PL 720 – License status report

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1 License history

License:	PL720 – blocks 7317/4, 7317/5 and 7317/6	
Awarded:	June 21st, 2013	
License period:	Expires June 21st, 2019 Initial period: 6 years	
License group:	Equinor Energy AS	60% (Operator)
	DEA Norge AS	20%
	Petoro AS	20%
License area:	838.565 km^2	
Work program:	Acquire 3D seismic and decision on drilling.	

Meetings held:

20.08.2013	EC/MC startup meeting
23.10.2013	EC workshop
27.11.2013	EC/MC meeting
20.03.2014	EC work meeting
16.06.2014	EC/MC meeting
16.09.2014	Seismic interpretation
15.10.2014	Basin modelling
27.11.2014	EC/MC meeting
14.04.2015	EC work meeting
11.06.2015	EC/MC meeting
25.06.2015	CSEM work meeting
03.11.2015	EC work meeting
24.11.2015	EC/MC meeting
11.02.2016	EC workshop CSEM
14.04.2016	Triassic work meeting
24.11.2016	EC/MC meeting
22.11.2017	EC/MC meeting
21.06.2018	EC work meeting
22.11.2018	EC/MC meeting

Work performed:

2013: License start-up. Establishing work program. Seismic interpretation. Specialist services (petrophysics and basin modelling). SWB12 3D seismic processing (PSTM) and testing.

2014: SWB12 3D seismic processing (PSTM) and seismic interpretation. Stratigraphic framework and basin modelling. CSEM Feasibility study.

2015: SWB12 3D seismic reprocessing (PSDM). Prospect evaluation Jurassic and Triassic prospectivity. Stappen CSEM survey.

2016: PL718-720 CSEM survey evaluation.

2017: Awaiting post Koigen Central well analysis

2018: Prospect evaluation. Decision made to surrender license.

Reason for surrender:

The 7317/9-1 Koigen Central well was drilled in the neighboring license (PL718) (fig. 1.1), and are located 12 km to 25 km from the Camilla prospects (fig 1.2). The results from the Koigen Central showed poor reservoir quality and no signs of free migrated hydrocarbons.

[redacted]

It has been decided to surrender the license due to lack of prospectivity based on Koigen Central well data.

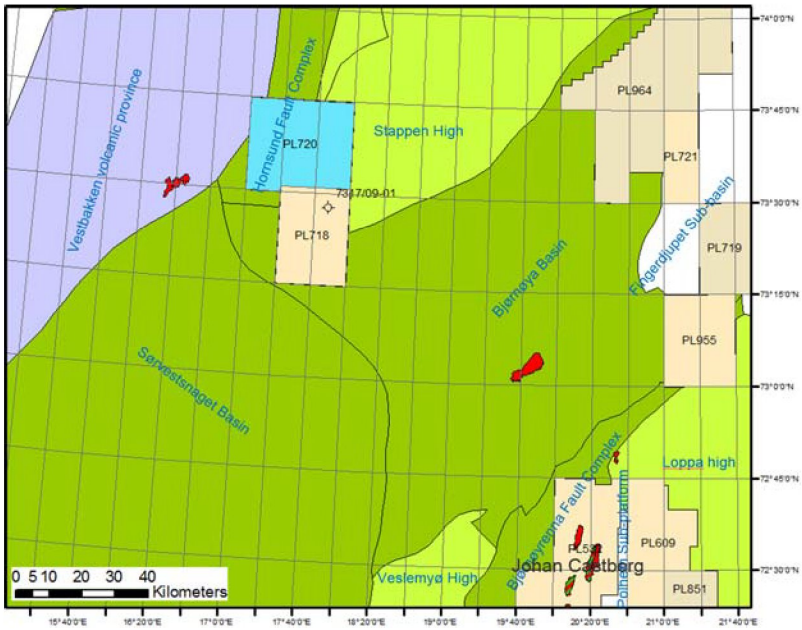


Figure 1.1 Western Barents Sea structural element map showing the location of the PL720 license and the surrounding discoveries.

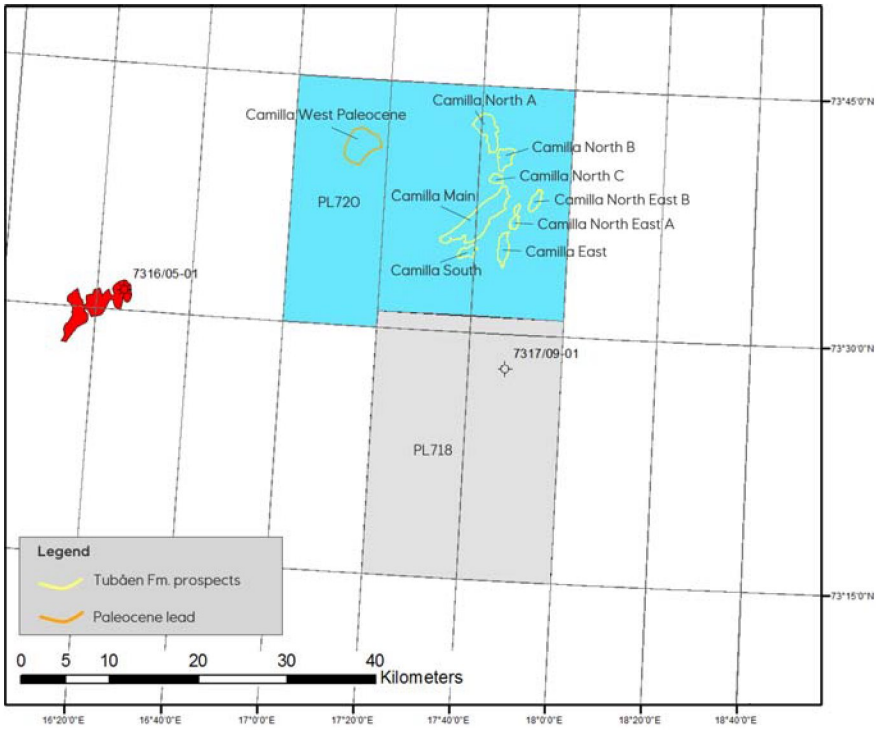
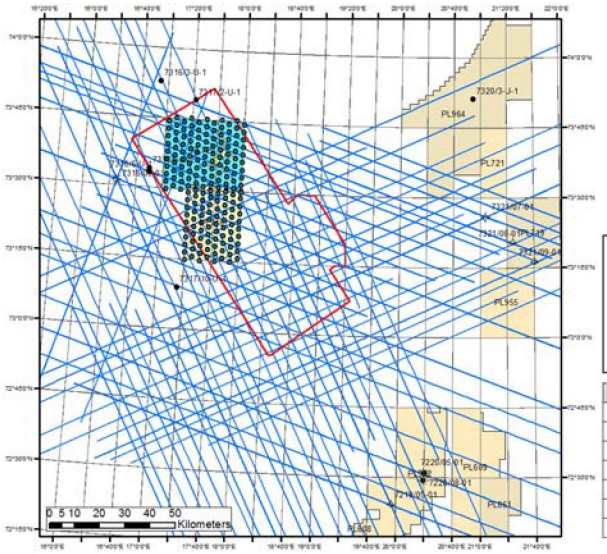


Fig 1.2 PL720 license prospect map. Camilla prospects and lead.

2 Database overview

2.1 Seismic data

The SWB12 3D seismic PSTM and PSDM data was used to interpret and evaluate the Camilla prospects. An overview of seismic data included in the common database is shown in Figure 2.1. Wells in common database are listed in Table 2.1 and Table 2.2.



Seismic survey	2D/3D	Year	Quality	NPDID
NBR06	2D	2006	Fair	4365
NBR07	2D	2007	Fair	4451
NBR08	2D	2008	Good	4573
NBR09	2D	2009	Good	-
NBR10	2D	2010	Good	7219
NBR11	2D	2011	Good	7408
SWB12	3D	2014	Poor/Fair	7569

Figure 2.1 Common seismic and CSEM database.

2.2 Well data

Table 2.1 Common well database.

Wells	Year	Drilling operator	Present License	Status	Age at TD	Formation at TD	NPDID
7316/5-1	1992	Norsk Hydro Produksjon AS	Open area	Gas	Late Cretaceous	Kveite Fm.	1987
7321/7-1	1988	Mobil Exploration Norway INC	Open area	Gas shows	Middle Triassic	Snadd Fm.	1284
7321/8-1	1987	Norsk Hydro Produksjon AS	PL719	Shows	Late Permian	Røye Fm.	1070
7321/9-1	1988	Norsk Hydro Produksjon AS	PL719	Shows	Late Triassic	Snadd Fm.	1339
7220/8-1	2011	Statoil Petroleum AS	PL532	Oil/Gas	Late Triassic	Snadd Fm.	6484
7219/9-1	1988	Norsk Hydro Produksjon AS	PL532	Shows	Late Triassic	Snadd Fm.	1138
7219/8-1	1992	Saga Petroleum ASA	Open area	Dry	Early Jurassic	Stø Fm.	2031

Table 2.2 Common well database (IKU shallow boreholes)

Wells	Year	Drilling operator	Present License	Status	Age at TD	Group at TD	NPDID
7316/3-U-1	1989	IKU SINTEF-GRUPPEN	Open area	Dry	Upper Miocene	Nordland Gp.	1446
7316/6-U-1	1989	IKU SINTEF-GRUPPEN	Open area	Dry	Lower Miocene	Nordland Gp.	1447
7316/6-U-2	1989	IKU SINTEF-GRUPPEN	Open area	Dry	Lower Eocene	Sotbakken Gp.	1448
7317/2-U-1	1985	IKU SINTEF-GRUPPEN	Open area	Dry	Eocene	Sotbakken Gp.	953
7317/10-U-1	1989	IKU SINTEF-GRUPPEN	Open area	Dry	Paleocene	Sotbakken Gp.	1449
7320/3-U-1	1985	IKU SINTEF-GRUPPEN	PL964	Dry	Late Jurassic	Adventdalen Gp.	955

3 Results of geological and geophysical studies

The regional geological framework is described in the application for blocks 7317/4,5,6,8 and 9, from the 22nd round application.

Processing

In the first phase of PL720, the work program was to acquire 3D seismic. Except a small portion of the northeastern corner of PL720, the license is covered by the SWB12 3D seismic survey. SWB12 was acquired and processed by Fugro in April 2014 (PSTM) and reprocessed in January 2015 (PSDM) together with CGG.

The overall SWB12 3D seismic quality in PL720 varies. A very hard seabed and high velocities near surface together with high line spacing in acquisition, made the processing challenging. Some compromises in the processing sequence was made to keep primary reflectivity, but also leaving some noise.

Mapping

The main focus has been the mapping of the Jurassic Realgrunnen Subgroup, present within rotated fault blocks in the southern part of Stappen High (Fig.3.1).

Hekkingen Fm. and Realgrunnen reflectors could be interpreted quite confident, except in the northwestern part of the license. In the northwest, in the downfaulted area within the Hornsund Fault Complex, the seismic quality is inadequate and seismic interpretation is of very low confidence. However, the overall seismic quality of the Realgrunnen prospects, located on the Stappen High, is considered acceptable. The seismic quality is not adequate for seismic amplitude driven geomorphology/ geology.

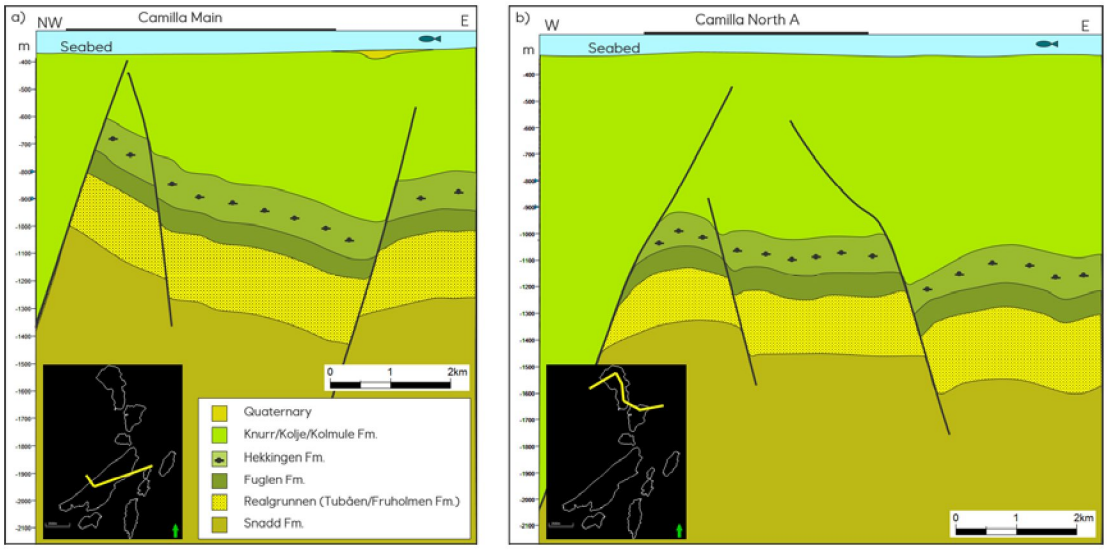


Figure 3.1 Geo-seismic depth section of SWB12. a) Camilla Main prospect, b) Camilla North A prospect

The seismic quality is good enough for structural interpretation with well-defined faults, and the seismic interpretation is confident on defining prospect outlines/structural interpretation. Below the Realgrunnen, the seismic quality decreases with depth exponentially and stratigraphic interpretation has a low confidence.

Source and migration

[redacted]

[redacted]

Fig 3.2 Hekkingen Fm. maturity map.

Uplift history

The result of the thermal history reconstruction for the sedimentary units in the Koigen Central well (based on AFTA and VR data), identified three major tectonic events in Paleocene, Eocene and Plio-Pleistocene. It dates the timing of Stappen High uplift to 62 Ma, which marks the beginning of the cooling from the paleo-thermal maximum.
Maximum maturity levels in all pre-Cenozoic units were reached because of deeper burial during the Late Cretaceous and Early Paleocene. Active hydrocarbon generation from any potential source rock within these units ceased at the beginning of cooling in Paleocene.

AVO

The 3D seismic data quality of the SWB12 is insufficient to derisk prospects using AVO analysis, and CSEM was used to finalize the prospect chance of success. SWB12 3D dataset is generally noisy. Gather data becomes very noisy below seabed multiple and the dataset is lacking in near angles at target depths.

[redacted] Low seismic data quality in the Stappen High area could be linked to a hard and wrinkly seabed. Efforts to remove multiple energy may have damaged some of the subtle amplitude relationships.

CSEM

PL720 is covered by the BSMC12F CSEM survey (Fig 2.1) which was used as support for conventional seismic analysis. [redacted]

[redacted]

4 Prospect update report

The nearby Koigen Central Well (7317/9-1) (Fig. 4.1) was drilled on the Koigen Central prospect in 2017 and was dry. The Stø and Nordmela Fm. are missing, and only very thin zones were observed in the Tubåen Fm. with porosities above 10%. There is no reservoir present in neither Fuglen, Tubåen or Fruholmen Fm., and the permeability values is below ~0.5mD. The Realgrunnen reservoir is not working due to Quarts cementation and clay matrix.

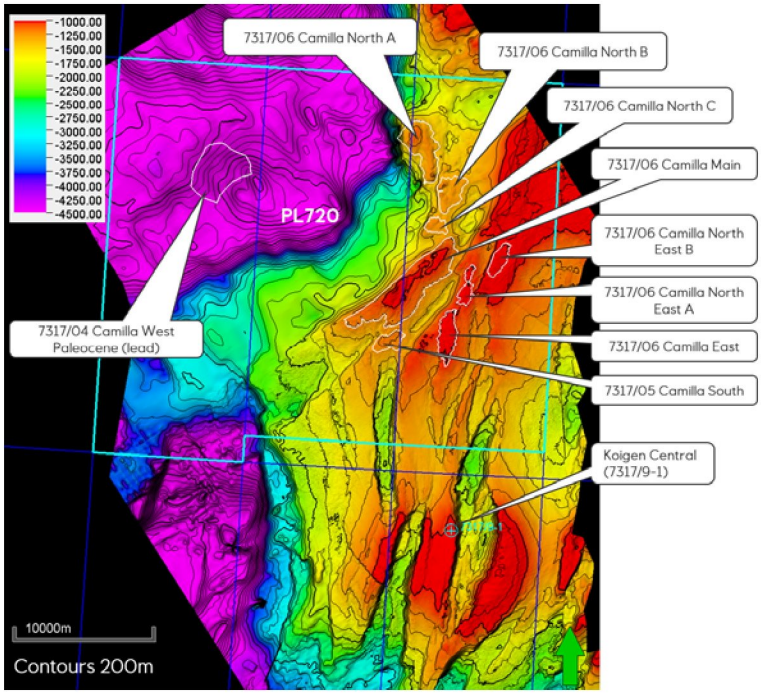


Fig 4.1 Top Realgrunnen depth map. Prospect polygons at structural closure.

Realgrunnen Gp.

At Tubåen Fm., eight structural closures have been mapped and these define the prospects shown in Figure 1.2 and 4.1. For the hydrocarbon filling of the prospects, Johan Castberg has been used as a reference area with underfilled structures. A new risk assessment has been performed post Koigen Central. Updated reservoir parameters are summarized in Table 4.1 and 4.2, and updated volume potential is shown in Table. 4.3.

Extremely high seismic velocities at shallow depth show large net erosion in the area. Results from the nearby Koigen Central well show that the formations have been deeply buried and undergone extensive uplift which has destroyed the reservoir properties. The Camilla prospects show similar seismic velocities and uplift and erosion history as Koigen Central, indicating similar maximum burial and reservoir development, and properties. For the majority of the Realgrunnen prospects the reservoir parameters from Koigen Central well has been used in the volume calculation (Table 4.1) due to similar maximum burial. In two of the prospects, Camilla Main and Camilla North A, the reservoir parameters have been calibrated due to less maximum burial (Table 4.2).

Table 4.1 General reservoir/ fluid parameters

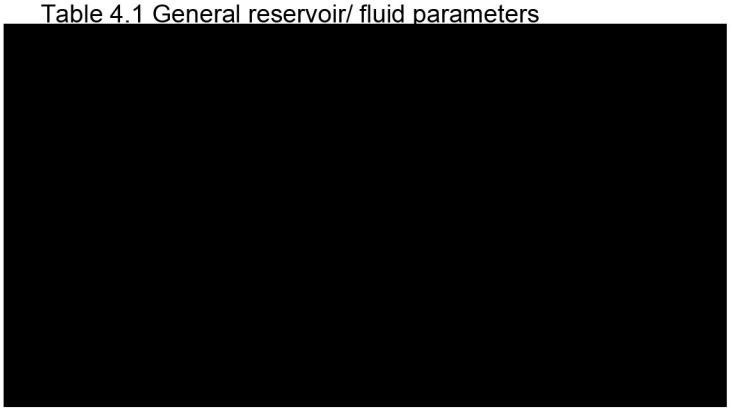


Table 4.2 Reservoir/ fluid parameters used for the Camilla Main & Camilla North A prospects

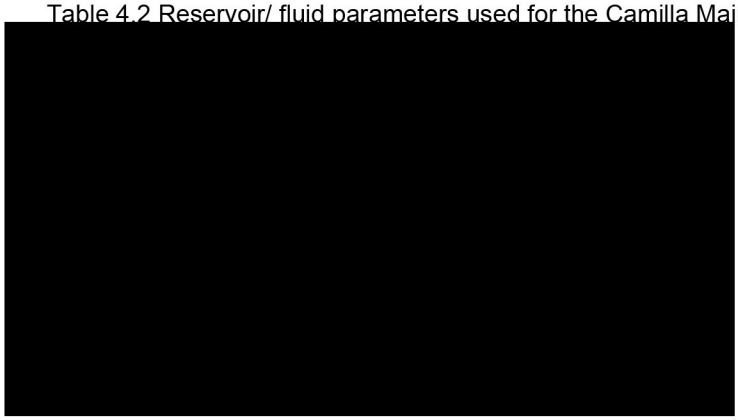
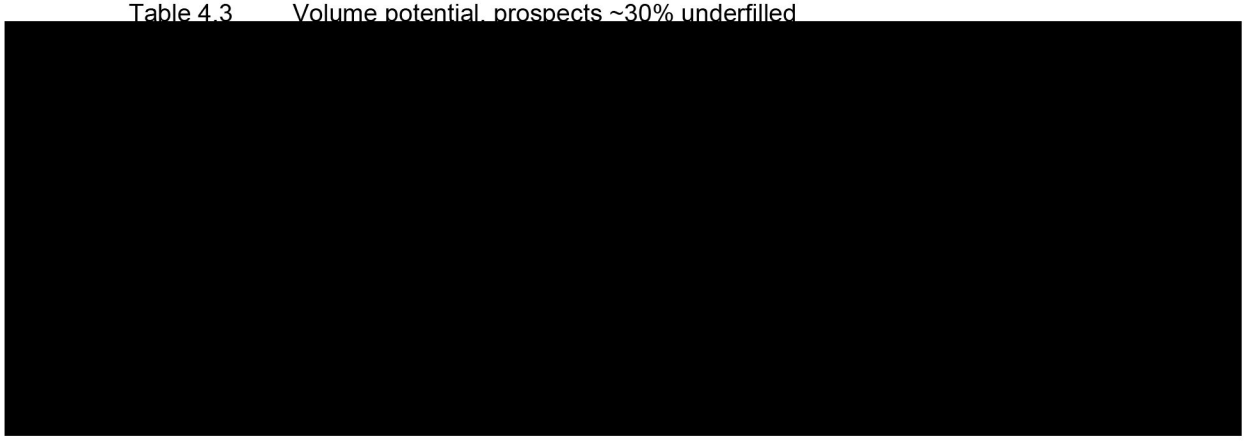


Table 4.3 Volume potential, prospects ~30% underfilled



Cretaceous

39m of Cretaceous sands was proved in Pilot Hole 7317/6-U-1 and the results does not show a conclusive reservoir potential. No Cretaceous prospects has been identified.

Paleocene

[redacted]

The Paleocene conceptual model is associated with substantial risk associated to reservoir presence, source migration and trap seal and no prospectivity besides the Realgrunnen prospects has been identified.

5 Technical evaluation

The Camilla prospects have low resource potential and an overall very low P(g). Hydrocarbon migration failure in Koigen Central well gives an elevated migration risk for the remaining prospects. Trap seal has high risk due to three major tectonic uplift events post hydrocarbon expulsion, and reservoir presence has increased risk based on results from Koigen Central Well.

6 Conclusion

The PL720 was surrendered based on reservoir quality failure together with low commercial value in remaining prospectivity.