

PL911 relinquishment report

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 vår energi

1 History of the production licence

- Awarded 02.03.2018
- Vår Energi operator 60%, ConocoPhillips 40%
- Work program:
 - Acquire seismic. Drill or drop decision by 02.03.2020
 - BoK 02.03.2022
 - BoV 02.03.2024
 - PUD 02.03.2025
- Management and Exploration committee meetings overview
 - MCEC meeting # 1: 04.05.2018
 - MCEC meeting # 2: 20.11.2018
 - MCEC meeting # 3: 20.11.2019

The PL911 license was awarded 02.03.2018 to Vår Energi AS (Point Resources AS at the time) and ConocoPhillips. Vår Energi was granted the operator-ship with 60% of the equity and ConocoPhillips the remaining 40% (Fig. 1.1).

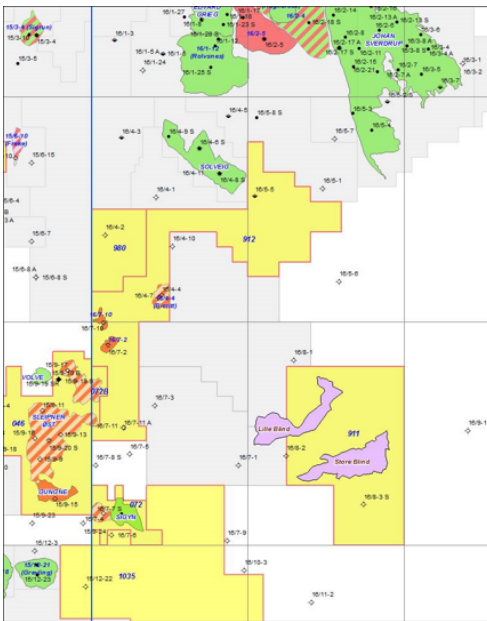


Fig. 1.1 License overview

The PL911 license map with Store Blind and Lille Blind prospects.

The initial 2-year work program was to purchase new 3D seismic. PGS had acquired new broadband data in the area in 2016. The 765 km² PGS16M03-16902VIK dataset was purchased over the license area. The dataset also covered the relinquished PL775 license.

The PL911 license was acquired based on two prospects identified in Paleocene. They were Store Blind and Lille Blind. The concept was the same as the Jackpot prospect in the neighbouring PL775 (PL775 Relinquishment report) which was Tertiary thickness anomalies east of the NPD official pinch-out line for the Paleocene turbidite play (Ty and Heimdal Fms). The idea was that the thickness anomaly between Top Chalk and Top Sele Fm subtracted by a uniform shale thickness of 192m could represent sand.

The new 3D seismic improved the imaging significantly in the Tertiary interval and allowed for more detailed mapping of the Rogaland Gr. Specifically this was an intra Lista event not seen on the vintage data. The Intra Lista reflector showed the thickness anomaly identified between top chalk and the top Sele Fm to be present in the Upper Paleocene post the influx of Heimdal/Ty turbidites from the East Shetland basin. Thus, proving NPD pinch-out line of the play.

Based on the mapping of the new 3D broadband dataset, both prospects were no longer valid. The license group believe the chance of finding Paleocene reservoir deposited in the license very limited to impossible and therefore recommend relinquishing the acreage.

2 Database overviews

2.1 Seismic data

The PL911 license acquired 383 km² of the PGS16M03-16902VIK dataset. In addition to the 382 km² of the same dataset for the PL775 license, the total broadband database was 765 km² (Fig. 2.1). The broadband data was Pre Stack Depth Migrations of good quality. It was essential in resolving the Tertiary prospectivity in the license.

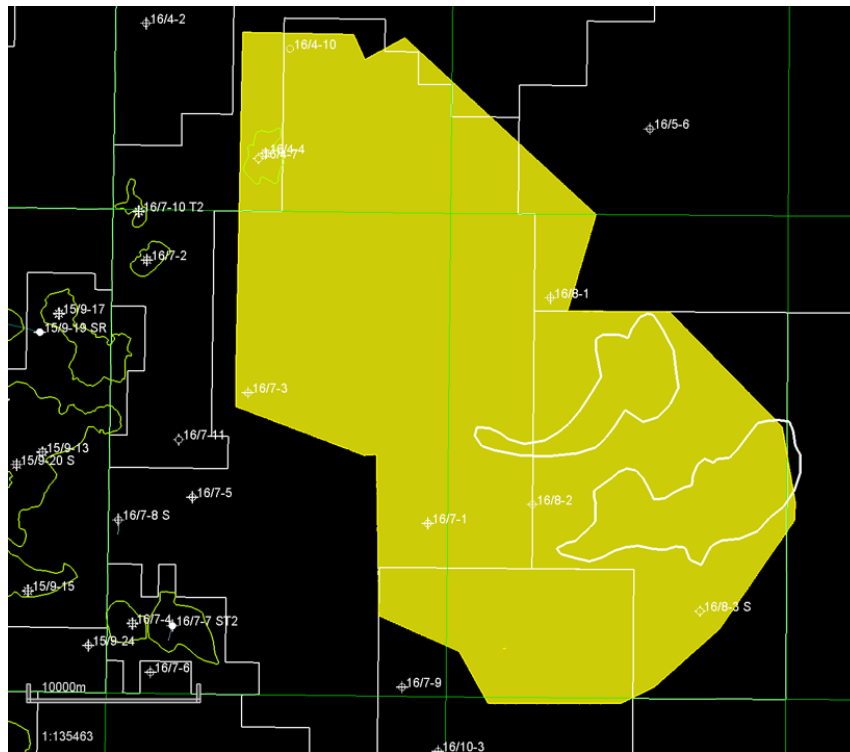


Fig. 2.1 Seismic database
The outline of the 765 km² broadband data

For regional work the TUN15M01 dataset was used. This is a poststack merge consisting of the following surveys (listed in the order they were merged):

Table 2.1 TUN15M01 surveys

Post stack merge surveys
ST11012
ST0611
ES9401
LN08M03
LN0703
UP96
ST98M3
ST9511
ES9402RC98
UH3D95
MC3DQ15
ST0208

ST04M11

2.2 Well data

- Listing of wellbores incl. NPDID for well results that are included in this status report

Table 2.2 Well database

Well name	NPDID
15/9-9	328
15/9-11	329
15/9-16	79
16/4-1	229
16/4-2	1560
16/4-4	5441
16/4-5	6216
16/4-6	7098
16/4-7	7208
16/4-8S	7415
16/4-9S	7631
16/4-10	7731
16/5-1	189
16/5-5	7285
16/5-6	7962
16/7-1	146
16/7-2	40
16/7-3	75
16/7-4	91
16/7-5	134
16/7-7S	3244
16/7-8S	4612
16/7-9	6382
16/8-1	335
16/8-2	234
16/8-3S	7115
16/9-1	151
17/4-1	153
17/12-2	340

3 Results of geological and geophysical studies

The main activity in the license evaluation has been based on the new 3D seismic dataset. Also, a lot of special studies were performed in the PL775 license (PL775 relinquishment report) which had a direct relevance to the prospectivity in the PL911 license.

The 16/8-3S well had a mud gas anomaly in the Oligocene Hordaland Fm. The highest measured samples were almost 4%. The operator of the well had collected mud gas tubes for every 100m in the wellbore. Six tubes from 1100 to 1600 m were analysed and showed a molecular and isotopic composition clearly of biogenic origin and not from a mature source rock.

A rock physics study was carried out to compare amplitudes in the prospect area with analogue wells in the Greater Sleipner area. According to rock physics modelling the Ty/Heimdal Fm is a hard sand with negative gradient with angle. If wet, a Class I AVA and Class Iip with hydrocarbons. Cross-plotting Intercept vs Gradient attributes for key areas in the license did not give encouraging results. The mapped hard event most likely represented a marly shale penetrated in the 16/8-3S well.

In addition, a velocity inversion was carried out. One of the benefits with broadband data is high quality velocity data. The velocities combined with the near offsets gave a detailed image which could be used to distinguish lithologies (Fig. 3.1). The chalk was separated into Tor Fm and the reworked Ekofisk Fm. However, this did not indicate sand in the Paleocene interval. To further explore the high-quality velocity dataset, the license tried out ModelGeo's velocity inversion method which matches the velocity field to known lithologies in wells. The result was the same as the simpler velocity inversion.

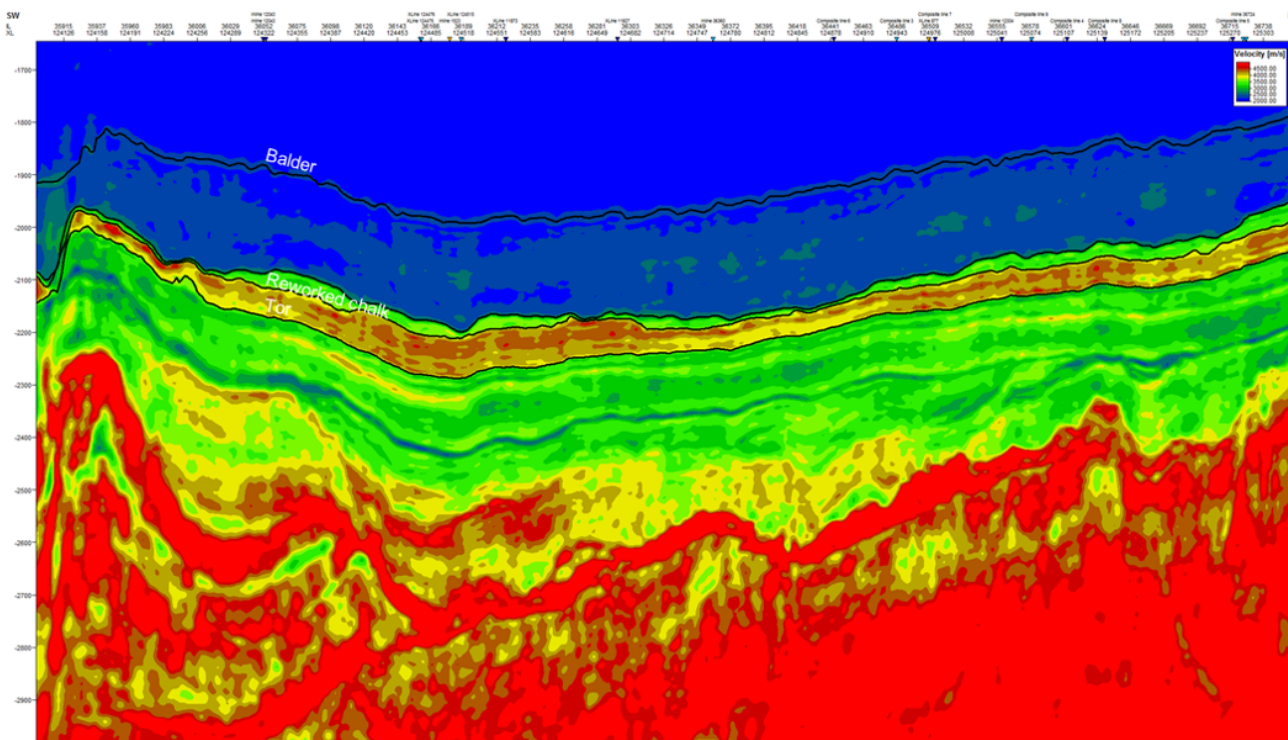


Fig. 3.1 Velocity Inversion

Utilizing the detailed velocity field and the high quality broadband data to create a velocity inversion highlighting different lithologies in the section

The negative results of the Tertiary prospectivity lead to shift in focus. The Mesozoic was considered non prospective due to lack of mature Jurassic source and very tortuous migration route from the mature Jurassic source rocks further west. Instead the sub-salt prospectivity was evaluated. A special study was initiated to investigate the potential for a Paleozoic source. A set of 5 wells were pick out for source potential study by APT: 7/3-1, 15/5-3, 16/3-2, 16/10-4 and 17/3-1. The hope was that this could give an indication of a Devonian source similar to what has been found in the Orchardia basin on the UK side. The study concluded that there was no convincing evidence for Devonian sourced hydrocarbons in the samples (Fig. 3.2).

	Devonian	Upper Jurassic	16/3-2	17/3-1	7/3-1	15/5-3	16/10-4
Carotane (m/z 123)	Abundant	Not significant	X	X	X	X	
Carbon isotope ratios	Usually lighter than -31‰ (range -31 to -35.6‰)	Usually heavier than -31‰ (range -25 to -31‰)	X	X	X		
C ₂₇ ββ steranes (m/z 218)	Depleted relative to C ₂₈ & C ₂₉	Not depleted	X			X	X
C ₂₈ bisnorhopane	Absent	Relatively Abundant	X	X	X	(X)	X
C ₂₉ steranes	Dominant						
C ₃₀ triterpane	Low-moderate concentrations	Generally absent	X				
C ₃₀ steranes	Absent	Abundant	(X)	(X)	X	X	X
Gammacerane (m/z 191)	Moderate concentrations	Low concentrations	X	X	X	X	X
Diacholestanes (m/z 217)	Depleted	Not depleted					
Diasteranes	Depleted						
Hopane/sterane ratio	Higher (bacterial dominated)	Lower (algal dominated)					
C ₂₃ -C ₃₅ hopanes	Low concentrations		X	X	X	X	X

Table 1: Comparison of distinguishing features for Devonian and Upper Jurassic oils (summarised from Curran, 1987a; The Geochem Group, 1986; Peters et al., 1989).

X = Indication of Devonian SR
 X = Negative for Devonian SR

Fig. 3.2 Summary of the Devonian oil study

The table show a summary of results of the Devonian source rock study of relevant wells. There were no clear evidence of a Paleozoic source in the sampled wells.

4 Prospect update report

There were two prospects identified in the PL911 license in the APA2017: Store Blind and Lille Blind.

The were stratigraphic traps in the Ty/Heimdal Fms. The concept was based on the "uniform shale model". This model was developed on the Balder field. by de-sanding the Tertiary interval, they discovered that the remaining shales had a fairly uniform thickness across the area. This concept was applied to the area east of the well 16/4-4. The isochron between Top Chalk and Top Sele Fm showed a thickness anomaly (Fig. 4.1). Plotting total section thickness versus total Tertiary sand thickness in for wells in the area gave a good trend. The cut-off were around 192m. The resulting "net sand thickness" map showed residual thickness further east of the official NPD pinch-out line.

The new PGS seismic dataset improved the resolution of the Paleocene. One could map an Intra Lista reflector. This reflector change the timing of the accommodation space in the area. The Top Chalk to Intra Lista isochron (Fig. 4.2) shows no anomalous thickness. Only some marly Våle Fm shales, tagged in the 16/8-3S, in the area of Store Blind. The Intra Lista to Top Sele Fm isochron (Fig. 4.3) shows the thickness anomaly to be later than the influx of the Paleocene turbidites of Ty and Heimdal Fms. Thus, the likelihood of finding Paleocene sand reservoir in the PL911 license is most likely none.

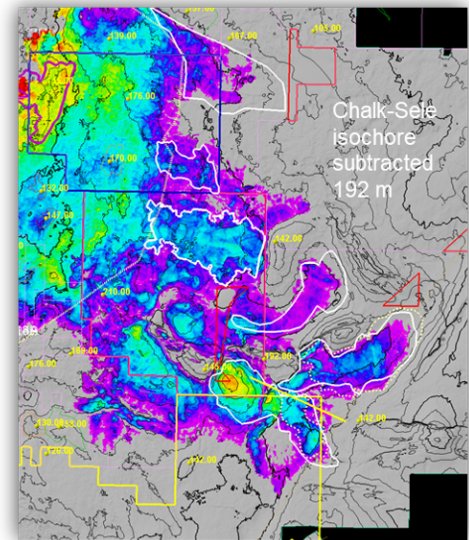


Fig. 4.1 Top Chalk to Top Sele isochron

This shows the residual thickness after subtracting 192m of "uniform shale".

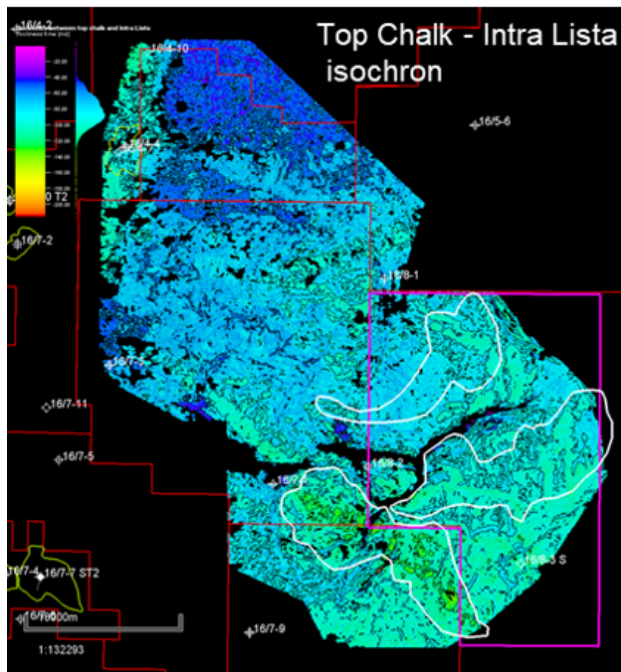


Fig. 4.2 Top Chalk to Intra Lista isochron

The thickness anomaly almost gone in the area. There is some residual thickness in the Store Blind area, but that is related to marly Lista Fm, tagged in the 16/8-3S well.

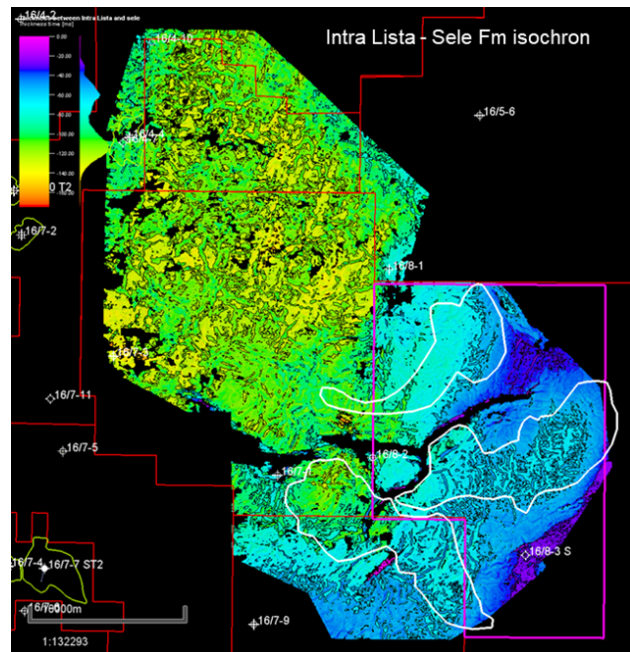


Fig. 4.3 Intra Lista to Top Sele isochron
Most of the residual thickness appears after the main influx of the Paleocene turbidites.

5 Conclusion

Based on the technical work done in the PL911 and PL775 licenses the partner group has decided to relinquish the area. The original prospects applied for are no longer valid. The Jurassic prospectivity has also been looked at, but the lack of mature Jurassic source rocks in the area and a tortuous migration route from mature basins in the west, makes this interval unprospective. The Paleozoic prospectivity has also been evaluated, but the question of a deep source is still a significant risk. The current view is that the license does not have a drillable prospect.