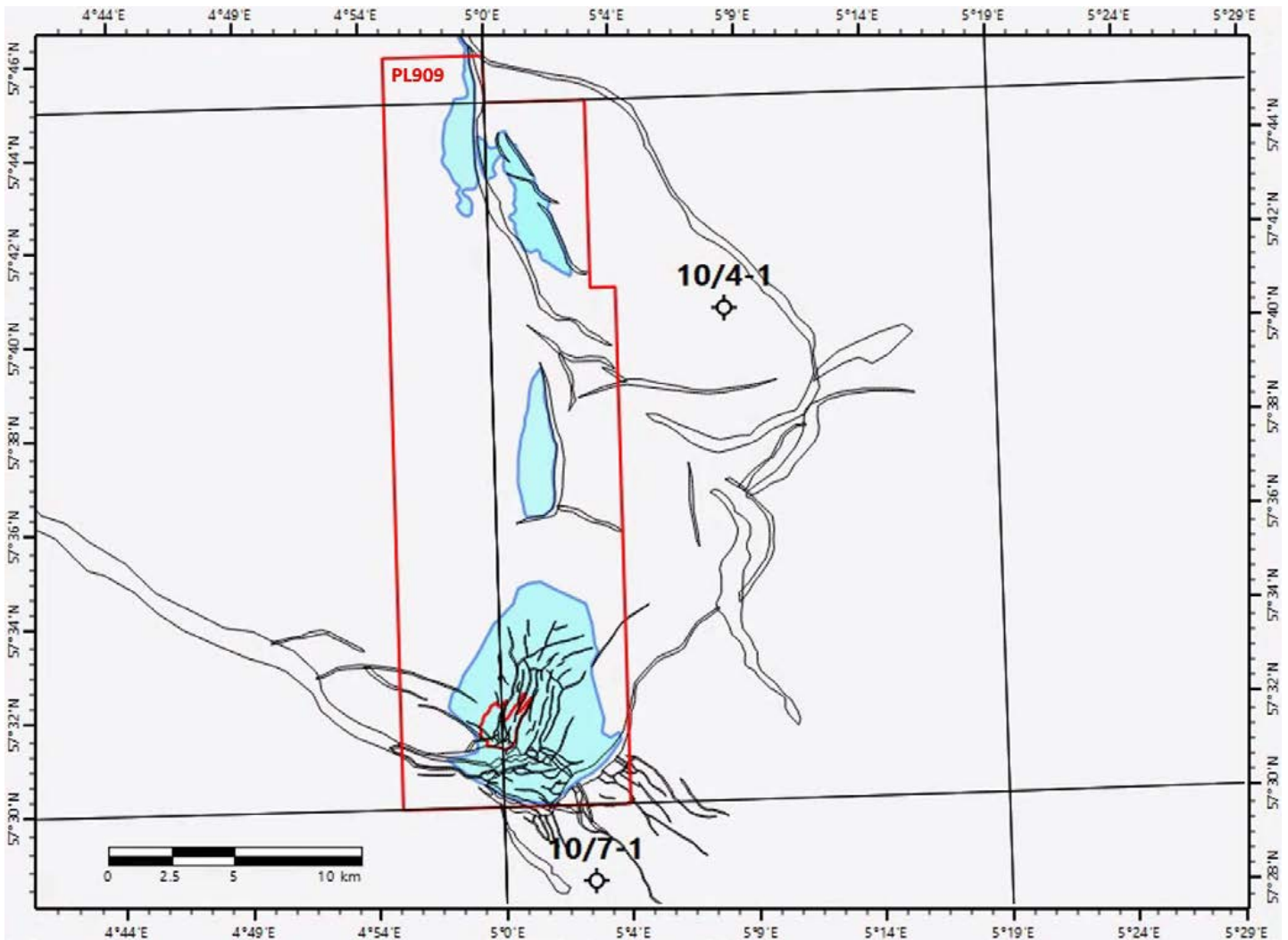


PL909 Status Report



Repsol Norge AS



2020

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1 History of the production licence

PL909 was awarded on March 2nd, 2018 as part of the APA 2017 license round to Repsol Norge AS (70%) as operator, and Skagen44 AS (30%) as partner.

Work commitments and time limits

Within 2 years or before March 2nd, 2020:

- Conduct geological and geophysical studies
- Drill or drop decision

Within 4 years or before March 2nd, 2022

- Drill exploration well
- Concretize (BoK) or drop decision

Within 6 years or before March 2nd, 2024

- Conduct conceptual studies
- Continuation (BoV) or drop decision

Within 7 years or before March 2nd, 2025

- Prepare development plan (PDO)
- Submit PDO or drop decision

Overview of meetings held

- Initial meeting: March 13th, 2018
- Work meeting: March 25th, 2018
- Work meeting: April 4th, 2018
- EC/MC meeting: June 20th, 2018
- Work meeting: October, 3rd, 2018
- EC/MC meeting: November 14th, 2018
- Work meeting: December 20th, 2018
- Work meeting: March 7th, 2019
- EC/MC meeting: June 12th, 2019
- EC/MC meeting: November 19th, 2019

Grounds for surrender

The license work program was completed by conducting relevant geological and geophysical studies. Following the completion of the work program, the partnership has concluded that no prospect has been identified that can support a positive drilling decision. Based on this, the partnership decided unanimously to surrender the production license.

2 Database overviews

2.1 Seismic data

The seismic database consists of publicly available 2D datasets, multiclient 2D datasets and publicly available 3D datasets within and near the licence area. Initially the seismic interpretation of the licence area was carried out on MC3D-EGB2005 3D survey. Detailed structural interpretation over the prospects was carried out on PSDM reprocessed dataset, MC3D-EGBR13. The interpretation of the available 2D surveys was performed in order to better define regional trends, main tectonic phases as well as reservoir and source rock mapping and distribution on a wider area. All the seismic datasets used in the evaluation of the license are shown in Figure 2.1 and listed in Table 2.1.

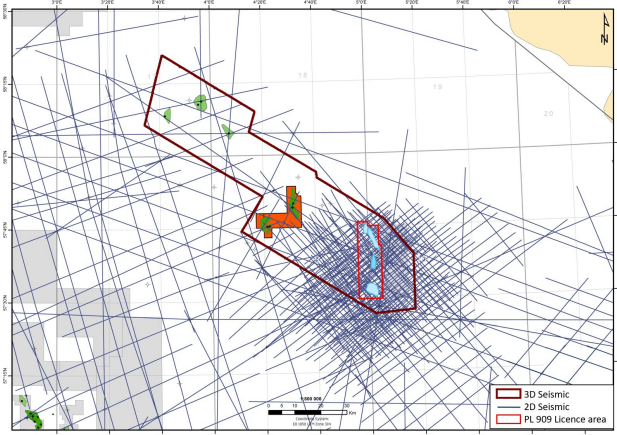


Figure 2.1 Coverage the seismic data used in the licence

Table 2.1 Seismic database

Survey	Year	Type	NPDID
MC3D-EGB2005	2005	3D	4294
MC3D-EGBR13	2005/2013 PSDM reprocessing	3D	4294
EBSOO	2000	2D	4036
GFR-93	1993	2D	3585
GNSR-91 GC	1991	2D	3391
MN9206-0C	1992	2D	3521
NSR04	2004	2D	4260
SG8726	1987	2D	3023
SH8707	1987	2D	3038
ST8302	1983	2D	2583
ST8606	1986	2D	2896
ST8712	1987	2D	3056
UG97_GC	1997	2D	3897

2.2 Well data

The well database consists of public and non-public wellbores used in the evaluation of the license. Table 2.2 lists all the wellbores used in the license.

Table 2.2 Well database

Well name	Year	Composite logs	Checkshots	Core	Geochemistry	CPI	Pressure Data	NPDID
9/2-1	1987	x	x	x	x	x	x	1038
9/2-2	1987	x	x	x	x		x	1135
9/2-3	1989	x	x	x	x	x	x	1294
9/2-5	1995	x	x	x		x	x	2599
9/2-6S	1996	x		x	x		x	2867
9/2-7S	1997	x		x	x		x	3087
9/2-11	2010	x				x		6341
9/3-1	1986	x	x	x		x	x	921
9/3-2	2005	x			x	x		5173
9/4-1	1968	x			x	x		150
9/4-3	1968	x	x		x			152
9/4-4	1977	x	x		x			305
10/4-1	2015	x				x	x	7724
10/5-1	1976	x	x		x	x		306
10/7-1	1002	x	x	x	x		x	1972
10/8-1	1970	x	x		x	x		175
17/12-1R	1972	x	x		x			514
17/12-2	1973	x	x	x	x			340
18/10-1	1980	x	x	x	x		x	342
18/11-1	1974	x	x	x	x			343



3 Results from geological and geophysical studies

The special studies carried out in the licence area are listed in Table 3.1. The studies, which were carried out after the licence was awarded are discussed below.

Table 3.1 List of the studies used in the licence

Study name	Year	Company
3D Gravity Modelling of Salt Structures in North Sea Block 9/2	1996	Statoil
Core description and sequence stratigraphy of the Sandnes Fm, Yme field	1998	Statoil
Biostratigraphic Correlation: Yme Field Area	1998	GeoStrata
Geochemical oil-correlation study: Bream, Brisling and Yme Fields	1999	Statoil
Depth and Timing of Neogene Erosion	2003	Globex Norway AS
Basin modelling Egersund Basin	2004	Aceca
Egersund Basin: Rock physics and seismic amplitude modelling	2004	R.P.A
PL316, Egersund Basin fault seal study	2004	Badleys
Regional Play Fairway Evaluation on the Norwegian North Sea	2005	PGL
A stratigraphic reconstruction of Bulk volatile geochemistry from fluid inclusions	2006	F.I.T
Multicomponent kinetics of a source rock from the Tau Fm	2006	Sintef
Pore pressure and vertical migration in the Yme area	2006	Sintef
Yme area petroleum system	2006	Sintef
Egersund basin: Basin modelling Study	2007	PGL
Bulk Kinetics of two samples from well 9/3-2	2007	APT
Technical note on the Jurassic reservoir in the Yme Field	2010	Ichron
Petroleum systems study and structural reconstruction	2019	Repsol
AVO Feasibility study	2018	Repsol
Fault seal analysis	2019	Repsol

Petroleum systems study

New basin modelling study and structural reconstruction was carried out in order to better assess the main risk factors in the Egersund basin area, which were migration, amount of generated hydrocarbons and timing of the structures in relation to migration. The analysis results of three oil samples from Yme field, heatflow model, which took into account crustal thinning and a new seismic interpretation were implemented to this study.

Basin modelling showed that although both Tori and Lucy structures were present at the time of migration, only Lucy lead had mature source in the fetch area. Even then, the oil analysis results showed that only the type of source rock, which generated the oil in Yme Beta was sufficient to have potential to fill the Lucy trap.

AVO feasibility study

Earlier an AVO study with inconclusive results had been carried out in the Yme area, about 50 km to the west, but since both Lucy and Tori structure were shallower, it was decided to do a new attempt. Unfortunately already the feasibility study carried out on the well data revealed that it was not possible to differentiate the water from the oil case.

Fault seal analysis

Lucilla prospect, which was discovered after the revised seismic interpretation, was relying in the east on a normal fault, which did not displace the whole Sandnes reservoir within the mapped closure. Fault seal analysis was carried out in order to assess the sealing capacity of the potential shale smear along this fault. According this study the complete sealing would be attained down to 14 m throw in the fault, which would allow the complete fill of the mapped closure.



4 Prospect update report

Originally one prospect, "Tori" and three, leads "Lucy", "Maria" and "Lisa" were identified in the licence area (Figure 4.1).

Common for all of these is:

1. Reservoir - Sandnes Formation shallow marine sandstone with secondary potential in the underlying more terrestrial Bryne Formation
2. Seal - Egersund and Tau formation shales
3. Source rock - Tau formation shale

The trap of Tori prospect was defined by 3-way dip closure to the west and north striking normal fault in the east. Lisa lead was defined as a hanging wall 3-way dip closure and Maria 4-way dip closure. Lucy lead was a complex trap with fault delineated southern crestal part and densely faulted northern part with 3-way dip closure.

New basin modelling and structural reconstruction showed that the original primary target, Tori prospect, was located in migration shadow and fetch area of Maria lead was not large enough to fill the structure. Revised fault interpretation revealed that the fault defining the northern limit of Lisa lead was split to set of ramps, which did not allow mapping of a trap. After all the other targets were abandoned further work was focused to evaluate if the Lucy lead could be matured to be a prospect.

Structural reconstruction showed that migration to Lucy lead would work through the whole geologic history of the structure, whilst the biggest risk factors were the amount of generated hydrocarbons in the fetch area and trap integrity. Also the lengthy, about 40 km long, migration route raised some concern.

After the revised seismic interpretation different structural closure possibilities in the Lucy area were evaluated (Figure 4.2). Because the 2019 basin model indicated that the amount of generated hydrocarbons could not fill the whole Lucy structure, it was evaluated as two smaller independent prospects, here referred as Lucy South and Lucy North. Since Lucy North is located on the migration route to Lucy South and is dependent on sealing faults between the two, these prospects are excluding one another.

Fault interpretation revealed that about 50 m long section of westbound fault in the crestal southern part of the Lucy South trap did not have vertical displacement (Figure 4.3). Consequently the side seal risk was considered to be too high to justify further work on Lucy South.

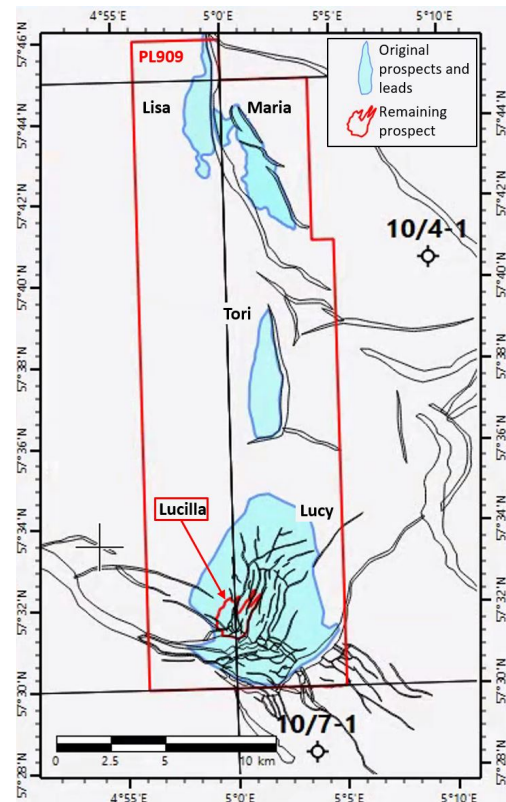


Figure 4.1 Remaining prospect and original prospects and leads in the licence area

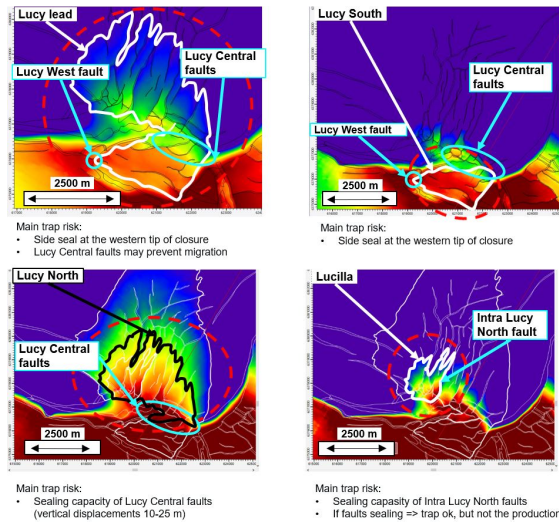


Figure 4.2 Lucy area trap locations

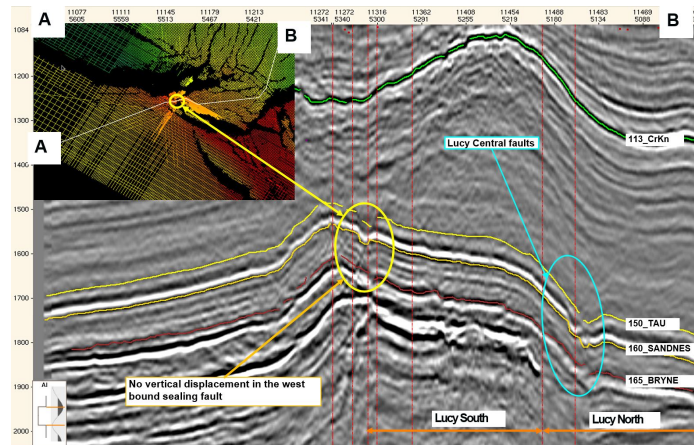


Figure 4.3 Lucy prospect westbound fault

In the area between Lucy South and North a detailed fault interpretation, combined with information from the seismic coherence cube, was carried out in order to find out if potential fault seal was present between the compartments. Vertical displacement of the faults in the area of interest was only 10-25 m. Fault seal analyses indicated that attaining the fully sealing fault at Sandnes reservoir level would demand at least 14 m vertical displacement. Since it is likely that there are also sub-seismic faults with smaller vertical displacement in this critical area, it is very unlikely that side seal for Lucy North is present.

The final exploration effort in the Lucy area was the evaluation of "Lucilla" prospect, defined as a set of tilted fault blocks in the west of the Lucy North (Figure 4.4, Figure 4.5).

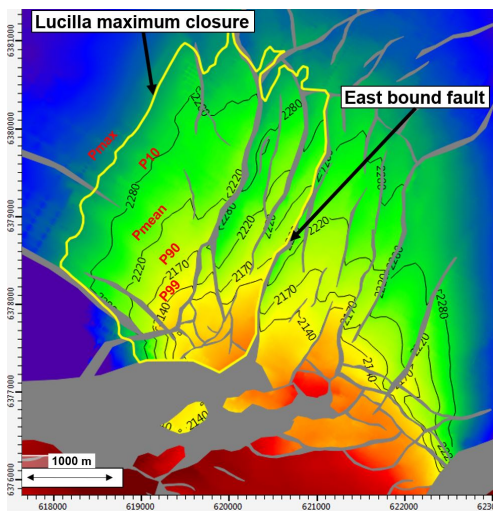


Figure 4.4 Lucilla depth structure map

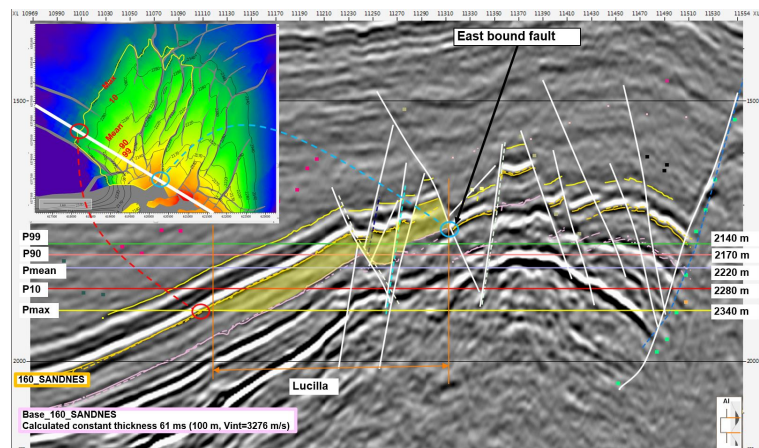


Figure 4.5 Seismic sections across Lucilla, inline 5176, MC3D-EGBRM13

Biggest risk factors for this prospect were considered to be the sealing capacity of the eastbound fault, long migration route and possibly limited amount generated hydrocarbons within the fetch area. Fault seal analysis indicated that eastbound fault is completely sealing over the whole length of Lucilla trap. Chance of geological success for the prospect was assessed to be 22.7 % with main risk being set on migration. Prospect data summary is shown in the Table 4.1.

Table 4.1 Prospect data for the Lucilla prospect (NPD's Table 5)

Table 5: Prospect data (Enclose map)										
Oil & Gas case: This is case no.:	Block Play name	9/6 & 10/4 NPD will insert value	Prospect name New Play (Y/N)	Lucilla No	Discovery/Prospect/Lead Outside play (Y/N)	Prospect No	Prospect ID (or New)	NPD will insert value	NPD approved (Y/N)	Assessment year Seismic database (2D/3D)
Resources IN PLACE and RECOVERABLE										
Volumes, this case										
Main phase										
Associated phase										
In place resources										
Oil [10 ⁶ Sm ³] (>0.00)	Low (P90)	5.07	Base, Mean	13.26	High (P10)	26.08	Low (P90)	Base, Mean	High (P10)	2019
Gas [10 ⁶ Sm ³] (>0.00)	Low (P90)	1.25	Base, Mode	7.53	High (P10)	6.94	Low (P90)	Base, Mode	High (P10)	13D
Oil [10 ⁶ Sm ³] (>0.00)	Reservoir Chrono (from)	1.25	Reservoir litho (from)	Sandnes Fm.	Source Rock, chrono primary	Kimmeridgian	Source Rock, litho primary	Tau Fm.	Seal, Chrono	Callovian-Kimmeridgian
Gas [10 ⁶ Sm ³] (>0.00)	Reservoir Chrono (to)	1.25	Reservoir litho (to)	Sandnes Fm.	Source Rock, chrono secondary	Kimmeridgian	Source Rock, litho secondary	Tau Fm.	Seal, Litho	Egersund Fm.
Probability [fraction]										
Total (oil + gas + oil & gas case) (0.00-1.00)	Oil case (0.00-1.00)	0.23	Trap (P2) (0.00-1.00)	0.00	Gas case (0.00-1.00)	0.00	Oil & Gas case (0.00-1.00)	0.23	Retention (P4) (0.00-1.00)	0.50
Reservoir (P1) (0.00-1.00)	Trap (P2) (0.00-1.00)	0.90	Charge (P3) (0.00-1.00)	0.90	Comments	0.56	Retention (P4) (0.00-1.00)	0.50	Retention (P4) (0.00-1.00)	0.50
Parameters:										
Depth to top of prospect [m MSL] (< 0)	Low (P90)	2010	High (P10)	2010						
Area of closure [km ²] (> 0.0)	Low (P90)	1.2	High (P10)	5.0						
Reservoir thickness [m] (> 0)	Low (P90)	88	High (P10)	110						
H-C column in prospect [m] (> 0)	Low (P90)	160	High (P10)	288						
Gross rock vol. [10 ⁶ m ³] (> 0.000)	Low (P90)	0.063	High (P10)	0.365						
Net / Gross [fraction] (0.00-1.00)	Low (P90)	0.55	High (P10)	0.69						
Porosity [fraction] (0.00-1.00)	Low (P90)	0.15	High (P10)	0.24						
Permeability [mD] (> 0.0)	Low (P90)	300.0	High (P10)	500.0						
Water Saturation [fraction] (0.00-1.00)	Low (P90)	0.30	High (P10)	0.20						
Bq [Rm ³ /Sm ³] (< 1.0000)	Low (P90)	0.25	High (P10)	0.20						
lBo [Sm ³ /Rm ³] (< 1.00)	Low (P90)	0.59	High (P10)	0.77						
GOR, free gas [Sm ³ /Sm ³] (< 0)	Low (P90)	56	High (P10)	68						
GOR, oil [Sm ³ /Sm ³] (< 0)	Low (P90)	0.20	High (P10)	0.33						
Recov. factor, oil main phase [fraction] (0.00-1.00)	Low (P90)	0.20	High (P10)	0.33						
Recov. factor, gas ass. phase [fraction] (0.00-1.00)	Low (P90)	0.20	High (P10)	0.33						
Recov. factor, gas main phase [fraction] (0.00-1.00)	Low (P90)	0.20	High (P10)	0.33						
Recov. factor, liquid ass. phase [fraction] (0.00-1.00)	Low (P90)	0.20	High (P10)	0.33						
Temperature, top res [°C] (> 0)	Low (P90)	73	High (P10)	73						
Pressure, top res [bar] (> 0)	Low (P90)	228	High (P10)	228						
Cut off criteria for NG calculation										
	1.		2.	3.						
For NPD use:										
NPD will insert value				NPD will insert value				Kart oppdatert		
NPD will insert value				NPD will insert value				Kart dato		
NPD will insert value				NPD will insert value				Kart nr.		



5 Technical evaluation

In the license application, a conceptual development plan with a subsea tieback to the Yme field was considered for a discovery in the Tori prospect.

Following the completion of the prospectivity evaluation, no prospect has been identified in the license that can be matured to a state that can justify exploration drilling. Based on this, no further technical evaluations have been carried out for possible development of the remaining prospectivity in PL909.



6 Conclusion

The prospectivity evaluation of the licence lead to abandonment of all the original exploration targets, Tori, Maria and Lisa. One new prospect, "Lucilla", was identified within original maximum closure of Lucy lead.

Recoverable resources of Lucilla were estimated to be 3.7 Mm³ of oil equivalents, which did not meet the estimated minimum economic resource volume 4.2 Mm³.

Since no drillable prospect has been identified, the partnership has unanimously decided to surrender the production licence.