PL 848 – Licence status report

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1 Licence history

License: PL848 - blocks 7119/2, 7119/3 and part of blocks 7119/5 and 7119/6

Awarded: February 5th, 2016

License period: Expires February 5th, 2022
Initial period: 2 years

License group:

Statoil Petroleum AS	50% (Operator)
Eni Norge AS	30%
Petoro AS	20%

License area: 776.3 km^2

Work program: Reprocessing of seismic and decision to drill or drop within February 5th 2018.
Extended to August 5th 2018.

Meetings held:

03.05.2016	EC/MC startup meeting
02.11.2016	EC/MC meeting
10.11.2017	EC/MC meeting
21.12.2017	EC/MC work meeting

Work performed:

2016:	Licence start-up, seismic reprocessing.
2017:	Seismic reprocessing and geological/geophysical evaluation of prospectivity.
2018:	Decision made to surrender licence.

Reason for surrender:
The prospectivity in PL848 has been re-evaluated on good quality, reprocessed PSDM seismic, and it is difficult to derisk the prospects further. Prospect maturation has increased the risk of the main prospect, the Lower Cenozoic Fantastico prospect. Evaluation of secondary prospectivity in the Jurassic indicates that the Caliente prospect has low volume potential and low probability of success. In summary, no drillable prospects have been identified in the licence.

2 Database overviews

Seismic

An overview of the common seismic database is shown in Fig. 2.1 and Table 2.1. The 3D surveys CP11101 and SH9301 were merged and reprocessed as ST17M03 as part of the licence work commitment.

Seismic survey	Survey type	Line/Trace	Year	Quality
CP11101	3D	Full survey	2011	Variable
SH9301	3D	Full survey	1993	Variable
ST17M03	3D	Full survey	2017	Good
NBR07RE09	2D	Line: NBR07RE09-227875_ trace: 1500 - 9237 Line: NBR07RE09-224580_trace: 4500 - 13400	2009	Good
NBR08	2D	Line: NBR08-225415_trace: 2400 - 12400 Line: NBR08-228596_trace: 3350 - 12000 Line: NBR08-141983_trace: 1200 - 16800 Line: NBR08-138755_trace: 33000 - 39000	2008	Good
MCG1001	2D	Line: MCG1001-186_trace: 1 – 11500	2010	Good

Table 2.1 PL848 common seismic database

Wells

An overview of the common well database is shown in Fig. 2.1 and Table 2.2.

Well	Year	Drilling operator	Present license	Status	Age at TD	Formation at TD
7119/7-1	1983	Norsk Hydro Produksjon AS	PL076	P&A	Permian	undef.
7119/12-3	1983	Den norske stats oljeselskap a.s.	PL060	P&A	Early Jurassic	Nordmela Fm
7120/1-2	1989	A/S Norske Shell	PL108	P&A	Late Triassic	Fruholmen Fm
7120/2-3S	2011	Lundin Norway AS	PL438	P&A	Late Triassic	Snadd Fm
7120/7-3	1984	Den norske stats oljeselskap a.s.	PL077	P&A	Early Jurassic	Nordmela Fm
7120/8-1	1981	Den norske stats oljeselskap a.s.	PL064	P&A	Late Triassic	Fruholmen Fm
7218/11-1 T2	2013	Repsol Exploration Norge AS	PL531	P&A	Early Cretaceous	Kolmule Fm
7218/8-1	2014	GDF Suez E&P Norge AS	PL607	P&A	Early Cretaceous	Kolmule Fm
7220/7-1	2012	Statoil Petroleum AS	PL532	P&A	Late Triassic	Fruholmen Fm
7220/10-1	2012	Eni Norge AS	PL533	P&A	Late Triassic	Snadd Fm

Table 2.2 PL848 common well database

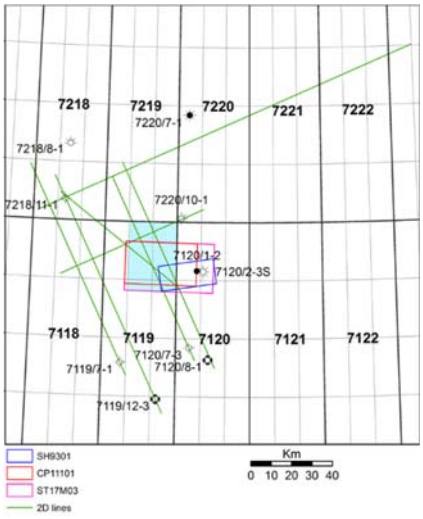

Figure 2.1 PL848 seismic and well database

3 Results of geological and geophysical studies

Reprocessing

Geophysical analysis for APA2015 identified Fantastico as an AVO anomaly with possible conformance to structure. It was observed that this conformance was stronger in time than depth. Large local velocity variations relating to Quaternary channels in the overburden were also observed (Fig. 3.1a). Seismic reprocessing was undertaken to resolve velocity- and data- quality uncertainties that might be responsible for the discrepancy.

PSDM reprocessing has achieved a seamless merge of surveys CP11101 and SH9301 into ST17M03. The quality of ST17M03 is generally good, with less noise, fewer acquisition footprints and better continuity of reflectors than the legacy data. The definition of faults is generally improved although there remain some areas of poorer quality related to the major fault system at the western edge of the Loppa High (Fig. 3.1a). The improved flattening of the angle stacks provides a more robust basis for the estimation of AVO intercept and gradient. The prospectivity in the licence has been re-evaluated on the new data.

AVO

[redacted]

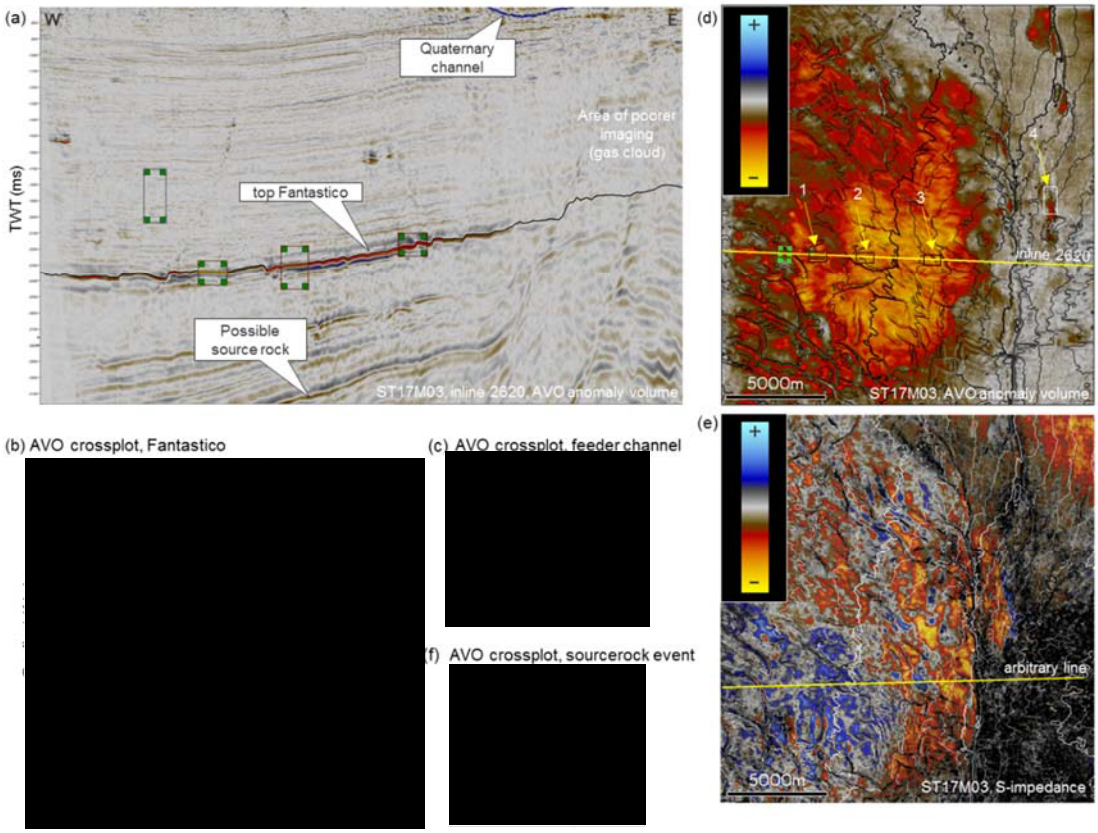

Figure 3.1 AVO summary, Fantastico prospect

The AVO separation from the background indicates a probable hydrocarbon effect which is distinct from the brine-filled response of feeder channel sandstones to the east of Fantastico (Fig 3.1.c,d). Variations in AVO strength across the prospect are seen, but no clear amplitude shut-off can be identified. AVO anomaly variations are therefore most likely due to low saturation hydrocarbons, probably combined with reservoir quality/thickness variations. Comparison with sandstones of similar age in the 7319/12-1 Pingvin discovery shows that a hydrocarbon contact would be seen if one was present (Statoil 2015[1]). The presence of brine-filled sands to the east of Fantastico suggest that hydrocarbons migrating through the prospect escaped upwards along the fault (gas clouds are observed in the overburden along the fault) without charging the feeder channel sandstones in the footwall.

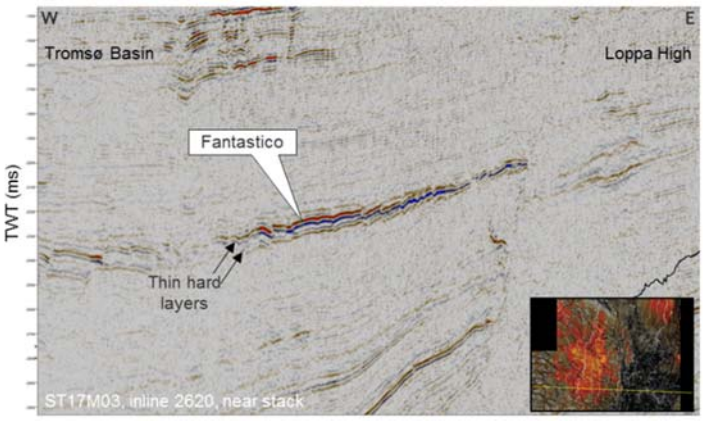

Figure 3.2 Seismic S-impedance through Fantastico

S-impedance shows limited contrast with the underlying shales (Fig. 3.1e, Fig. 3.2), rendering this attribute an unreliable lithology indicator that cannot be used to define the prospect container. Similar geophysical behaviour is shown by the sandstones in the Pingvin discovery.

Geophysical analysis of a bright, acoustically soft reflector ca. 800ms below Fantastico (Fig. 3.1f) reveals class 4 AVO behavior. This regionally extensive event may indicate the presence of source rock, the varying amplitude response possibly reflecting variations in organic content.

Analysis of the Caliente prospect shows a very weak soft AVO class 3-4 response on the upper fault block (Fig. 3.3). No depth-conformant AVO amplitude shut-off is observed and no clear sand container can be interpreted from S-impedance. There are no obvious indications of hydrocarbons or any flatspot within the Jurassic package.

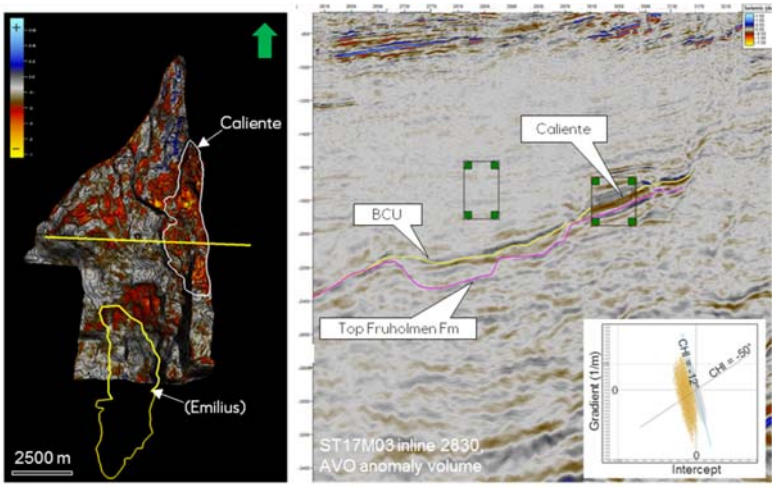

Figure 3.3 AVO summary, Caliente prospect

Geophysical analysis of the Lower Cretaceous Emilius lead demonstrates a hard class 1 AVO event that is indicative of lithology rather than hydrocarbon. The event brightens up-dip and is interpreted as a possible carbonate-rich deposit. Based on this analysis, Emilius is no longer considered prospective.

4 Prospect update report

The main prospect in the license is the Lower Cenozoic Fantastico prospect. RMS amplitude extractions of the full stack seismic show lobe geometries and possible feeder channel systems originating from the Loppa High (Fig. 4.1). These are well imaged on both the reprocessed and legacy seismic and are interpreted as part of a deep-marine turbidite system. For the APA 2015 the prospect outline was defined by the extent of RMS amplitude brightening (Fig. 4.1a). The prospect was assessed as a combined stratigraphic/structural trap, with lateral- and down-dip seal provided by stratigraphic pinch-out, and up-dip juxtaposition seal provided by the fault system at the edge of the Loppa High. Top seal was provided by shales in the Torsk Formation (Fig. 4.1c). The main risk was trap.

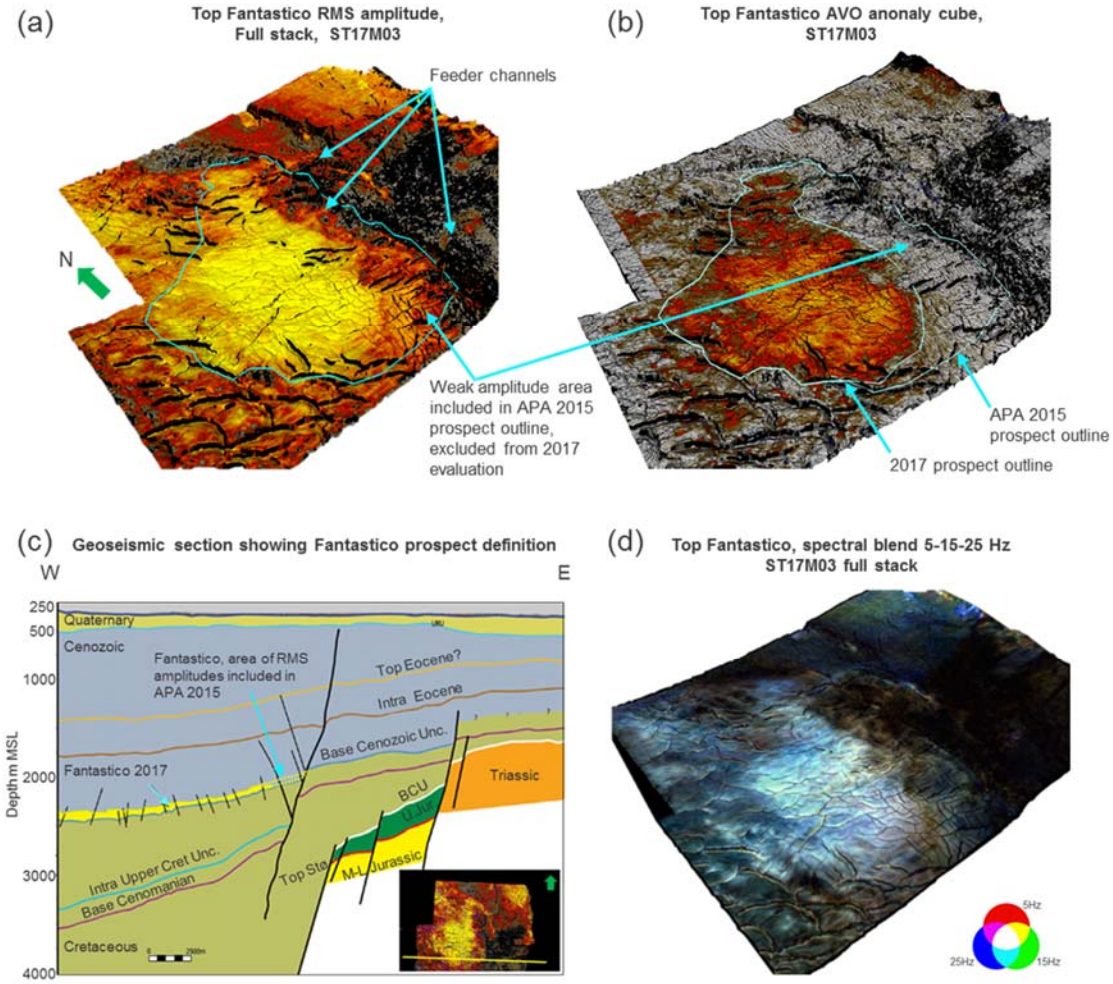

Figure 4.1 Fantastico prospect definition

In the revised assessment based on reprocessed seismic, the prospect container is defined by the extent of AVO amplitude anomaly (Fig. 4.1b). This is supported by RGB frequency decomposition extractions which show strong constructive colour interference in the area of AVO brightening (Fig. 4.1d). The area of weak amplitudes adjacent to the eastern bounding fault does not show an AVO response and is excluded

from the revised prospect outline. This results in a reduction in bulk rock volume and recoverable resources compared to the APA 2015. Trap remains the main risk.

An alternative explanation for the lack of a fluid contact on seismic is that Fantastico is oil-filled to spill. However, this would require an oil column in excess of 330 m, a scenario considered unlikely in the Barents Sea. Based on the lack of amplitude depth conformance, a fairly strong DHI downgrade is now applied to the prospect.

The Lower-Middle Caliente prospect in Block 7119/3 represents secondary prospectivity in the licence (Fig. 4.2). Caliente is down-faulted 3-way closure with possible reservoirs in the Tubåen and Fruholmen formations. The upper part of the Realgrunnen Subgroup (Stø and Nordmela formations) has been removed by erosion. Top seal is provided by Cretaceous shales and shales of the Hekkingen Formation represent a possible source. The main risk is trap. One of the main uncertainties in the evaluation of Caliente is the seismic welltie which relies on jump correlations across the bounding faults of the prospect. Poor seismic imaging in the south introduces further uncertainty to the horizon interpretations.

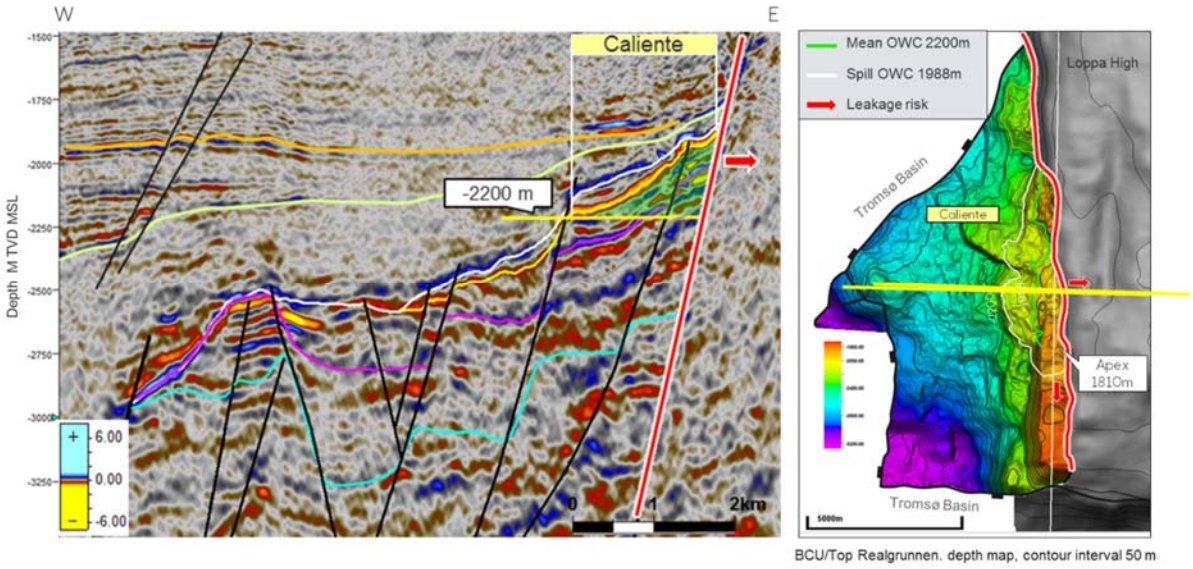

Figure 4.2 Fantastico prospect definition

An overview of the prospectivity in the licence is shown in Fig. 4.3.

The volume and risk for Fantastico and Caliente are shown in Table 4.1 and Table 4.2.

Table 4.1 PL848 volume and risk

[redacted]

Table 4.2 PL848 initial risk assessment

[redacted]

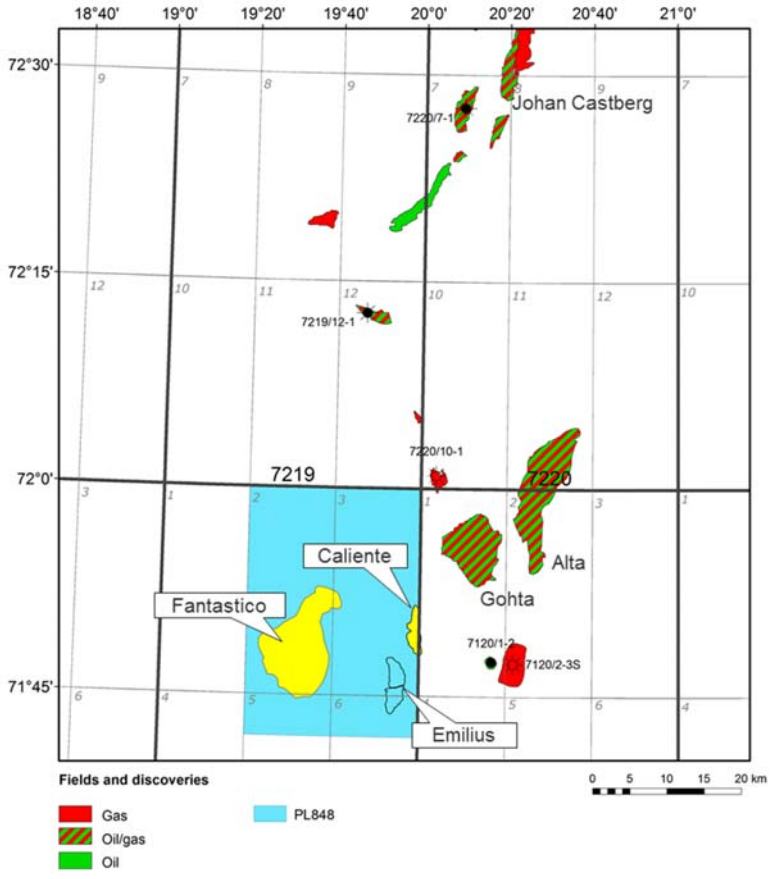

Figure 4.3 PL848 licence overview map

5 Technical evaluation

Fantastico has a relatively low resource density (large area, thin reservoir and variable N/G) that would require many wells to produce. [redacted]

Fantastico is located ~30km from the Alta discovery in PL609 (Fig. 4.3). A combined development could have a commercial potential. However, since it is expected that Fantastico would need to invest in its share of a standalone floater, the required volume for Fantastico would be significantly above the expected mean volume.

An oil discovery in Fantastico is technically feasible as a tie-back to the future Johan Castberg FPSO, located ~85 km to the north east. This would require subsea boosting and the required volume of this development would also be above the expected mean volume.

The remaining prospectivity (Caliente) has a significantly lower volume potential than Fantastico. A technical/economic evaluation of Caliente has not been performed.

6 Conclusion

During the 2015 APA it was thought that it might be possible to derisk main prospect, Fantastico, by reprocessing the seismic. PSDM reprocessing has improved the overall quality of the data. Geophysical evaluation of the new data indicates a high probability of reservoir but does not demonstrate a clear depth-conformant AVO amplitude shut-off. The AVO anomaly is most likely due to the presence of low-saturartion hydrocarbons. The new evaluation results in a reduction in volumes and a higher overall prospect risk. Secondary prospectivity in the Jurassic, represented by the Caliente prospect, has limited volume potential and a low probability for success.

In summary, no drillable prospects have been identified in the licence.

7 References

Statoil 2015[1]. Discovery Evaluation Report 7319/12-1 Pingvin. 74 pp.