



Status Report for License PL627 and PL627B

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TABLE OF CONTENTS:

1. HISTORY OF THE PRODUCTION LICENSE	3
2. DATABASE OVERVIEWS	4
2.1. Seismic data 2.2. Well data	
3. RESULTS OF GEOLOGICAL AND GEOPHYSICAL STUDIES	
4. PROSPECT UPDATE	9
SEA-BED TO CRETACEOUS: Upper and middle Jurassic: Lower Jurassic and Below:	10
5. TECHNICAL EVALUATION	11
6. CONCLUSION	12

LIST OF FIGURES:

Figure 1 : PL627 license location map and prospect and discovery outlines Error! Bookmark r	ot defined.
Figure 2 : Common license database including seismic outlines and wells	5
Figure 3 : Skirne Field and Skirne East prospect with main risk indicated	6
Figure 4 : Petrophysical interpretation of well 25/6-5S	7
Figure 5 : Result of basin modelling study	8
Figure 6 : Remaining Tertiary prospectivity	10
Figure 7 : Remaining Jurassic prospectivity	10
Figure 8 : Gabba prospect	11

LIST OF TABLES:

Table 1 : Overview of license meetings held	. 2
Table 2 : Studies carried out on license	
Table 3 : Petrophysical analysis results of explo well 25/6-5S	
Table 4 : Initial resources estimated on license	
Table 5 : Prospective resources remaining on PL627/Pl627B at time of relinquishment	

1. History of the production license

Total applied for PL627 during the 2011 APA. PL627 was awarded to Total (40% operator), Centrica (20%), Det Norske (20%) and Faroe (20%) in 2012. A Drill or Drop decision had to be made before the 3rd of February 2014. In 2014 the decision was taken to drill an exploration well (25/6-5S) on the license and at this time an application was made for a small part of block 25/6 as part of the APA 2014 as protection acreage for the Skirne East prospect to avoid any potential unitisation issues in case of discovery. This extension was awarded as PL627B.

25/6-5S (NPDID 7662) was spud on the 12th March 2015 and it reached its formation TD at 2520m MD on the 2nd April, 2015. The end of operations was the 10th April 2015, with a total of 30 days operations. The well encountered gas/condensate in a 37m thick sandy reservoir in the Hugin Formation. It proved a GWC at 2316m TVDss which did not correspond to a large closure and suggests hydrocarbon leakage. The hydrocarbon column found was 9m, corresponding to a small 4-way dip structure. With the drilling of 25/6-5S all commitments have been fulfilled, including seismic acquisition and geological/geophysical studies. The next decision gate (BOK) is set for 3rd February 2018. TEPN does not intend to concretize PL627 and as a consequence recommends relinquishing the licenses. The current licensees on PL627(B) are as follows: Total (40% operator), Spirit Energy (20%), Faroe (20%) and Aker BP (20%). A map showing the licence outline of PL627 and PL627B with outer boundaries of prospects and discoveries can be seen in Figure 1.

For an overview of license meetings see table 1:

Date	Meeting				
	EC	WM			
13.04.2012		х			
22.05.2012			x		
13.06.2012	х	х			
27.11.2012	х	х			
11.04.2013	х	х			
07.06.2013	х	х			
08.11.2013	х	х			
21.01.2014			x		
17.03.2014			x		
09.04.2014	х	х			
10.06.2014	х	х			
29.09.2014			x		
21.10.2014	х	х			
27.01.2015	х	х			
17.02.2015			x		
19.03.2015			x		
21.05.2015	х	х			
17.09.2015	х	х			
24.11.2015	х	х			
16.06.2016	х	х			
22.09.2016	х	х			
14.11.2016	х	х			
14.06.2017	х	х			
15.11.2017	х	х			



Figure 1: Map showing license outline and prospect and discovery outlines.

2. Database overviews

2.1. Seismic data

The common license database, agreed by the license partners, consists of 3D seismic data, and well data. The common license database is itemized in Figure 2. Due to the quality of the existing data on the license upon license award a number of options were considered including a reprocessing and a Broadseis test acquisition. Various reprocessing was carried out and is itemized below in Figure 2, including the acquisition of a Broadseis survey across the license. The interpretation of the Skirne East prospect was finalized on the delivered PSTM. After the drilling of the Skirne East prospect a PSDM was acquired across part of the license.

PL627/B – Common license database

Seismic data: ST9707 ٠

- NO07M01
- ES9403
- UHN98
- MC3D NVG11M

Wells:

- 24/6-2
- 25/1-3
- 25/2-1, 4, 5, 6, 12, 13, 14, 15, C-1
- 25/3-1
- 25/4-1, 5, 6, 9
- 25/5-1, 2, 3, 4, 5, 7, A-1, B-01, C-01
- 25/6-1,2,3
- 25/7-1, 2, 3, 4
- 25/8- 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, C-18 (A, B, T2), C-20 .
- 25/9-1,2,3
- 25/10-3
- 25/11-2, 19, 23
- 26/4-1,2



Figure 2: Common license database including seismic outlines and wells.

Below (table 2) is a list of studies both geological and geophysical that have been carried out on the license since the award of the license in 2012.

Date	Action or study
02/2012	PL627 Award
03/2012	1st License meeting
06/2012	Approval of Work Program by Partnership
06/2012	Kick Off meeting Reprocessing project with WesternGeco
08/2012	Broadseis Test Seismic Acquisition (CGG)
08/2012	Purchase and copy of UHN98 / ST9707
09/2012	Coverage issue detected, purchase of ES9403
10/2012	Decision to prioritize PSDM on Skirne East
10/2012	Kick Off meeting Basin Modeling (Total HQ), finalized in 2014/2015
11/2012	Final Delivery of Cretaceous / Paleocene Sedimentological synthesis (TEPN)
02/2013	Delivery of Provisional PSDM on ST9707/UHN98 – Final PSTM expected in July 2013
03/2013	Final Delivery of Broadseis seismic data (Full stack + Sub-stacks)
04/2013	Final Delivery of Well log quantitative interpretation synthesis-Ty sands
07/2013	No PSTM Delivery – Beginning of Reprocessing project delay due to WesternGeco
08/2013	Presentation of Skirne East assessment to Total HQ
	Recommendation to finalize the prospect assessment on final PSTM.
09/2013	Fluid substitution feasibility study completed (TEP NORGE)
10/2013	Provisional PSTM Substacks data delivered by WesternGeco.
12/2013	Full Stack PSTM Final delivery on 15th of December – transfered to
	Petrobank on 18th December - Available for partners on 6th January.

01/2014	Geochemistry analytical study launched on fluids from 25/5-3, 25/5-4,
	25/5-7 and 25/6-1 wells.
2015	Continuation of geochemical analytical study launched on fluids from well
	25/8-7 to be included in the Gabba prospect evaluation.
2015	Petrophysical evaluation of Hugin Fm. in wells in PL627 to establish
	reservoir properties and trends for the Gabba prospect.
2016	PSDM received.
2017	Paleoscan study to assess for any remaining unseen prospectivity.

Table 2: Studies (geological and geophysical) carried out on license.

2.2. Well data

Well 25/6-5S has been drilled on PL627 to test the Skirne East prospect. The key wells for the license and prospect evaluation are listed in Figure 2 in the database section:

• **25/6-5S (Skirne East) NPDID (7662):** The well was spudded on the 12th of March, 2015. The well encountered gas/condensate in 37m thick sandy reservoir in the Hugin Fm. A gas-water contact was identified at 2316m TVDss. The hydrocarbon column was calculated to be 9m which corresponds to a small 4-way dip closure (see results of geological studies section for more detail).

3. Results of geological and geophysical studies

The Skirne East prospect (Figure 3) was matured by the license and the seal was identified as the main risk of the prospect. The Skirne East well was drilled by well 25/6-5S which was spud on the 12th of March, 2015 and reached its formation TS at 2520m MD on the 2nd April, 2015. The well encountered gas/condensate in a 37 m thick sandy reservoir in the Hugin Formation. It proved a GWC @ 2316 m TVDss which did not correspond to a large closure and suggests hydrocarbon leakage. The hydrocarbon column found was 9 m, corresponding to a small 4-way dip structure. The well was Plugged and Abandoned on the 10th of April 2015.



Figure 3: Skirne field and Skirne East prospect. Indicated is the main risk of sealing in turquoise.

In terms of structural/stratigraphic picking the well was in line with the prognosis. As for the petroleum results, the well encountered 36.9m of gross reservoir in the Hugin Fm. Using a cut-off for Phie of >10% and for Vshale <40%, a net of 30.2m was obtained having an average porosity of 23% (Table 3, Figure 4).

Well	Interval	DEPTH_TOP	DEPTH_BASE	GROSS	NET	NTG	PHIEH	PHIE_AV	VCL_AM	SWE_AM
	METRES	METRES	METRES	METRES	М	v/v	V/V	V/V	v/v	V/V
25/6-55	HUGIN	2458.8	2495.7	36.9	30.18	0.82	6.92	0.23	0.19	0.75
25/6-55	HUGIN_PAY	2458.8	2468	9.2	9.10	0.99	2.17	0.24	0.19	0.31
25/6-55	HUGIN_WATER	2468	2495.7	27.7	21.07	0.76	4.75	0.23	0.19	0.94

Table 3: Petrophysical analysis results of the exploration well showing excellent reservoir characteristics



Figure 4: Petrophysical interpretation of well 25/6-5 S Indicating good net and good porosities

Eight planned formation pressure points were taken during the drilling of this well. The acquisition was performed from 2258.20 mMD to 2486.66 mMD in the 8 $\frac{1}{2}$ " section, covering the entire drilled Hugin Fm section. The points indicate an oil and water trend. The points have been plotted together with the points taken from 25/5-3 (Skirne). It can be observed that a depletion of 36.61 bars has occurred between the Skirne East discovery and the Skirne Field. This suggests an active aquifer connecting the 2 structures.

The main risk identified prior to drilling was the lateral leakage through reservoir juxtaposition along the southern bounding faults, showing a low throw in some locations. The thicker reservoir section found (37m, compared to the 25m expected) increases the probability of connection between sand sediments on each side of the fault and may explain the failure of the trap. This can be confirmed by the encountered GWC at 2316m.

To assess the prospectivity of the license both prior to the drilling of Skirne East and post-drilling a number of geological studies were carried out. See table 2 in the previous section to see timing of studies carried out. A Cretaceous/Paleocene sedimentological synthesis was performed with a final delivery in 2012. The study identified and correlated 11 sequences. Corresponding paleogeographical maps were constructed, showing the influence of Top Cretaceous paleogeography on the deposition of the Ty sands. As a follow on to this study a quantitative interpretation of Ty sand well logs was performed in 2013. A fluid substitution feasibility study was completed for the Skirne East prospect. Also in 2012 a basin modelling study was launched in order to better understand the possible kitchens in the surrounding area and their relative maturity and timing of expulsion. The basin modelling study was finalized in 2015 and concluded that PL627 was in a non-mature province and therefore depended on a long migration pathway from one or more of the mature kitchens in the surrounding area (Figure 5). In 2014 an initial geochemical analytical study was launched on fluid samples from wells: 25/5-3, 25/5-4, 25/5-7 and 25/6-1. In 2015-2016 an additional geochemical study was carried out on well 25/8-7 in order to better characterise the fluid and its origin found in the well including maturity, source rock origin, type mix, comparison to surrounding results and to try and explain the charging phase(s) for the Gabba prospect. 25/8-7 was chosen as it was believed to be on the possible migration pathway towards Gabba. The conclusion of the reinterpretation of samples from 25/8-7 were inconclusive as although from the biomarkers there were no significant indications of paleo or present day biodegration there remains the possibility that the analyzed Hugin extract represents the residual fraction of a condensate whose light fraction (initially representing the majority of the fluid) has been lost. Therefore the conclusions from the biomarkers may not necessarily be representative of the whole fluid.



Figure 5: Result of basin modelling study with respect to migration pathway into the non-mature province of PL627.

4. Prospect update

The identified prospectivity at the outset of the license from the partner companies was presented at the first MC meeting (Table 4). The key prospectivity for the license was identified in the Jurassic and Tertiary intervals. In the first meeting of the license held in 2012 the recommendation was to focus initially on the Paleocene prospectivity of the license (Tømmermann, Skirne East and Eiganes).

Prospect/Lead	Prospect (P)/ Lead (L)	Unrisked recoverable resources (Mboe)	Probability of Discovery (%)	Part in acreage applied for (%)	Litho / Chrono stratigraphic level (reservoir)	Reservoir depth (m MSL)	Distance to infrastructure (km)
Eistla	Ρ	3-5-12		100	Brent	2530	10
Ulfrun	Ρ	2-5-16	22	100	Brent	2585	8
Ulfrun North	Р	2-3-21	22	100	Brent	2490	2
25/5 «D»	Ρ	5-8-19	9	100	Hugin	2215	13
Hugin South	Ρ	4-7-23	9	100	Hugin	2140	14
25/8-9 Up-Dip	Ρ	2-3-4	46	100	Hugin	2370	10
Skirne East	Ρ	10-17-47	11	100	Hugin	2286	12
Eiganes	Ρ	6-12-53	10	100	Ту	2023	12
Skirne East	L			100	Ту		
Tømmermann	L			100	Ту		

Table 4: Initial Resources (All values are based on P90-P50-P10 volumes as reported in the APA application for the licence in 2011)

After the drilling of Skirne East the prospectivity of the block was re-evaluated. The primary prospectivity of the license is in the Jurassic and Tertiary, but the license has also been screened for other remaining prospectivity from seabed down to basement. The remaining prospectivity considered on the license is presented in the sections below and in table 5. The main difference is in prospect D which was renamed as the Gabba prospect (discussed in the Jurassic section). The Tømmermann lead is no longer considered as valid on the licence. Otherwise there have only been minor changes to the volumetrics and risking on the remaining prospects on the license.

	Category	Status	Play	Name	Unrisk resources (Mboe)	Fluid	Po/Pg	Main risk	Exploration type
	Contingent R.	D	Mid Jurassic	<u>Skirne</u> East	0.8-1.3-2-1.3 (updip potential to the East: 1.2-1.8-2.5)	-	(48%)		
2	Prospect		Mid Jurassic	Gabba	7-18-40-21	G/C	36%	Lateral seal	Emerging
nos	Prospect		Tertiary	Eiganes.	7.6-19.6-45-23.6	0	10%		Emerging
2	Prospect		Mid Jurassic	Ulfrun	2.7-6.9-14.3-7.8	G/C	22%		Emerging
רמו בוור	Prospect		Mid Jurassic	<u>Ulfrun</u> North	1.7-6.9-17.9-8.6	G/C	22%		Emerging
3	Prospect		Mid Jurassic	Eistla	1.6-4-7.1-4.3	G/C	25%		Emerging
	Prospect		Mid Jurassic	Hugin South 1	4.2-11-19-11.4	G/C	9%		Emerging

Table 5: Prospective resources considered remaining on PL627/PL627B at time of relinquishment.

Sea-Bed to Cretaceous: There is no prospectivity identified in the Cretaceous interval. However in the Tertiary there is on prospect identified. The potential of the Tertiary interval is related to the turbiditic sands of the Ty Formation. There is one, assumed to be oil, prospect on the license. The Eiganes prospect is considered to be very risky (10% Pg) with the main risk being the migration and timing. It is considered to be too small to be economical.



Figure 6: Remaining Tertiary prospectivity

Figure 7: Remaining Jurassic prospectivity

Upper and Middle Jurassic: PL627 contains the following Jurassic prospects (Figure 7):

The remaining prospectivity of the Jurassic interval is mainly represented by the Gabba (previous D prospect) prospect (Figure 7). The Gabba prospect (previously D prospect) is considered to be the best object remaining on the license with good economics at the time of assessment. With a recent PSDM and the Skirne Field located to the north of the prospect, the geometry and reservoir characteristics are believed to be well understood. The main risk of the Gabba prospect is considered to be the lateral seal. In 2016 an exploration well was presented to Total management with a fast development tie-back solution to the Heimdal platform (Figure 8). However the prospect was rejected due to the lack of materiality of the prospect and the time criticality linked to the Heimdal platform.

Other Middle Jurassic prospects identified on the license include Ulfrun, Eistla and Hugin South 1, these are all considered to be more risky and of smaller size than Gabba.



Figure 8: Gabba prospect, seismic lines and fast track development back to Heimdal

Lower Jurassic and Below:

No prospectivity has been identified below the Middle Jurassic due to lack of identified closures and principally the burial depth of the objectives that are considered to affect the prospectivity of these intervals.

5. Technical evaluation

An economical study was carried out for the Gabba prospect. It was assessed as a potential exploration well with a fast development tie-back to the Heimdal process platform in the Central North Sea (Figure 8). The well was assessed to be drilled in 2017 with the conversion to a development well with a sidetrack in 2019 with estimated first oil by early 2020. It was considered a low CAPEX/DRILEX development with cash generation within 1 year of start-up. OPEX was assessed to be highly time dependent as the Heimdal platform reaches end of life. Gabba was assessed as being economical but of too low materiality.

An economical study was also carried out after the drilling of the Skirne East prospect. However when taking into account the disappointing well results the discovery was assessed as not being economical for development.

6. Conclusion

Grounds for full relinquishment of the PL627/PL627B licenses are the following:

- The license BoK deadline is the 3rd of February, 2018.
- Main target, Skirne East, has been drilled and found not to be economical.
- Remaining prospectivity on the license has been assessed as lacking in materiality or very low in volumes.