PL 996

License Status Report

Contents

1. PL996 History

1.1 PL996 Summary

PL996 is located in the Møre Basin, to the west of the Ormen Lange Field. The license area covers block 6304/6 and parts of blocks 6304/9, 6305/1, 6305/4 and 6305/7 (Ref. Fig.1). The license was awarded to A/S Norske Shell (Operator 50%) and Equinor (50%) on15.03.2019 (APA 2018). The first license milestone is a Drill or Drop decision to be taken February 2021.

The license was evaluated on new reprocessed 3D data and incorporating results from a new well, 6304/3-1 (Coeus). This well was drilled in 2018 on a prospect in the neighbouring PL832 license in the Danian play, which is also the main play for opportunities in PL996. Key risks were related to extent of submarine fan systems seen in the Ormen Lange field and reservoir quality in a more distal location in the basin, as well as quality and size of traps. Several of the prospects and leads were relying on traps with stratigraphic sealing mechanism.

Of the three prospects described in the APA application, Svolder, Carmen and Figaro, only Carmen remains, but with a reduced volume, below economic threshold. The identified leads were also evaluated but the data do not provide support for HC filled traps. Low Pg or low volumes are the basis for the partner decision to not continue PL996 after the Drill or Drop milestone in February 2021.

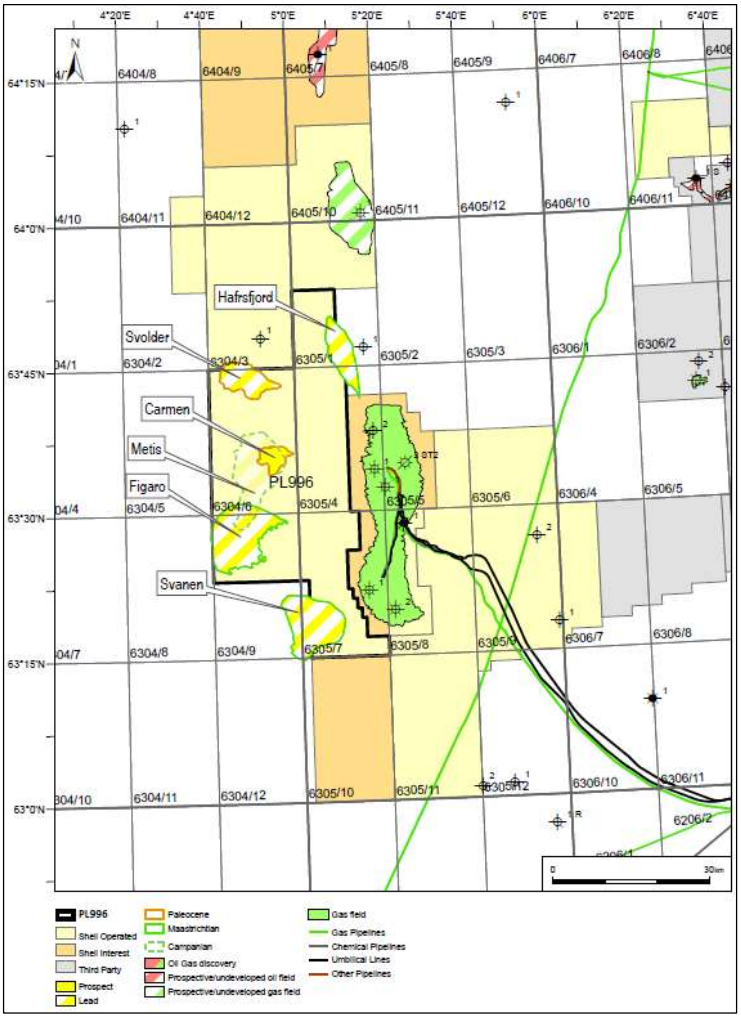


Fig. 1 – License Location Map with prospects and leads. PL996 is located west of the Ormen Lange gas field.

1.2 Status of Work Commitment

The firm work programme in the first 2-year phase consisted of 3D seismic reprocessing. The partnership carried out a reprocessing and pre-stack merge of the available seismic surveys in the greater Ormen Lange area. The Operator has also completed technical studies incorporated into the evaluation, in order to understand the main uncertainties and risks.

1.3 Licence Meetings

The following PL996 meetings have been held:

- 2019, May 3rd, EC/MC Committee meeting #1
- 2019, November 6th, EC/MC Committee meeting #2
- 2020, March 20th, Work meeting #1
- 2020, November 17th, EC/MC Committee meeting #3

1.4 Explanation of grounds for lapse

A technical summary of the evaluations is given in Table 3. No drillable prospects have been identified, and the partnership has agreed to relinquish the licence.

- Table 1. Outcome of Technical Evaluation

Name	Play	Status in APA application	Current status	Outcome of Technical Evaluation
Carmen	Egga	Prospect	Lead	Carmen has varying soft seismic anomaly across the original prospect outline. The most confident part of the Carmen anomaly is confined by faults and dip which constitutes a structural compartment and trap. There was also a conceptual model considered, involving thinner reservoir outside this compartment and thus possible an extension of Carmen. However, absolute inversion using the reprocessed data only supports the smaller fault bounded compartment, which is used as P50 in the volume assessment. The work has resulted in increased POS for Carmen as the trap is now more robust. The volume is however reduced and is not considered sufficient for an economic tie-in to Ormen Lange.
Svolder	Egga	Prospect	Not pursued	Svolder is located only 7 km south of the Coes prospect which was drilled in 2018. Svolder shares similar seismic response as Coeus which was dry and penetrated only very thin streaks of sandstone. Svolder was therefore not further pursued as a lead.
Figaro	Egga / Springar	Prospect	Not pursued	Figaro is a poorly defined, conceptual distal fan lobe south of Carmen. The trap is considered to require a stratigraphic seal mechanism towards Carmen in the north. It has only weak amplitude indication that was not improved with the reprocessed data. Figaro was therefore not pursued further as a lead.
Svanen	Springar	Lead	Not pursued	Svanen has a poor trap definition and new seismic has not been able to resolve this. Absolute inversion showed no HC response. Seismic modelling shows higher correlation to brine than a gas. Svanen was therefore not pursued further as a lead.
Hafrsfjord	Egga	Lead	Not pursued	This was a conceptual lead on the flank of the Ormen Lange structure. The trap relies on stratigraphic trapping mechanism. There is no indications in available data to polarize the low POS. Absolute inversion show no HC indication in Egga or Springar. No HC indication is seen on the Turonian and Cennnomanian, and sand presence at these levels are unlikely or highly uncertain. The 6305/1-1 well located just up-dip of Hafrsfjord did not encounter any Turonian sandstone (Cennomanian was not penetrated). Hafrsfjord was no longer pursued as a lead.
Metis	Nise	Lead	Lead	Absolute inversion indicated an amplitude response associated with HC content. However, the Nise play is considered reservoir lean in the Ormen Lange area, with only thin, laminated straks of sandstone encountered in the nearby wells (Ellida and Midnattsol). Metis would only be considered as secondary target together with Carmen.

2. Database Overview

2.1 Common Database Details

Wells used in the technical evaluation and resource assessment for the licence area are shown in Table 4.

- Table 2. Well Database
  Offset wells used in the evaluation

Well name	Common Name	NPDID	Drilled year (TD)	Result
6304/3-1	Coeus	8497	2018	Dry
6305/1-1	Ormen Lange North	3555	1998	Dry
6305/5-1	Ormen Lange	3144	1997	Gas
6405/10-1	Midnattsol	5565	2007	Gas
6405/7-1	Elida	4749	2003	oil

Well name	Common Name	NPDID	Drilled year (TD)	Result
6404/11-1	Havsule	4465	2002	Dry
6305/9-2	Dovregubben	6502	2011	Dry
6305/9-1	Blåveis	4297	2001	Dry
6305/12-1	C-prospect	1808	1991	Shows
6306/10-1	Skalmen	1551	1990	Oil /Gas shows

2.2 Seismic Database

2D and 3D seismic data were used in the evaluation of the prospects and leads. The main dataset used was the reprocessed dataset, SH19M01. A summary of the seismic utilised in the evaluation of PL996 is shown in Table 5 and fig. 2.

- Table 3. Seismic Database
  2D and 3D seismic surveys used in the evaluation of PL996:

Survey name	NPDID	3D / 2D	Aquisition /Repro	Operator / owner
SH19M01 *		3D	2019	A/S Norske Shell
MNR04	4252	2D	2004	TGS/Spectrum
MNR05	4298	2D	2005	TGS/Spectrum
MNR06	4364	2D	2006	TGS/Spectrum
MNR07	4450	2D	2007	TGS/Spectrum
MNR08	4571	2D	2008	TGS/Spectrum
MNR09	7001	2D	2009	TGS/Spectrum
MNR10	7224	2D	2010	TGS/Spectrum
MNR11	7389	2D	2011	TGS/Spectrum
MC2D-OLE2003	4207	2D	2003	TGS/Spectrum
ST98	3951	2D	1998	Statoil
SG9308	3616	2D	1993	Statoil (old Saga Petroleum)
ST8705	3049	2D	1987	Statoil
GFB-84	2607	2D	1984	WesternGeco
GMT-84	2609	2D	1984	WesternGeco

* SH19M01: reprocessed seismic (See below and fig. 3).

SH19M01 underlying merged data

Survey name	NPDID	3D / 2D	Aquisition /Repro	Operator / owner
SH14001	8042	3D	2014	Shell
NH9602	3784	3D	1996	Norsk Hydro
OLSE98	3915	3D	1998	PGS
AX0801	4507	3D	2008	Aker Exploration
Moere3D	4109	3D	2001	CGG
BPN9602	3756	3D	1996	BP
SH16001	8347	3D	2016	Shell
SH0501	4310	3D	2005	Shell
TUN14001**	8095	3D	2014	Tullow

** TUN14001: post-migration processing applied and merged with SH19M01.

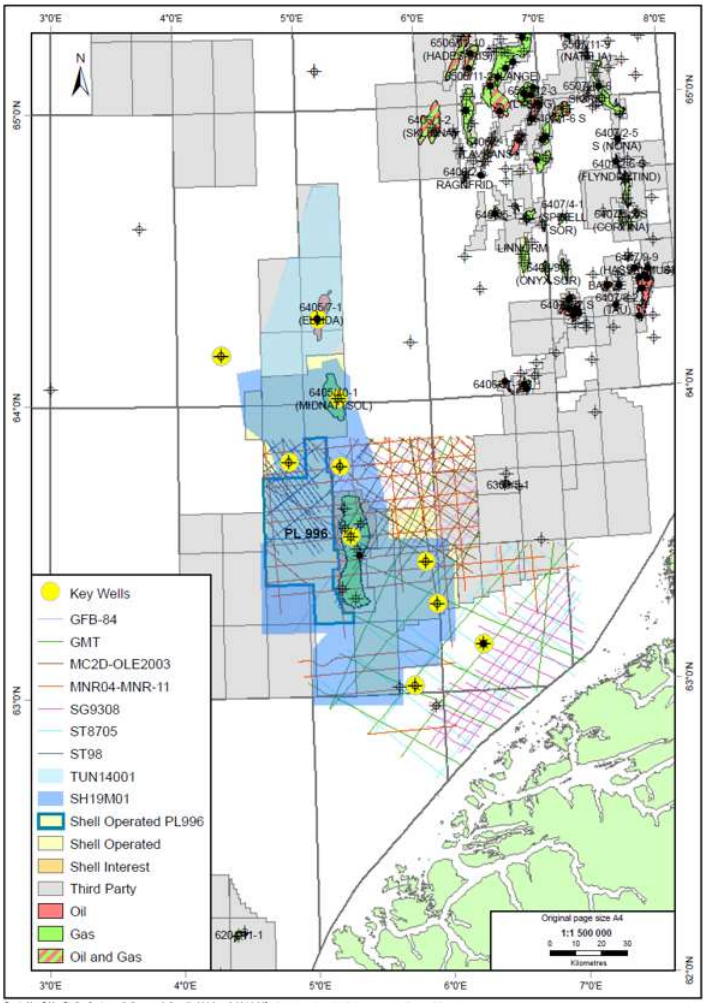


Fig. 2 - Seismic database for PL996.

3. Results of Geological and Geophysical Studies

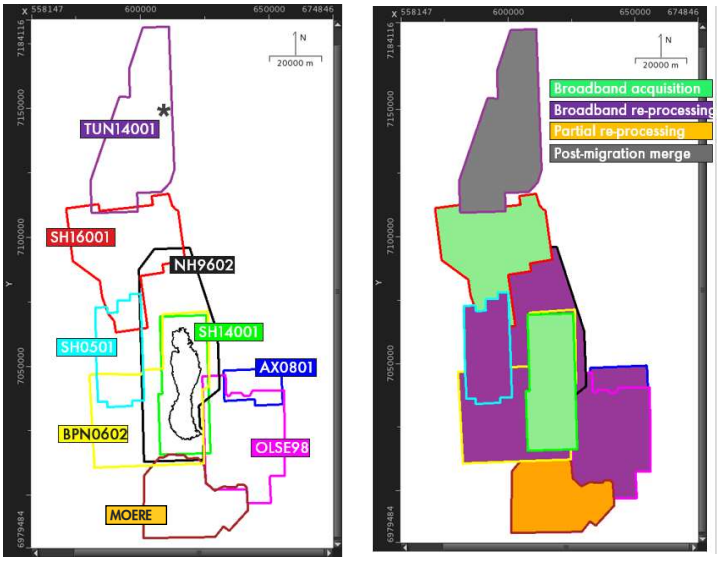
3.1 General geological and geophysical studies

The following G&G studies were carried out in the license evaluation:

- Seismic merge and reprocessing
- Seismic interpretation and spectral decomposition
- Rock physics and AVO inversion screening

3.1.1 Seismic merge and reprocessing

Nine 3D seismic surveys were merged and reprocessed into a semi-regional dataset (SH19M01). Figure 3 shows the survey locations and a few details of the surveys. The aim of the reprocessing was to get a large contiguous dataset with broadband quality to enable calibration with wells across the region, visualisation of large depositional features and improve imaging on all levels, including the deeper levels, below Springar.



	Broadband acquisition, re-imaged with new velocities	Broadband re-processed from field tapes	Broadband re-processed from field tapes	Broadband re-processed from field tapes	Regularized and residual de-hosting	Broadband re-processed from field tapes	Broadband re-processed from field tapes	Broadband acquisition, re-imaged with new velocities	Post-migration merge CGG BroadSeis 2014-16 processing
Survey	**SH14001**	**NH9602**	**OLSE98**	**AX0801**	**MOERE**	**SH0501**	**BPN9602**	**SH16001**	**TUN14001**
Year Acquisition	2014	1996	1998	2008	2000-2001	2005	1996	2016	2014
Acquired by	PGS (Geostreamer)	PGS (conv)	PGS (conv)	Aker Exploration AS	CGG	PGS (conv)	PGS (conv)	PG S (Geostreamer)	CGG (BroadSeis)

Fig. 3 - Seismic surveys included in the SH19M01reprocessed dataset.

The broadband processing resulted in an improved dataset:

- increased bandwidth in the data
- improved imaging in the shallow and deep
- calibrated velocities
- improved phase behaviour
- more balanced amplitudes laterally and in time (vertically)

3.1.2 Seismic interpretation and spectral decomposition

Seismic interpretation of key horizons was re-evaluated using the new reprocessed data set. Locally, faults were verified or remapped. This resulted in a new set of time and depth structure maps. Figure 4 shows the regionally interpreted horizons. The new horizons were used to inspect the new seismic and create spectral decomposition on various levels to look for features that can aid the recognition and interpretation of depositional features (Figure 5). In addition, the maps were used in an update of the basin model.

The updated structure maps did not significantly impact the prospects and leads outlines. However, the seismic calibration with wells within this new large dataset altered the view of reservoir and HC fill potential. The results of the visualisation techniques were also still ambiguous but allowed a cleared comparison between opportunities that originally were in different seismic datasets and therefore less robust in terms of comparison. For example, Svolder can be more confidently compared with the dry well Coeus (Fig. 5).

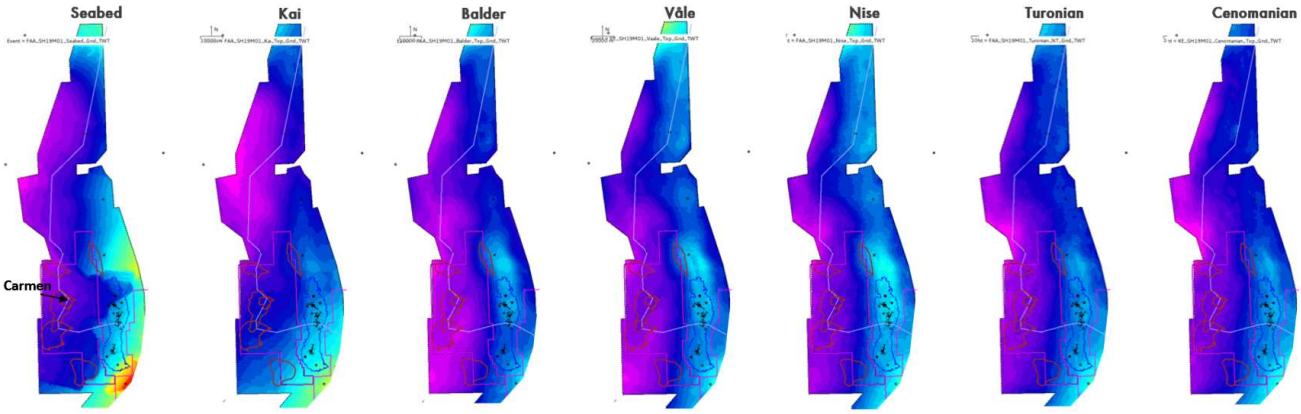


Fig. 4 - New mapped surfaces used as new input for update of basin model and prospect/lead evaluations. (this figure shows time maps)

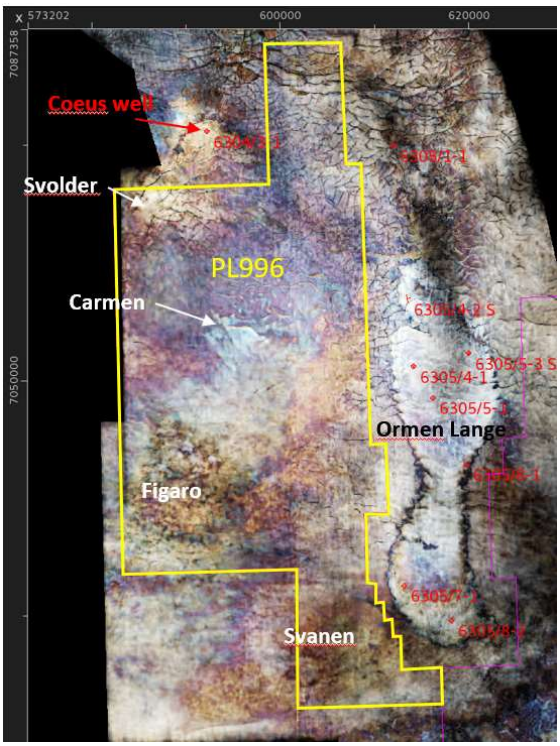


Fig. 5 - Spectral Decomposition. Example of image extracted from the Danian level. Such images were used in attempt to redefine the extent of the submarine fan systems. Whilst a clearer image than before was achieved, the interpretation of the more distal parts of the depositional systems is still uncertain. The Coeus well introduced a new calibration point further outboard, showing very limited sand content.

3.1.2 Rock physics and AVO inversion screening

Existing rock physics study was updated with the new 6304/3-1 well (Coeus). The rock physics database formed input to a seismic inversion which was further used in the evaluation of the individual prospects and leads. Example from the inversion can be seen in Figure 6.

The new large contiguous dataset covered all the PL996 opportunities and wells around the Ormen Lange field. It allowed robust well to seismic calibration and comparison of seismic features across the area. Together with the seismic inversion results and derived products, the new seismic was used in the evaluation of the potential for reservoir and hydrocarbon fill.. Only the main fault compartment in Carmen has positive support from the inversion.

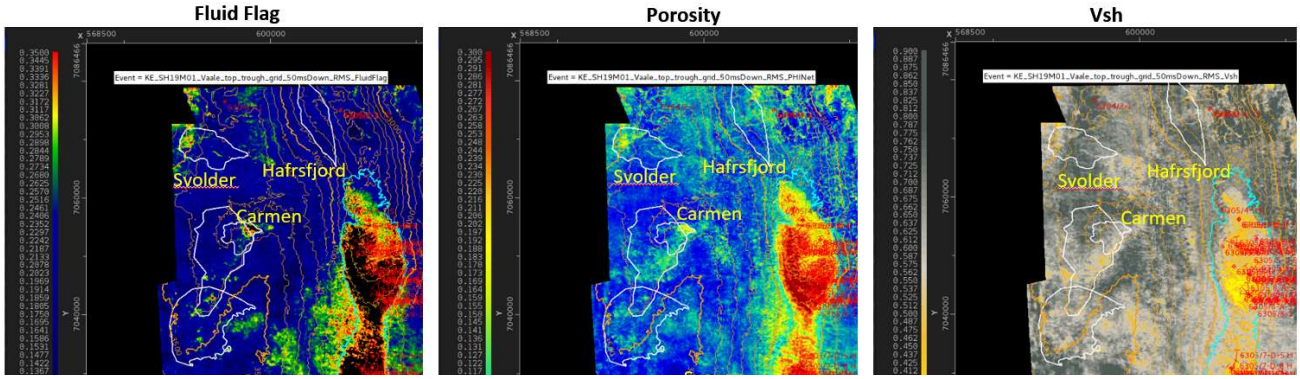


Fig. 6 - Vaale Fm (Egga Mbr.) inversion results. Note the prominent anomaly in the gas filled reservoir of Ormen Lange and lack of similar response elsewhere in the data set, apart from within the fault compartment of Carmen. (See fig. 9 for close-up of Carmen anomaly)

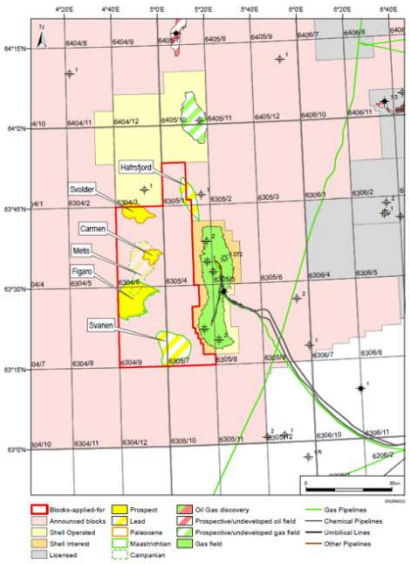
4. Prospect Update Report

4.1 Prospects

4.1.2 Overview

At the time of application, the results from the 6304/3-1 Coeus well, close to the PL996 Svolder prospect, was not available. This well would provide a new calibration point for depositional models in this more distal part of the basin. Furthermore, new broadband seismic was available over the Coeus prospect, and there was an opportunity to merge this dataset with broadband reprocessing of other data. This would introduce the latest technology and warrant a re-evaluation for the opportunities west of the Ormen Lange field.

Fig. 7 shows a map with the location of prospects and leads at the time of the APA application, as well as the resource table.



Discovery/ Prospect/ Lead name [1]	D/ P/ L [2]	Case (Oil/ Gas/ Oil&Gas) [3]	Unrisked recoverable resources [4]						Probability of discovery [5] (0.00 - 1.00)	Resources in acreage applied for [%] [6] (0.0 - 100.0)	Reservoir		Nearest relevant infrastructure [8]	
			Oil [10^6Sm^3] (>0.00)			Gas [10^9Sm^3] (>0.00)					Litho-/ Chrono-stratigraphic level [7]	Reservoir depth [m MSL] (>0)	Name	Km (>0)
			Low (P90)	Base (Mean)	High (P10)	Low (P90)	Base (Mean)	High (P10)						
Svolder	P	Gas	0,10	0,60	1,10	1,80	9,90	18,60	0,08	100,0	Egga Mb/ Paleocene	3250	Ormen Lange	32
Carmen	P	Gas	0,00	0,20	0,40	0,50	3,70	7,20	0,17	100,0	Egga Mb/ Paleocene	3240	Ormen Lange	22
Figaro	P	Gas	0,00	1,10	2,70	0,10	19,20	46,10	0,14	100,0	Springar Fm/ Upper Cretaceous	3310	Ormen Lange	31
Svanen	L	Gas								100,0	Egga Mb/ Paleocene & Springar Fm/Upper Cretaceous	3160	Ormen Lange	16
Hafrsfjord	L	Gas								40,0	Egga Mb/ Paleocene & Springar Fm/ Upper Cretaceous	2760	Ormen Lange	24
Metis	L	Gas								100,0	Nise Fm/ Upper Cretaceous	3510	Ormen Lange	25

Fig. 7 – Form APA application: Map with location of prospects and leads, and resource table (NPD Table 2)

4.1.3 Key Risks and Uncertainties

Key risks for all the prospects and leads in PL996 is presence of reservoir and trap (for the stratigraphic traps). The plays for the opportunities in PL996 are:

- Danian interval - Egga sandstones
- Maastrichtian interval - Springar sandstones

Both these sandstone intervals are submarine fan deposits sourced from the southeast and the same as the gas producing reservoirs in the Ormen Lange field. The westward and distal development of these fan systems have not been proven and could be poorly developed or absent. The 6304/3-1 Coeus well did not encounter significant reservoir and thus a negative calibration point, heavily influencing the evaluation of Svolder.

4.1.4 Carmen prospect:

Carmen was the most robust prospect in the PL996 portfolio. Evaluation of the prospect with the new data indicates smaller volumes than previously. The seismic data and absolute inversion strongly indicate the fluid fill is in an area confined by faults and dip closure (Figure 6 and 8). This fault block is used as the P50 area in the new evaluation. There is less evidence for a larger trap with a stratigraphic trapping component extending outside this fault block which was previously postulated. Hence the volume has been reduced compared to the APA evaluation. The POS has increased from 0.17 to 0.3, partly because of an increase of the Trap/closure risk element (0.8 to 0.9) and partly for using a DHI uplift.

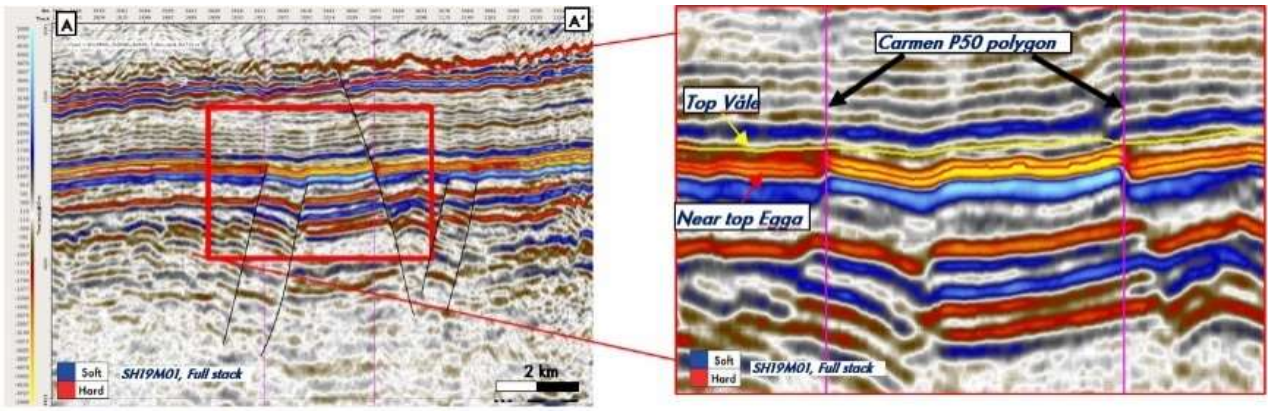


Fig. 8 - Seismic line over Carmen (SH19M01, full stack). Note bounding faults defining the more robust structural trap, corresponding to the seismic anomaly. See Fig. 9 for location of line, a-a'.

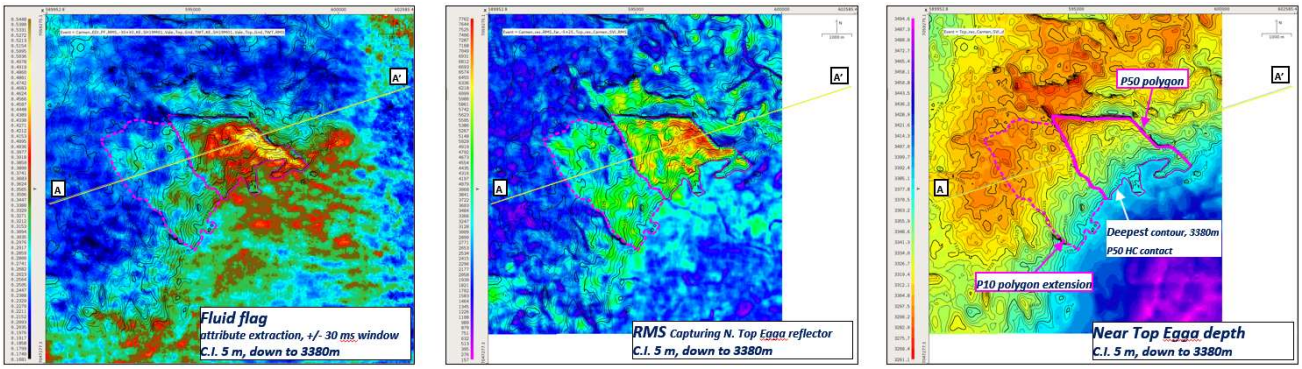


Fig. 9 - Three maps of Carmen. From left to right: Inversion showing fluid indication, amplitude extraction and to the far right, depth map. Both the inversion and amplitude maps show good HC indications for the smaller structural compartment (P50).

4.1.5 Svolder prospect

The Svolder lead is located only 7 km SSW of the drilled Coeus prospect. The two are in the same play and show a similar seismic response (Figure 10). As the Coeus well encountered mostly clay and siltstone in the Danian, it is regarded a high probability for similar lithologies in Svolder, as also indicated by the seismic inversion. The Svolder prospect, which already had a low POS, has therefore been further downgraded and is no longer considered as an opportunity.

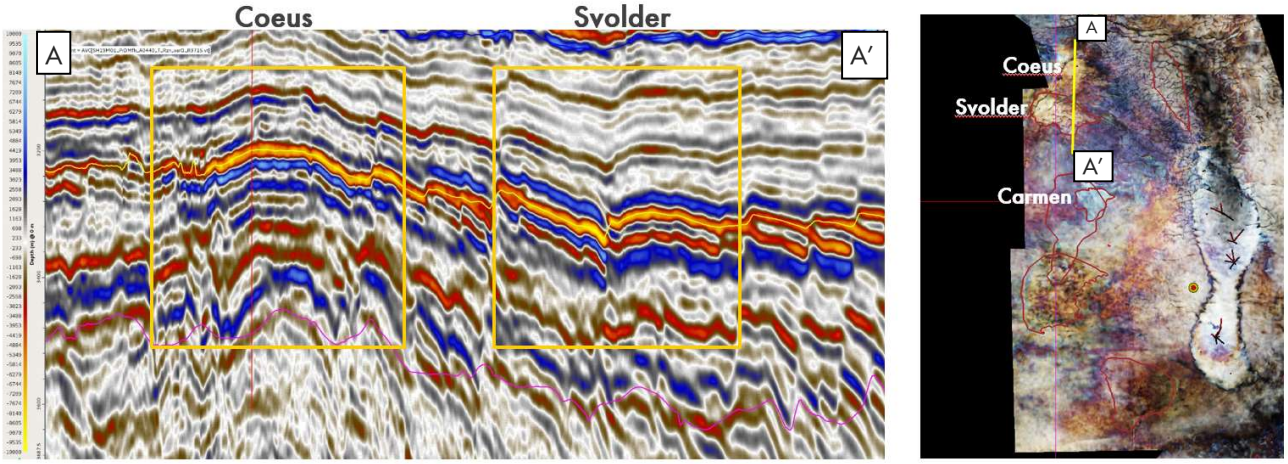


Fig. 10 - Seismic section (SH19M01, fullstack) across the drilled Coeus prospect and the Svolder lead. A spectral decomposition image from Danian level is shown on the right. Note similar response on seismic section and the spectral decomp. image.

4.1.6 Figaro Prospect

Figaro was defined as a distal Egga/Springar lobe located to the south of Carmen, with a possible up-dip stratigraphic seal separating it from Carmen. The new data only gives a weak amplitude support and the trap definition remains poor. There is no support in the inversion data. The Figaro potential is downgraded and no longer pursued.

4.1.7 Svanen

Svanen is located on the west flank of the Ormen Lange field and requires a stratigraphic seal to prevent spilling into Ormen Lange. It originally had a weak amplitude indication for hydrocarbons and was considered a risky lead. The new data has not allowed to further constrain the trap definition nor has the inversion given any better indication for fluid fill. The POS for the Svanen lead therefore remains low and it was not further pursued in the license.

4.1.8 Hafrsfjord

The Hafrsfjord is a conceptual opportunity on the flank of Ormen Lange North, west of the dry well 6305/1-1. The concept involved up-dip and lateral seal created by shale-out of a conceptual sandy Egga lobe extending from the south. The concept is not supported by the results from seismic evaluation using the new data and the inversion shows no indication of hydrocarbons. The low POS remains, and the lead was not pursued further in the license.

4.1.9 Metis

The Metis lead is located below Carmen on the Nise level. It was originally identified on poor seismic data as a structure with potential for Nise sandstone reservoir. Further evaluation of the Nise play around Ormen Lange however shows the potential for well-developed Nise sandstone is low and could be tested in a better location than Carmen. Metis is only considered as a possible secondary target for a well targeting Egga sandstones in Carmen.

5. Technical Evaluations

New technical evaluations were carried out to evaluate the PL996 volume potential and the feasibility for economic development in the context of the wider Ormen Lange field activities. With the revised volumes and POS however, none of the PL996 opportunities are seen to be commercially attractive.

6. Conclusions

The evaluation of the licence has concluded with the following view:

- The technical evaluations have not found robust evidence for well-developed Egga Mbr. or Springar Fm. sandstones for the prospects and leads in PL996, possibly with the exception of the Carmen prospect.
- The evaluation has reduced the volume in the Carmen prospect. The prospect is seen to primarily (P50) be the part confined by faults and structural dip. The area of Carmen is hence smaller than considered before, but the trap is more robust and the POS has increased.
- Evaluation of the development concepts and associated economics has been carried out. Carmen was the only robust prospect left in the portfolio, but the volume potential is limited and considered too small for a commercial project.

All work commitments for the licence have been fulfilled, but a drill-worthy prospect has not been identified. Therefore, the partnership unanimously recommends the relinquishment of PL996.

7. Appendix

Appendix A

Block	6304/6	Prospect name	Carmen	Discovery/Prosp/Lead		Prosp ID (or New!)	NPD will insert value	NPD approved (Y/N)	
Play name	NPD will insert value	New Play (Y/N)		Outside play (Y/N)					
Oil, Gas or O&G case:	Gas	Reported by company	Shell	Reference document	PL996 Relinquishment Document			Assessment year	2020
This is case no.:	1 of 1	Structural element	Møre Basin	Type of trap	Structural	Water depth [m MSL] (>0)	1270	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)					0.11	0.19	0.30	0.55
	Gas [10^9 Sm^3] (>0.00)	1.49	2.24	3.72	6.58				
Recoverable resources	Oil [10^6 Sm^3] (>0.00)					0.04	0.06	0.14	0.26
	Gas [10^9 Sm^3] (>0.00)	0.95	1.62	2.41	4.32				
Reservoir Chrono (from)	Paleocene	Reservoir litho (from)	Egga Fm	Source Rock, chrono primary	Upper Jurassic	Source Rock, litho primary	Spekk Fm	Seal, Chrono	Paleocene
Reservoir Chrono (to)		Reservoir litho (to)		Source Rock, chrono secondary		Source Rock, litho secondary		Seal, Litho	Tang Fm.
Probability [fraction]									
Total (oil + gas + oil & gas case) (0.00-1.00)	0.19	Oil case (0.00-1.00)	0.00	Gas case (0.00-1.00)	1.00	Oil & Gas case (0.00-1.00)	0.00		
Reservoir (P1) (0.00-1.00)	0.48	Trap (P2) (0.00-1.00)	0.90	Charge (P3) (0.00-1.00)	1.00	Retention (P4) (0.00-1.00)	0.45		
Parametres:	Low (P90)	Base	High (P10)	*Comments*					
Depth to top of prospect [m MSL] (> 0)		3280		*Applying a DHI uplift will bring the POS from 0.19 to 0.3.*					
Area of closure [km^2] (> 0.0)	5.0	7.3	16.6						
Reservoir thickness [m] (> 0)	8	30	47						
HC column in prospect [m] (> 0)		100							
Gross rock vol. [10^9 m^3] (> 0.000)	152.000	254.000	465.000						
Net / Gross [fraction] (0.00-1.00)	0.38	0.59	0.79						
Porosity [fraction] (0.00-1.00)	0.17	0.22	0.27						
Permeability [mD] (> 0.0)	10.0	100.0	600.0						
Water Saturation [fraction] (0.00-1.00)	0.35	0.42	0.51						
Bg [Rm3/Sm3] (< 1.0000)	0.0035	0.0038	0.0043						
1/Bo [Sm3/Rm3] (< 1.00)									
GOR, free gas [Sm^3/Sm^3] (> 0)	8842	13020	18867						
GOR, oil [Sm^3/Sm^3] (> 0)									
Recov. factor, oil main phase [fraction] (0.00-1.00)									
Recov. factor, gas ass. phase [fraction] (0.00-1.00)									
Recov. factor, gas main phase [fraction] (0.00-1.00)	0.56	0.65	0.74						
Recov. factor, liquid ass. phase [fraction] (0.00-1.00)	0.56	0.65	0.74	For NPD use:					
Temperature, top res [°C] (>0)	80			Innrapp. av geolog-init:	NPD will insert value	Registrert - init:	NPD will insert value	Kart oppdatert	NPD will insert value
Pressure, top res [bar] (>0)	340			Dato:	NPD will insert value	Registrert Dato:	NPD will insert value	Kart dato	NPD will insert value
Cut off criteria for N/G calculation	Vsh<0.5	2.	3.					Kart nr	NPD will insert value

8. References

APA 2018 Application, Blocks 6304/6 & 9, 6305/1, 4 & 7