license PL662 the only prospect identified is within a 'mini' basin with accommodation space for turbiditic sands, the North Ekofisk Farsund (NEF) Prospect (see table 4). The prospect lies south of King Lear Farsund turbidite discovery, which is the key analogue for NEF.

Sand prone basins close to local highs are found in the surrounding of the license (King Lear: east of Hydra high (Figure 3); Eldfisk Deep: east of Grensen Nose (south of area shown in Figure 3); 2/2-5 and 2/1-5: south of Sørvestlandet High (Figure 3)).

The Late Jurassic (Farsund Fm.) represents a transgressive/backstepping period with sand influxes by erosion of local highs and/or dismantlement of the J60 shelf into the basins during two low-stand periods. It is believed that the turbidites of King Lear were sourced from the Hydra High (Figure 3). The Julius wells 2/4-23S and 2/4-16 have thin to no sand development towards and on top of the Julius Triassic pod. Cuesta like features on the seismic image could indicate an alternation of lithology, sand and shale. By-pass could bring sand further into the basin, but sourcing from the Hydra High would first be captured by the basin to the northwest of PL662 (PL333B Statoil op. with Total as partner, Timon prospect, relinquished 2017), before reaching the NEF basin (Figure 4). The main risk for the NEF prospect is therefore reservoir presence.

These results have not significantly changed the evaluation compared to the original application for award.

EAST CENTRAL GRABEN CHRONO - LITOSTRATIGRAPHIC CHART & PETROLEUM SYSTEM

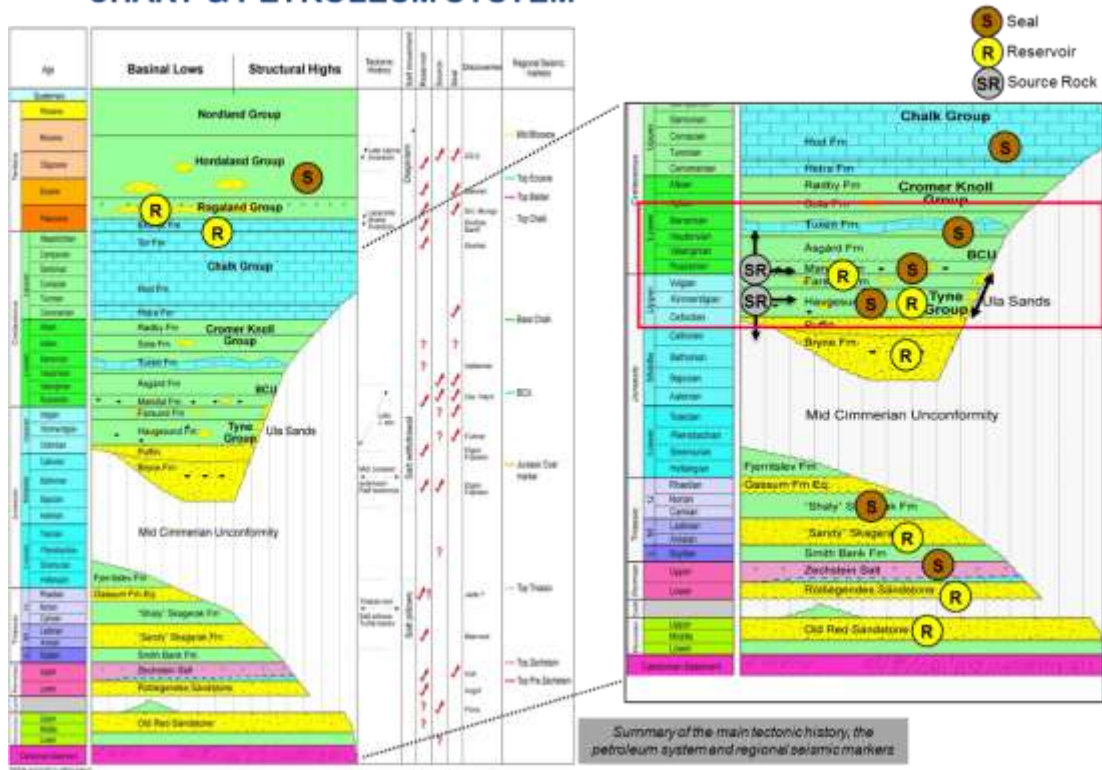


Figure 3. Petroleum Systems Chart Eastern Central Graben

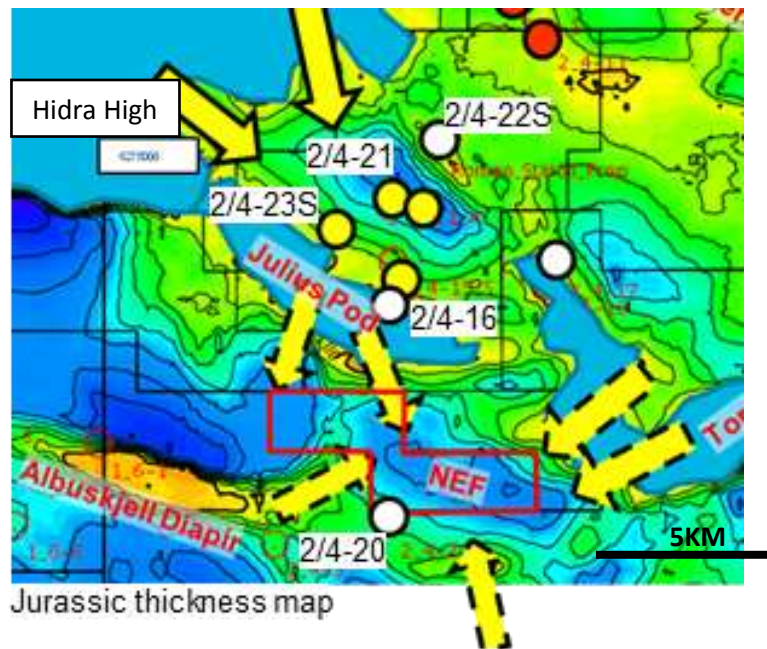


Figure 4 Upper Jurassic thickness map showing the Hydra High and the point of entry on east side of Hydra High for sands entering the King Lear mini basin. The arrows indicate the suggested path ways the sands could have run off the Hydra high into the basins. The dashed arrows indicate possible path ways the sands reached the NEF prospective area.

4. Prospect update report

4.1 Geometry

The trap is a one-way dip closure to the north, bounded by faults to the west and east, and cut by the BCU to the south. Well 2/4-20 was drilled on the top of the northward dipping faultblock/crest of the trap. This well encountered no sands in the prospective Farsund interval due to erosion during the base Cretaceous. The prospect is visualized in Figure 5 and a well correlation is given in Figure 6.

The hydrocarbon fill of the prospect is defined by a uniform distribution of the contacts, where the P100 is equal to the crest and P0 to the spill, giving a maximum column of ~300m.

4.2 Reservoir

At King Lear (wells 2/4-21 and 21A) well developed sands were found with a gross thickness of 51m, N/G of 44% and a porosity of 21%. Permeability from core ranges from 1mD to 70mD. The reservoir quality at prospect scale is considered to be good. Petrography shows that the majority of the sandstones are fine grained and well sorted. The porosity and permeability lie on a relatively well defined trend. On average most of the samples range between 15-25% porosity and 1-10mD permeability. The turbidites drilled in 2/4-23S were thinner than expected (net 6m while 11m was prognosed), but still show similar reservoir properties.

4.3 Seal (pressure)

The crest of the prospect shows is cut by the Base Cretaceous unconformity to the south (Figure 5). The shales of the Lower Cretaceous Cromer Knoll Group form the ultimate vertical seal. This configuration is similar to the King Lear Discovery. Pressure study with data from surrounding wells shows the Ula Fm has ~50 bar higher overpressure than the Farsund Fm. In the most likely scenario, the top seal integrity stays intact; in the high case (Farsund same pressure as the Ula Fm) the crest will be close to the Fracture Gradient.

4.4 Source rock and Migration

The source rock is a well-known type II marine shale with contribution of terrestrial material (Type II-(III)) with the Farsund Fm being the main contributor. Analysis of both gas and condensate fractions in nearby fields and discoveries shows the thermal maturity of its source to be in the wet gas window with a corresponding Vitrinite Reflectance maturity between 1.2 and 1.4% Ro. Migration and timing poses no risk, as the sands are embedded within the source rock.

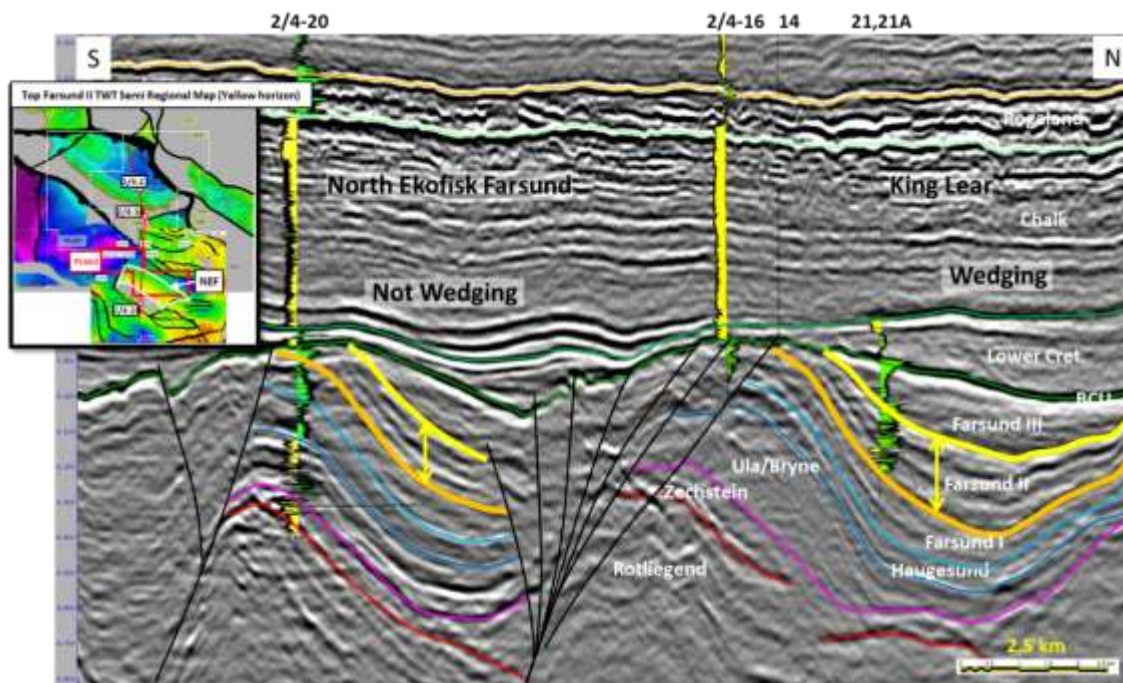


Figure 5 North Ekofisk Farsund (NEF) Prospect identification on map and seismic.

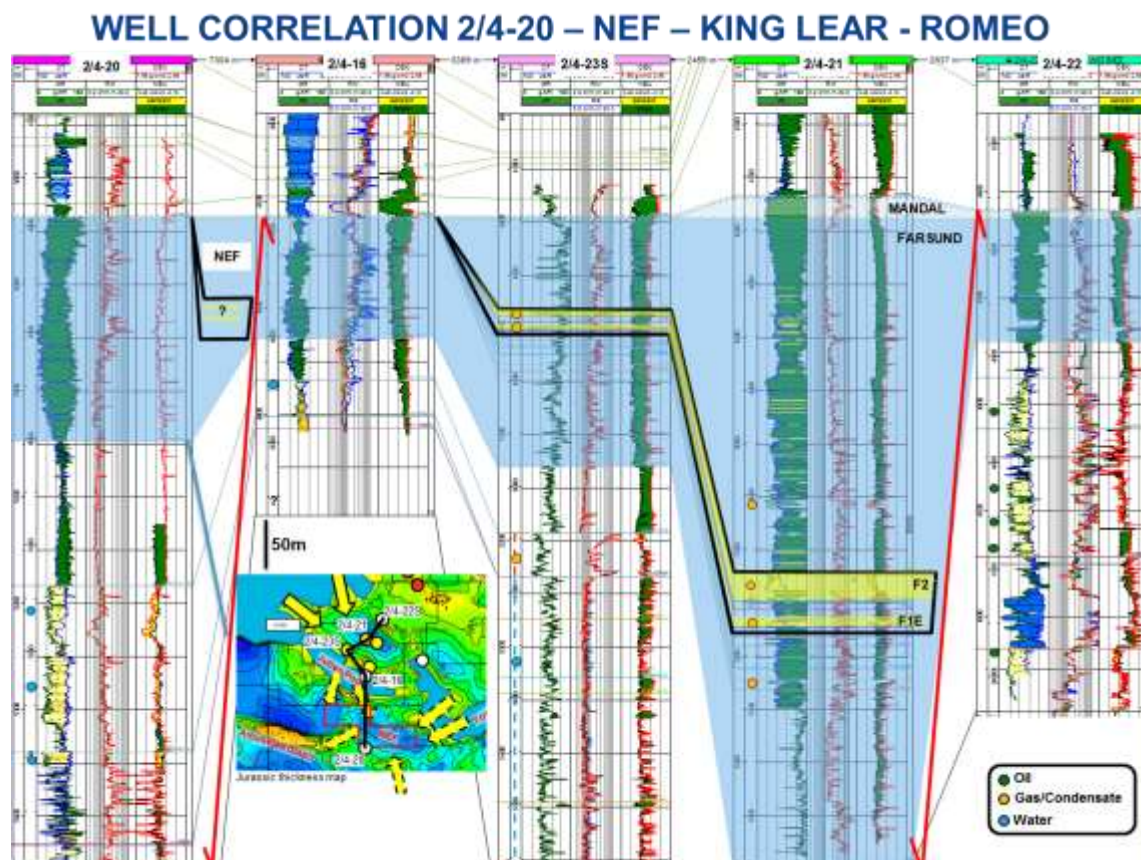


Figure 6 Well correlation

4.5 Resources and Risking

By volume, NEF is approximately 54% in the PL662 license, with the remaining 46% in PL018 to the south in which Total is partner with a working interest of 39.9%. Initial Resource estimation is given in Table 3. Prospective resources remaining at time of surrender are given in Table 4. Resources detailed risking are shown in Table 5.

Initial	Category	Status	Play	Name	Unrisk resources (Mboe)	Fluid	Po/Pg	Main risk	Exploration type
	Prospect		Farsund turbidites (Upper Jurassic)	NEF	30.8/45.3/83– 51.3	G/C	28%	Reservoir Presence	Exploration

Table 3 Estimated P90-P50-P10 resources from APA 2012

Current	Category	Status	Play	Name	Unrisk resources (Mboe)	Fluid	Po/Pg	Main risk	Exploration type
	Prospect		Farsund turbidites (Upper Jurassic)	NEF	6.9/34.8/82.5 – 40.6	G/C	28%	Reservoir Presence	Exploration

Table 4 Estimated P90-P50-P10 resources remaining

Risk factor						Risk evaluation	
	SOURCE ROCK	MIGRATION & TIMING	RESERVOIR	GEOMETRY	SEAL	PG	PG DHI
P.O	100 %	100 %	50 %	80 %	70 %	28 %	
Main risk	Reservoir Presence						

Table 5. Risking parameters

4.6 Other potential plays in the PL662 license

- Paleocene:**

The very distal part of Paleocene Forties and Andrew Formation sandstones extend into the area of interest. Only one meter of sand was encountered in well 2/4-20, with no visible porosity. Furthermore, no trapping geometries are identified at Paleocene level within the license (Figure 8A).

- Upper Cretaceous (Chalk):**

No closure and deep buried Chalk make the Upper Cretaceous play not prospective within license PL662 (Figure 8B)

- Lower Cretaceous Cromer Knoll Group:**

Turbidite sandstones were identified in well 2/7-15 (Ran sandstones). They are sourced from reactivated structural highs and charged by Upper Jurassic source rocks and stratigraphically trapped. The play is conceptual in the Eastern Central Graben. The NEF basin is not in direct proximity to a sand-prone source.

The remaining Lower Cretaceous prospectivity is low and does not support any further exploration activity on this license.

- **Mid Jurassic and below:**

There is no prospectivity identified below the Upper Jurassic series as it was found water bearing in well 2/4-20 drilled close to the crest of the tilted basin.

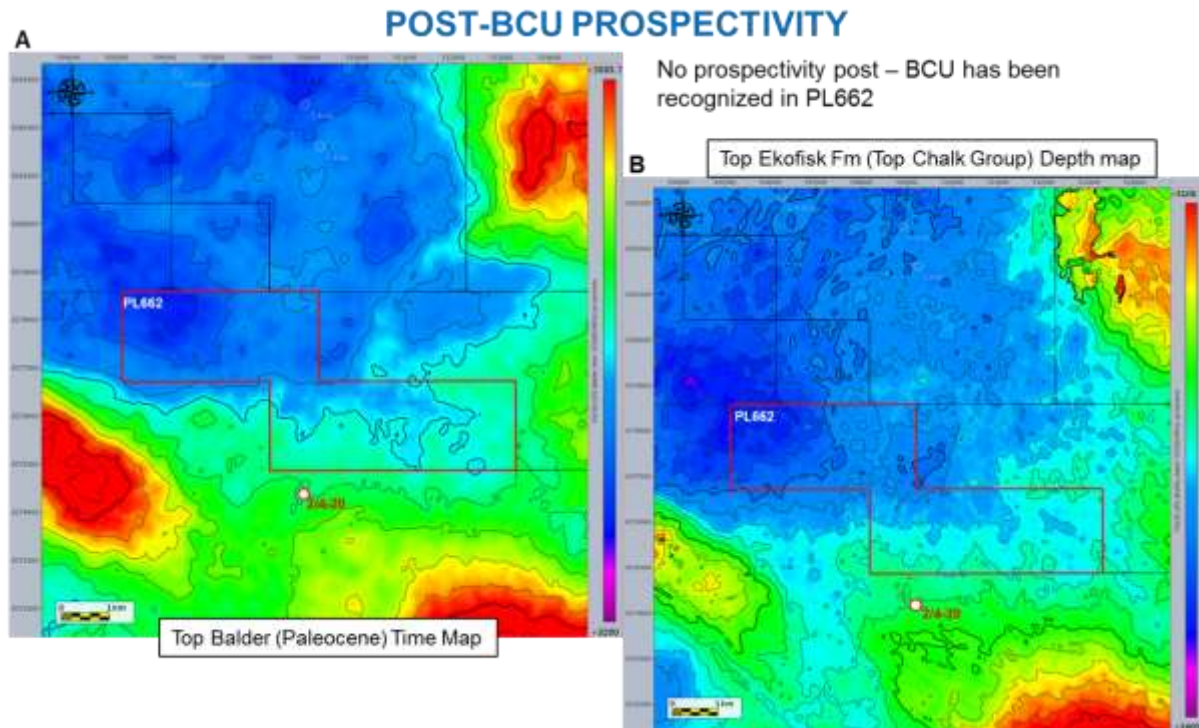


Figure 7 A – Paleocene Top Balder time map and B – Top Chalk depth map. No closures are identified in both Paleocene and Upper Cretaceous.

5. Technical evaluation

The remaining resources of the NEF prospect do not allow for a stand-alone development. The Oljedirektorat have asked the owners of PL044 (Conoco Philips) and PL146/333 (Statoil) to look into the possibility to create a new gas processing capacity, to develop the gas and condensate discoveries of Tommeliten Alpha and King Lear, respectively, with an emphasis to create maximum value. A joint study from Conoco Philips, ENI, Statoil, and Total proposed 4 alternatives for a tie in solution to Ekofisk, which is most cost effective. A definite conclusion could not be made based on the results of the screening. Further studies are required to demonstrate feasibility, including a higher degree of technical and commercial maturity, both for field development costs and tie-in alternatives/cost.

If and when this gas hub is in place, smaller prospects could add value and reduce find to production time. Therefore, drilling an exploration well today will not be economically viable.

6. Conclusion

Rationale for surrender of the PL662 license are the following:

- The current status is that the area development 'gas hub' operated by Conoco Phillips (Ekofisk/Tommeliten) and/or Statoil (King Lear) will not be developed until there is capacity available on the Ekofisk platform.
- Economic valuation shows that the prospect is not material enough to be economical. These valuations are based on a tie-in to existing infrastructure.