



## **PL 1068 – Licence status report**

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## Summary

PL1068 (Equinor Energy AS Op / 60%, Norske Shell AS / 20%, Wintershall Dea Norge AS / 20%) was awarded 14<sup>th</sup> of February 2020 (APA 2019) with a decision on DoD to be taken within 14<sup>th</sup> of February 2022. The main prospect in the license is the Lutsi prospect, which was mapped out on SH0701 and the regional full fold post-stack merge ST17M10 for the APA 2019 application, written by Equinor Energy. Lutsi is a 4-way dip closure at Lysing Fm. level. Key risks of the prospect are trap seal related to possible reactivation of the faults close to apex in addition to reservoir presence and quality. A quantitative geophysical analysis of SH0701 is performed, resulting in an uplift in DFI risking. Additional prospectivity was mapped in the Springar Fm. The business case for the licence was tie-in volumes to Aasta Hansteen via a development of Balderbrå and Gullstjerne in PL894. At the time of award of PL1068 it was already clear that Balderbrå was a technical discovery and the Gullstjerne prospect was dry. However, the licensees accepted the licence with the aim of maturing sufficient volumes for a tie-in to Aasta Hansteen via the Asterix development. Technical evaluation of the tie-in distance to Aasta Hansteen via Asterix has revealed that it is not feasible to tie-in gas volumes from PL1068, due to distance and seafloor temperature. The evaluated volumes in PL1068 are not sufficient for the need for stand-alone volumes to develop prospectivity in PL1068 and this is the basis for the license decision to relinquish PL1068 before the DoD deadline.

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## 1 History of the production license

<b><u>Licence:</u></b>	PL1068	
<b><u>Awarded:</u></b>	14.02.2020	
<b><u>Licence blocks:</u></b>	6603/5 & 6603/6	
<b><u>Licence period:</u></b>	<b>Expire 14.02.2027 (DOD 14.02.2022)</b>	
<b><u>Licence group:</u></b>	Equinor Energy AS	60% (Operator)
	Norske Shell AS	20%
	Wintershall Dea Norge AS	20%
<b><u>Licence area:</u></b>	823.270 km <sup>2</sup> (Figure 1-1)	
<b><u>Work program:</u></b>	DoD, deadline February 14 <sup>th</sup> 2022.	
<b><u>Meetings held:</u></b>		
14.05.2020	EC/MC startup meeting	
26.11.2020	EC/MC meeting	
<b><u>Work performed:</u></b>		
2020:	License start-up Technical evaluation on valuation. G&G work: Screening for prospectivity in Lysing and Springar Fm's, additionally to what was defined in the APA application.	
2021:	License decision made to drop the license	

### **Reason for drop:**

A technical evaluation on valuation has concluded that a development of the prospects in PL1068 as tie-in candidates via Asterix to Aasta Hansteen is not a possibility. Stand-alone volumes are required in PL1068 in order to develop the license. The available data have been screened and stand-alone volumes are not found in PL1068 as per now and therefore it is recommended to drop the license.

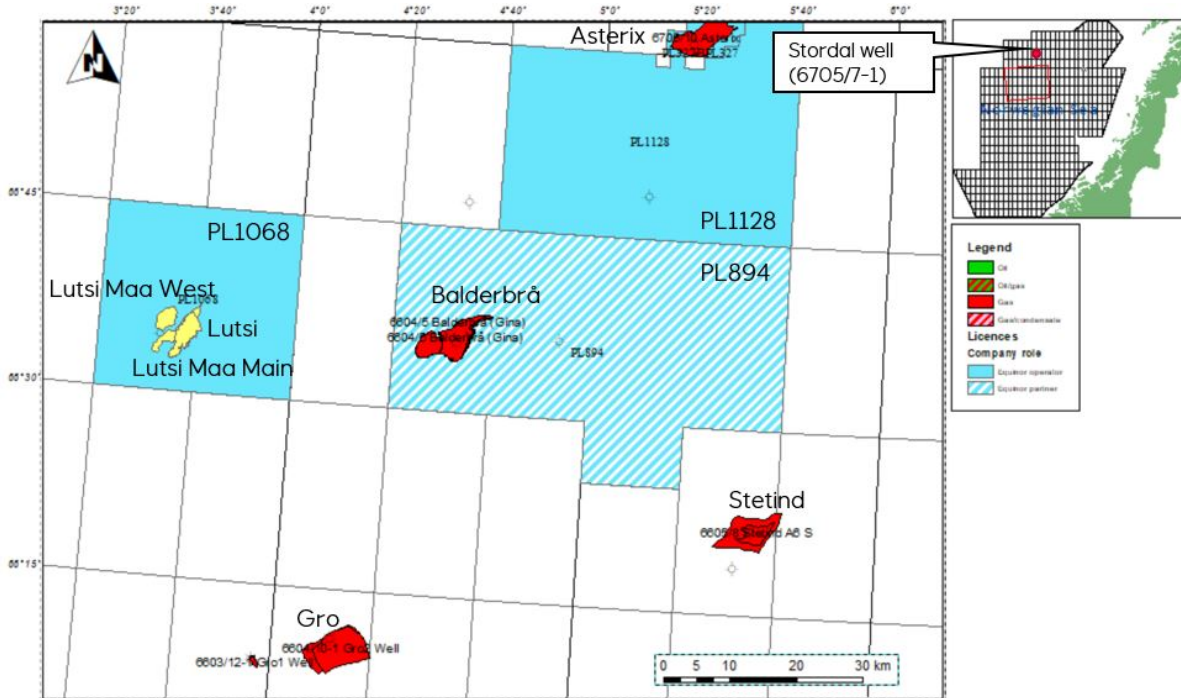
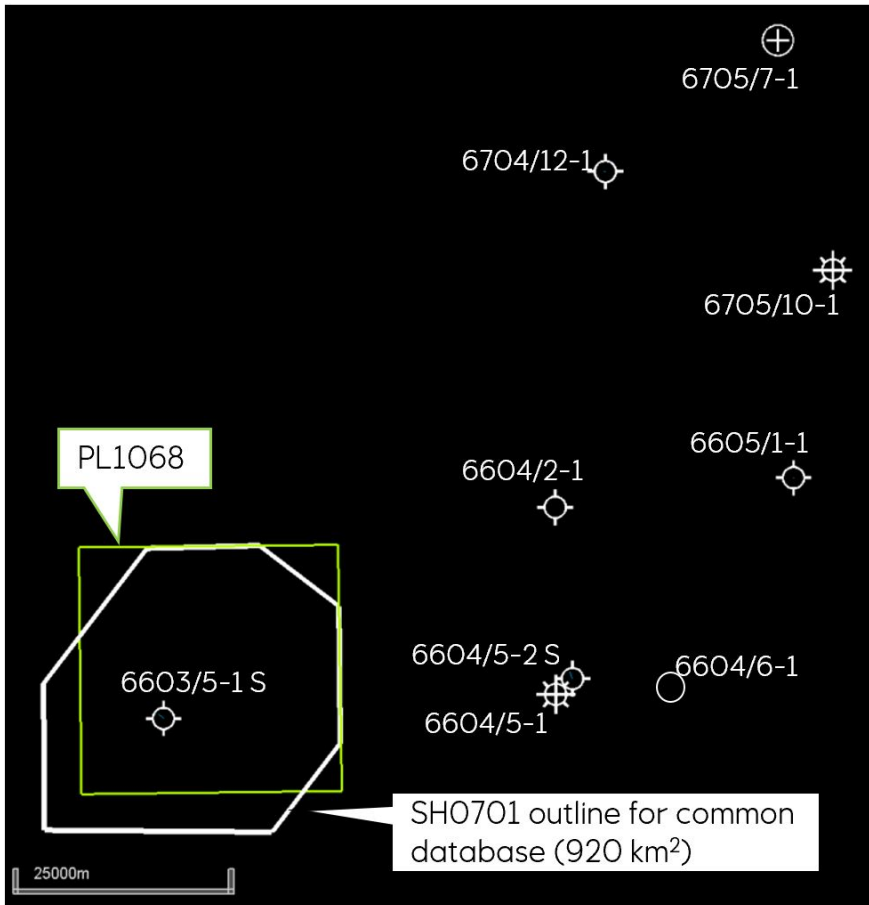


Figure 1-1 PL1068 location with prospect outlines, Lutsi, Lutsi Maa West and Lutsi Maa Main.

## 2 Database overviews

### 2.1 Seismic data

The SH0701 3D seismic survey is approved as common database in PL1068 and is the survey used for G&G work in the license (Table 2-1). All existing angle stacks are used in the prospect evaluations.



**Figure 2-1 Overview map showing the approved common database outline of 3D SH0701. The regional 3D merge ST17M10 is also used for prospect evaluation but it is not part of the common database in the license. The nearest wells from the common database are shown on the map.**

Seismic	Type	Stacks
SH0701	3D	All stacks
All relevant and released lines	2D	Available stacks

**Table 2-1 List of 2D/3D seismic in the PL1068 common database**

## 2.2 Well data

A list of wells in the common well database for PL1068 is listed in Table 2-2 and some of the wells are shown in Figure 2-1.

Well name	Alias	Year	Operator
6603/5-1 S (*)	Dalsnuten	2010	A/S Norske Shell
6603/12-1	Gro-1	2009	A/S Norske Shell
6604/2-1	Gullris	2011	BG Norge AS
6604/5-1	Balderbrå	2018	Wintershall Norge AS
6605/1-1	Obelix	2009	Statoil Hydro AS
6605/8-1	Stetind 1	2005	Norsk Hydro AS
6605/8-2	Stetind 2	2008	Norsk Hydro AS
6607/5-2	Utgard	1991	Eso Norway AS
6704/12-1	Gjallar	1999	Saga Petroleum AS
6705/7-1 (*)	Stordal	2017	Repsol Norge AS
6705/10-1 (*)	Asterix	2009	Statoil Hydro AS
6706/11-1	Ægir	1998	Den norske stats olje. AS
6706/11-2	Gymir	2015	Statoil Petroleum AS
6706/12-1	Snefrid S	2008	Statoil Hydro AS
6706/12-2	Snefrid N	2015	Statoil Petroleum AS
6706/12-3	Roald Rygg	2015	Statoil Petroleum AS
6707/10-1	AaHa	1997	BP Norway Ltd.
6707/10-2 A	Haklang W	2008	Statoil Hydro AS
6707/10-2 S	Haklang	2008	Statoil Hydro AS
6707/10-3 S	Ivory	2014	Centrica Resources AS
Access to all released wells	Full access to key wells (*)		

**Table 2-2 List of wells in PL1068 common well database. Key wells are 6603/5-1 S, 6705/10-1 and 6705/7-1.**

### 3 Results of valuation evaluation

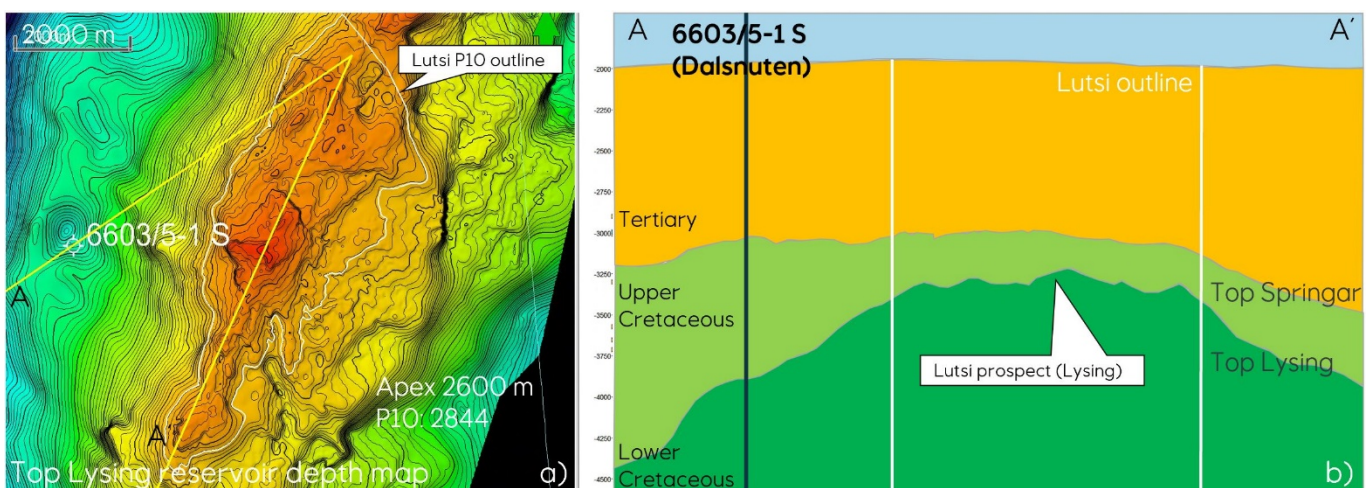
The background for the APA application on the Lutsi prospect was based on the valuation done for the APA, saying that an economic case was depended on a tie-in to Aasta Hansteen via Balderbrå. The Balderbrå appraisal was dry. Hence, a technical exercise has been done after the license award as a tie-in solution via Asterix. The evaluation has shown that

the potential well-head temperature of the gas from Lutsi is too cold to mix with the Asterix gas flow. Thus, hydrate generation is expected to occur in the pipe-lines from Asterix to Aasta Hansteen due to the long distance. The conclusion is that Lutsi is not a tie-back candidate for the Aasta Hansteen spar. Stand-alone volumes, which are assumed to be more than 40 G Sm<sup>3</sup> (recoverable), are needed to develop any prospects in PL1068.

## 4 Prospect update report

### Lysing Fm.:

The main prospect in the license is the Lutsi prospect, which is interpreted and evaluated on the 3D seismic dataset SH0701 and the full fold post-stack merge ST17M10 for the APA application in 2019. Lutsi is a 4-way dip closure sealed by Cretaceous shales as are found in the nearby Dalsnuten well. Apex is at 2600 m and the P10 HC column is evaluated to be 244 m (Figure 4-1). The reservoir is representing the Lysing Fm. of Turonian/Coniacian age. Fault activity around the Lutsi prospect has resulted in missing Lysing sections in the Dalsnuten well, but 90 m of relatively good sand is proven in the Stordal well 100 km to the north of Lutsi. The Lysing reservoir in Stordal is regarded as being located in the proximal part of the deep-marine basin floor fan, sourced from East Greenland. The Lutsi prospect is also believed to be located in the proximal part of the system, however, slightly more distal than Stordal. Reservoir parameters are expected to be fairly good (Table 4-1). A regional basin model identifies several source rocks of Cretaceous age in the Vøring area, which are relevant for the Lutsi prospect. The prospect location on a regional high is favouring gas migration into the prospect. Gas generation is proven in several wells in the Vøring area (Asterix, Balderbrå, Gro, & Stetind discoveries, Aasta Hansteen field) and is therefore not considered to be a major risk for the Lutsi prospect. A quantitative geophysical analysis was performed on the SH0701 dataset, showing support for HC's on the P-impedance stack, but with reservoir of questionable quality in the Lutsi prospect. A DFI in Lutsi is observed on the seismic dataset, resulting in DFI risking upgrade in the prospect evaluation, and hence, a total Pg of 29%. Mean in-place volumes are 18.6 MSm<sup>3</sup> OE (Table 6-1). Key risks of the prospect are trap seal related to possible reactivation of the faults close to apex in addition to reservoir presence/quality.



**Figure 4-1 a) Top Lysing depth map with Lutsi P10 prospect outline. b) Geosection through the Lutsi prospect and the Dalsnuten well.**

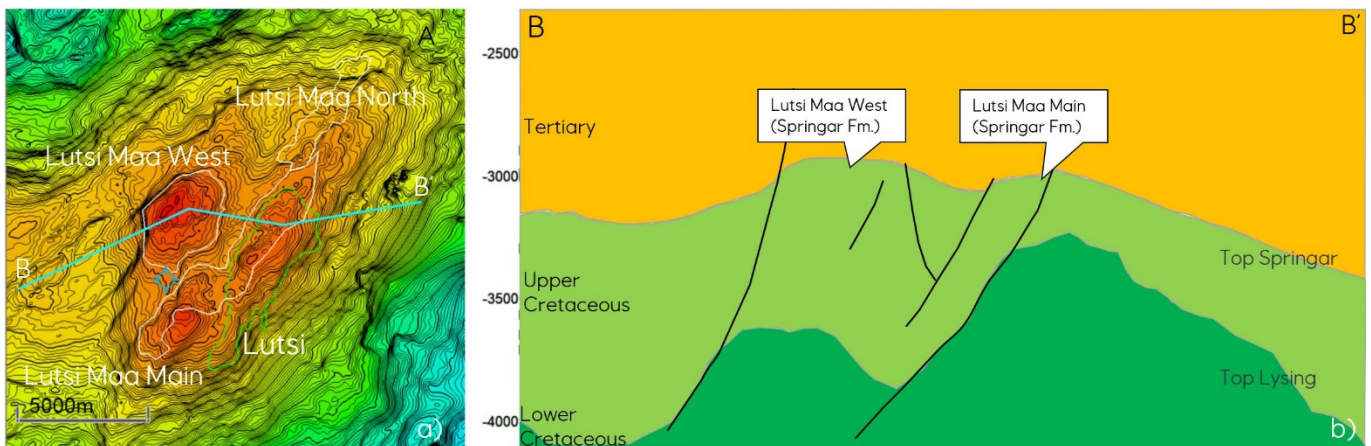


Parameters reservoir/fluid	Min	Mean	Max
Reservoir thickness (m)	50	96	150
N/G	0.4	0.7	0.9
Porosity	0.15	0.23	0.28
Oil saturation	0.5	0.7	0.8
Gas saturation	0.5	0.7	0.8
Wet gas shrinkage factor	1	1	1
GOR [Sm <sup>3</sup> /m <sup>3</sup> ]	32	65	97
Shrinkage factor oil 1/Bo [Sm <sup>3</sup> /m <sup>3</sup> ]	0.68	0.83	0.97
Expansion factor gas (1/Bg) [Sm <sup>3</sup> /m <sup>3</sup> ]	224	229	246
Condensate yield [Sm <sup>3</sup> /10 <sup>6</sup> Sm <sup>3</sup> ]	0	5	208
Recovery factor non. assoc. gas	0.45	0.6	0.75
Recovery factor condensate	0.35	0.5	0.65

**Table 4-1 Lutsi prospect parameters for volume input. Reservoir parameters are calibrated to the Stordal well.**

**Springar Fm.:**

In Springar, two prospects and one lead are mapped with clear DFI indications, Lutsi Maa West, Lutsi Maa Main and Lutsi Maa North (Figure 4-3 ). All three Springar structures are 4-way dip closures. The mean in-place volumes are 3.5 and 5.6 MSm<sup>3</sup> OE respectively, both with a Pg of 27% after DFI upgrade (Table 6-1).



**Figure 4-2 – a) Springar minimum amplitude on fluid cube, +20 ms. C.I.: 10 m. White outlines are Springar prospects and leads, green outline is the Lysing outline. b) Geosection through Lutsi Maa West and Lutsi Maa Main prospects.**

**Other prospectivity:**

An Eocene lead (Bynuten) was identified for the APA application. This lead has not been matured any further. The remaining license has been scanned for additional closures with amplitude anomalies on Lysing and Springar levels. This was done to explore for prospects that could lift the total volume potential in the license, to make it robust for a stand-alone development. On Lysing level, several 4-way dip closures with HC indications are identified, holding recoverable volumes of less than 1 G Sm<sup>3</sup>. On Springar level, no opportunities have been found, apart from the already mapped

structures. Hence, identified and mapped HC volumes at the present stage are not sufficient for a stand-alone development.

## 5 Technical assessment

The performed economic evaluations are described in chapter 3 in this report. The conclusion is that stand-alone volumes are required for development of PL1068. Table 6-1 shows the current volume potential in PL1068, mapped by the Operator. The presented volumes are not enough for a stand-alone development and based on that the partnership in PL1068 has decided to drop the license before the DoD deadline.

Prospect/Lead	In-place resources P90-Mean-P10 [MSm3 OE]	Rec. resources P90-Mean-P10 [MSm3 OE]	Pg	HC phase split (gas/oil %)
Lutsi (P)	5.8 – 18.6 – 31.7	1.2 – 8.0 – 14.6	29%	90/10
Lutsi Maa M (P)	2.3 – 5.6 – 10.5	1.4 – 3.3 – 6.3	27%	Gas case
Lutsi Maa W (P)	2.0 – 3.5 – 5.5	1.2 – 2.1 – 3.3	27%	Gas case
Lutsi Maa N (L)	0.9 – 5.4 – 10.8	0.5 – 3.3 – 6.5	63%	Gas case
Bynuten (L)				

**Table 6-1 Volume potential and risk in PL1068.**

## 6 Conclusion

The mapped HC volume potential in PL1068 is not sufficient for a development and the license has been dropped prior to the DoD milestone in February 2022.