

Relinquishment report

PL 1029



In cooperation with Lundin Energy Norway



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1 License history

Award and work program

Lundin Norway AS (Lundin) applied for and was awarded parts of blocks 7221/3, 7222/1,2,3, 7321/12, 7322/10,11,12, shown in Fig. 1.1, following APA 2018. PL1029 was awarded 01.03.2019 to Lundin as operator (40%), DNO Norge AS (40%) and Spirit Energy Norge AS (20%) as partners. It was awarded with an initial period of 7 years, and Drill or Drop (DoD) decision to be made within two years by 01.03.2021. The work program was to acquire and reprocess 3D seismic data.

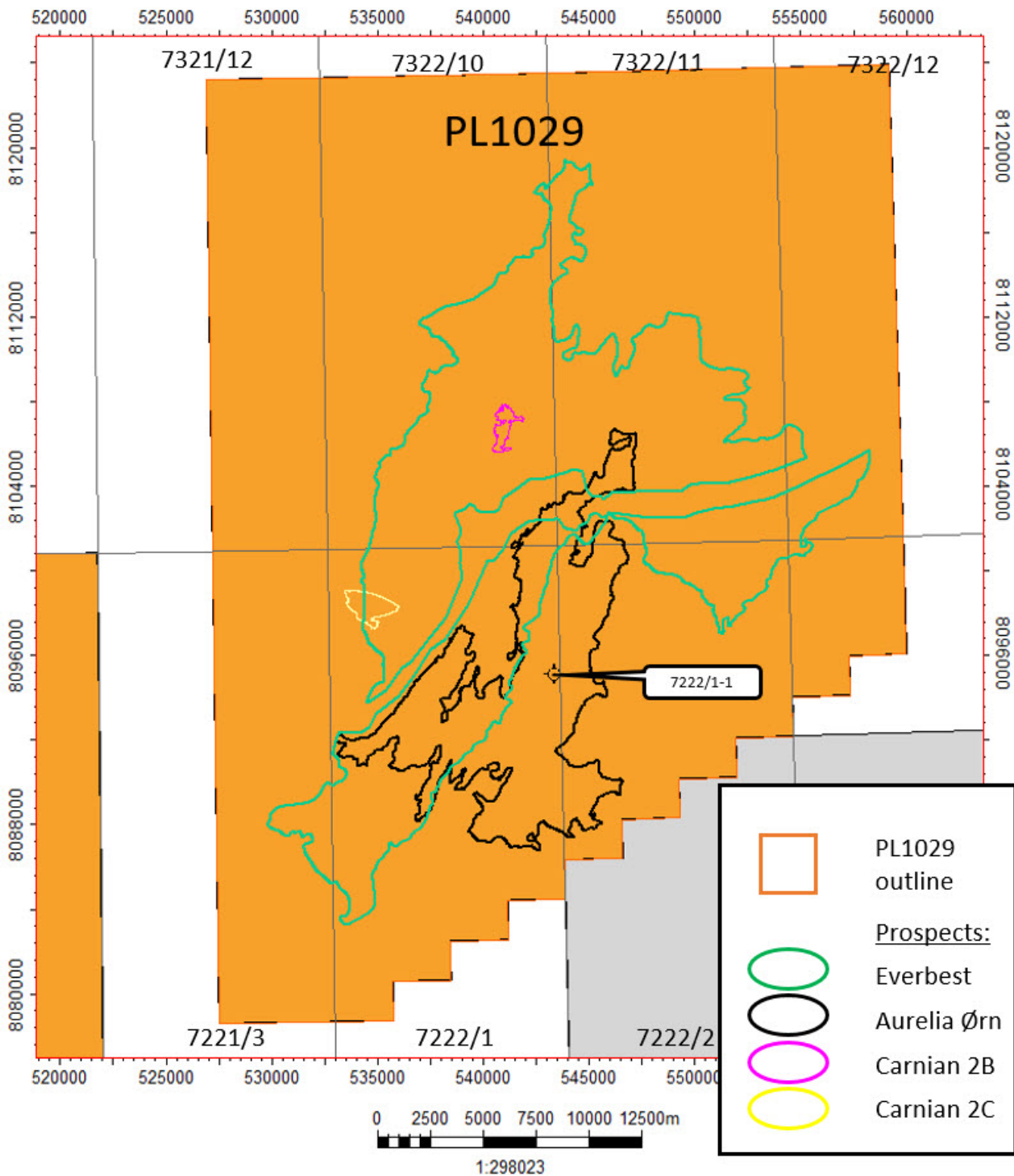


Fig. 1.1 PL1029 license extent and prospect outlines

The DoD has since been extended to 01.03.2022, in order to be able to base the decision on the 7322/6-1 S Shenzhou well results. The Shenzhou well was dry, and therefore did not de-risk prospectivity in PL1029. The PL1029 Joint Venture has therefore reached a Drop decision. MCEC meetings were held yearly in Q4 from 2019 to 2021. EC work meetings took place on February 12th 2020 and March 25th 2021.

2 Database overview

2.1 Seismic data

Fig. 2.1 shows the seismic database for PL1029, which includes DG11002 (part of and listed under the name Hoop 11, NPDID 7424), and most of ST10020 (NPDID 7235), which have been merged and reprocessed into the 1424km²-large LN19M04. The PL1029 purchase and reprocessing of this data fulfills the corresponding part of the license work program.

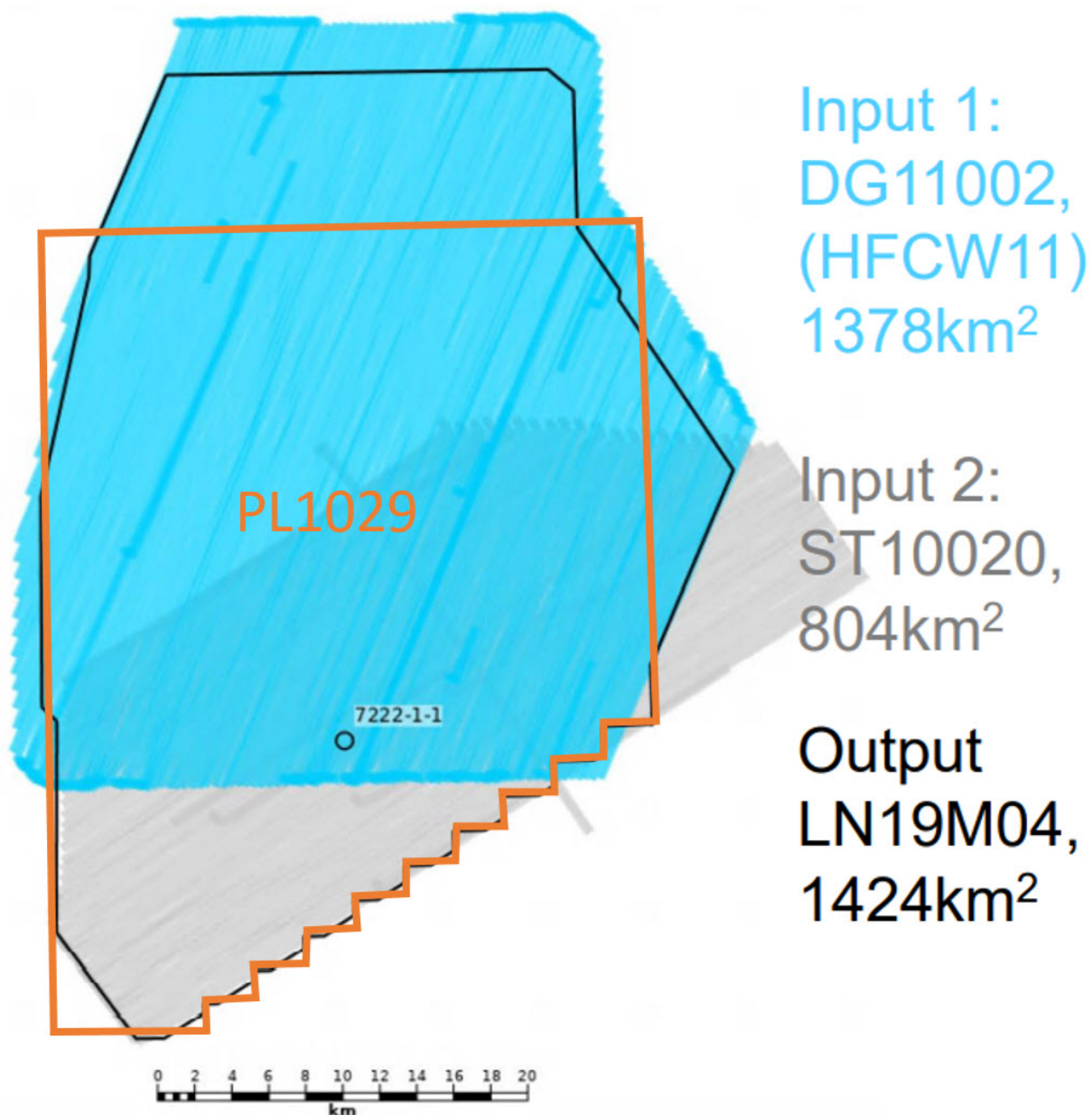


Fig. 2.1 Seismic database

2.2 Well data

The wells relevant to this status report are well 7322/6-1 S Shenzhou in PL722 (NPDID 9285) and well 7222/1-1 Aurelia (NPDID 7987) which is located within PL1029.

3 Geological and geophysical studies and results

Studies

The following studies were carried out in PL1029, relevant to the evaluation of prospectivity in the licence:

- Seismic 3D merge and re-processing project (LN19M04) carried out by Dug London
- Seismic interpretation
- Sampling and geochemical analysis of well 7222/1-1 Aurelia
- Maturity and migration modelling
- 2D structural modelling
- Carbonate reservoir studies including core workshop, investigating Ørn Formation and Røye Formation analogues.
- Frequency decomposition and generation of RGB-blend volumes for seismic attribute analysis
- AVO analysis

Results

Seismic reprocessing

The purpose of the LN19M04 re-processing was to create a seamless regional 3D seismic volume with clear imaging of the structure within the Permo-Carboniferous levels and the undrilled reservoir within the Gipsdalen Group. In addition, the area has large horizontal velocity contrasts which warranted a full PreSDM imaging step inclusive of velocity model building. Only one well has been drilled within the reprocessing area. This well did not penetrate the Permian which is the target for this reprocessing. In general the seismic data quality was good. The main issues with the data were surface-related multiples, seismic interference and linear noise caused by the shallow water bottom. The resulting merged, reprocessed LN19M04 data generally improved the ease of seismic interpretation on key horizons, and improved the clarity of seismic attribute maps. Imaging of both faults, and of strata within the mixed evaporitic-carbonate units was improved (from an already good starting point).

Carbonate reservoir and attribute analysis

The reprocessing was a key first step prior to generation of frequency decomposition and seismic attribute analysis. The Permo-Carboniferous succession in PL1029 is complex due to the interplay of salt and evaporite units, carbonate units, and the burial and uplift history. Attribute mapping and RGB-blend images were used to analyze the presence and distribution of carbonate reservoir sweetspots (e.g. carbonate buildups or karstified units) and differentiate between these and non-reservoir units (e.g. salt/evaporites). These observations, combined with analogue studies from relevant Barents Sea wellbores and field data from Svalbard, were implemented in the evaluation of the Everbest and Aurelia Ørn prospects.

Hydrocarbon maturation and migration modelling and structural reconstruction modelling

Maturation and migration modelling combined with a structural 2D model over the Everbest and Aurelia Ørn prospects predict presence of mature Triassic sourcerock, however the Paleozoic

prospects maintain a dependency on charge from a Paleozoic source, and retention over a respectively long time. Tilting and change in trap geometry as a result of late uplift is modelled to have an effect on any retained hydrocarbon volumes.

4 Prospect update and technical evaluation

The Everbest Fafner prospect, the main prospect from the APA 2018 application (), and the Aurelia Ørn prospect, have been the focus of the technical evaluations. A map showing outlines of these two prospects is provided in Fig. 1.1. A structural map and cross-section through Everbest is provided in Fig. 4.1 . The updated volume and risk summaries can be found in Table 4.2. Given the distances to existing infrastructure exceeding tie-in distances according to today's technology, only P50 volumes with stand-alone potential are considered to be interesting. The reservoir evaluation of Everbest did not provide any uplift for reservoir presence or quality probabilities; on the contrary, the reservoir risk has been increased over the course of the prospect evaluation using the reprocessed data. Top seal is also a key risk for both the Aurelia Ørn and Everbest prospects, also due to excellent data quality which has allowed for imaging of karst, sinkholes, and unconformities in the overburden about the prospects. Both prospects rely on a Paleozoic source rock, yet unproven in the Barents Sea although recently tested by nearby Shenzhou well 7322/6-1 S. Hydrocarbon source and migration have therefore low probabilities for both Everbest and Aurelia Ørn prospects.

Table 4.1 Resource table for Everbest prospect from the APA 2018 application

Prospect name	D/ P/ L	Case	Unrisked recoverable resources						Probability of discovery	Resources in acreage applied for (%)	Reservoir		Nearest relevant infrastructure	
			Oil (10 ⁶ Sm ³)			Gas (10 ⁹ Sm ³)					Litho-/ Chronostratigraphical level	Reservoir depth (m MSL)	Name	km (>0)
			P90	Mean	P10	P90	Mean	P10						
Everbest	P	Oil	17	42	74	3	8	13	0.04	100	Gipsd. Gp	2600	Johan Castb.	80
Everbest Ladinian	L	Oil								100	Snadd Fm	1210	Johan Castb.	80
Everbest Kobbe	L	Oil								100	Kobbe Fm	1450	Johan Castb.	80
Everbest Bjarmeland	L	Oil								100	Bjarmel. Gp	2340	Johan Castb.	80
Stella	L	Oil								100	Bjarmel. Gp	2180	Johan Castb.	80
Everbest Ørn	L	Oil								100	Gipsd. Gp	2910	Johan Castb.	80

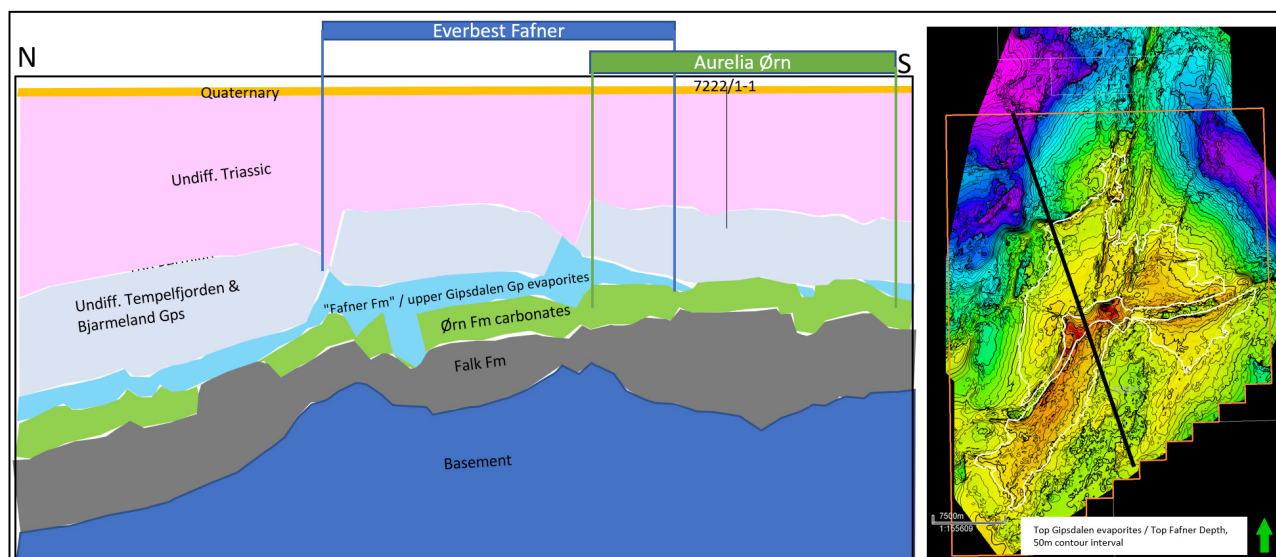


Fig. 4.1 Everbest Fafner and Aurelia Ørn prospects
Geosection (left) through the Everbest Fafner and Aurelia Ørn prospects. Orientation of the line is displayed in the Top Fafner reservoir / Top Gipsdalen evaporites depth map (right).

Table 4.2 Inplace and recoverable volumes (oil) and discovery probabilities

Prospect	P/L	Case	STOOIP MSM3			Recoverable resources liquid MSM3			Probability for Discovery (oil) (%)	Reservoir
			P90	P50	P10	P90	P50	P10		
Aurelia Ørn	P	oil	3.0	29.0	80.0	1.0	11.0	34.0	4.8	Ørn Formation carbonates
Everbest S1	P	oil	17.0	81.0	171.0	6.0	28.0	60.0	2.4	Fafner intra-evaporite
Everbest S2	P	oil	10.0	40.0	84.0	3.0	14.0	29.0	2.4	Fafner intra-evaporite
Everbest S3	P	oil	7.0	19.0	36.0	2.0	7.0	13.0	2.4	Fafner intra-evaporite
Carnian 2B	P	oil	< 1	< 1	< 1	< 1	< 1	< 1		Snadd Carnian channel
Carnian 2C	P	oil	< 1	< 1	1.5	< 1	< 1	< 1		Snadd Carnian channel

To evaluate the full potential of prospectivity in PL1029, the overlying Triassic stratigraphy has also been investigated. Seismic AVO analysis and rock physics modelling has been performed, and multiple prospects and leads have been identified, however either with poor amplitude support or good DHIs but small volume potential. Two Carnian prospects which have been evaluated are shown in Fig. 1.1 and volumes provided in Table 4.2.

5 Conclusion

On the basis of the high risk and relatively small P50 volume potential for the Aurelia Ørn and Everbest prospects, as well as the very small volume potential for Triassic targets in PL1029, the JV has not identified any drillable candidates. The decision was therefore made to relinquish the license prior to the DoD deadline.