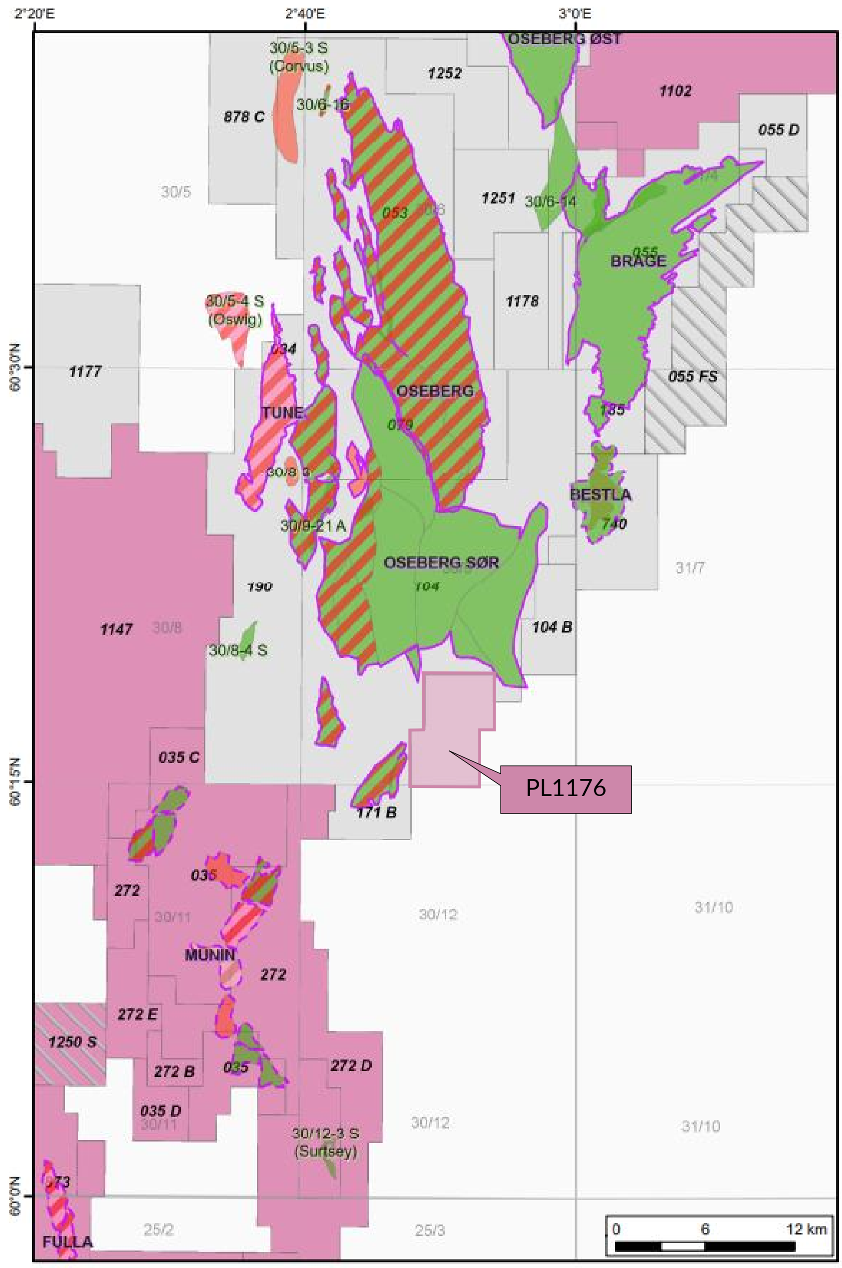
# PL1176
# RELINQUISHMENT REPORT
# May 2025




Partner:

# Relinquishment Report PL1176

## Table of Contents

List of Figures

List of Tables

# 1 License history

### Award, licensees and operator

PL1176 was awarded in the APA2022 licence round on the 17.02.2023[1]. The licence is situated in block 30/9 close to the Oseberg South Field on the Bjørgvin Arch (Fig. 1.1). The licence group consists of Aker BP (Operator, 60%) and Concedo (40%).

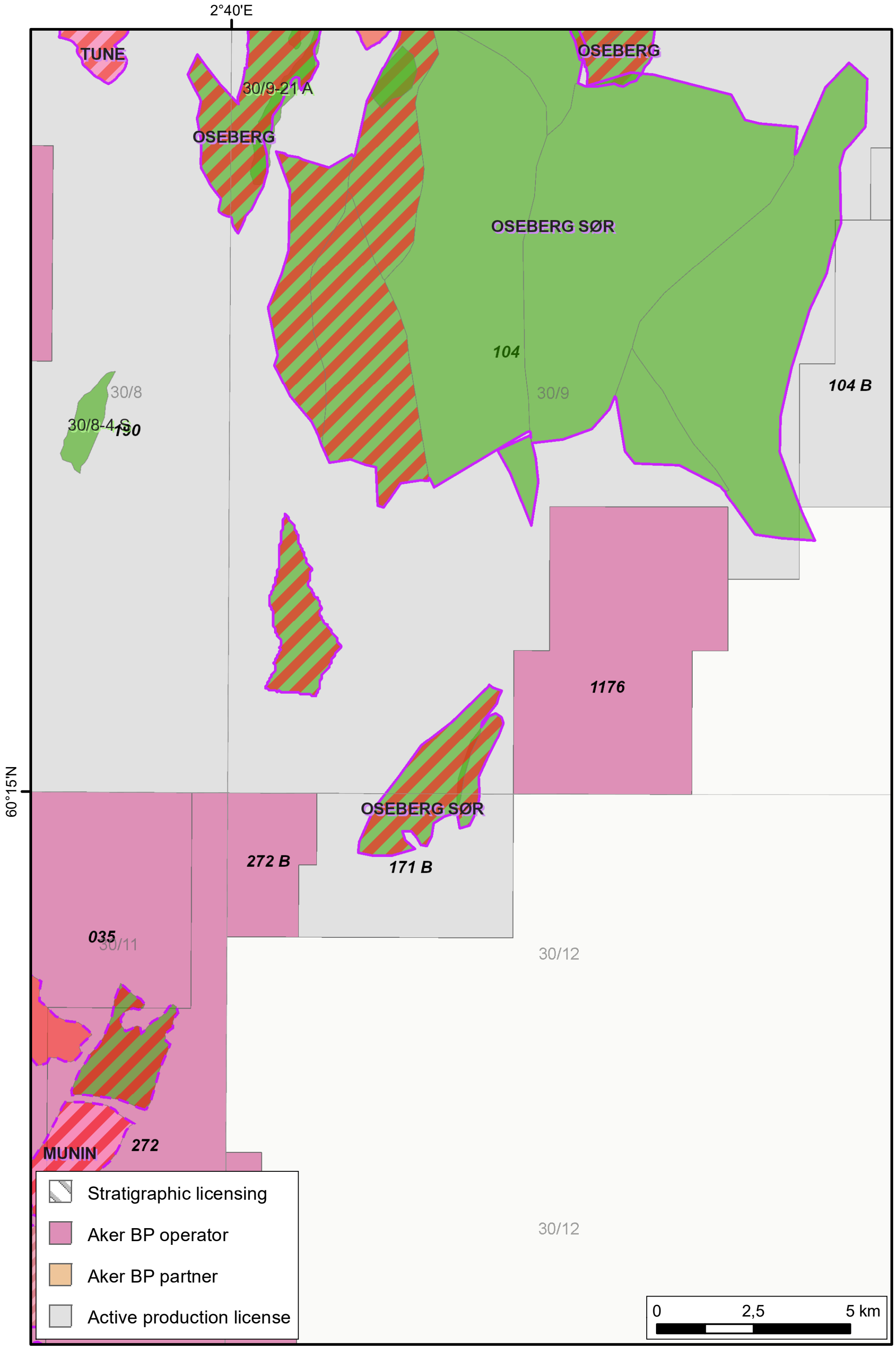



Fig. 1.1 PL1176 licence area *Location of the PL1176*

### Work program

The work program includes what's listed below, and is completed within the license obligation 17/2-2025:

- Do reprocessing of 3D seismic
- Perform study of geology and geophysics
- Make a decision to drill

The licensees have purchased new dual azimuth seismic data which covers the licence plus some area around. Seismic interpretation, petrophysical analysis and fault sealing analysis has been performed in the licence period. The work also includes analysis of the available 4D data over the area. The licensees have unanimously decided not to take a positive drill decision and therefore the licence will lapse. The work obligations of the licence are fulfilled.

### Meetings held in the licence

Table 1.1 MC, EC and Work meeting activity in PL1176

| Date | Activity | Comment |
|---|---|---|
| 20.03.2023 | EC/MC-meeting | Start up of the licence |
| 06.11.2023 | EC/MC-meeting | Ongoing work and budget |
| 26.06.2024 | EC work meeting | Example of new seismic, ongoing work |
| 29.11.2024 | EC/MC-meeting | Ongoing work including preliminary volumes and risk. Budget. Way forward |
| 10.01.2025 | Work meeting | Partner presents own work |
| 28.01.2025 | Work meeting | Volumetric, risking, comparison operator and partner work |

### Reasons for licence lapse

The Koseberg prospect has been the only prospect in the licence. The prospect has reservoir in the Brent Gp. Fault analysis and seismic interpretation showed that in order to trap hydrocarbons in the licence there either have to be a pinch-out/truncation trap of the Tarbert Fm or a high column in the Ness and Etive Fms. The Tarbert pinch out trap model is considered to have high risk on trap definition and seal. For the Ness and Etive Fms, most of the possible volumes are situated in the licence to the north. Based on this, the licence could not take a drill decision and the licence is lapsed.

# 2 Database

## 2.1 Seismic data

The common seismic database (CSD) in PL1176 consists of the seismic survey CGG24M01 (SURVEY: CGG18M01, 22M01, 22001, 22003. NPD ID: 7984, 8128, 8179, 8194, 8195, 8196, 8252, 8332, 10321, 10332): which is an East-West, North-South Dual Azimuth processing purchased by both companies in the licence. The CSD for the license is outlined in the figure (Fig. 2.1).

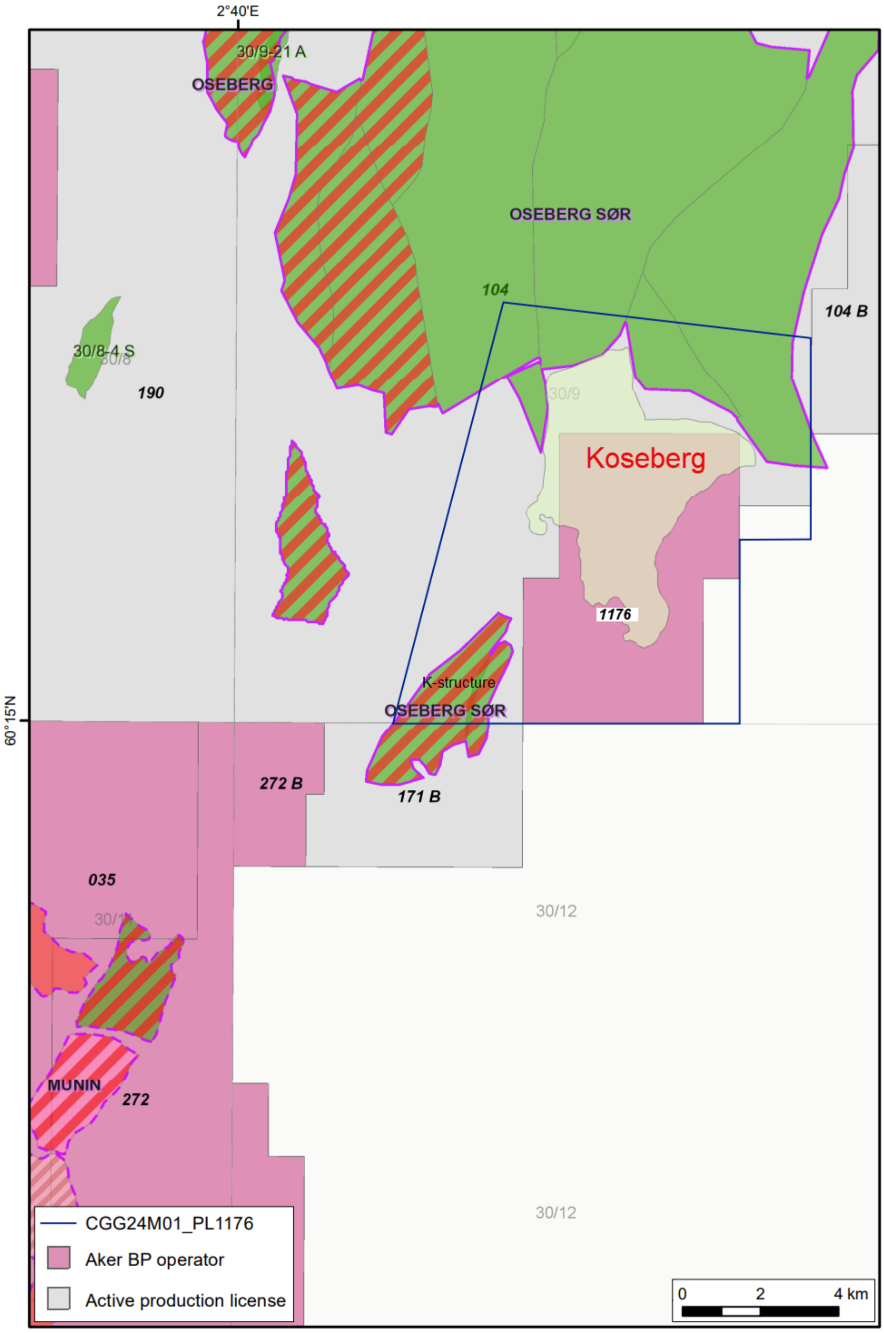



Fig. 2.1 Common seismic database *Outline (blue) of the part of CGG24M01 which is the common seismic database for PL1176.*

There was also performed 4D analysis using the following seismic surveys:

- 4D processed together (2010 & 2018): EQ18M15: ST18202(NPDID 8605)/ST18201(NPDID 8585) & EQ18M14: ST10007(NPDID 7272)/ST10003(NPDID 7228)
- 4D processed together (2008 & 2014): ST0823(NPDID 4611) & ST14206(NPDID 8049).

## 2.2 Well Data

The listed wells are included in the common database. It is including production wells on J-structure, K-structure and Stjerne. All the wells are released.

Table 2.1 Exploration wells in the common database

| Exploration well | Drilling ended | NPDID for the well path |
|---|---|---|
| 30/8-4 S | 04.02.2009 | 5974 |
| 30/9-5 S | 19.07.1985 | 478 |
| 30/9-6 | 21.04.1987 | 1027 |
| 30/9-9 | 06.11.1989 | 1442 |
| 30/9-10 | 21.09.1990 | 1514 |
| 30/9-11 | 19.11.1990 | 1673 |
| 30/9-11 A | 29.12.1990 | 1705 |
| 30/9-12 | 09.05.1991 | 1717 |
| 30/9-12 A | 04.06.1991 | 1770 |
| 30/9-13 S | 11.10.1991 | 1811 |
| 30/9-13 SR | 17.07.2002 | 4586 |
| 30/9-14 | 14.05.1993 | 2076 |
| 30/9-15 | 05.01.1994 | 2223 |
| 30/9-16 | 08.08.1994 | 2361 |
| 30/9-18 | 11.04.1995 | 2552 |
| 30/9-20 S | 11.02.2002 | 4463 |
| 30/9-22 | 10.03.2009 | 6034 |
| 30/9-25 | 20.09.2013 | 7249 |
| 30/11-6 S | 02.07.2004 | 4950 |
| 30/12-1 | 07.03.1994 | 2248 |

Table 2.2 Development wells in the common database

| Development Well | NPDID for the well path |
|---|---|
| 30/9-J-11 H | 5272 |
| 30/9-J-11 AH | 5423 |
| 30/9-J-11 BH | 5426 |
| 30/9-J-12 H | 4971 |
| 30/9-J-12 HT2 | |
| 30/9-J-12 HT3 | |
| 30/9-J-12 HT4 | |
| 30/9-J-12 HT5 | |
| 30/9-J-12 HT6 | |
| 30/9-J-12 HT7 | |
| 30/9-J-13 H | 5138 |
| 30/9-J-13 AH | 5139 |
| 30/9-J-13 BH | 6141 |
| 30/9-J-14 H | 5024 |
| 30/9-J-14 AH | 7087 |
| 30/9-J-14 BH | 7139 |
| 30/9-J-15 H | 6035 |
| 30/9-J-16 H | 5201 |
| 30/9-J-16 HT2 | |
| 30/9-J-16 HT3 | |
| 30/9-K-11 H | 4315 |
| 30/9-K-12 H | 3797 |
| 30/9-K-13 H | 3872 |
| 30/9-K-14 H | 3894 |
| 30/9-M-11 H | 6841 |
| 30/9-M-12 AH | 6843 |
| 30/9-M-12 AHT2 | |
| 30/9-M-12 AHT3 | |
| 30/9-M-12 H | 6842 |
| 30/9-M-12 HT2 | |
| 30/9-M-13 H | 6844 |
| 30/9-M-14 H | 6845 |
| 30/9-M-14 AH | 6846 |

# 3 Geological and geophysical studies

**Studies relevant for the prospectivity in PL1176**

**Seismic processing**

The licensed data from the dual azimuth survey in the area was delivered in two phases. Phase 1 was a preliminary processing of the data and Phase 2 had a more complete processing sequence. The phase 2 version was delivered from CGG in the summer of 2024. The data was improved in comparison with the fast track (phase 1) data and the velocity model was more detailed.

**Seismic Interpretation**

Preliminary seismic interpretation was performed on the Phase 1 data and much of the interpretation concepts were established. A final interpretation was performed on the Phase 2 data. Both horizons and faults were interpreted. The fault interpretation had special focus as the faults were later used in a fault sealing capacity study. One of the most challenging issues was interpreting the pinch out of the Tarbert Fm. towards the high in the north. There were also challenges related to the seismic quality below hard reflectors in the Tertiary.

**Petrophysical Analysis**

The three most relevant wells have been updated and re-evaluated through petrophysical analysis, this applies to the wells 30/9-9, 30/9-16 and 30/9-18.

**4D analysis**

2 sets of publicly available 4D data exist covering the northern part of the Koseberg prospect (2018-2010 & 2014-2008). Pre-production pressures at Oseberg was so that gas out of solution was expected in the area.  The 4D data was used in the prospect evaluation to look for 4D anomalies that could indicate accumulations of HC in the Koseberg prospect. A 4D anomaly, softening and  slow down, was detected within the Oseberg South 30/9-9 segment, vertically within the Brent Gp. It was interpreted as either inferring a sealing fault between Oseberg south and Koseberg or possible representing a OWC in the Oseberg South segment.

**Pressure analysis**

At least 4 pressure segments can be identified near the licence area, of which the segment tested by well 30/9-18 (Koseberg) has an intermediate overpressure. The highest overpressure is recorded down-flank, in the 30/9-16 (K-structure) with overpressure one bar higher than in Koseberg. This slight overpressure adds some stress on faults in the spill route from K and make migration easier to Koseberg. For the 30/9-20 S segment it facilitates across-fault migration from Tarbert (in 30/9-20S) to Ness in Koseberg (30/9-18) where overpressure is a few bars less.

The lowest overpressure is found updip of Koseberg, in the 30/9-11 (6 bar less) and the 30/9-9 segments (a few bars less). While pressure conditions are favourable for migration into Koseberg, it is negative for having an efficient seal. By adding overpressure to the buoyancy pressure, the up-dip seal potential seems insufficient to keep a column large enough to extend from the apex-area located in the PL104 licence down into the Koseberg prospect.

**Fault seal analysis**

Koseberg at Tarbert Fm level is a complex trap that requires reservoir truncation and sealing faults. The conceptual geometry of the prospect is illustrated on Fig. 3.1 and the 3D structural framework is shown in Fig. 3.2.

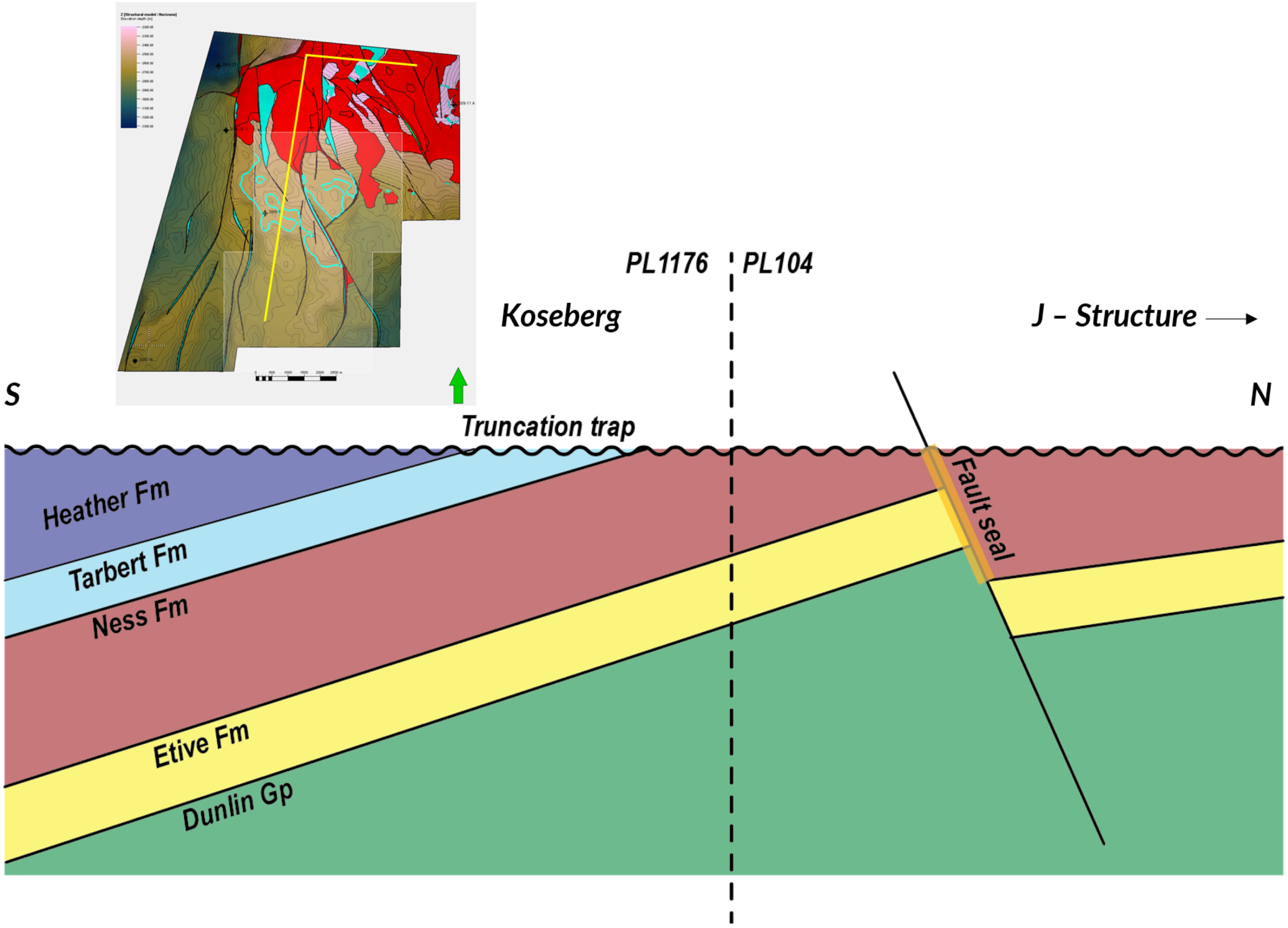



Fig. 3.1 Koseberg trap concept *Conceptual model for the sealing of the Koserberg structure at different intervals. NB Tarbert Formation is also fault seal dependent to the east in a maximum filling sceanario.*

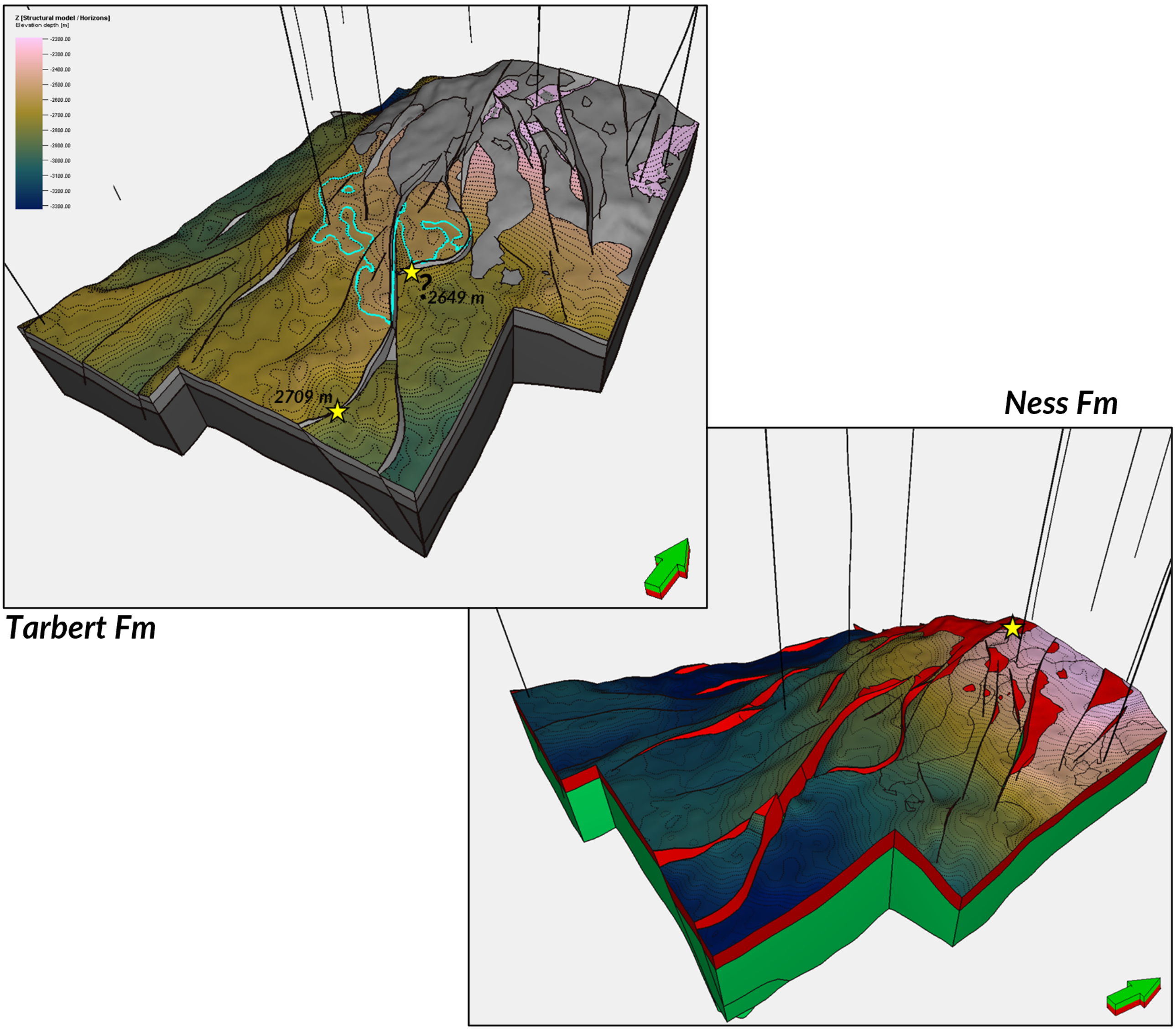



Fig. 3.2 3D fault geometries at top Tarbert and Ness formations. *Yellow stars indicate weak points along faults. Tarbert Fm is self-juxtaposed at 2649 m and 2709 m depth, which are both deeper than the observed water-up-to in well 30/9-18. Juxtaposition seal exist updip. However, if this juxtaposition and stratigraphic seal had worked, well 30/9-18 should not be dry. Ness Fm is self-juxtaposed in the apex-area which is very negative for fault seal for this stratigraphic interval.*

If Tarbert Fm is eroded on the crest of the field then the column height is defined by a normal fault that down throws Tarbert Fm to the east and juxtaposes Koseberg against Heather Fm shale. The shallowest Tarbert to Tarbert juxtaposition across this fault occurs at either 2649 m or 2709 m depth, both of which are deeper than water-up-to encountered in well 30/9-18.

Trapping in the Ness and Etive Fms is reliant on membrane fault seal where both formations are self juxtaposed in the north of the prospect (Fig. 3.2). The membrane sealing capacity of the faults in the Koseberg area was investigated in two ways: 1) empirically by offset well analysis, particularly the adjacent Oseberg Sør field, and 2) deterministic analysis using publically available hydrocarbon column height predictions, in this case the model from Yielding et al., 2010 [2]. Both methods suggest that faults in the greater area and within Koseberg can seal hydrocarbon columns. Empirical analysis showed that faults in Oseberg Sør can seal columns of up to 350 m (see Childs et al., 2009 [3]). For example, the fault that delineates the Oseberg Sør C and J structures juxtaposes Tarbert Fm on the hanging wall (C) against Tarbert, Ness or Etive Fms on footwall (J), with a contact difference of 290 m.

Deterministic analysis was based on the construction of fault seal triangles (Fig. 3.3) to calculate shale gouge ratio (SGR). SGR was then converted to a column height prediction based on the Yielding et al., 2010 formula. These data indicated that faults with throws greater than 30 m would hold oil columns of 80-120 m, while faults with throw greater than 50 m would hold columns greater than 160 m. The fault seal estimates from the two methods are outlined in . These apply for the Ness an Etive Fm, which are fault seal dependent. Tarbert remains a juxtaposition trap down to the leak points outlined in the text above.

Coals included as 0.8 Vsh HCCH 730 kg/m3

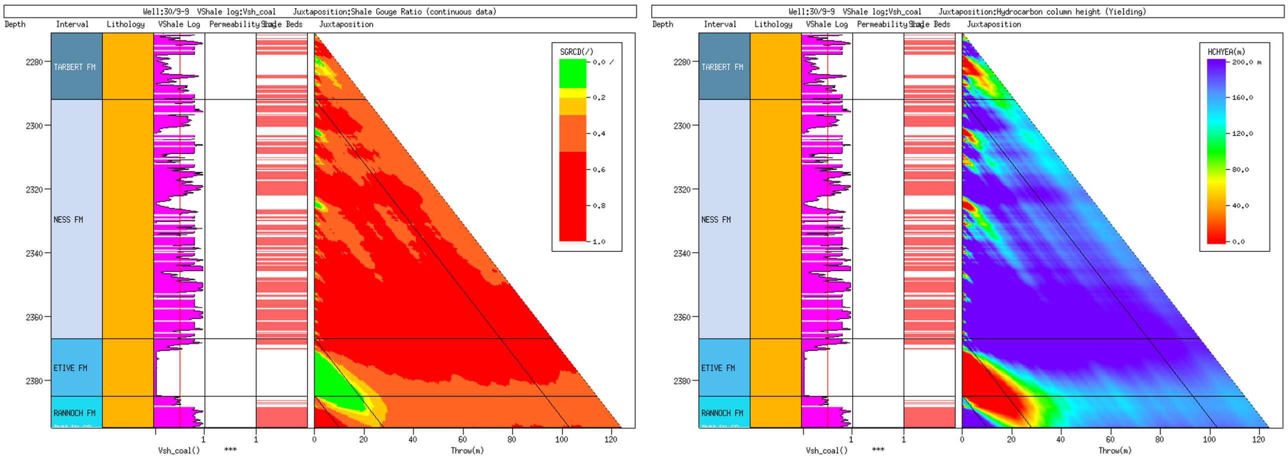



Fig. 3.3 Fault seal triangles showing shale gouge ratio (left) and hydrocarbon column height (right) for the 30/9-9 well *Coals were included as a 0.8 vsh and the column height was caclulated using a fluid density of 730 kg/m3*

Table 3.1 Oil and gas column height estimates for the Koseberg prospect

**Footwall trap**

**Juxtaposition trap**

## Fault seal estimates

***Oil (730 kg/m3)***

| Formation | Throw | SGR | CH (Yielding, 2010) | Contact | CH (Childs, 2009) | Contact | Critical point/apex | Comment |
|---|---|---|---|---|---|---|---|---|
| Tarbert | 15 m | 35 | 80 | 2789 | 140 | 2849 | 2709 | Critical point defined by truncation, not fault seal |
| Ness | ca. 35 m | 55 | 190 | 2540 | 200 | 2550 | 2350 | Critical point and apex same point |
| Etive | ca. 35 m | 63 | 238 | 2658 | 300+ | 2720 | 2420 | Critical point and apex same point |

***Gas (250 kg/m3)***

| Formation | Throw | SGR | CH (Yielding, 2010) | Contact | CH (Childs, 2009) | Contact | Critical point/apex | |
|---|---|---|---|---|---|---|---|---|
| Tarbert | 15 m | 35 | 35 | 2744 | 300+ | 3009 | 2709 | Critical point defined by truncation, not fault seal |
| Ness | ca. 35 m | 55 | 81 | 2431 | 300+ | 2650 | 2350 | Critical point and apex same point |
| Etive | ca. 35 m | 63 | 100 | 2520 | 300+ | 2720 | 2420 | Critical point and apex same point |

Whilst the empirical and deterministic results show similar results in the case where the respective aquifer pressures across faults are similar, the sealing capacity of the faults on Koseberg remains uncertain. This is primarily due to the difficulty in defining the geometries, including throw and linkage at the crest of the structure, and the pressure conditions with Koseberg situated on the high-pressure side of the faults. If the faults are less connected and accommodate lower throws, the expected column heights would be smaller and contacts correspondingly shallower.

**Change in the understanding compared to the original application for award**

The improved seismic data made it possible to interpret surfaces and faults more accurately. In addition, instead of evaluation the whole Brent Gp as one reservoir, the prospect was split into the three reservoir zones: Tarbert, Ness and Etive. The detailed fault seal study resulted in a lower maximum column height for Ness and Etive than had been assumed for the Brent Gp in the application. In combination, this led to reduced volumes and increased risk for the Koseberg prospect.

# 4 Prospect update

In PL1176 there was only one prospect identified in the APA 2022 namely Koseberg. No further prospects or leads were identified in the licence.

**Koseberg prospect**

Originally the Koseberg prospect was defined as the whole Brent Gp updip of well 30/9-18 towards the Oseberg Sør, J structure. For more information about the 30/9-18 well, see [4]. The trap was a structural trap dependent on fault sealing towards the north and northeast. Trap seal was considered the main risk of the prospect. During the development of the prospect, finer division of the Brent Gp into Tarbert, Ness and Etive lead to the possibility of a pinch out trap of the Tarbert Fm. This model for Tarbert Fm were not dependent on fault sealing towards north. The Ness and Etive Fms reservoirs were still dependent on fault sealing. See Fig. 4.1 and Fig. 4.2.

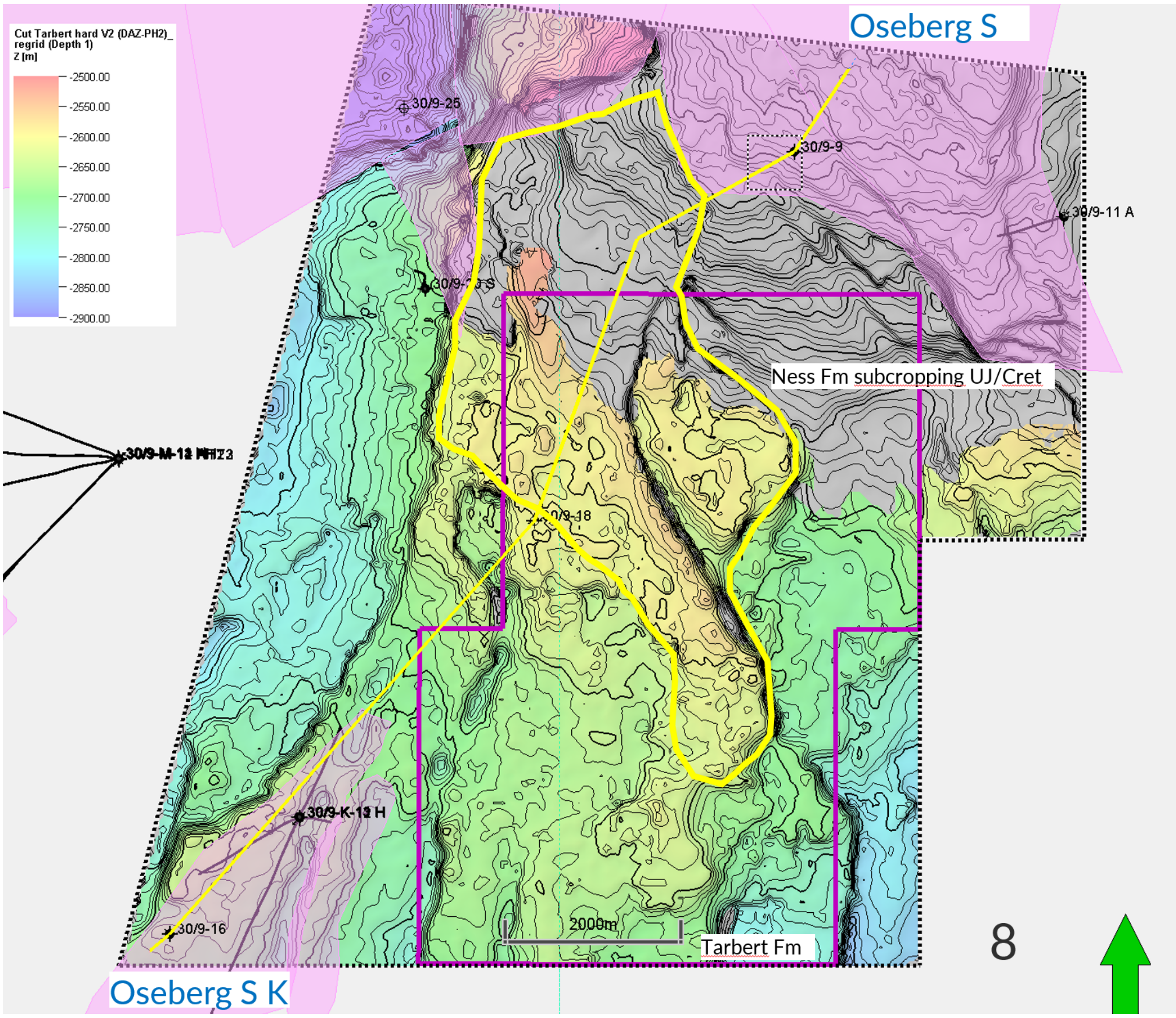



Fig. 4.1 Top reservoir map *Areal extend of "Top Tarbert" in color, eroded Tarbert in grey. Yellow outline indicates approximately the Koseberg prospect location.*

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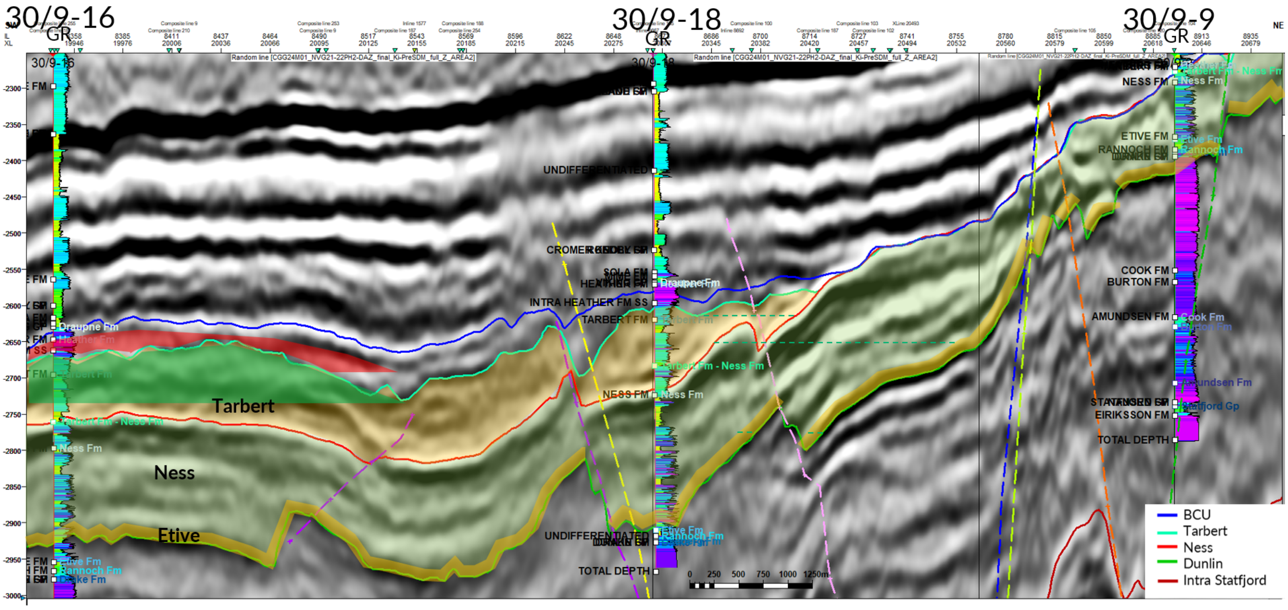


Note, the well depths does not match the seismic well exactly

Fig. 4.2 Seismic section in depth *Seismic section, CGG24M01_NVG21_22PH2_DAZ, in depth over the Koseberg prospect.*

**Changes in resource volumes and probability estimates**

The most significant update in the resource estimates in Koseberg came with the splitting into three reservoir zones and updates in the column heights for the individual zones. Another change was the model of a pinch out trap for the Tarbert Fm. The reduction of the column heights came from the fault sealing study and affected the Ness and Etive volumes in particular.

The Trap Seal was viewed as the highest risk for the Koseberg Tabert pinch out model since the interpretation of the pinch out is uncertain and there is a risk of having a thin Tarbert sandstone all the way up to the J-structure on Oseberg Sør.

**Revised prospect data**

The HC phase calculated for the Koseberg prospect was oil with associated gas, but a gas cap may be present. The resource calculations for the Tarbert. Ness and Etive segments update are listed in the tables below, see Fig. 4.3, Fig. 4.4 and Fig. 4.5.

The risking for Koseberg is summarized in the table below:

Table 4.1 Risking Koseberg Tarbert Fm

| Risk element Koseberg Tarbert Fm | Evaluation PL1176 | Comment |
|---|---|---|
| Reservoir (presence and quality) | 1.0 | Reservoir presence and quality proven in nearby wells, like 30/9-18, -9 and -16 |
| Seal (presence and trap geometry) | 0.12 | Thief sand may be present. Negative observation: 30/9-18 well is not filled (shallower than critical point defined). Uncertainties in trap definition/interpretation. |
| Source (presence, migration and timing) | 0.8 | Source proven in area, HC in Tarbert Fm in nearby wells |

Table 4.2 Risking Koseberg Ness Fm

| Risk element Koseberg Ness Fm | Evaluation PL1176 | Comment |
|---|---|---|
| Reservoir (presence and quality) | 1.0 | Reservoir presence and quality proven in nearby wells, like 30/9-18, -9 and -16 |
| Seal (presence and trap geometry | 0.5 | Trap geometry likely. Fault seal analysis shows max case 300m column |
| Source (presence, migration and timing) | 0.2 | Ness is dry in nearby wells. |

Table 4.3 Risking Koseberg Etive Fm

| Risk element Koseberg Etive Fm | Evaluation PL1176 | Comment |
|---|---|---|
| Reservoir (presence and quality) | 1.0 | Reservoir presence and quality proven in nearby wells, like 30/9-18, -9 and -16 |
| Seal (presence and trap geometry | 0.5 | Trap geometry likely. Fault seal analysis shows max case 350m column |
| Source (presence, migration and timing) | 0.5 | Etive is dry in -16 & -18 wells, but discovery in -9 well |

Table 4.4 Risking Koseberg Brent Gp (APA 2022)

| Risk element Kosberg APA 2022 (Brent Gp) | Evaluation | Comment |
|---|---|---|
| Reservoir | 1.0 | |
| Trap | 0.45 | |
| Charge | 0.75 | |
| Retention | 0.9 | |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Block | 30/9 | Prospect name | Kosberg Tarbert | Discovery/Prosp/Lead | Prospect | Prosp ID (or New!) | NOD will insert value | NPD approved (Y/N) | |
| Play name | NOD will insert value | New Play (Y/N) | | Outside play (Y/N) | | | | | |
| Oil, Gas or O&G case: | Oil | Reported by company | Aker BP | Reference document | | | | Assessment year | 2025 |
| This is case no.: | 1 of 1 | Structural element | Bjørgvin Arch | Type of trap | Pinch out trap | Water depth [m MSL] (>0) | 106 | Seismic database (2D/3D) | 3D |
| **Resources IN PLACE and RECOVERABLE** | | **Main phase** | | | | **Associated phase** | | | |
| **Volumes, this case** | | Low (P90) | Base, Mode | Base, Mean | High (P10) | Low (P90) | Base, Mode | Base, Mean | High (P10) |
| In place resources | Oil [$10^6$ $Sm^3$] (>0.00) | 0,85 | 1,53 | 3,02 | 5,84 | | | | |
| | Gas [$10^9$ $Sm^3$] (>0.00) | | | | | 0,15 | 0,30 | 0,54 | 1,04 |
| Recoverable resources | Oil [$10^6$ $Sm^3$] (>0.00) | 0,29 | 0,56 | 1,06 | 2,05 | | | | |
| | Gas [$10^9$ $Sm^3$] (>0.00) | | | | | 0,07 | 0,11 | 0,25 | 0,47 |
| Reservoir Chrono (from) | Bajocian | Reservoir litho (from) | Tarbert fm | Source Rock, chrono primary | Kimmeridgian | Source Rock, litho primary | Draupne fm | Seal, Chrono | Kimmeridgian |
| Reservoir Chrono (to) | Bathonian | Reservoir litho (to) | Tarbert fm | Source Rock, chrono secondary | Kimmeridgian | Source Rock, litho secondary | Heather fm | Seal, Litho | Heather fm |
| **Probability [fraction]** | | | | | | | | | |
| Total (oil + gas + oil & gas case ) (0.00-1.00) | 0,10 | Oil case (0.00-1.00) | 0,10 | Gas case (0.00-1.00) | 0,00 | Oil & Gas case (0.00-1.00) | 0,00 | | |
| Reservoir (P1) (0.00-1.00) | 1,00 | Trap (P2) (0.00-1.00) | 0,12 | Charge (P3) (0.00-1.00) | 0,80 | Retention (P4) (0.00-1.00) | 1,00 | | |
| **Parametres:** | Low (P90) | Base | High (P10) | *Comments:* | | | | | |
| Depth to top of prospect [m MSL] (> 0) | 2330 | 2330 | 2330 | *Mean values have here been used as the base case for the input parameters.* | | | | | |
| Area of closure [$km^2$] (> 0.0) | 1,2 | 2,8 | 4,5 | | | | | | |
| Reservoir thickness [m] (> 0) | 240,0 | 275,0 | 310,0 | *In the petrophysical evaluation of the reservoir parameters for the reference wells, the Thomas Stieber (1975) method was utilised for most of the wells. This method utilises cut-offs for net res fraction and porosity. (Net res fraction is the fraction of the desired facies that is of reservoir quality; net reservoir rock/ net sand).* | | | | | |
| HC column in prospect [m] (> 0) | 225 | 241 | 258 | | | | | | |
| Gross rock vol. [$10^9$ $m^3$] (> 0.000) | 0,014 | 0,048 | 0,091 | | | | | | |
| Net / Gross [fraction] (0.00-1.00) | 0,61 | 0,66 | 0,73 | *Gross rock volume is the HC-bearing gross volum, that is the GRV calculated down to the HCW contact* | | | | | |
| Porosity [fraction] (0.00-1.00) | 0,18 | 0,19 | 0,21 | | | | | | |
| Permeability [mD] (> 0.0) | | | | | | | | | |
| Water Saturation [fraction] (0.00-1.00) | 0,20 | 0,22 | 0,24 | | | | | | |
| Bg [Rm3/Sm3] (< 1.0000) | 0,0000 | 0,0000 | 0,0000 | | | | | | |
| 1/Bo [Sm3/Rm3] (< 1.00) | 0,61 | 0,64 | 0,67 | | | | | | |
| GOR, free gas [$Sm^3/Sm^3$] (> 0) | | | | | | | | | |
| GOR, oil [$Sm^3/Sm^3$] (> 0) | 159 | 180 | 201 | | | | | | |
| Recov. factor, oil main phase [fraction] (0.00-1.00) | 0,32 | 0,35 | 0,38 | *Retention (P4) after accumulation, is part of the trap risk.* | | | | | |
| Recov. factor, gas ass. phase [fraction] (0.00-1.00) | 0,40 | 0,45 | 0,50 | | | | | | |
| Recov. factor, gas main phase [fraction] (0.00-1.00) | | | | | | | | | |
| Recov. factor, liquid ass. phase [fraction] (0.00-1.00) | | | | For NPD use: | | | | | |
| Temperature, top res [°C] (>0) | | | | Innrapp. av geolog-init: | NOD will insert value | Registrert - init: | NPD will insert value | Kart oppdatert | NPD will insert value |
| Pressure, top res [bar] (>0) | | | | Dato: | NOD will insert value | Registrert Dato: | NPD will insert value | Kart dato | NPD will insert value |
| Cut off criteria for N/G calculation | 1. | 2. | 3. | | | | | Kart nr | NPD will insert value |

Fig. 4.3 Resource table Koseberg Tarbert

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Block | 30/9 | Prospect name | Koseberg Ness | Discovery/Prosp/Lead | Prospect | Prosp ID (or New!) | NOD will insert value | NPD approved (Y/N) | |
| Play name | NOD will insert value | New Play (Y/N) | | Outside play (Y/N) | | | | | |
| Oil, Gas or O&G case: | Oil | Reported by company | Aker BP | Reference document | | | | Assessment year | 2025 |
| This is case no.: | 1 of 1 | Structural element | Bjørgvin Arch | Type of trap | 1.1 Fault dependen | Water depth [m MSL] (>0) | 106 | Seismic database (2D/3D) | 3D |
| **Resources IN PLACE and RECOVERABLE** | | **Main phase** | | | | **Associated phase** | | | |
| **Volumes, this case** | | Low (P90) | Base, Mode | Base, Mean | High (P10) | Low (P90) | Base, Mode | Base, Mean | High (P10) |
| In place resources | Oil [$10^6$ $Sm^3$] (>0.00) | 2,17 | 3,64 | 6,79 | 12,85 | | | | |
| | Gas [$10^9$ $Sm^3$] (>0.00) | | | | | 0,39 | 0,67 | 1,22 | 2,31 |
| Recoverable resources | Oil [$10^6$ $Sm^3$] (>0.00) | 0,75 | 1,08 | 2,38 | 4,52 | | | | |
| | Gas [$10^9$ $Sm^3$] (>0.00) | | | | | 0,17 | 0,27 | 0,55 | 1,05 |
| Reservoir Chrono (from) | Bajocian | Reservoir litho (from) | Ness Fm | Source Rock, chrono primary | Kimmeridgian | Source Rock, litho primary | Draupne Fm | Seal, Chrono | Kimmeridgian |
| Reservoir Chrono (to) | Bajocian | Reservoir litho (to) | Ness Fm | Source Rock, chrono secondary | Kimmeridgian | Source Rock, litho secondary | Heather Fm | Seal, Litho | Heather Fm |
| **Probability [fraction]** | | | | | | | | | |
| Total (oil + gas + oil & gas case ) (0.00-1.00) | 0,10 | Oil case (0.00-1.00) | 0,10 | Gas case (0.00-1.00) | 0,00 | Oil & Gas case (0.00-1.00) | 0,00 | | |
| Reservoir (P1) (0.00-1.00) | 1,00 | Trap (P2) (0.00-1.00) | 0,50 | Charge (P3) (0.00-1.00) | 0,20 | Retention (P4) (0.00-1.00) | 1,00 | | |
| **Parametres:** | Low (P90) | Base | High (P10) | *Comments:* | | | | | |
| Depth to top of prospect [m MSL] (> 0) | 2330 | 2330 | 2330 | | | | | | |
| Area of closure [$km^2$] (> 0.0) | 1,7 | 4,1 | 6,7 | *Mean values have here been used as the base case for the input parameters.* | | | | | |
| Reservoir thickness [m] (> 0) | 240,0 | 275,0 | 310,0 | *In the petrophysical evaluation of the reservoir parameters for the reference wells, the Thomas Stieber (1975) method was utilised for most of the wells. This method utilises cut-offs for net res fraction and porosity. (Net res fraction is the fraction of the desired facies that is of reservoir quality; net reservoir rock/ net sand).* | | | | | |
| HC column in prospect [m] (> 0) | 152 | 210 | 267 | | | | | | |
| Gross rock vol. [$10^9$ $m^3$] (> 0.000) | 0,074 | 0,226 | 0,423 | | | | | | |
| Net / Gross [fraction] (0.00-1.00) | 0,33 | 0,35 | 0,37 | *Gross rock volume is the HC-bearing gross volum, that is the GRV calculated down to the HCW contact* | | | | | |
| Porosity [fraction] (0.00-1.00) | 0,19 | 0,20 | 0,22 | | | | | | |
| Permeability [mD] (> 0.0) | | | | | | | | | |
| Water Saturation [fraction] (0.00-1.00) | 0,30 | 0,35 | 0,40 | | | | | | |
| Bg [Rm3/Sm3] (< 1.0000) | 0,0000 | 0,0000 | 0,0000 | | | | | | |
| 1/Bo [Sm3/Rm3] (< 1.00) | 0,61 | 0,64 | 0,67 | | | | | | |
| GOR, free gas [$Sm^3/Sm^3$] (> 0) | | | | | | | | | |
| GOR, oil [$Sm^3/Sm^3$] (> 0) | 159 | 180 | 201 | | | | | | |
| Recov. factor, oil main phase [fraction] (0.00-1.00) | 0,32 | 0,35 | 0,38 | *Retention (P4) after accumulation, is part of the trap risk.* | | | | | |
| Recov. factor, gas ass. phase [fraction] (0.00-1.00) | 0,40 | 0,45 | 0,50 | | | | | | |
| Recov. factor, gas main phase [fraction] (0.00-1.00) | | | | | | | | | |
| Recov. factor, liquid ass. phase [fraction] (0.00-1.00) | | | | For NPD use: | | | | | |
| Temperature, top res [°C] (>0) | | | | Innrapp. av geolog-init: | NOD will insert value | Registrert - init: | NPD will insert value | Kart oppdatert | NPD will insert value |
| Pressure, top res [bar] (>0) | | | | Dato: | NOD will insert value | Registrert Dato: | NPD will insert value | Kart dato | NPD will insert value |
| Cut off criteria for N/G calculation | 1. | 2. | 3. | | | | | Kart nr | NPD will insert value |

Fig. 4.4 Resource table Koseberg Ness

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Block | 30/9 | Prospect name | Koseberg Etive | Discovery/Prosp/Lead | Prospect | Prosp ID (or New!) | NOD will insert value | NPD approved (Y/N) | |
| Play name | NOD will insert value | New Play (Y/N) | | Outside play (Y/N) | | | | | |
| Oil, Gas or O&G case: | Oil | Reported by company | Aker BP | Reference document | | | | Assessment year | 2025 |
| This is case no.: | 1 of 1 | Structural element | Bjørgvin Arch | Type of trap | 1.1 Fault dependen | Water depth [m MSL] (>0) | 106 | Seismic database (2D/3D) | 3D |
| **Resources IN PLACE and RECOVERABLE** | | **Main phase** | | | | **Associated phase** | | | |
| **Volumes, this case** | | Low (P90) | Base, Mode | Base, Mean | High (P10) | Low (P90) | Base, Mode | Base, Mean | High (P10) |
| In place resources | Oil [$10^6$ $Sm^3$] (>0.00) | 1,21 | 1,23 | 5,42 | 10,08 | | | | |
| | Gas [$10^9$ $Sm^3$] (>0.00) | | | | | 0,22 | 0,22 | 0,97 | 1,80 |
| Recoverable resources | Oil [$10^6$ $Sm^3$] (>0.00) | 0,42 | 0,40 | 1,90 | 3,55 | | | | |
| | Gas [$10^9$ $Sm^3$] (>0.00) | | | | | 0,10 | 0,09 | 0,44 | 0,82 |
| Reservoir Chrono (from) | Bajocian | Reservoir litho (from) | Etive Fm | Source Rock, chrono primary | Kimmeridgian | Source Rock, litho primary | Draupne Fm | Seal, Chrono | Kimmeridgian |
| Reservoir Chrono (to) | Bajocian | Reservoir litho (to) | Etive Fm | Source Rock, chrono secondary | KImmeridgian | Source Rock, litho secondary | Draupne Fm | Seal, Litho | Heather Fm |
| **Probability [fraction]** | | | | | | | | | |
| Total (oil + gas + oil & gas case ) (0.00-1.00) | 0,25 | Oil case (0.00-1.00) | 0,25 | Gas case (0.00-1.00) | 0,00 | Oil & Gas case (0.00-1.00) | 0,00 | | |
| Reservoir (P1) (0.00-1.00) | 1,00 | Trap (P2) (0.00-1.00) | 0,50 | Charge (P3) (0.00-1.00) | 0,50 | Retention (P4) (0.00-1.00) | 1,00 | | |
| **Parametres:** | Low (P90) | Base | High (P10) | *Comments:* | | | | | |
| Depth to top of prospect [m MSL] (> 0) | 2420 | 2420 | 2420 | | | | | | |
| Area of closure [$km^2$] (> 0.0) | 1,2 | 3,8 | 6,6 | *Mean values have here been used as the base case for the input parameters.* | | | | | |
| Reservoir thickness [m] (> 0) | 8,0 | 11,2 | 14,0 | *In the petrophysical evaluation of the reservoir parameters for the reference wells, the Thomas Stieber (1975) method was utilised for most of the wells. This method utilises* | | | | | |
| HC column in prospect [m] (> 0) | 157 | 229 | 298 | *cut-offs for net res fraction and porosity. (Net res fraction is the fraction of the desired facies that is of reservoir quality; net reservoir rock/ net sand).* | | | | | |
| Gross rock vol. [$10^9$ $m^3$] (> 0.000) | 0,012 | 0,055 | 0,099 | | | | | | |
| Net / Gross [fraction] (0.00-1.00) | 0,92 | 0,95 | 0,98 | *Gross rock volume is the HC-bearing gross volum, that is the GRV calculated down to the HCW contact* | | | | | |
| Porosity [fraction] (0.00-1.00) | 0,22 | 0,25 | 0,28 | | | | | | |
| Permeability [mD] (> 0.0) | | | | | | | | | |
| Water Saturation [fraction] (0.00-1.00) | 0,30 | 0,35 | 0,40 | | | | | | |
| Bg [Rm3/Sm3] (< 1.0000) | 0,0000 | 0,0000 | 0,0000 | | | | | | |
| 1/Bo [Sm3/Rm3] (< 1.00) | 0,61 | 0,64 | 0,67 | | | | | | |
| GOR, free gas [$Sm^3/Sm^3$] (> 0) | | | | | | | | | |
| GOR, oil [$Sm^3/Sm^3$] (> 0) | 159 | 180 | 201 | | | | | | |
| Recov. factor, oil main phase [fraction] (0.00-1.00) | 0,32 | 0,35 | 0,38 | *Retention (P4) after accumulation, is part of the trap risk.* | | | | | |
| Recov. factor, gas ass. phase [fraction] (0.00-1.00) | 0,40 | 0,45 | 0,50 | „ | | | | | |
| Recov. factor, gas main phase [fraction] (0.00-1.00) | | | | | | | | | |
| Recov. factor, liquid ass. phase [fraction] (0.00-1.00) | | | | For NPD use: | | | | | |
| Temperature, top res [°C] (>0) | | | | Innrapp. av geolog-init: | NOD will insert value | Registrert - init: | NPD will insert value | Kart oppdatert | NPD will insert value |
| Pressure, top res [bar] (>0) | | | | Dato: | NOD will insert value | Registrert Dato: | NPD will insert value | Kart dato | NPD will insert value |
| Cut off criteria for N/G calculation | 1. | 2. | 3. | | | | | Kart nr | NPD will insert value |

Fig. 4.5 Resource table Koseberg Etive

# 5 Technical evaluation

No updated technical economical evaluation was performed for the Koseberg prospect since the risk was regarded to be too high and the volume potential too low.

# 6 Conclusion

The main prospect from the APA2022 application Koseberg, has been evaluated in the licensing period. The evaluation has lead to improved understanding of trap, charge and reservoir. The main topics in the evaluation have been:

- Seismic interpretation of faults and horizons on new dual azimuth seismic
- Petrophysical interpretation
- Fault sealing analysis
- Evaluation of 4D data
- Pressure studies

Koseberg is considered to have too high risk with too low volume potential to be drillable from the PL1176 licence. Subsequently, a drop decision was taken in license group and the licence is lapsed.

# References

1 APA 2022 Production licence application (PL 1176), block 30/9, North Sea - Koseberg prospect, Concedo (2022)

2 Yielding, G., Bretan, P. and Freeman, B., 2010. Fault seal calibration: a brief review. *Reservoir Compartmentalization*, (347), p.243.

3 Childs, C., Sylta, Ø., Moriya, S., Morewood, N., Manzocchi, T., Walsh, J.J. and Hermanssen, D., 2009. Calibrating fault seal using a hydrocarbon migration model of the Oseberg Syd area, Viking Graben. *Marine and Petroleum Geology*, *26*(6), pp.764-774.

4 Final Well report, section A (Geology), well 30/9-18, Norsk Hydro (1995)