

**PL 983**  
**License relinquishment report**  
**(Licence status report)**

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## Summary

The PL983 license was awarded 1<sup>st</sup> of March 2019 to Equinor (operator), Total Energies EP Norge AS, DNO Norge AS and Petoro with a requirement of performing relevant geological and geophysical studies in addition to acquire 3D geological data. The work obligations in the license are fulfilled.

Midtfjellet and Orrhaugen are the two main prospects in PL983. They are described as 4-way dip-dependent closures, with Mid Jurassic Sandnes/Bryne Formations as primary targets for Midtfjellet and Sandnes/Bryne Fms and Staffjord Group as primary target for Orrhaugen. Top seal for both prospects is the thick Upper Jurassic Viking Group shale, and source for both prospects is believed to be Upper Jurassic Tau/Draupne shales with possible additional contribution from Lower Jurassic Staffjord shales.

The main challenge in this area is the presence of a mature source. A new basin model of the Stord basin and the Aasta Graben indicate that both the Tau/Draupne and the Staffjord source is early mature in the area. Hence, a limited amount of hydrocarbons are expected to be expelled from the source rock, and a charge limitation has been used on all prospects in PL983. Mean inplace volumes of Midtfjellet is 12,1 MSm<sup>3</sup> oe with a Pg of 18% and 11,8 MSm<sup>3</sup> oe for Orrhaugen, with a Pg of 12%.

The results from the 31/11-1 S Stovegolvet well (in PL785S) did not reduce the risk of the prospects in PL983. Neither did the results from the geochemistry analysis give any positive indications that would change the results of the existing basin model. Hence, the volumes remain moderate, and the risk remains high for the prospects in PL983, and the partnership recommends dropping the PL 983 license at the DoD deadline on the 1<sup>st</sup> of March 2022.

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## 1 Licence history

**License:** PL983

**Awarded:** 01.03.2019

**License period:** Expires 01.03.2026  
 Initial period: 6 years

**License group:**

Equinor Energy AS	40% (Operator)
Total Energies AS	20%
DNO Norge AS	20%
Petoro	20%

**License area:** 1460,189 km<sup>2</sup>

**Work programme:** Acquire 3D seismic  
 Study of geology and geophysics

**Meetings held:**

07.05.2019	EC/MC startup meeting
07.11.2019	EC/MC meeting
19.06.2020	EC/MC meeting
24.11.2020	EC/MC meeting
07.12.2021	EC/MC meeting

**Work performed:**

2019:	License start-up.
2019:	3D seismic acquisition
2019-2020:	Seismic interpretation and well tie. Depth conversion and depth uncertainty modelling, DFI/Seismic modelling. Evaluation of reservoir and depositional model. Source rock evaluation, 3D basin model and Migration modelling Geological/geophysical evaluation of prospectivity
2021:	Decision to extend DoD period with 1 year to wait for the 31/11-1 S Stovegolvet well result
2021:	Reevaluation of prospectivity after the Stovegolvet well
2021:	Decision made to surrender license.

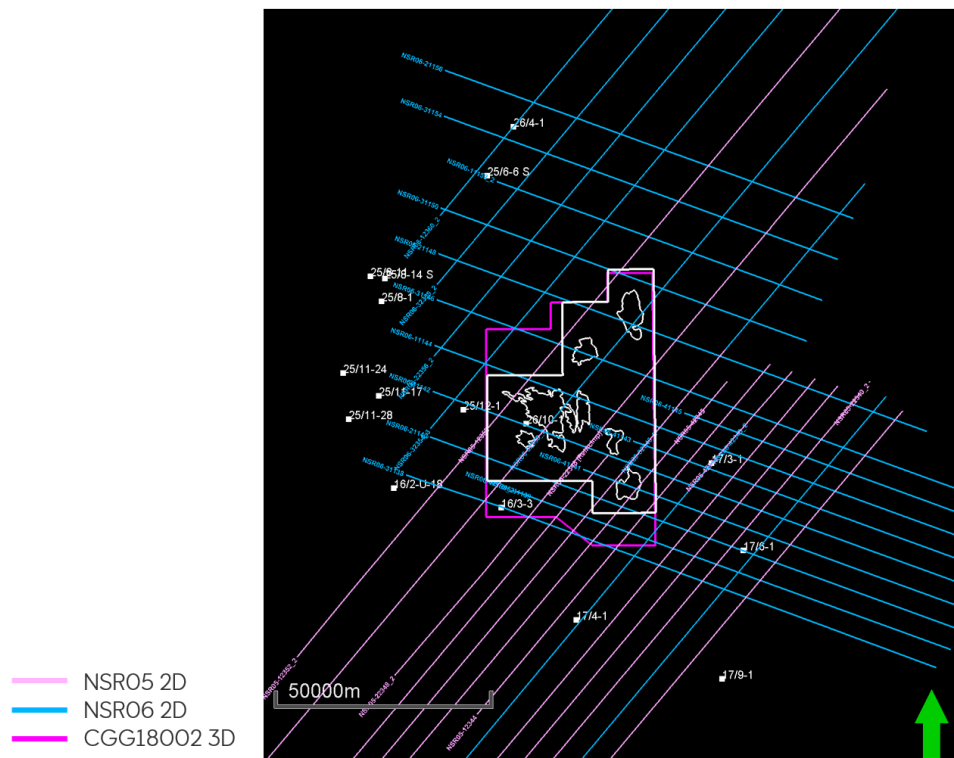
**Reason for surrender:**  
 The prospectivity in PL983 has been evaluated on good quality seismic. Main risks for the prospects are the source maturity and migration. The results from the 31/11-1 S Stovegolvet well, did not give any positive indications that would change the existing basin model for the area. Hence, the volumes remain moderate, and the risk remains high for the prospects in PL983, and the partnership recommends dropping the PL 983 license at the DoD deadline on the 1<sup>st</sup> of March 2022.

## 2 Database overviews

### 2.1 Seismic data

**Table 1:** List of seismic surveys in the common license database (see Figure 1). The CGG18M01 PSTM was used as the main data set for the last seismic interpretation for Stovegolvet.

Seismic survey	2D/3D	Year	Quality	NPDID
CGG18002	3D	2018	Good	
MC3D-SBS2012_merge	3D	2012	Good	
NRS05 (12 lines)	2D	2005	Moderate-good	
NRS06 (22 lines)	2D	2006	Moderate-good	



**Figure 1** Common seismic database with all the 2D seismic lines and the extent of the CGG18002 3D survey.

## 2.2 Well data

**Table 2: Key wells**

Well	Year	Operator	NPDID
17/3-1 Bark	1995	Elf Petroleum Norge AS	2576
17/6-1 Svanøgle	2011	Norwegian Energy Company ASA	6501
25/6-6 S Pabow	2019	Equinor	8688
31/11-1 S Stovegolvet	2020	Equinor	9241

See Appendix 1 for full list of wells in common database.

### 3 Results of geological and geophysical studies

PL983 is located on the Patch Bank Ridge between the Stord Basin in the north and the Aasta Graben in the south, and approximately 30km northeast of the Johan Sverdrup Field (Figure 2). The PL983 license was awarded to Equinor, Total Energies, DNO and Petoro in March 2019.

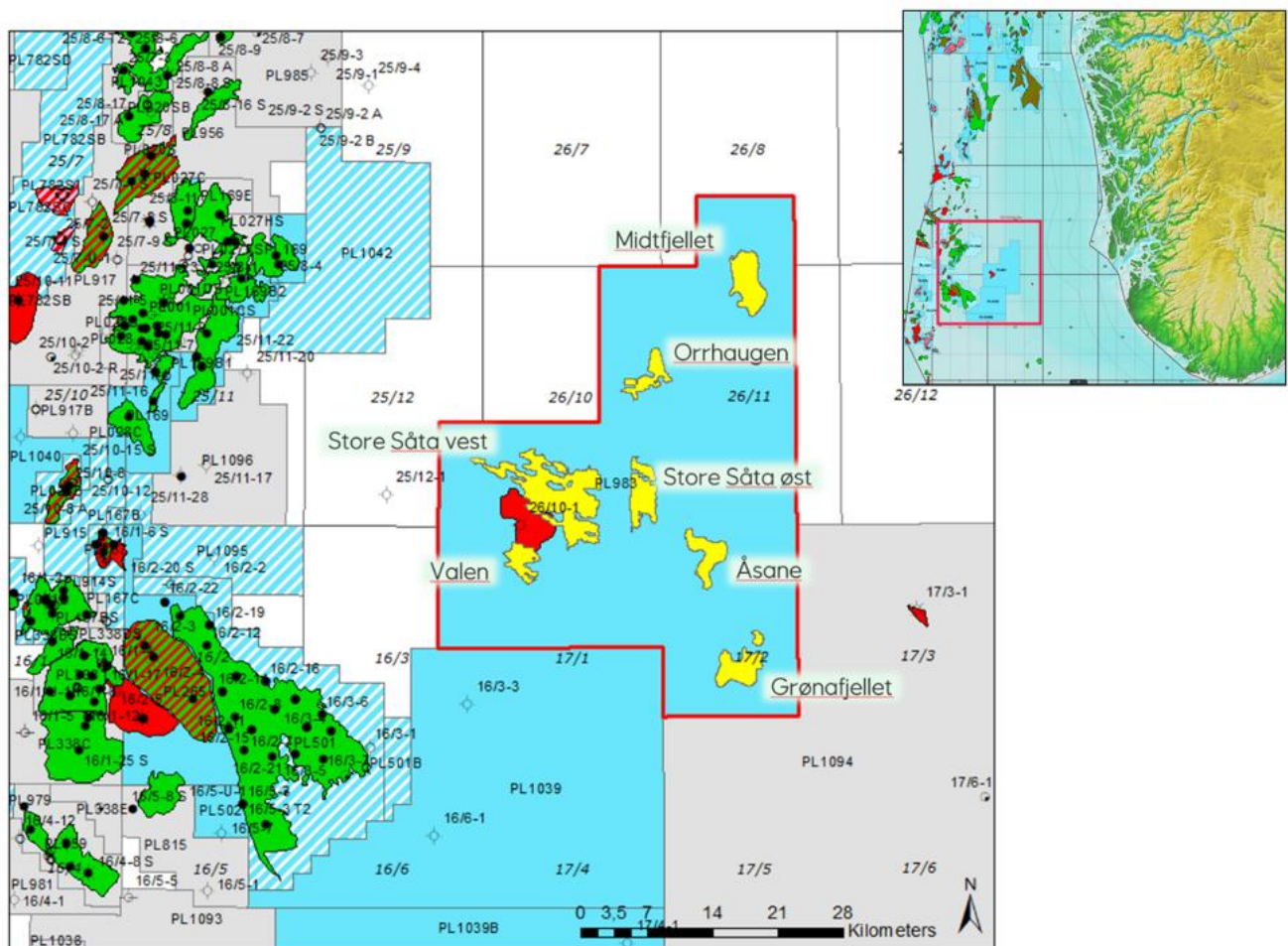


Figure 2 Location map of PL983.

The CGG18002 Broadseis survey was used for seismic interpretation. Horizons could be mapped with high confidence and structural detail due to the excellent quality of the seismic data. Mapping the subcrop below the Upper Jurassic top seal was of particular importance for reservoir prediction, where key mappable horizons were Near Base Viking, intra Vestland coals and an intra Statfjord horizon. Depth conversion was performed with the CGG18002 velocity model that showed good calibration to wells, consistency with seismic horizons and included lateral velocity variations which was particularly important given the strong uplift of the eastern Stord Basin. Seismic DHIs could not be identified in the prospects. However, LFP/AVO modelling suggested that only small DHI-effects were expected in the case of oil fill and that they would be difficult to identify given the strong seismic response from coals in the Vestland Group and the heterogeneous reservoir in the Statfjord Group. In addition, the Upper Jurassic Tau Formation source rock was mapped basinwide using NSR 2D lines indicating organic rich Tau



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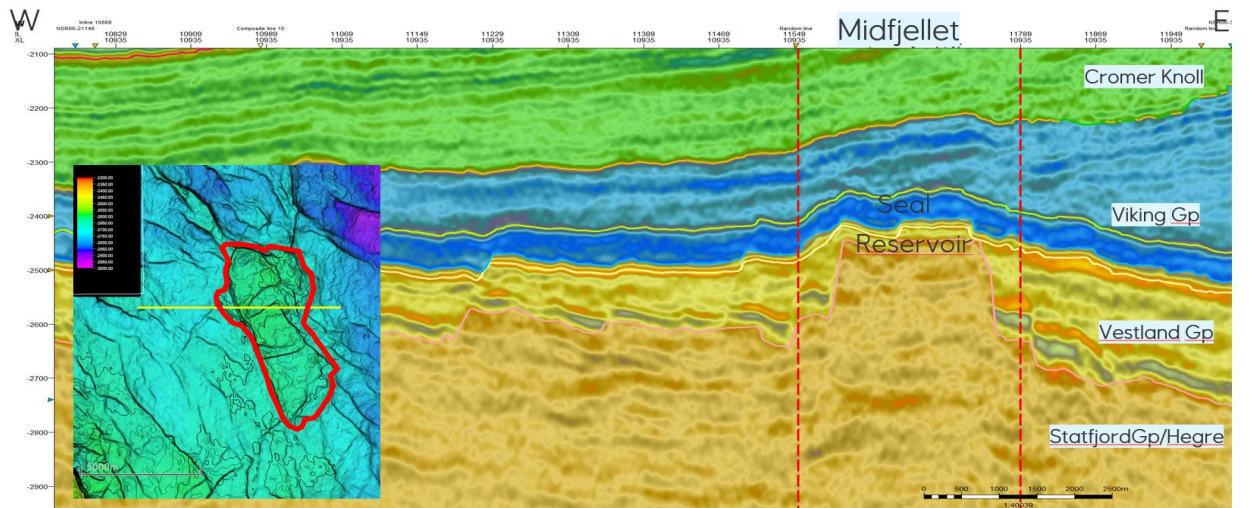
Formation with excellent source rock potential both in the Åsta Graben and the southern part of the Stord Basin. Well data from key wells also indicate good to excellent source rock potential in the Statfjord Group shales/coals.

A new basin model covering the Aasta Graben area and most of the Stord basin was generated. The main purpose of the model was to test if a conventional model could explain the two small discoveries in the Aasta Graben in the 17/3-1 Bark and the 17/6-1 Svanøgle wells. Secondly, it was to give input to risk and volume for the prospects in both PL983 and PL785S. All available temperature and vitrinite data were examined in calibration of the model. The result showed that the two discoveries could be explained by a conventional model. Further, the results showed an early mature Tau/Draupne and Statfjord source both in the Aasta Graben and the Stord basin. However, the main uncertainty is the level of maturity reached by the potential source rocks. Different methodology for maturity calibration gives a large spread in estimated maturity and this is the main factor which dictates the generated volume outcome in the prospects.

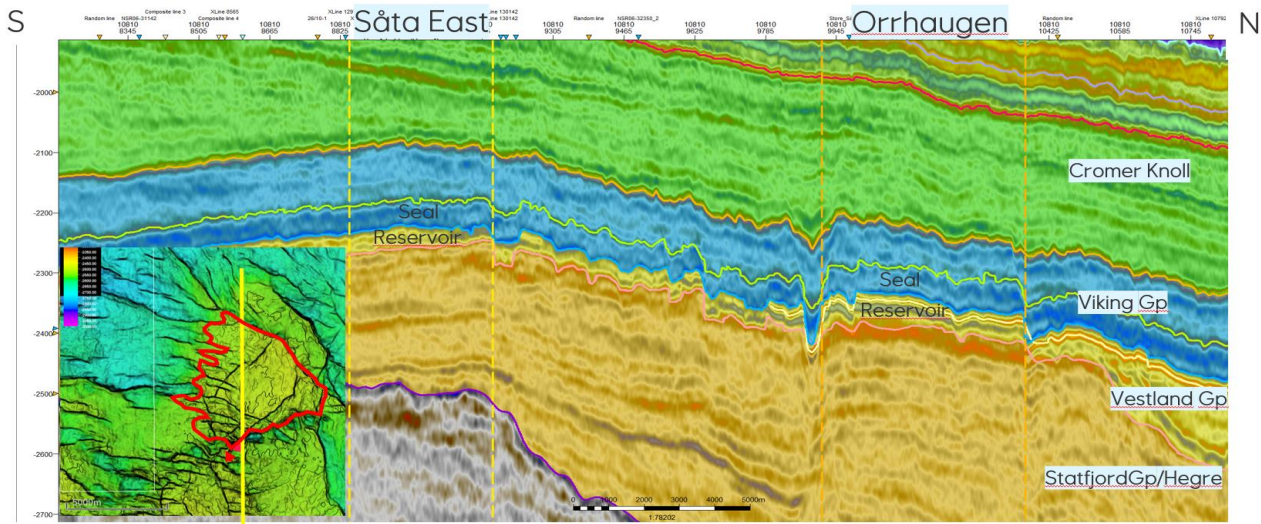
## 4 Prospect update report

The PL983 license contains several prospects (Figure 2), and the Store S ata prospect was originally identified as the main prospect. Store S ata was initially interpreted on 2D data, and the idea was that the prospects would be fed from a kitchen in the south; the Aasta Graben area where two small discoveries already exist (17/3-1 and 17/6-1). However, post-access, 3D seismic data was acquired and interpreted. And after an internal QC process, the focus shifted to Midtfjellet and Orrhaugen, due to the basin model results indicating challenges on migration to Store S ata. Midtfjellet and Orrhaugen are now believed to be in a more favourable position for HC migration and are therefore regarded better candidates.

Midtfjellet (Figure 3) and Orrhaugen (Figure 4) are defined as 4-way dip-dependent closures, with Mid Jurassic Sandnes/Bryne Formations as primary targets for Midtfjellet and Sandnes/Bryne Fms and Statfjord Group as primary target for Orrhaugen. Top seal for both prospects is the thick Upper Jurassic Viking Group shale, and source for both prospects is believed to be Upper Jurassic Tau/Draupne shales with possible additional contribution from Lower Jurassic Statfjord shales. Midtfjellet is placed first on the HC migration route, and Orrhaugen is dependent on fill-spill from Midtfjellet. Mean inplace volumes for Midtfjellet is 12,1 MSm<sup>3</sup> oe with a Pg of 18% and 11,8 MSm<sup>3</sup> oe for Orrhaugen, with a Pg of 12%. The remaining volumes at Jurassic level can be seen in Table 1.



**Figure 3** Seismic cross section through Midtfjellet and top reservoir depth map.



**Figure 4** Seismic cross section through Orrhaugen (and Sâta East) and top reservoir depth map.

Given the negative well result of 31/11-1 S Stovegolvet, where no sources were proven, source and migration are still a very high risk for the prospects in PL983. Further, the results of the geochemistry analysis did not give any positive indications that would change the result of the existing basin model. Hence, the volumes remain moderate, and the risk remains high for the prospects in PL983 (Table 3).

**Table 3:** Recoverable resources for Stovegolvet segments.

Prospect/ Lead	P/L	Phase	Unrisked recoverable resources						Probability of discovery (%)	Resource In license (%)	Reservoir	
			Oil (MSm3)			Assoc. Gas (GSm3)					Stratigraphic level	Reservoir depth (m MSL)
			P90	Mean	P10	P90	Mean	P10				
Midtjfellet	P	Oil	1,16	3,83	7,22	0,106	0,37	0,92	17,9	100	Sandnes/Bryne Fms	2588
Orrhaugen	P	Oil	1,05	3,76	8,16	0,094	0,432	0,97	11,8	100	Sandnes/Bryne Fms/Statfjord Gp	2462
Store Sâta	P	Oil	0,909	3,44	7,22	0,034	0,172	0,382	14,9	100	Sandnes/Bryne Fms/Statfjord Gp	2370
Valen	P	Oil	1,53	2,89	4,51	0,065	0,165	0,297	10,1	100	Sandnes/Bryne Fms	2380
Åsane	P	Oil	0,934	2,36	4,33	0,039	0,134	0,266	6	100	Lower Statfjord Gp	2495
Grønafjellet	P	Oil	1,06	3,63	7,73	0,046	0,207	0,461	8,4	100	Sandnes/Bryne Fms	2540

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## 5 Technical assessment

A full economic valuation has not been carried out on any of the prospects in PL983. However, an assessment of the threshold volume for the Midtfjellet prospects was done with the following assumptions:

- Subsea tieback to Johan Sverdrup (70km)
- 4 slot template
- Production pipeline with electric heating (DEH) due to the long distance
- Water injection line (WI for pressure support)
- Umbilical
- 3-4 wells (2 OP + 1 or 2 WI) + 1 EXP well
- Tie-in at JS 2029+ (potential capacity starting to open)
- Sub-sea boosting not included

## 6 Conclusion

The work program for PL983 has been completed with acquiring new 3D seismic and extensive G&G work. A new basin model of the Stord Basin gave indications of an early mature source. However, the negative well result from the 31/11-1 S Stovegolvet well did not reduce the risk of the prospects in the PL983 license.

## Appendix 1 List of wellbores in the common license database.

Well	Year	Age	Drilling operator	Current license	Status	Age at TD	Data access
25/6-6 S	2019	0	Equinor Energy AS	870	dry	Triassic	Raw
16/2-U-18	2016	3	Statoil Petroleum AS	501	inconclusive/oil	Triassic	Raw
25/11-28	2015	4	Statoil Petroleum AS	916	dry	Basement	Raw
26/10-1	2015	4	Lundin Norway AS	983	gas	Miocene	Raw
17/6-1	2011	8	Norwegian Energy Company ASA	open	oil	Late Triassic Skagerrak Fm	Raw, Discovery Evaluation Report
17/12-4	2009	10	BG Norge AS	972	oil	Triassic Skagerrak	Raw
25/11-24	2007	12	Norsk Hydro Petroleum AS	169	oil	Early Jurassic Statfjord Gp	Raw
25/8-14 S	2003	16	Esso exploration and production Norway A/S	27	oil	Early Jurassic Statfjord Gp	Raw
25/8-11	1997	22	Esso exploration and production Norway A/S	27	oil	Early Jurassic Statfjord Gp	Raw
17/3-1	1995	24	Elf Petroleum AS	open	gas	Pre-devonian basement	Raw
25/11-17	1993	26	Norsk Hydro Petroleum AS	916	dry	Pre-devonian basement	Raw
16/3-3	1989	30	Esso exploration and production Norway A/S	open	dry	Late Cretaceous Tor Fm	Raw
26/4-1	1987	32	BP Norway	open	dry	Triassic Hegre Gp	Raw
9/2-1	1987	32	Den norske stats oljeselskap AS	316	oil	Triassic Skagerrak Fm	Raw
17/9-1	1973	46	Esso exploration and production Norway A/S	976	dry	Middle Jurassic Vestland Gp	Raw
25/12-1	1973	46	A/S Norske Shell	open	dry	Devonian?	Raw
25/8-1	1970	49	Esso exploration and production Norway A/S	27	oil	Early Permian Rotliegend Gp	Raw
17/4-1	1968	51	Elf Petroleum AS	open	dry	Early Permian Rotliegend Gp	Raw

>20yrs      >2yrs      <2yrs