



TotalEnergies EP Norge AS



PL982 Relinquishment Report

Ownership

- Total E&P Norge AS 60%
- Aker BP ASA 40%

Stavanger, 27th August 2021

Contents

Contents	2
1. History of the production Licence	3
2. Data base Overview.....	5
2.1 Seismic Data	5
2.2 Well Data	7
3. Results of Geological and Geophysical Studies.....	9
3.1 Rock physics and elastic inversion.....	10
3.2 Geological interpretation from well and seismic data.....	11
4. Results of the completed studies and impact on the Prospect evaluation	12
5. Prospect update - Remaining prospectivity	12
6. Technical assessment	15
7. Conclusions	15

1. History of the production Licence

The Licence is located in the Norwegian Central North Sea (South Viking Graben), in the block 16/3 (Figure 1). It is adjacent to the Equinor operated Johan Sverdrup field (Total 8.44%) which is producing oil from Upper Jurassic reservoir.

The Licence was awarded to TotalEnergies operator 60% and Aker BP 40% the first of March 2019 for an initial period of seven years. This period is divided into 4 phases:

- Phase A - 2 years – Reprocessing of 3D seismic, Drill or drop decision (DOD)
- Phase B – 2 years – Drill an exploration well, Decision for concretization (BOK)
- Phase C – 2 years – Conceptual development studies, Decision to continue (BOV)
- Phase D – 1 year – Plan for development (PDO)

The intention as described in the application for the licence was that the first two years of the initial period work program would be used to de-risk the prospect through extensive G&G studies. This would include seismic inversion and re-interpretation of multiple 3D data sets, rock physics modelling, as well as special studies focused on facies analysis, reservoir characterisation and regional petroleum system evaluation incorporating Total proprietary data from Johan Sverdrup field.

The commitment related to phase A is seismic reprocessing. It has been agreed with MPE (Ministry of Petroleum and Energy) that the seismic inversion carried out over a large area covering the Licence is relevant and sufficient to fulfil the commitment.

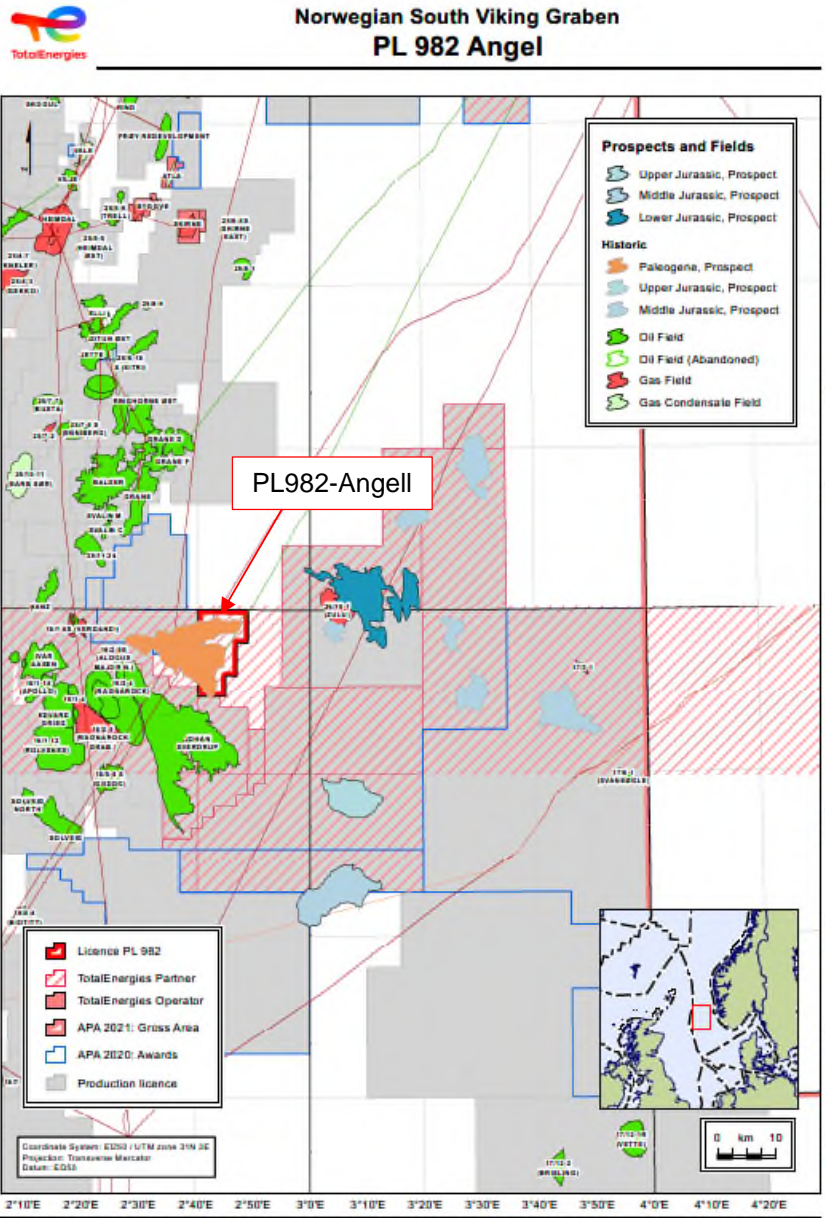


Figure 1: Location map for the PL982 Licence

The licence covers an area of 103,347Km². The exploration potential is represented by only one prospect – Angell - which was interpreted as a potential turbiditic lobe of Paleocene age deposited on top chalk (stratigraphic trap). The volumetric evaluation was at the time of the application as follow:

Prospect figures	P90	P50	P10	UMR	Pg	Fluid
Gross Resources, Risk, POTEX (investment scenario) Mb Bcf Mboe Oil Scenario	27	173	443	210		Oil
	7	44	116	54	14%	
Trap Type	Stratigraphic			Main risk		reservoir

The key incentives were a low drilling cost (shallow depth, hydrostatic pressure regime) and a potential tieback to the Johan Sverdrup facilities.

The key risks were related to reservoir presence (50%), to migration (50%) and to seal (60%). The Probability of Geological Success was 14%.

The new evaluation of the prospect results in a much higher geological risk (Reservoir and Migration). The prospect is then no longer considered drillable, leading to an early surrender of the Licence.

Studies and budgets have been presented to the partner during the MC-EC meetings held on 14th June 2019, 13th November 2019 and 25th June 2020.

2. Data base Overview

2.1 Seismic Data

Several public domain 2D and 3D datasets of varying vintages and data quality exist over the Licence (Figure 2). The seismic interpretation has been performed on the PGS MC3D-SVG2011 data, which cover the Licence entirely. The data quality is considered moderate to good for the interval of interest, with some areas of lower quality due to Oligocene-Eocene injectites creating imaging problems and disturbance in the pre-Eocene section. All seismic surveys available to TotalEnergies and utilized in the evaluation of the Licence are listed in table 1

Dataset	2D / 3D	Comments
NSR-05	2D	Regional 2D seismic.
NSR-06	2D	Regional 2D seismic.
NSR-08	2D	Regional 2D seismic.
LN0902	3D	Geostreamer survey central to most work done on the Johan Sverdrup field. Extensively reprocessed.
LN1002	3D	Survey done by PL546 over blocks 25/11 and 25/12.
LN12M02	3D	Broadseis/Broadsource survey covering Utsira High.
MC3D-SVG2011	3D	Geostreamer multi-client survey by PGS.
PGS MegaMerge	3D	Merge of large number of public domain 3D surveys in the North Sea.
ST14M07	3D	Post-stack merge of Johan Sverdrup OBN survey ST14200 and LN0902-ST-Z13B reprocessed version of LN0902.

Table 1: TotalEnergies Seismic database

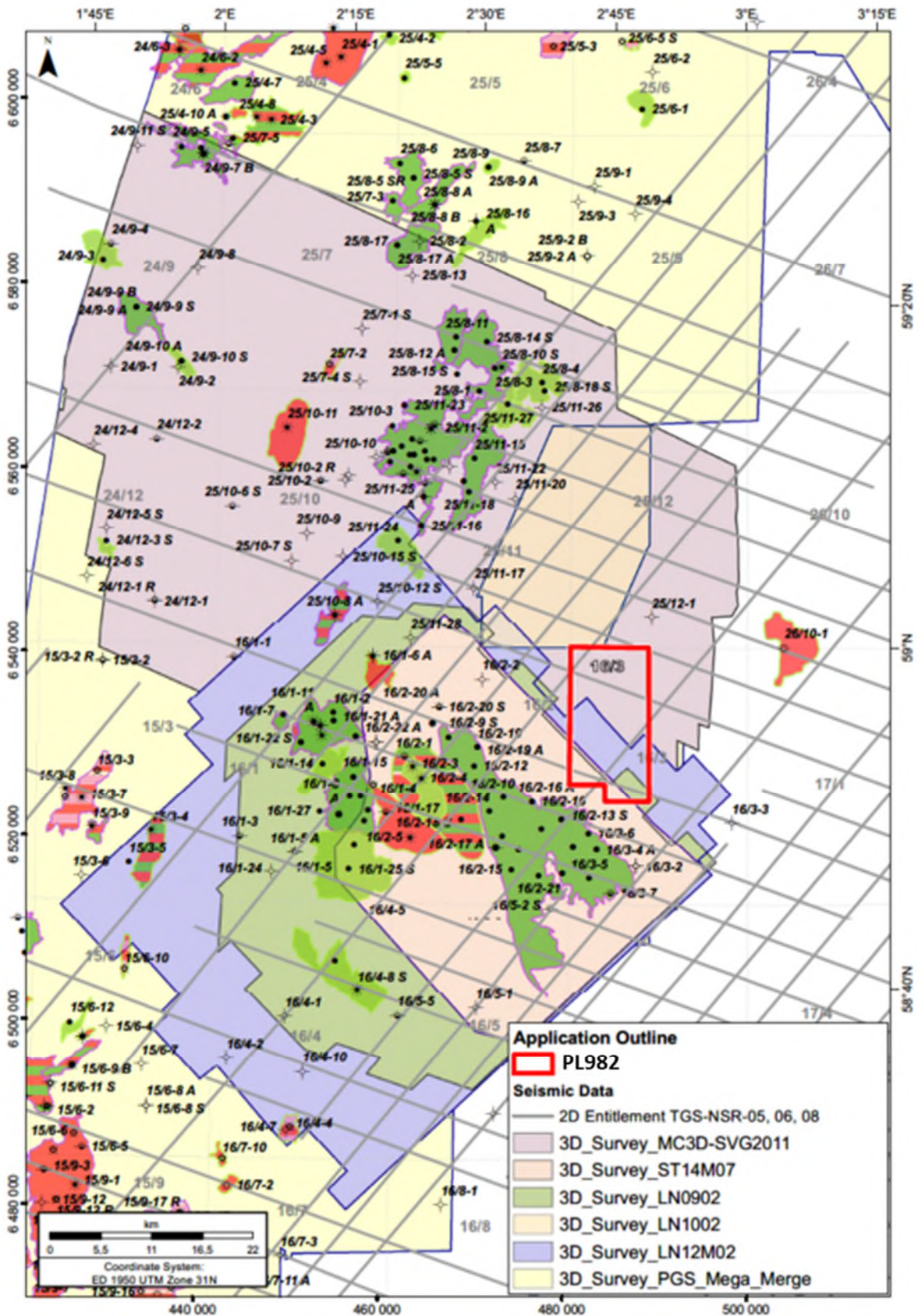


Figure 2: Seismic data coverage

2.2 Well Data

No well was drilled on the PL982 Licence. TotalEnergies database in the area contains a substantial set of released, proprietary and traded wells. The wells used for the evaluation are listed in the table 2, with their location shown in Figure 3.

Well	HC content	TD Formation	NPDID	Well	HC content	TD Formation	NPDID
15/3-3	Gas/Condensate	Skagerrak Fm	313	16/2-6	Oil	Zechstein Gp	6374
15/9-A-26	Gas	Sleipner Fm		16/2-9 S	Oil	Basement	6615
16/2-2	Dry	Rødby Fm	4408	16/2-16	Oil	Rotliegend Gp	7047
16/2-3	Oil/Gas	Basement	5551	16/2-20 A	Oil shows	Basement	7316
16/2-4	Oil/Gas	Basement	5625	16/2-U-18	Oil	Skagerrak Fm	
16/2-12	Oil	Basement	6952	16/3-2	Dry	Basement	334
16/3-4	Oil	Basement	6553	16/3-3	Dry	Tor Fm	1415
16/4-4	Gas/Condensate	Tor Fm	5441	16/3-5	Oil	Rotliegend Gp	7046
16/7-2	Gas	Rotliegend Gp	40	16/3-6	Oil	Basement	7182
24/12-1 R	Oil shows	Triassic Gp	513	16/4-1	Dry	Basement	229
24/12-2	Oil shows	Heather Fm	348	25/7-2	Gas/Condensate	Sleipner Fm	1494
25/10-6 S	Oil shows	Sleipner Fm	2728	25/7-3	Oil	Tor Fm	2623
25/10-8 A	Dry	Draupne Fm	3098	25/8-1	Oil	Rotliegend Gp	173
25/10-10	Dry	Zechstein Gp		25/8-4	Oil	Hod Fm	1986
25/10-12ST2	Dry	Smith Bank Fm	7293	25/10-2 R	Oil shows	Basement	511
25/11-1	Oil	Basement	143	25/10-5	Oil	Viking Gp	365
25/11-7	Oil	Tor Fm	368	25/10-8	Oil/Gas	Rotliegend Gp	2955
25/11-24	Oil	Statfjord Gp	5470	25/11-3	Dry	Ekofisk Fm	185
25/11-28	Dry	Basement	7776	25/11-5	Oil	No Group Defined	366
16/1-6 S	Oil/Gas	Ekofisk Fm	4711	25/11-6	Oil	Cromer Knoll Gp	367
16/1-1	Oil shows	Hod Fm	147	25/11-8	Oil	Ekofisk Fm	369
16/1-3	Oil shows	Basement	84	25/11-13	Oil	Tor Fm	373
16/1-5 A	Oil shows	Heather Fm	3626	25/11-15	Oil	Statfjord Gp	1872
16/1-11 A	Oil	Skagerrak Fm	6364	25/11-16	Oil	Hod Fm	1920
16/1-15	Oil	Basement	6517	25/11-17	Dry	Basement	1921
16/1-18	Oil	Basement	7314	25/11-21 A	Oil	Lista Fm	2812
16/1-19 S	Dry	Basement	7255	25/12-1	Dry	Devonian	374
16/2-1	Oil shows	Basement	144				

Table 2: Well data base – Key wells highlighted in red

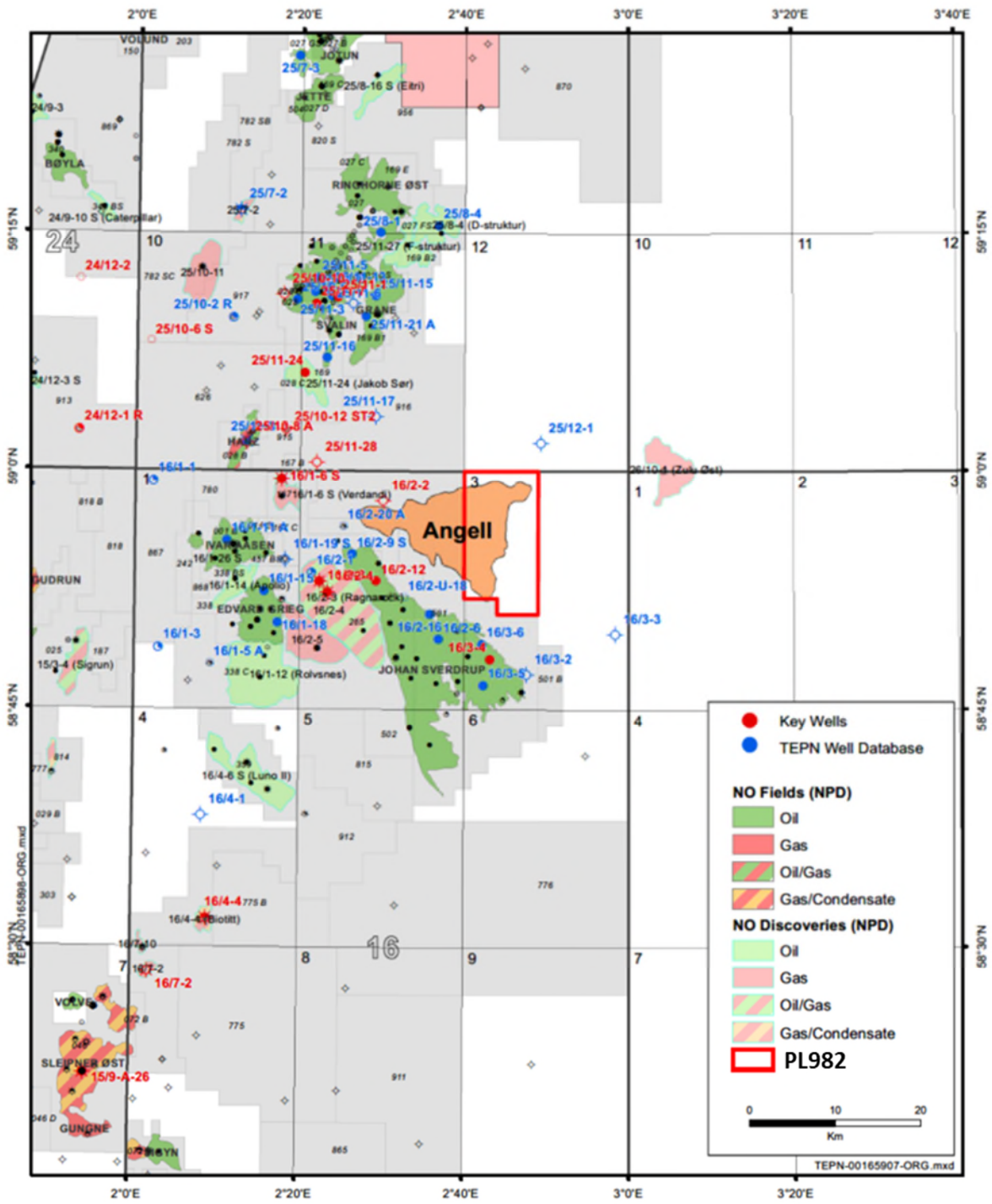


Figure 3: Location of the well database. Key wells in red

3. Results of Geological and Geophysical Studies

The Licence is located on the Utsira High which is a major tilted block, part of the eastern margin of the Jurassic South Viking Graben. During Tertiary times, the Basin is the site of a high sedimentation rate, especially due to a massive turbiditic sedimentation sourced from the western margin. These turbiditic fairways are stopped eastward by the structural highs and especially by the Utsira high. Locally, some channel/fan complexes were deposited over the western edge of the Utsira high like in the Balder and Grane fields located 20km to the North from Angell. An eastern extension of the turbiditic system could lead to the deposition of the assumed Angell fan complex in the licence area (Figure 4).

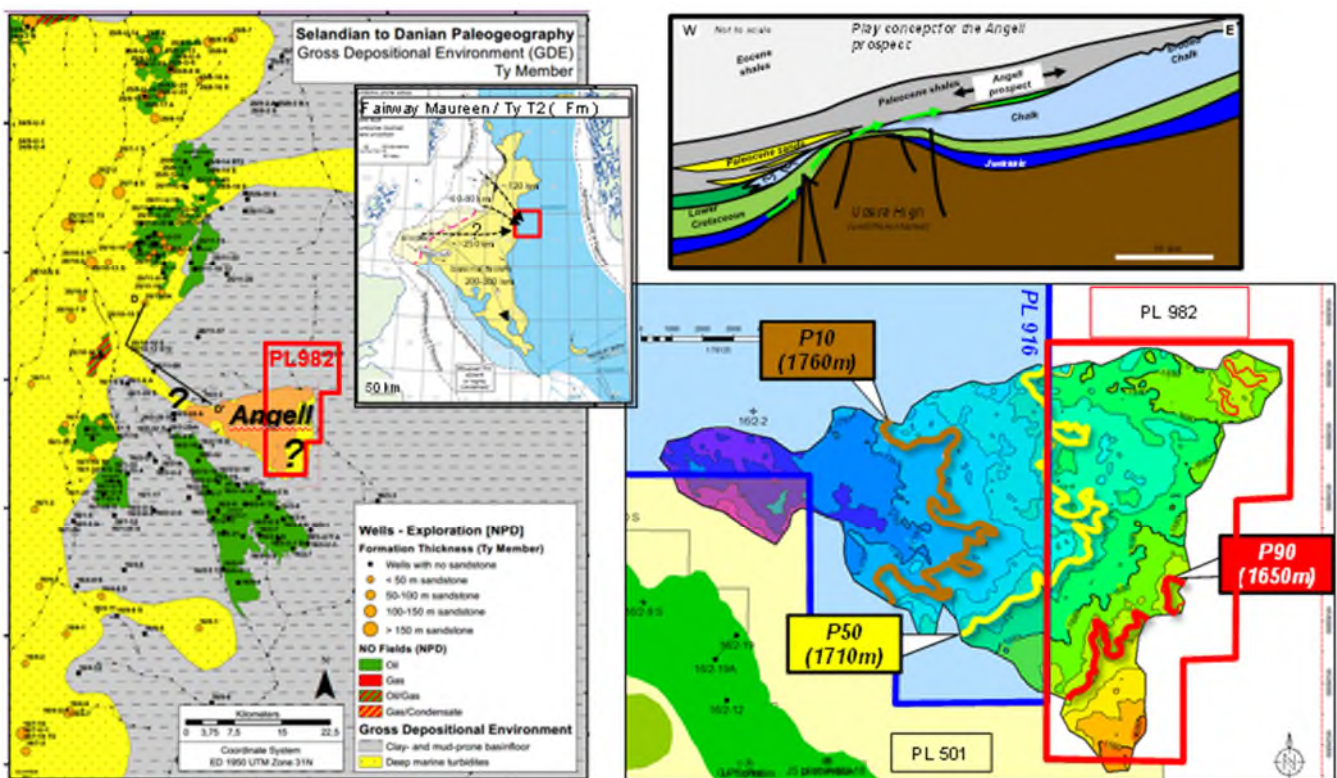


Figure 4: Angell prospect – Geological concept

The Paleocene turbiditic plays have been intensively and successfully explored in the South Viking Graben while only few wells explored on the Utsira high, failures are mainly due to reservoir absence.

The overall technical work performed in 2019/2020 aimed to de-risk the extent of the turbiditic system on Angell and to evaluate the sand reservoir presence.

3.1 Rock physics and elastic inversion

A rock physics model and an elastic inversion have been carried out over an area of approximately 2700km². This selected area goes beyond the extent of the Licence in order to include the key calibration wells.

The main objectives of the reservoir characterization study were to:

1. Obtain an AVO/Rock physics understanding of the observed rocks of Paleocene age over-lying the Chalk in the vicinity of the Angell prospect to support the interpretation of the seismic signal. 10 calibration wells were used for this study, representing the overall facies.
2. Estimate robust Acoustic Impedance and VpVs-ratio properties from seismic to drive the lithological interpretation of the seismic anomaly over Angell prospect. A good correlation between attributes from well logs and at the seismic scale was achieved.
3. Use of Acoustic Impedance and VpVs-ratio properties in a wide regional area to help to understand the depositional context of the prospect.

The seismic inversion was evaluated as very reliable after a proper QC. Unfortunately, Acoustic Impedance and VpVs-ratio do not show sufficient discrimination between Sands and Reworked chalk (Figure 5). The results do not allow to conclude on the sand presence or absence in Angell.

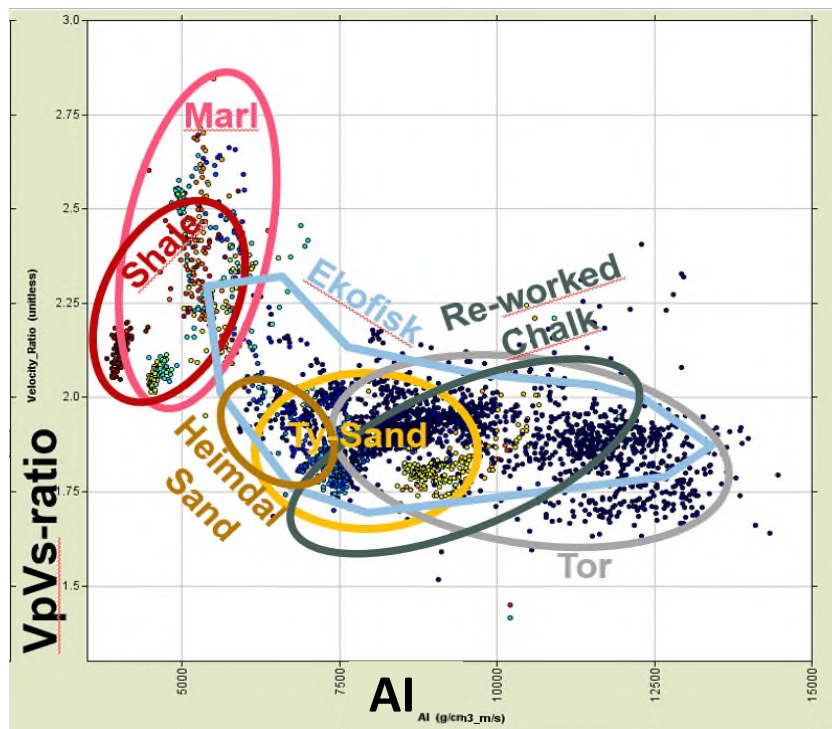


Figure 5: At well scale, VpVs ratio and AI of sand and rework chalk overlap too much and induce unambiguous discrimination.

3.2 Geological interpretation from well and seismic data

1. A large Paleocene synthesis based on the well data has been undertaken focussing on the lithology and on the detailed stratigraphy. The result shows that the Paleocene sands are disappearing by pinch out against the western flank of the Utsira High. The pinch out which occurs about 12km west of Angell is well calibrated by a large number of wells and is locally visible on seismic. It was concluded then that the Paleocene Sands can unlikely reach the Angell area.
2. The well data synthesis also has revealed the common occurrence of reworked chalk within the Paleocene section in the area. In the vicinity of Angell, 3 chalk debris flows are proven by wells: a reworked chalk fan is present on the western hanging wall of the Utsira high, two are present on the Utsira high, below (at top Chalk) and above Angell. The reworked chalk, mixed with shales, has no reservoir property (porosity < 10%).
3. The detailed seismic interpretation allowed to compute seismic attributes within a fine layering. Particularly the coherency attribute allowed to characterise the drilled reworked chalk bodies as very specific chaotic and blocky facies. The coherency extracted at Top Angell shows the same seismic facies, leading to the conclusion that Angell is very likely made of reworked chalk (Figure 6).

In conclusion, the overall conducted studies and the detailed seismic interpretation highlighted that the presence of reservoir remains a very high risk on Angell prospect.

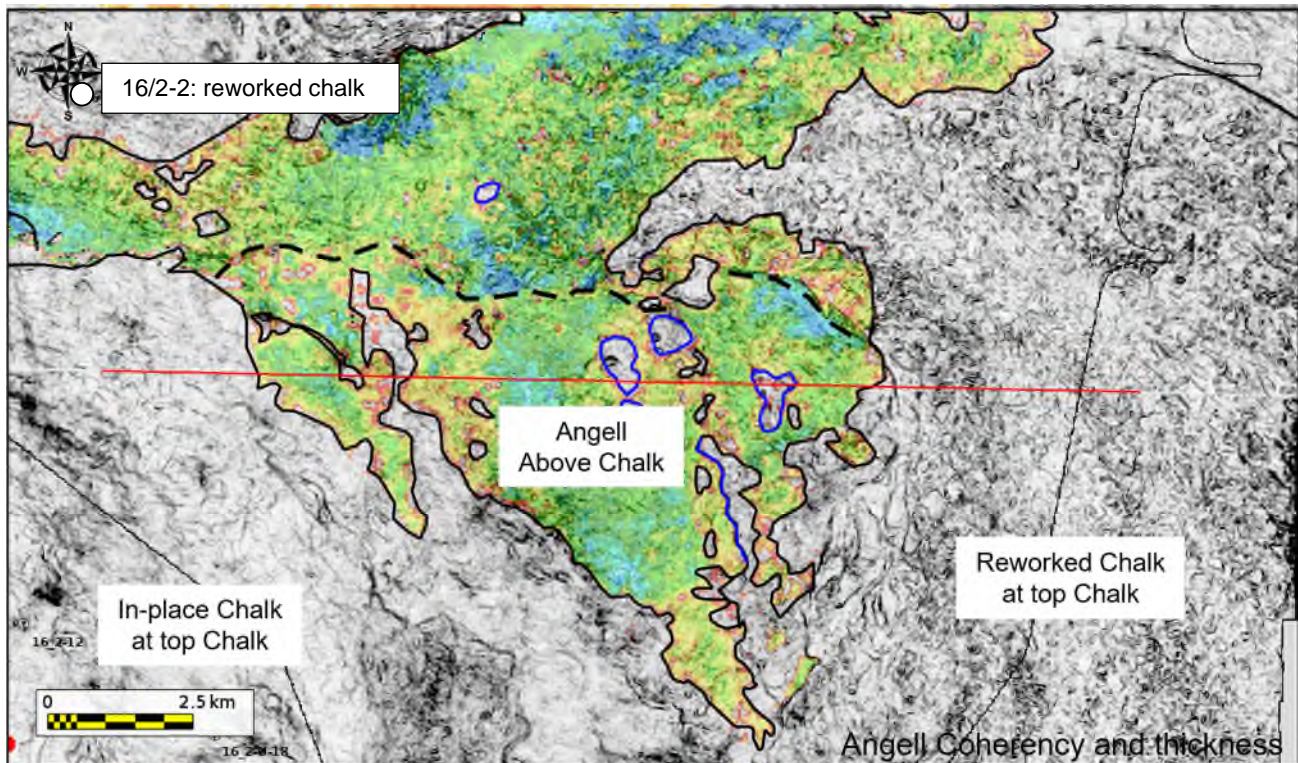


Figure 6: Coherency at top Chalk and top Angell.
Colors correspond to Angell thickness (Blue is thick, red is thin, average 30m)

4. Results of the completed studies and impact on the Prospect evaluation

Although the seismic inversion was inconclusive, the seismic attributes and the well calibrations (especially the nearest well 16/2-2) lead to conclude that Paleocene turbidites deposition is restricted to the western flank of the Utsira High and that Angell is very likely made of reworked chalk without any reservoir potential.

In term of geological risk, the new interpretation has increased the risk on the reservoir presence and also on migration because of the absence of carrier beds. The other risks (Source rock, Seal, geometry) remain unchanged. The updated Probability of Geological Success is of 4%, meaning an unacceptable risk to envisage a drilling.

The geometry of the prospect is unchanged leading to the same volumetric evaluation.

It is considered that further technical works or studies will not help to decrease the risk on the reservoir presence.

5. Prospect update - Remaining prospectivity

Angell was the only prospect identified at the time of the application. An exhaustive screening of additional potential plays has been done, from younger tertiary section to pre-BCU section (Figure 7). Well data and seismic amplitude maps have been used to identify potential additional plays.

The result of the screening shows a very limited prospectivity in the Licence:

- Eocene, Oligocene and lower Miocene turbiditic plays are absent over the Utsira High.
- Middle Miocene sands were deposited over the Licence but structuration either structural or stratigraphic is completely absent.
- The chalk is not a reservoir in the area.
- The Upper Jurassic Johan Sverdrup play is absent.
- Middle Jurassic sandstones are probably present, trapped in a stratigraphic closure extending mostly outside the Licence.
- Lower Jurassic and Triassic sections are absent. There is not structural closure at the deep levels including the basement.

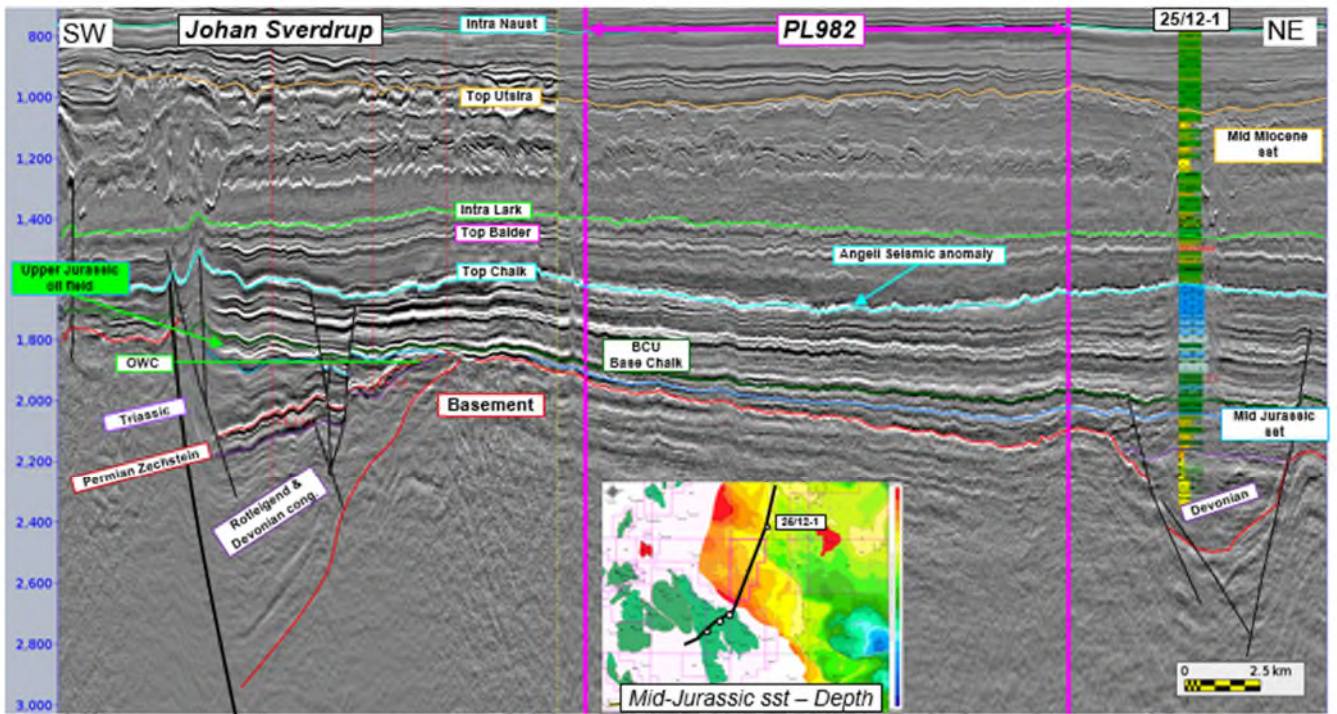


Figure 7: PL 982 Prospectivity screening

Following the prospectivity screening, Angell remains the only prospect in the Licence.

6. Technical assessment

The exhaustive technical work performed since the Licence award allowed to bring out the absence of drillable prospect in the Licence.

7. Conclusions

The main prospect at the time of application Angell have been fully evaluated based on the 3D seismic elastic inversion and interpretation studies. The evaluation has concluded that presence of sand is very unlikely. On this basis, it is considered that further work, including 3D seismic re-processing, will not have any positive impact on the current interpretation of the prospect.

The prospectivity screening of the shallow and the deeper parts of the stratigraphy has been completed without identifying any material lead or prospect.

As a conclusion, TotalEnergies as an operator decided in agreement with its partner Aker BP to early surrender the Licence on 15th of December 2020.