PL229D Relinquishment Report

New Document

vår energi

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1 Key Licence History

PL229D JV consists of Vår Energi, hereinafter Vår, (50% W.I. Operator) and Equinor Energy AS, hereinafter Equinor, (W.I. 50%) and covers an area of 35 sqkm including the apex of the identified Lupa prospect that largely straddles within PL229E (see Fig. 1.1). PL229D was awarded during the APA/TFO 2015 based on a G&G study commitment for the initial exploration phase of two years. Eni Norge, Now Vår, Operator of the blocks 7122/8 and 7122/9, fulfilled this work commitment by carrying out an extensive G&G evaluation of the license. After analysis and investigation of multiple seismic datasets covering the licence area, the Lupa prospect remains a risky and un-proven stratigraphic play, with remaining uncertainty on the AVO response combined with a lack of calibration analogue. In 2019 this led to a mis-alignment within the JV members on the way forward for the licence. Vår Energi favoured a drill decision, while Equinor favoured dropping the licence. With the approval from JV partners, an extension of 1 year was applied for, during which time Vår Energi would seek new partners to the JV, at which point a Sales and Purchase Agreement (SPA) will be executed between Vår and Equinor for Equinor s 50% license interest. The terms of the way forward agreement were posted on L2S on the 4th November 2019. A 6 months extension was granted by the authorities, with a new DoD deadline of 15th May 2020. Vår Energi has conducted data rooms during this time, in order to find a JV partner willing to join in a drill decision on Lupa. This endeavour was halted by the rapid onset of the Corona (Covid-19) virus and the subsequent commercial and economic shut-down, making it impossible during this time to continue to run data rooms and work towards forming a new JV. It has also had an effect on the ability of potential new partners to commit to joining the JV. The situation at that time was that there are 2 candidates that are very interested to farm in to the licence, but in the global health crisis, and the resulting economic downturn, they are unable to commit to a firm well. With the approval of the current JV partners, Vår Energi requested a further 8 month extension to the drill or drop decision on the PL229D licence with an updated DoD deadline of 15th January 2021 to finalise negotiations with potential JV partners that were interrupted due to Corona crisis and oil-price crash. On the 29th June 2020 the JV was informed that the licence extension would not be granted and that PL229D had lapsed from 16th May 2020.

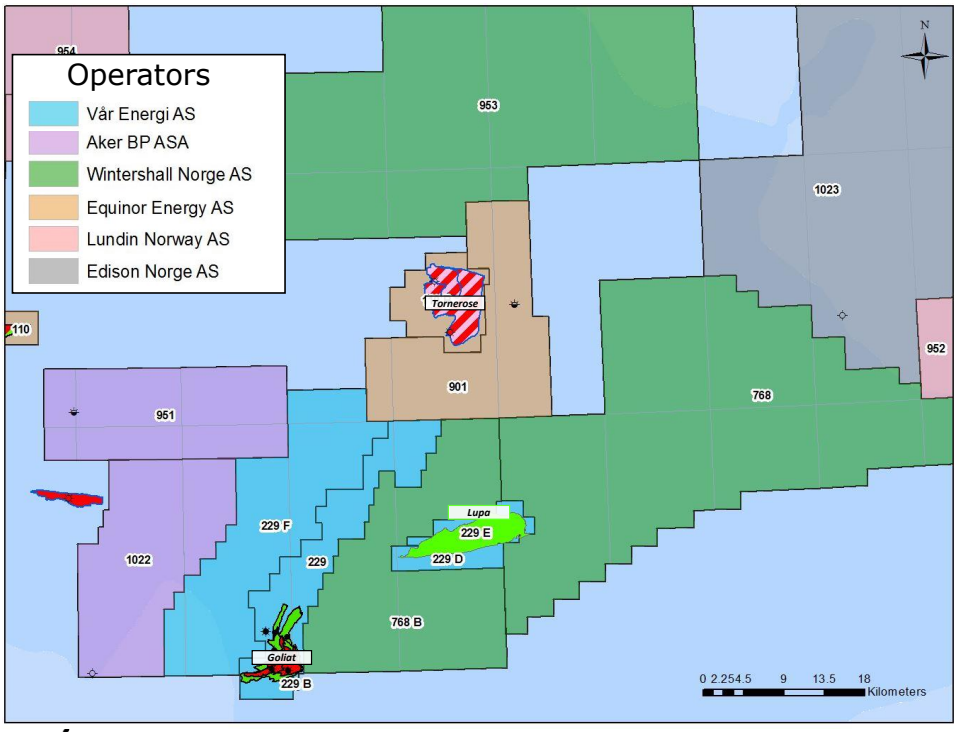

Fig. 1.1 PL229D Location Map

2 Database

The main seismic surveys used for prospect mapping in 2016, and tieing the prospect into regional interpretations are the 3D surveys EN0702 PSTM and PSDM, a conventional single azimuth survey acquired in 2007 by PL229 (Vår Energi operator). This seismic survey is a merge of two surveys with different polarities.

In 2017, the newly acquired seismic survey WIN17001 PSTM and PSDM by Wintershall Norge AS was available over the area of the PL22D and E licenses. WIN17001 is a 3D data set with both full and angle stacks in both time and depth (PSDM). The WIN17001 3D survey is of excellent quality and Vår have compared these data with existing internally acquired and reprocessed 3D datasets over the Finnmark Platform and the Lupa prospect. The WIN17001 data has a broader frequency spectrum than previous surveys, and preserves higher frequencies at the Lupa target interval resulting in a slightly higher vertical resolution (c.30m against c.35m from previous surveys).

In 2019, a reprocessing of the EN0702 seismic dataset produced the new EN19M02 PSTM and PSDM seismic volumes which have comparable quality and resolution as the WIN17001 PSTM and PSDM surveys. In addition, the EN0901 3D, and WIN14002 and BSS01 2D seismic surveys have been used in order to tie the WIN17001 and EN19M02 data to existing regional interpretations and to wells.

All available wells within the 3D area and nearby surrounding areas covered by 2D seismic have been investigated and tied to the seismic. These consist of wells: 7120/12-2, 7120/12-4, 7122/7-3, 7128/6-1 and 7128/4-1

3 Geological and Geophysical Studies

The 2016 seismic interpretation of the Lupa prospect was carried out on the 3D survey EN0702 PSTM and PSDM. An AVO study done in 2008 on the prospect was very discouraging because the polarity change was not taken into account. In 2014, new seismic interpretation performed on the reprocessed 3D survey EN0702 PSDM led to a revised interpretation and full coverage of the prospect with 3D seismic data. Consequently, a re-evaluation of the geological, stratigraphic and structural models, together with updated petroleum systems modelling study were carried out. This reduced the risks associated with seismic interpretation, seismic polarity and depth conversion. In 2016, a second revision of seismic interpretation was carried out on the 3D survey EN0702 PSTM and PSDM, followed by an AVO study performed in conjunction with Sharp Reflections.

In 2017, Wintershall Norge AS acquired a new seismic survey WIN17001 PSTM and PSDM over the PL229D and PL229E and surrounding areas. As part of a courtesy agreement, Vår Energi was entitled to a segment of the survey over PL229D and PL229E. A new seismic interpretation was quickly carried out, and the following AVO study by GEOS gave positive results on Lupa. It is worth to mention that the available seismic data from the WIN17001 survey cover ca. 90% of the Lupa prospect.

In 2019, a reprocessing of the EN0702 seismic dataset produced the new EN19M02 PSTM and PSDM seismic volumes allow a further investigation of the seismic data. This produced a new seismic interpretation and a further re-evaluation of the geological, stratigraphic and structural models.

Sedimentological, structural and PSM studies carried out in 2013-2014 for the license PL657 were available for the evaluation of the Lupa prospect.

All available wells within the 3D area and nearby surrounding areas covered by 2D seismic have been investigated and tied to the seismic. The same sedimentological model SPES 2013 carried out for PL657 was used and the reference wells are: 7120/12-2, 7120/12-4, 7122/7-3 and 7128/4-1.

4 Prospect Update

The play model for the Lupa Prospect is named Lowermost Triassic Shelfal Sandstone Play (Havert Fm.). The reservoir is considered to be Lower Triassic Havert Fm. lowstand sandstones with provenance from the Fennoscandian Shield, deposited at the toe of Permian clinoforms. Such lowstand sandstones are present on the Finnmark Platform but so far only the wells 7128/4-1, 7126/4-1 and 7130/4-1 have partially tested this play concept.

The vertical and lateral seals consist respectively of Triassic shales of the Havert Fm. and Permian shales of the Ørret Fm. The prospect relies on expulsion of hydrocarbons from the proven Middle Triassic Kobbe source rock from the kitchen area in the Hammerfest Basin. Migration of hydrocarbons can be modelled along Kobbe carrier in the Hammerfest Basin, juxtaposed with the Lower Triassic Havert Formation sandstones across the Troms-Finnmark Fault Complex and into the Finnmark Platform. Fig. 4.1 illustrates the lithology column for the area.

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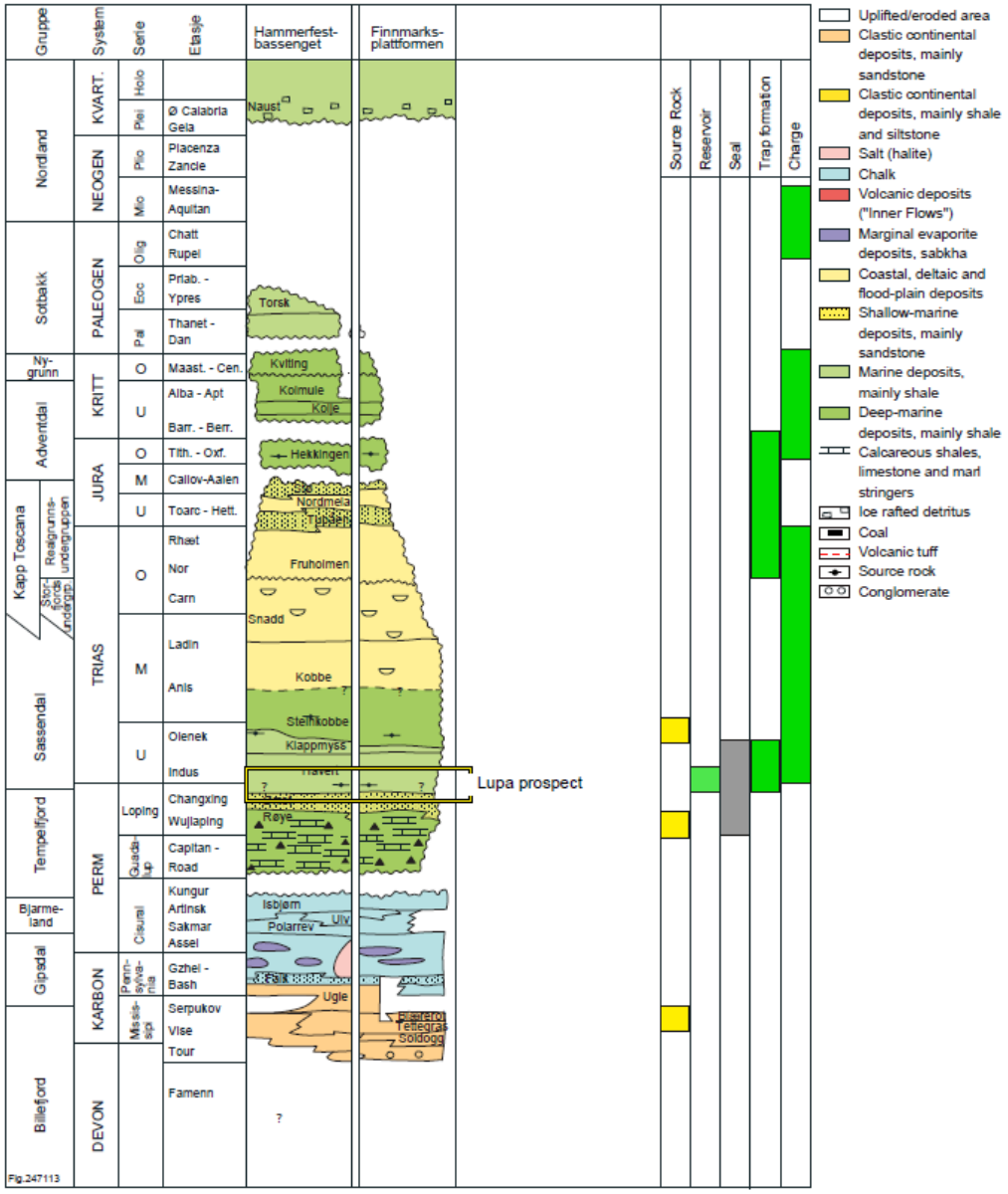

Fig. 4.1 Lithology Column

Prospect description

The Lupa prospect (Fig. 4.2) is located mostly inside license PL229E but the apex is in PL229D. The prospect is situated on the edge of the Finnmark Platform, on the footwall side of the Troms-Finnmark Fault Complex, with the roll-over "Goliat structure" in the hanging wall. The average water depth is 400 m.

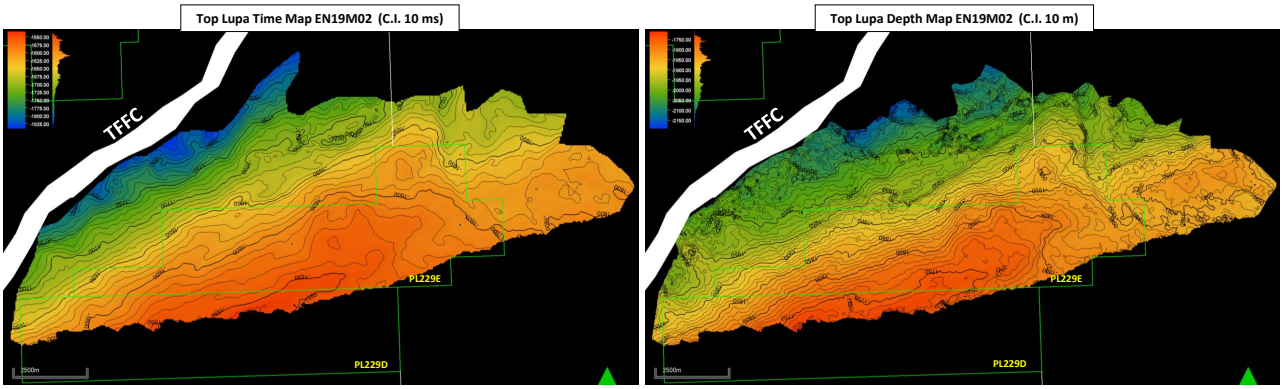

Fig. 4.2 TWT & DEPTH Maps

The prospect has been mapped on the Post Stack Depth Migration (PSDM) volumes of the EN19M02 3D survey. It has been interpreted as a stratigraphic pinch-out of lowstand sandstones deposited at the toe of Permian clinoforms. The reservoir is believed to be Lower Triassic Havert Formation Shelfal Sandstones sealed vertically by Triassic shales (Havert Fm.) and laterally by Triassic (Havert Fm.) and Permian shales (Ørret Fm.). The prospect is characterized by a stratigraphic closure associated with an amplitude anomaly.

Trap

The prospect is a stratigraphic trap in the Havert Formation Sequence 1 that consists of lowstand sandstones vertically and laterally sealed, respectively, by the Havert Formation Sequence 1 or 2 and Ørret Formation shales.

The reservoir sandstones in the prospect are on-lapping the top of the Ørret 2 clinoform unit. The apex of the prospect is located inside PL229D at about 1710 m TVDSS.

The trap definition is displayed in Fig. 4.3.

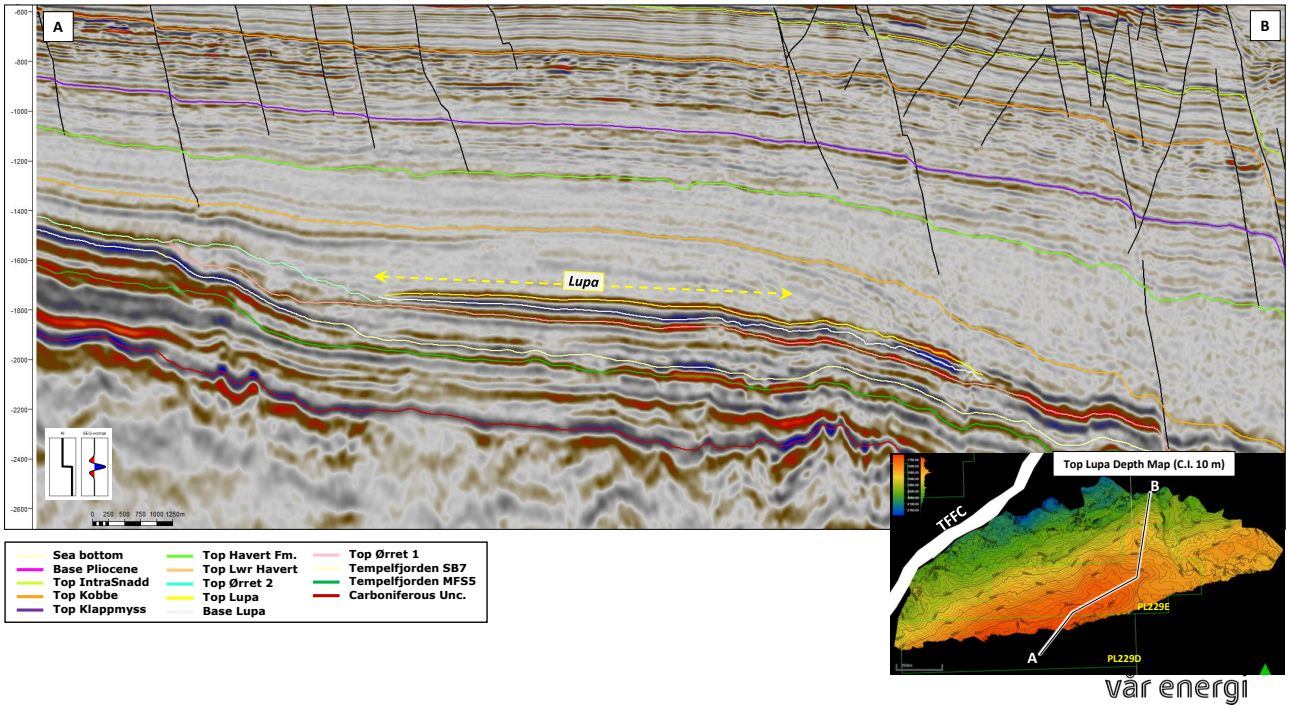

Fig. 4.3 Lupa Trap Definition

Reservoir

The target reservoir is lowstand sandstones belonging to Lower Triassic Havert Formation. The Lower Havert Fm. in the Finnmark Platform is characterized by a clinoform unit. Individual clinoforms represent the surface profile (time line) of the southern accretionary margin of an Early Triassic epicontinental basin deepening towards the north. In this framework the topset of the clinoforms corresponds to the shelf platform, with their foreset and bottomset representing the shelf margin that grades down into relatively deep-water areas, namely the slope, toe-of-slopes and basin-floor. Wells 7128/4-1, 7128/6-1 and 7130/4-1 proved the presence of good sandstone reservoir in the Lower Havert, interpreted as possible lowstand sandstones deposited as basin floor fan at the toes of prograding delta-front. Lowstand sandstones have been observed in the Finnmark Platform and these constitute the analogue for the Lupa prospect.

The presence of an amplitude anomaly is very encouraging regarding the presence of good reservoir sandstones in the prospect area (Fig. 4.4).

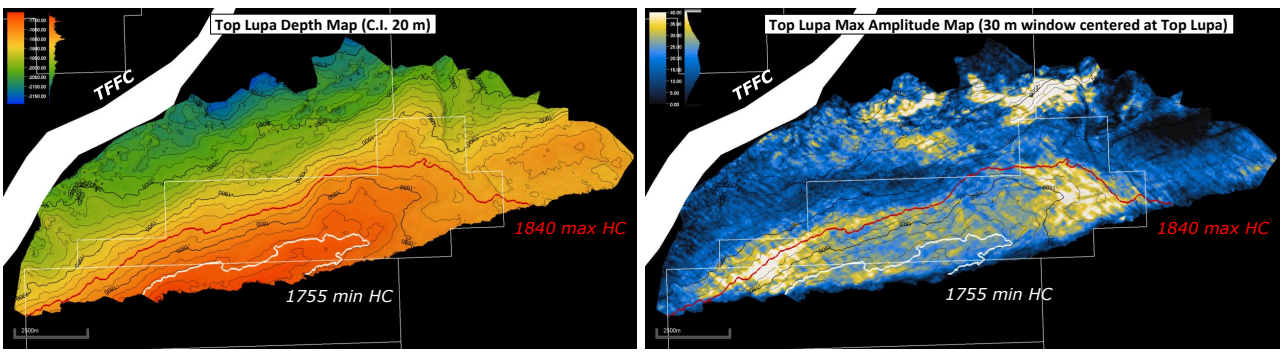

Fig. 4.4 Lupa Amplitude Map

Seal

The top seal for the Lupa prospect is the Lower Triassic shales. Although the Havert Formation contains both shales, siltstones and sandstones, it is interpreted to represent an effective vertical seal because the claystone/shale is thick and prominent in several wells in the area. The nearest key wells, 7122/7-3 and 7122/7-4 to the west on Goliat, have a basal Havert Formation shales sections of about 30 m that should act as an effective top seal especially for oil.

Bottom seal is provided by the Ørret 1 unit although there is the possibility of sandstones in this unit. The lateral seal is provided by the shales of the Ørret 2 unit.

Charge

The Triassic Kobbe Formation is a well proven as source rock in the area of the Hammerfest, and alternative sources may also be Permian or Carboniferous organic rich shales on local basins on the Finnmark Platform.

A 2014 PSM study suggests that the most probable source rock and migration carrier for the Lupa prospect is the Kobbe Fm.

For the Kobbe source rock the most likely migration is coming from a kitchen area in the Hammerfest Basin between the Goliat (PL229) and Nucula discoveries; migration occurs through several different carrier beds such as Kobbe, Klappmyss and Havert reservoir units that are in some places juxtaposed to Lwr Havert sst across the Troms-Finnmark Fault Complex and into Lupa. This fault complex has been reactivated several times with the latest tectonic activity in Plio-Quaternary; this could be positive for migration of hydrocarbons into trap. Migration/spillage of hydrocarbons from the basin to the platform might have occurred during uplift/ faulting episodes. Such a process can bring hydrocarbons over long distances.

5 Technical Evaluations

Volumetrics

Two different fluid scenarios have been considered for estimating HOIP: oil and gas with 50% chance each. The HIIP of the Lupa prospect are shown in the tables below.

Table 5.1 Lupa Volumetrics

Oil Case

LUPA	OOIP (Mbbl)								Mean MBOE
	P90	Mean	P50	P10	P90	Mean	P50	P10	
Total Structure	69,38	234,52	227,97	408,86	0.24	1,53	1,30	3,18	244,39

Gas Case

LUPA	Gas (Gm3)				Cond(Mbbl)				Mean MBOE
	P90	Mean	P50	P10	P90	Mean	P50	P10	
Total Structure	2,79	9,91	9,44	17,77	1,35	3,93	3,89	6,52	68,05

Risk

The reservoir chance is 90% at play level; this taking in consideration the presence of good reservoir sandstones in wells 7122/7-3, 7122/7-4S, 7128/4-1, 7128/6-1 and 7130/4-1 in the Lwr Triassic Havert Fm. and the proposed palaeogegraphic and facies maps.

Top and base seal are regionally present across the whole Finnmark although the presence of thin sandstone layers cannot be excluded. At play level top and base seal chances are 100%. Kobbe source rock is proven in the Hammerfest basin but the charging route of the Lupa prospect is very complex. This aspect has been evaluated partially at play level considering the migration halo leading to a source chance of 55%. The resulting overall play chance is 50%.

At local level the main risk is the trap due to the fact that it's a stratigraphic trap and the lateral seal may not be effective as described at play level. The presence of amplitude anomaly and the petro-acoustic modelling are interpreted as indication of presence of an effective reservoir. Concerning top seal there is no evidence on seismic of the presence of thief sandstones.

Overall, the local chance is 24% and the overall validated geological chance is 12%.

The geological POS is uplifted by the DHI matrix up to 18%

Table 5.2 Lupa Risking

LUPA	Play Risk Elements			Play	Local Risk Elements				Local	Overall
	Res	Seal	Source	POS	Res	Seal	Trap	Charge	POS	Chance
	90%	100%	55%	50%	75%	80%	55%	65%	24%	12%

DHI Conditioned	Reservoir	80 %
	Seal	83 %
	Source	64 %
	Trap	58 %
	Charge	73 %

6 Conclusions

The Lupa prospect lies almost entirely within the PL229E licence area, with the apex in PL229D.

Subsequent to PL229D lapsing, Vår Energi has worked to establish a new JV for PL229E, with Lundin (50/50 split) and together have secured the area covering the Lupa apex in the form of licence PL229G, awarded as part of the APA2020 concession round. PL229G has a firm well commitment, which will be drilled on the Lupa prospect.