

PL 977

Relinquishment Report



Partner:



vår energi

Relinquishment Report PL978

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1 Introduction

1.1 License Group

Aker BP ASA 60 % (Operator)

Vår Energi AS 40 %

1.2 Award and work program

Production license 977 was awarded 01.03.2019 as part of the APA 2018, with a commitment to perform G&G studies in the prospect area. Within two years of award, a drill or drop decision had to be made.

In PL777, the Hornet Prospect was drilled in May 2019. The dry well 15/6-16 S on the Middle Jurassic play resulted in increased risk on the remaining prospectivity within PL977.

ECMC meetings held:

27.03.2019

07.11.2019

16.06.2020

26.11.2020

As the work obligations have been fulfilled, a unanimous decision was made in PL977 to relinquish the license at the DoD gate 01.03.2021.

1.3 Identified prospectivity

One prospect is defined within PL977 (Fig. 1.1). The Lille Eirin Prospect is a small well-defined structural four-way closure with two reservoir levels. The prospect is located just south of the Eirin Discovery and NNE of the Gina Krog Field.

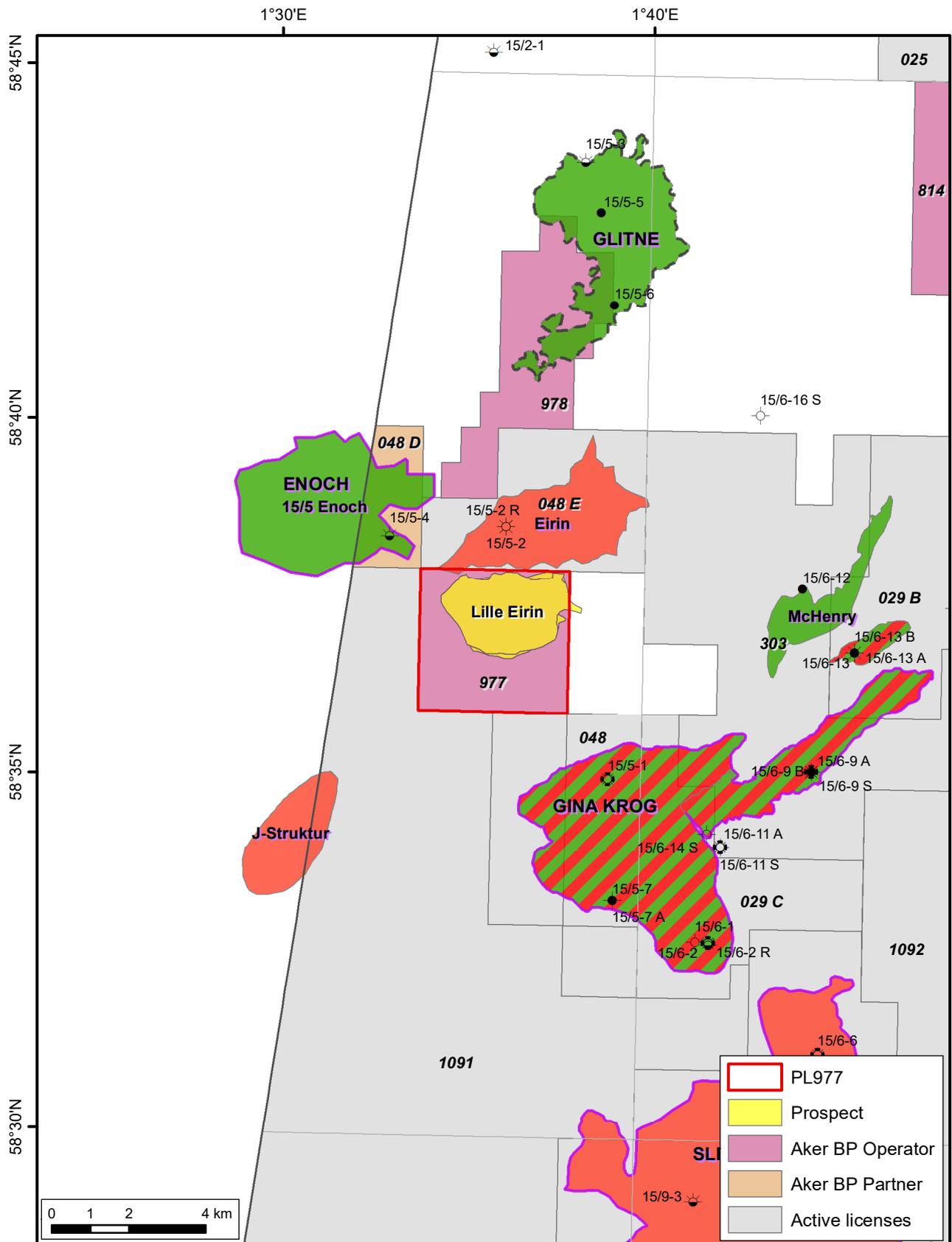


Fig. 1.1 Overview of PL977 and the remaining Lille Eirin Prospect.

Reservoir in Lille Eirin is the Middle Jurassic Hugin and Sleipner formations, with shallow marine and fluvial sandstones deposited in a deltaic/coastal plain environment, respectively. In addition, reservoir is also interpreted in the continental/fluvial sandstones of the Upper Triassic Skagerrak Formation. A seismic line with the prospect is shown in Fig. 1.2.

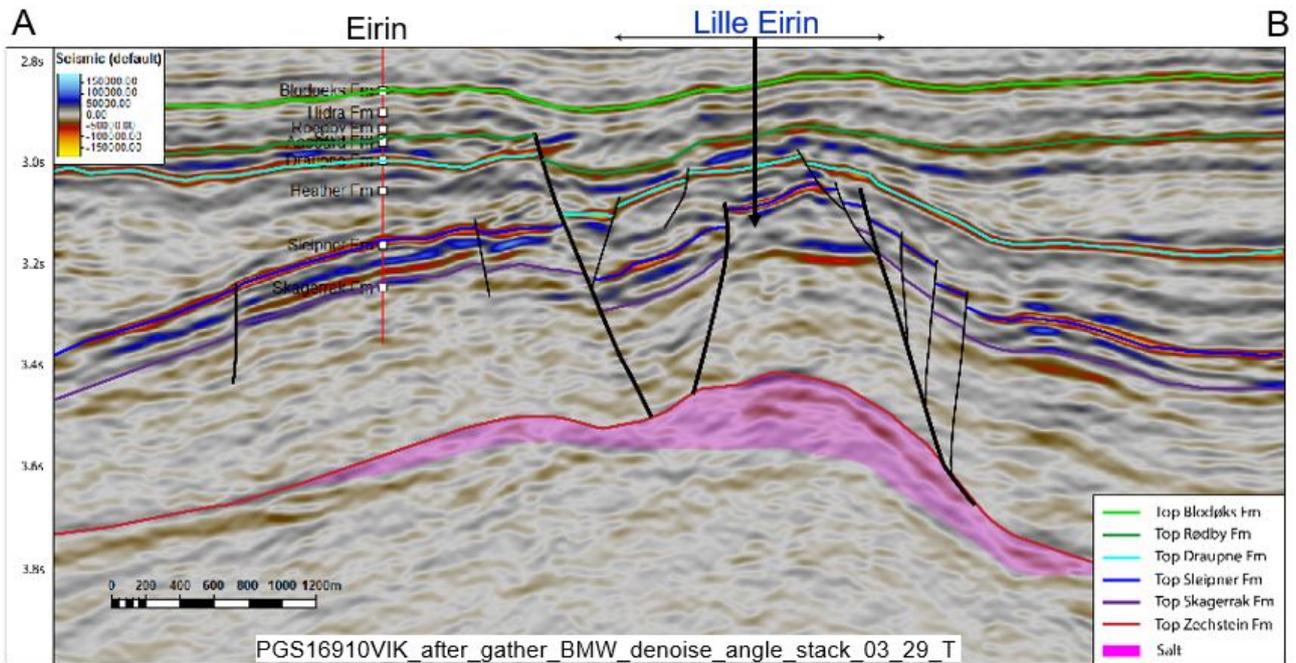


Fig. 1.2 Random seismic line through the Lille Eirin Prospect. See Fig. 1.3 for location of line.

Source rock is provided by the Upper Jurassic Draupne Formation. Draupne Formation is interpreted to directly juxtapose the Sleipner Formation reservoir and Heather Formation juxtapose the Skagerrak Formation.

The Draupne and Heather formations are inferred as top seal.

Migration is interpreted to be directly and local from the Vilje Sub-basin in the west.

The chance of success for the prospect segments (i.e., Hugin, Sleipner and Skagerrak formations) are estimated to 12, 31 and 27 %, respectively. Due to the high burial depth, with top Sleipner at 3800 m MSL, reservoir quality is considered the main risk. For the Hugin segment, top seal is also a risk. The deepest reservoir with the Skagerrak Formation, has a higher risk on migration compared to the shallower reservoir levels.

Top Sleipner and top Skagerrak reservoir maps are shown in Fig. 1.3 and Fig. 1.4.

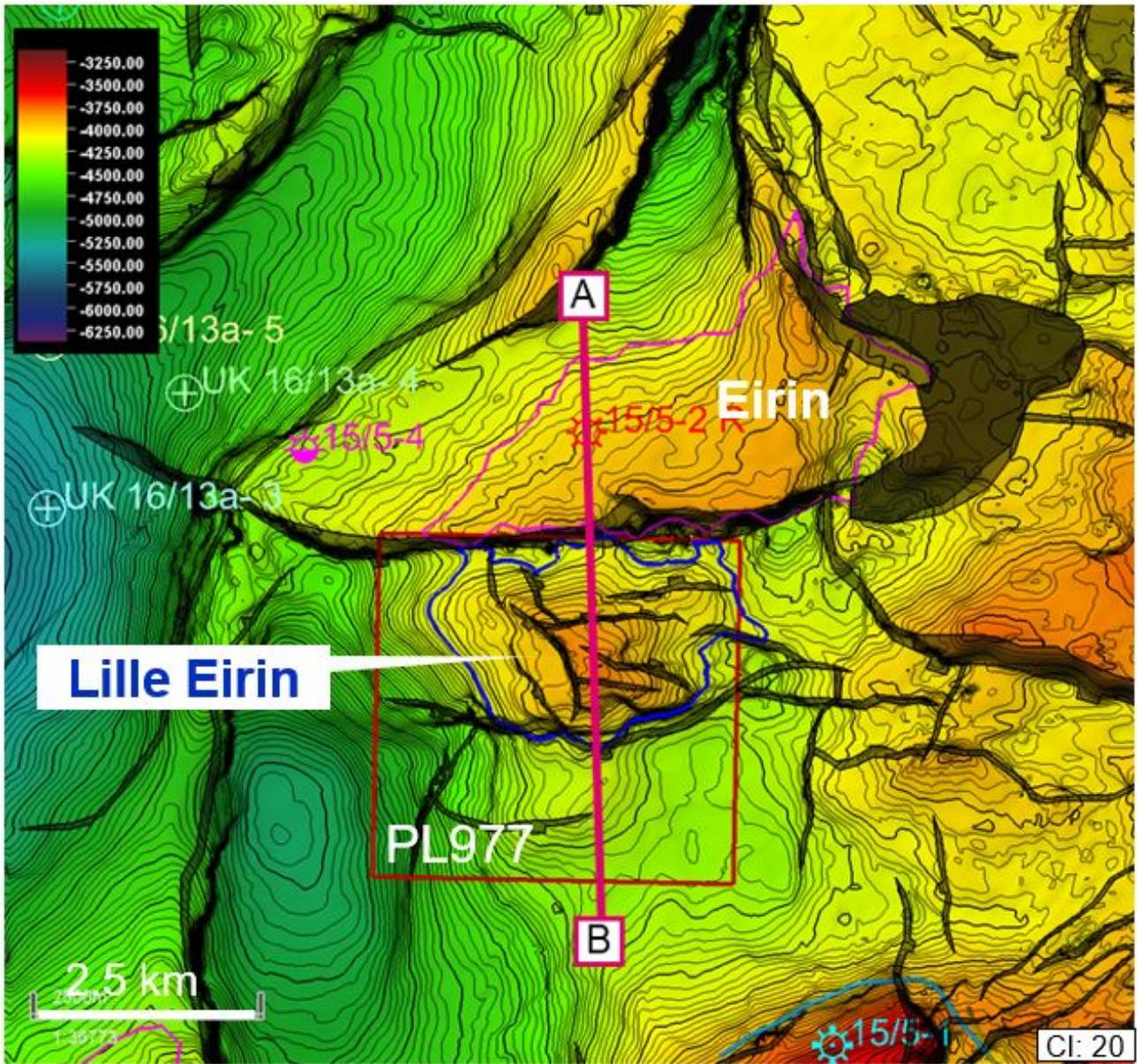


Fig. 1.3 Top Sleipner reservoir depth map including the Lille Eirin Prospect.

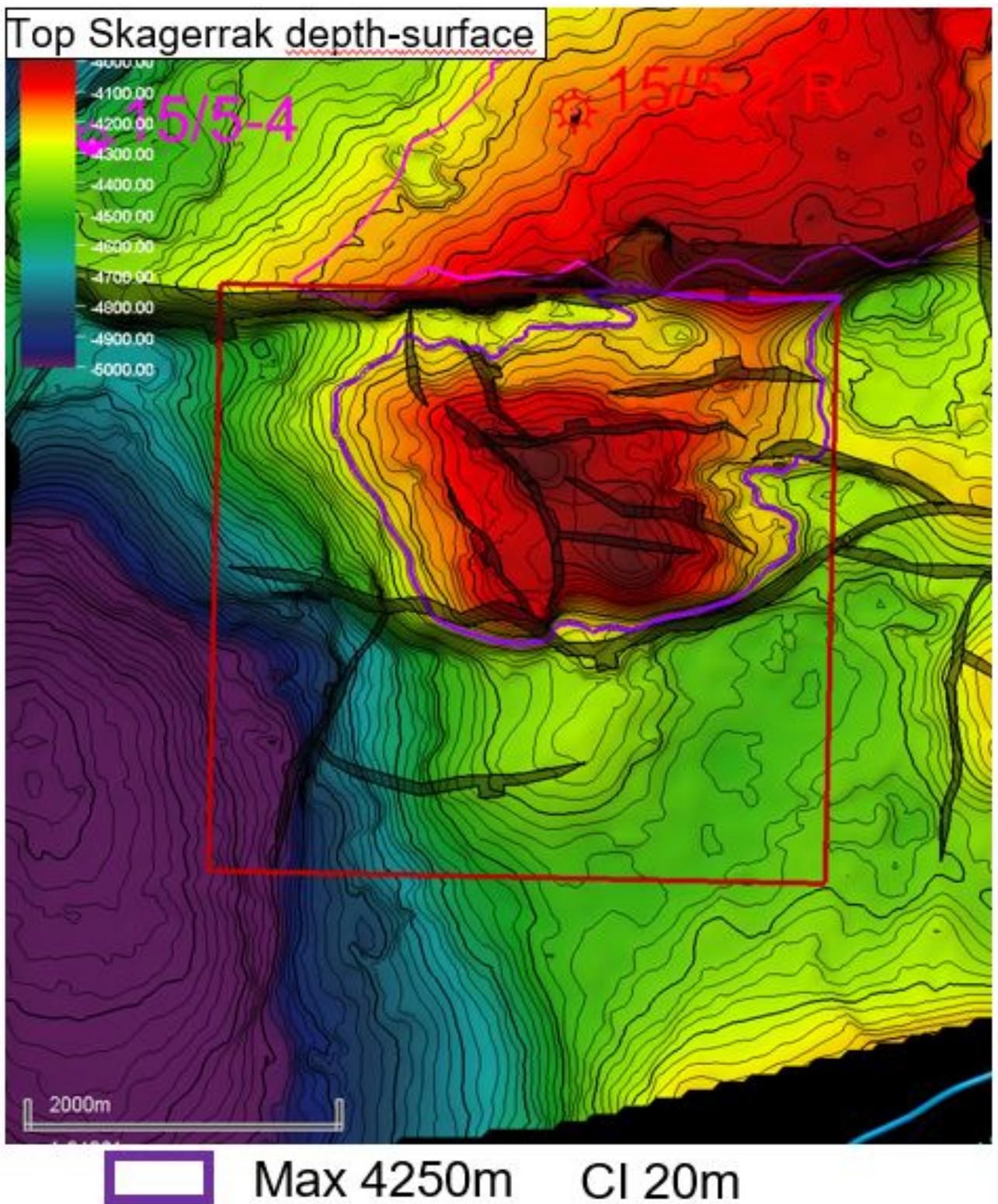


Fig. 1.4 Top Skagerrak reservoir depth map. PL978 outline in red.

2 Database

2.1 Seismic data

For interpretation of the Lille Eirin regional area, several seismic cubes were utilized prior to the APA 2018. For further prospect maturation, the main 3D seismic data used is the PGS16910VIK (Fig. 2.1 and Table 2.1).

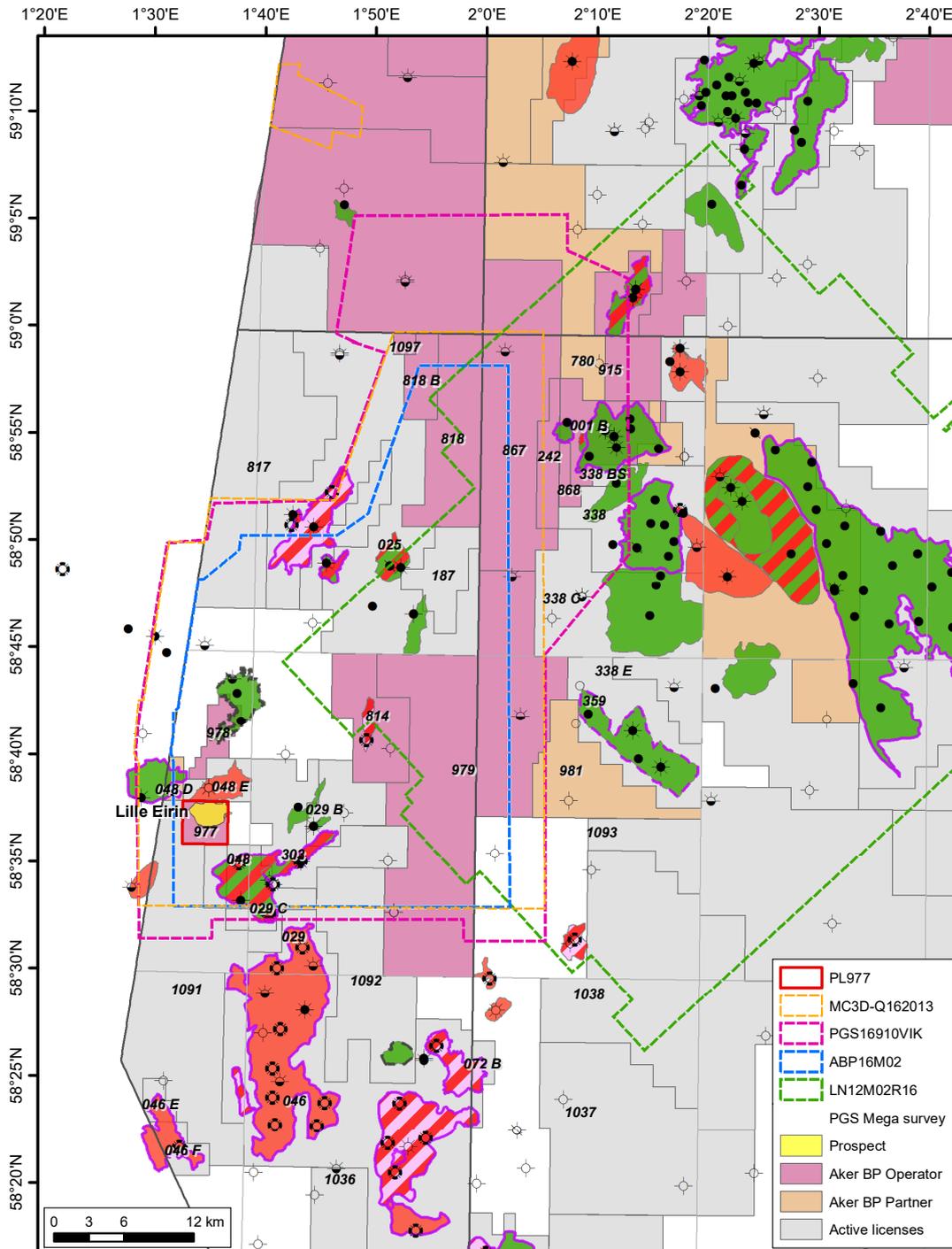


Fig. 2.1 Common seismic database in PL977.

Table 2.1 Seismic database and survey details.

3D Seismic survey	Survey type	Year	Offset data	Comment
PGS16910VIK	Reprocessed 3D	2018	x	PGS reprocessing of the multicient MC3D-Q162013.
ABP16M02	Reprocessed 3D	2017	x	Multi-azimuth reprocessing of MC3D-Q162013, MC3D-Q15 and NH9302. Both individual cubes for the involved surveys with corresponding angle stacks, and a MAZ full stack were produced
MC3D-Q162013	Original 3D	2013	x	
LN12M02R16	Reprocessed 3D	2016	x	Pre-processing, PreSDM migration, CBM migration and post-processing of LN12002 and LN11004
PGS Megamerge	Reprocessed 3D			Available on the UKCS & NCS

2.2 Well Data

The wells utilized and defined in the PL977 common database are shown in Fig. 2.2 and listed in Table 2.2.

Table 2.2 Common well database *Key wells are highlighted in grey. * No cores, ** No cores in relevant intervals.*

Well	Status	Year	TD (MD) [m]	TD Stratigraphy	CPI	Biostratigraphy	Cores studied	NPDID
15/2-1	Oil/gas shows	1982	4600	Late Permian - Zechstein Gp	Yes	Yes	Yes	308
15/3-4	Oil/gas	1982	4259	Triassic - Skagerrak Fm	Yes	Yes	Yes	314
15/3-5	Oil	1984	4130	Middle Jurassic - Sleipner Fm	Yes	Yes	No	52
15/5-1	Gas/condensate	1978	3800	Late Triassic	Yes	Yes	Yes	315
15/5-2 R	Gas	1979	4322	Triassic	Yes	Yes	No*	1250
15/5-3	Dry	1980	5042	Devonian	Yes	Yes*	No*	207
15/6-3	Gas/condensate	1974	3795	Late Triassic	No	Yes	No	318
15/6-4	Dry	1976	3505	Triassic - Skagerrak Fm	Yes	Yes	Yes	319
15/6-6	Gas/condensate	1982	3760	Late Triassic - Skagerrak Fm	Yes	Yes	No	38
15/6-7	Dry	1993	3540	Triassic - Smith Bank Fm	Yes	Yes	No**	2084
15/6-10	Gas/condensate	2009	3700	Late Triassic - Skagerrak Fm	Yes	Yes	No*	6030
15/6-11 S	Dry	2010	4042	Early Jurassic - Statfjord Gp	No	Yes*	No*	6488
15/6-12	Oil	2011	3930	Late Triassic - Skagerrak Fm	Yes	Yes	No*	6518
15/6-13	Oil	2015	3577	Late Triassic - Skagerrak Fm	Yes	Yes	Yes	7667
15/6-13 A	Dry	2015	3925	Late Triassic - Skagerrak Fm	No	No	No*	7668
15/6-13 B	Oil/gas	2015	3773	Late Triassic - Skagerrak Fm	No	No	No*	7718
15/6-14S	Dry	2017	4684	Middle Jurassic - Sleipner Fm	Yes	Yes*	No*	8293
15/6-16 S	Dry	2019	4203	Late Triassic - Skagerrak Fm	Yes	Yes	No*	8747
15/6-B-2	Oil	2018	3917	Middle Jurassic - Hugin Fm	Yes	Yes*	No*	7735
16/1-5	Dry	1998	2460	Pre-Devonian - Basement	Yes	Yes	Yes	3279
16/1-24	Dry	2015	2299	Late Jurassic - Hugin Fm	Yes	Yes*	No*	7616
UK16/07a-30Z	Oil	1987	5255	Middle Jurassic - Pentland Fm	No	No	No	
UK16/07a-33	Oil/gas shows	1993	6141	Middle Jurassic - Pentland Fm	No	No	No	
UK16/08-1	Oil	1972	4883	Middle Jurassic - Pentland Fm	No	Yes	No**	
UK16/08a-4	Gas/condensate	1986	4910	Middle Jurassic - Heather Fm	No	Yes	No	
UK16/08a-9z	Oil	1988	5165	Middle Jurassic - Pentland Fm	No	Yes	No	
UK16/08a-10	Dry	1988	4907	Middle Jurassic - Pentland Fm	No	No	No*	
UK16/13a-2	Gas/condensate	1982	4883	Triassic-Smith Bank Fm	No	No	No*	
UK16/13-1	Oil	1977	4502	Middle Jurassic - Pentland Fm	No	No	No	
UK16/13a-3	Oil	1985	5206	Middle Jurassic - Pentland Fm	No	No	No	

The 15/6-16 S Hornet well, drilled in May-June 2019, has been the most important well for risking the reservoir presence and quality.

2.3 Special studies

No special studies were performed in the license.

Study included in common database:

Surface Geochemical Survey using ORG sub-sea sampling and analysis within the Sleipner area (ORG Engineering AS, 2017).

3 Remaining prospectivity

Lille Eirin is the only prospect defined within PL977 (Fig. 1.1, Fig. 1.2, Fig. 1.3 and Fig. 1.4). After APA award, the work performed in the license to mature the Lille Eirin Prospect was:

- Seismic mapping and prospect maturation
- Paleogeographic reconstruction of the semi-regional area and in particular the timing of faulting of the Lille Eirin structure
- Petroleum system analysis including basin modelling and sedimentology
- Well studies of the 15/6-16 S Hornet well for update of the Lille Eirin Prospect risk

The above listed studies has confirmed that the presence of Hugin Formation sandstones deposited in the prospect area is unlikely. The Hornet well contributed to valuable reservoir data input to risk the Lille Eirin Prospect and to update the reservoir parameters for resource calculations of the Sleipner and Skagerrak reservoir segments. The Hornet well, drilled in May-June 2019 after award of PL977, encountered poor reservoir quality in both reservoir formations. Pre-APA 2018, volume and risk assessment indicated a marginal potential. The updates performed, has not strengthened the robustness of the prospectivity. The disappointing results of the Hornet and Freke-Garm wells have contributed to a downgrading of the larger area for the PL977 partnership.

Depth to apex of the Sleipner and Skagerrak formations in the Lille Eirin are 3800 and 3900 m MSL, respectively, with a highly uncertain 5-20 meters thick Hugin reservoir sandstone. Reservoir thickness of the main reservoirs are mapped to be in a range from 75 to 150 m. A maximum hydrocarbon column of 350 meters were estimated for each of the Sleipner and Skagerrak reservoirs segments.

Average (mean) N/G for the Sleipner reservoir used is 0.21 with a porosity of 13 %. Skagerrak reservoir properties used is an average N/G of 0.37 with a porosity of 12 %. For the Hugin reservoir, an average N/G of 0.5 and a porosity of 14 % were used.

Overall probability (Pg) for the prospect post APA 2018 has not changed significantly, however, the volume calculations show a reduced resource potential after implementation of the reservoir data from the Hornet and Freke-Garm wells.

The latest volumes and risk calculations in the license is summarized in Table 3.1.

Table 3.1 Remaining resources within PL977.

Prospect name (H-class)	Fluid phase	STOOIP [10^6 Sm^3] P90 – P50 – Mean – P10	Rec. Resources [10^6 Sm^3] P90 – P50 – Mean – P10	GCOS
Lille Eirin Hugin (H1)	Oil/gas	0.49 – 0.99 – 1.06 – 1.72	0.25 – 0.48 – 0.53 – 0.86	0.12
Lille Eirin Sleipner (H2)	Oil/gas	1.5 – 2.89 – 3.07 – 4.88	0.7 – 1.36 – 1.48 – 2.41	0.31
Lille Eirin Skagerrak (H2)	Cond.	1.79 – 3.63 – 3.91 – 6.33	0.96 – 2.09 – 2.26 – 3.75	0.27

4 Conclusion

The main prospect in the license PL977 is the Lille Eirin Prospect. The license was awarded with a 2 year work commitment to perform G&G studies prior to a drill or drop decision. The prospect, with reservoir in the Vestland Group and the Skagerrak Formation, was further matured during the license period. Results of exploration wells in the neighbouring PL777 (15/6-16 S Hornet) and PL814 (15/6-15 Garm), resulted in downgrading the reservoir properties in the Sleipner and Skagerrak reservoirs, hence a reduction of the initial volume estimates of Lille Eirin. Furthermore, the probability of encountering Hugin sandstones was further reduced give the adjacent well results. The above work and well results leaves the Lille Eirin Prospect with a considerable risk on reservoir quality, presence of Hugin reservoir and with a limited HC-volume potential. No upside potential is present given the limited size of the structure. The current resource estimate in the license is estimated to be below minimum economic field size, and hence is not of commercial interest by February 2021. There are no other prospectivity mapped in the license area.

As the G&G work obligations have been fulfilled, a unanimous decision was made in PL977 to relinquish the license at the DoD gate 01.03.2021.

5 References

ORG Geophysical AS, 2017: Surface Geochemical Survey Report, ORG17100- Sleipner Area

Aker BP ASA, 2019: Well 15/6-16 S Final Well Report. License PL 777

RPS, 2019: Petrographic Analysis of Well 15/6-16 S

Stratum Reservoir (Norway) AS, 2019: Composition Analysis of RDT Samples from Well 15/6-16 S

APT, 2019: Fluid and Gas Analysis Well 15/6-16 S



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