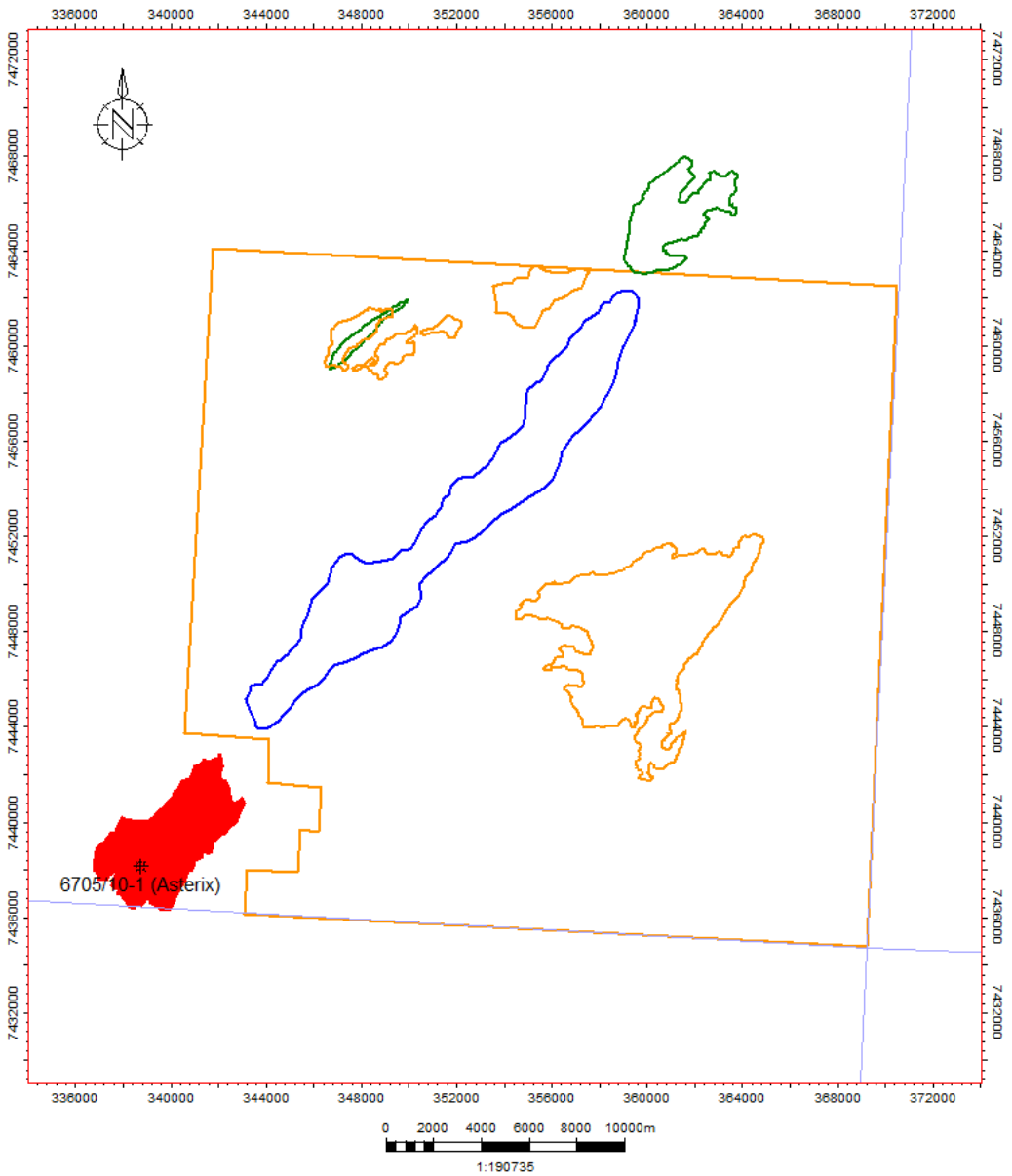
PL802 Relinquishment Report



Repsol Norge AS

PL802 Relinquishment Report

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1 Key License History

PL802 was awarded on February 6th, 2015 as part of the APA 2014 license round to Repsol Exploration Norge AS (40%) as operator, with partners Atlantic Petroleum Norge AS (20%), E.ON E&P Norge AS (20%) and OMV (Norge) AS (20%). Repsol Exploration Norge AS changed name to Repsol Norge AS. On December 31st, 2015 10% of Atlantic's interest was transferred to Statoil Petroleum AS. On January 13th, 2016 E.ON E&P Norge AS changed name to Dea E&P Norge AS. On May 18th, 2016 Dea's interest was taken over by DEA Norge AS. On January 20th, 2017 Atlantic's interest was transferred to M Vest Energy AS.

Initial work obligations and work periods

Within 2 years or before February 6th, 2017
- Conduct geological and geophysical studies
- Drill or drop decision

Within 4 years or before February 6th, 2019
- Drill exploration well
- Concretize (BoK) or drop decision

Within 6 years or before February 6th, 2021
- Conduct conceptual studies
- Continuation (BoV) or drop decision

Within 7 years or before February 6th, 2022
- Prepare development plan (PDO)
- Submit PDO or drop decision

Overview of meetings held
- Initial meeting: March 11th, 2015
- EC/MC meeting: November 6th, 2015
- EC/MC meeting: January 23rd, 2016
- EC/MC meeting: March 16th, 2016
- Work meeting: April 13th, 2016
- Work meeting: September 13th, 2016
- EC/MC meeting: November 23rd, 2016

Reason for relinquishment

The license work program was completed by conducting relevant geological and geophysical studies. Several prospects were mapped and evaluated, including the Ganske prospect that was considered the main prospect within the license. The estimated resources for the prospect were interesting but the geological risk was too high to create an economic viable project. Repsol proposed partners to ask for an extension of the Drill or Drop in order to carry out more G&G work and be able to de-risk the main prospect. The extension was only supported by Statoil Petroleum AS. Repsol proposed then a relinquishment of PL802 as no drillable prospect was ready to enter in the second phase of the license. The relinquishment was supported by partners.

2 Database

2.1 Seismic and other geophysical data

The seismic database consists of publicly available 2D datasets, multiclient 2D datasets and publicly available 3D datasets within and near the license area. Table 2.1 lists all the seismic datasets used in the license.

Table 2.1 List of the sesmic datasets used in the license

Survey name	Type	Category	Year	NPDID
NPD-ML-74	2D	Public	1974	2102
NPD-VØRB-85	2D	Public	1985	2765
NPD-VØRB-86	2D	Public	1986	2866
NPD-VØRB-89	2D	Public	1989	3263
NPD-VØRB-90	2D	Public	1990	3338
GVN-92	2D	Public	1992	3513
GMNR-94	2D	Public	1994	3650
VBT-94	2D	Public	1994	3701
SG9604	2D	Public	1996	3806
NH9706	2D	Public	1997	3863
GRE02	3D	Public	2002	4159
MNR04	2D	Multiclient	2004	4252
ST0410	3D	Public	2004	4271
MNR07	2D	Multiclient	2007	4450
MNR08	2D	Multiclient	2008	4571
SH1002	3D	Public	2010	7214

In addition a multiclient EMGS acquired CSEM 3D dataset is part of the geophysical license database.

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.

2.3 Special studies

A number of internal and external studies were performed to evaluate the prospectivity within the license. Table 2.3 lists all the studies used in the license.

Table 2.2 List of wellbores used in the license

Well name	Year	NPDID	Correlation	Facies analysis	Biostrat	Petro physics	Basin modelling	Seismic calibration	Velocity modelling	Rock physics
6507/2-1	1986	911	x	x	x	x		x		
6607/5-1	1987	1064	x			x		x		
6607/5-2	1991	1789	x			x	x	x		
6507/2-2	1992	1840	x	x	x	x		x		
6507/2-3	1994	2299	x	x	x	x		x		
6707/10-1	1997	3075	x	x	x	x	x	x	x	x
6706/11-1	1998	3202	x	x	x	x	x	x		
6704/12-1	1999	3759	x	x	x	x	x	x	x	x
6706/6-1	2003	4705	x			x	x	x		
6507/1-1	2004	4955	x	x	x	x		x		
6605/8-1	2005	4984	x	x	x	x		x		x
6607/2-1	2007	5471	x	x	x	x	x	x		
6507/2-4	2008	5685	x	x	x	x		x		
6605/8-2	2008	5812	x	x	x	x		x		x
6706/12-1	2008	5867	x	x	x	x		x		x
6706/10-2 S	2008	5918	x			x	x	x		
6707/10-2 A	2008	5931	x			x	x	x		
6605/1-1	2009	5979	x	x	x	x	x	x		x
6603/12-1	2009	5985	x			x		x		x
6705/10-1	2009	6044	x	x	x	x	x	x		x
6603/5-1 S	2010	6348	x	x	x	x		x		x
6604/10-1	2010	6356	x	x		x		x		
6604/2-1	2011	6568	x	x		x	x	x	x	x
6707/10-3 S	2014	7550	x			x	x	x		

Table 2.3 List of the special studies used in the license

Study name	Company	Year
Depth modelling and sensitivity analysis	Repsol	2015
ST0410 gather conditioning	Repsol	2015
Rock Physics Modelling and AVO study	Repsol	2016
Extended elastic impedance Inversion study	Repsol	2016
Structural evolution and restoration study	Repsol	2016
Basin modelling study	Repsol	2016
Seismic sequence stratigraphic and biostratigraphic study	Geolink	2016
Lysing formation analogue study	Geolink	2016
Seismic and quanitative interpretation study	Repsol	2016

3 Review of Geological and Geophysical Studies

Performed studies
The studies performed to evaluate the prospectivity within the license are listed in Table 2.3.

Results of block evaluation
The work carried out during the initial exploration phase in the license was mainly focused on better defining the prospects identified in the original license application and trying to de-risk them in order to get a drillable prospect. The operator made a special effort to try to de-risk the Ganske prospect, located on the Eastern fringe of the Gjallar Ridge, considered the main prospect within the license.

As a part of the license evaluation semi-regional seismic interpretation has been performed. Key regional horizons and several intra Cretaceous seismically recognizable horizons were mapped together with faults. This interpretation were used as input to the studies performed. The main focus for the rock physics study was to calibrate seismic elastic inversion performed on 3D ST0410 since it lacks a well inside the survey boundaries, and to de-risk the seismic anomaly being the driver for the Ganske Prospect. False AVO from lithology and fizz gas is a major problem in the Vøring Basin. The semi-regional rock physics study included lithology and fluid prediction (LFP) modeling, output of extended elastic impedance inversion (EEI) and amplitude versus offset (AVO) cubes used in the evaluation. One conclusion of the study was that high porosity sandstone and/or fizz gas saturation can produce false AVO effects.

In the original license application the reservoir of the Ganske prospect was defined as belonging to the Springar Formation, but based on the results of the performed studies this was changed to the Lysing Formation. The Lysing Formation rests uncomfortably on the Lange Formation and is interpreted to be sourced from the north-northeast and deposited as slope apron fan systems in the license area (Figure 3.1), structurally confined by underlying topography and fault blocks. Compared to the depositional facies maps of the original license application, channel-lobe characteristics are not found in the sandstone units within the license. Conversely, these deposits are systematically sheet-like, showing a high degree of amalgamation (coalescing turbidites), high net-to-gross ratio, and systematically blanket the lower and upper slope of the depositional systems. Since very few wells in the western Vøring Basin have penetrated the Lysing Formation, well results from the Marulk area on the Dønna Terrace were studied as an analogue for the depositional environment that was expected in the license area. The sandstones of the Lysing Formation within the license are believed to be directly comparable to those found in the proximal part of the Marulk depocenter. However, a very large regional variability in porosity was observed illustrating multiple sediment sources and the coexistence of multiple individual depocenters at various structural depths. The correction of the calculated amount of uplift observed in the area did not, unexpectedly, enhance the porosity-depth trend for the sandstones of the Lysing Formation. The presence of sandstones was also supported by the performed geophysical studies that showed a good lithology (sand) response.

As a result of the block evaluation a new lead named Limbo was defined with reservoir belonging to the Springar Formation. Furthermore, based on the results of the performed

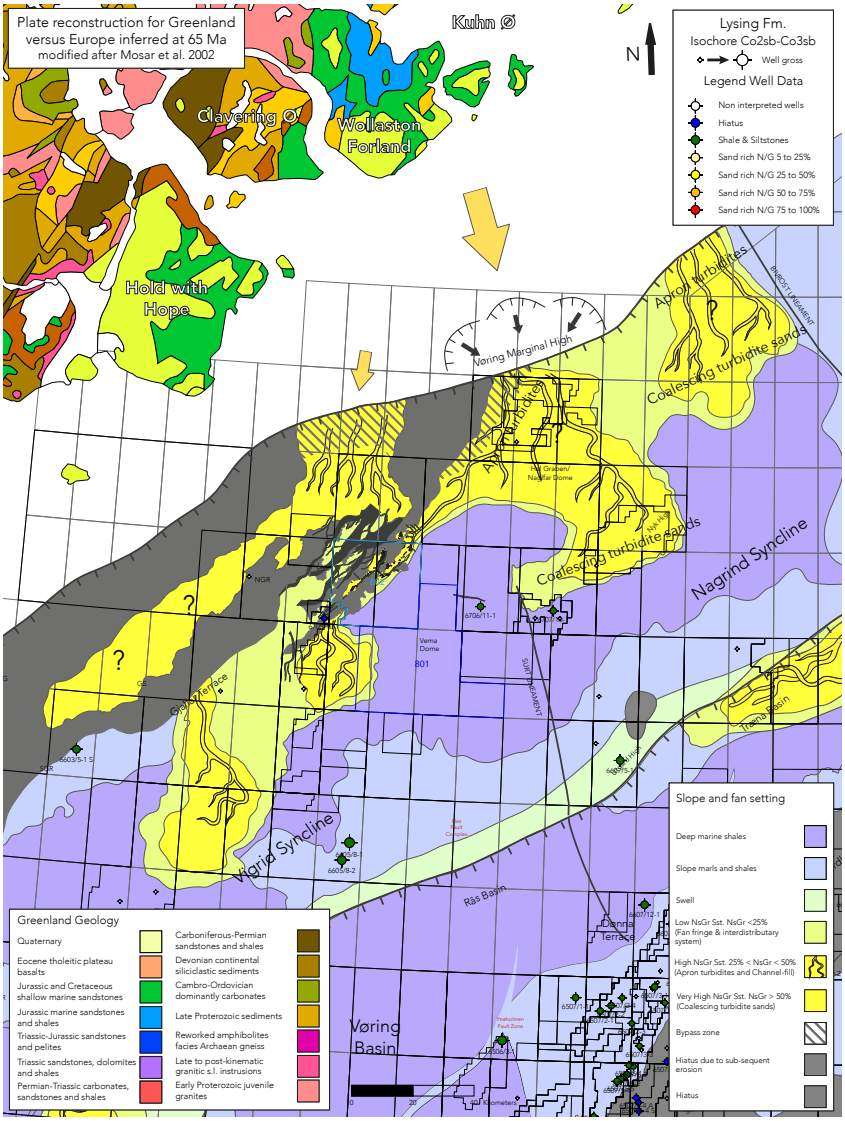

Figure 3.1 Regional facies map of the Coniacian Lysing formation

studies the reservoir of the Rødrev prospect was reinterpreted as being part of the Nise Formation. The final seismic interpretation over the Rødrev prospect has redefined its shape and it is currently lying outside PL802 acreage.

4 Prospect Update Report

In the original license application five Cretaceous prospects were identified, four in the Springar Formation and one in the Nise Formation. The Ganske prospect was considered the main prospect defined by amplitude anomalies indicating a stratigraphic trap in the Springar Formation, supported by far-offset brightening. The other prospects in the Springar Formation include Rødrev with the same trapping style as Ganske, while Isbjørn Springar and Gaupe were defined by four-way dip closures. The Rødrev prospect was also seen to extend into PL705. The only prospect in the Nise Formation, Isbjørn Nise, was defined by a three-way fault closure. The reservoir quality of the sandstones in the prospects was expected to be very good with amalgamated basin-floor fans sourced from the north-northeast. The Lange Formation was expected as the main source rock in the area. The migration pathway was expected to be vertical through faults from the Vigrid Syncline. The top and lateral seals of the prospects were the overlying mudstones of the Nise and Springar formations. The hydrocarbon type was expected to most likely be dry gas with some condensates.

The work carried out during the initial exploration phase has focused on maturing the Cretaceous prospectivity in the license area. After the evaluation four prospects and one new lead were identified within the license, one in the Lysing Formation, three in the Springar Formation and one in the Nise Formation. After the updated interpretation the Rødrev prospect is located in PL705 with reservoir belonging to the Nise Formation. Isbjørn Nise prospect has been re-defined honoring the top reservoir brightening and a clear flat event. Isbjørn Springar prospect is 4-way dip closure/truncation trap in Springar Formation in the same fault block. Gaupe prospect has minor edits to the outline compared to the initial definition. Limbo is a new lead in the Springar Formation, defined by a four-way/ truncation trap with DHI. All the identified prospects and leads are shown in Figure 4.1 and updated resource volumes and probability estimates are listed in Table 4.1.

Ganske prospect

Ganske is the main prospect in the license. The operator made a special effort to try to de-risk Ganske in order to get a drillable prospect. As a result of the studies performed in the license the reservoir in the Ganske prospect has been re-interpreted as being part of the Lysing Fm. The trap is defined as an up-dip pinch-out / truncation of on-lapping Lysing Formation onto the underlying shales of the Lange Formation. Sand is confined by underlying topography. The underlying Lange Fm shale acts as the base and lateral seal. The top seal is provided by the overlying shales of the Kvitnos Fm. The reservoir consists of Turonian-Coniacian amalgamated coalescing turbidite sandstones of the Lysing Formation. Figure 4.2 shows the Top Lysing Formation depth map as well as seismic cross-sections through the Ganske prospect. The results from the Rock Physics and AVO analysis cannot discard a possible lithology effect. EEI support presence of sand with porosity. The AVO response is laterally patchy. This together with no far offset confining to structure or flat event, supports a higher likelihood of non hydrocarbon filled reservoir. The results however does not rule out any potential for presence of hydrocarbons. Even though lack of a good Lysing reservoir analog in the area, quantitative interpretation supports sand and hence reservoir presence/quality is considered medium to low risk. The main risk was attributed to the lateral seal. In the northern part of the prospect it hits a fault where the Lysing Formation sandstones potentially may be juxtaposed against sandstones of the Nise and Springar formations. Medium risk was considered for the trap definition as the seismic interpretation

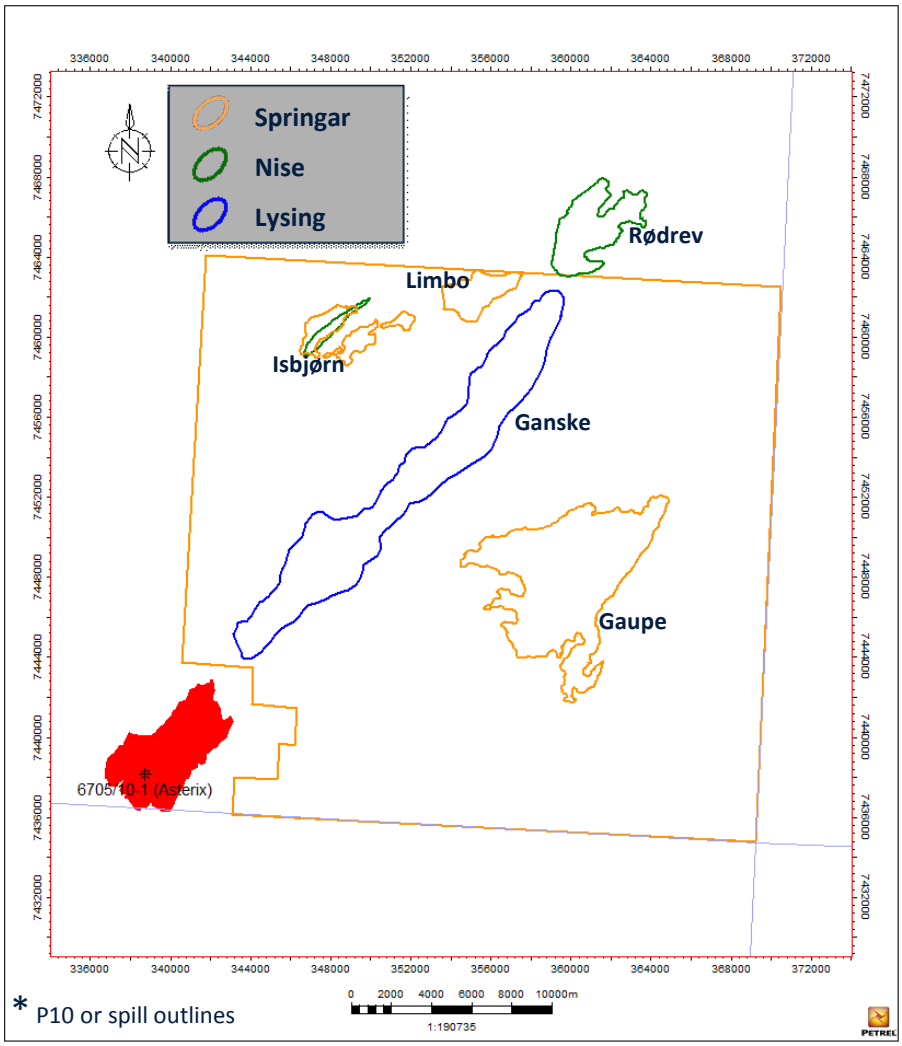

Figure 4.1 Identified prospects and leads in the license area

Table 4.1 List of identified prospects in the license area

Prospect name	Reservoir target	Reservoir depth (m)	Geological probability (%)	Gas (10^9Sm^3)			Condensate (10^6Sm^3)		
				P90	Pmean	P10	P90	Pmean	P10
Ganske	Lysing Formation	3270	19.6	4.02	13.33	26.98	0.12	0.38	0.75
Isbjørn Springar	Springar Formation	2950	15	0.38	2.83	6.93	0.01	0.08	0.19
Isbjørn Nise	Nise Formation	3075	65	0.30	0.82	1.53	0.01	0.02	0.04
Gaupe	Springar Formation	3330	26	1.06	4.18	9.45	0.03	0.12	0.27
Limbo	Springar Formation	3055	58	0.71	2.05	3.82	0.02	0.06	0.10
Rødrev	Nise Formation	3150	16	0.42	1.83	4.31	0.01	0.05	0.13

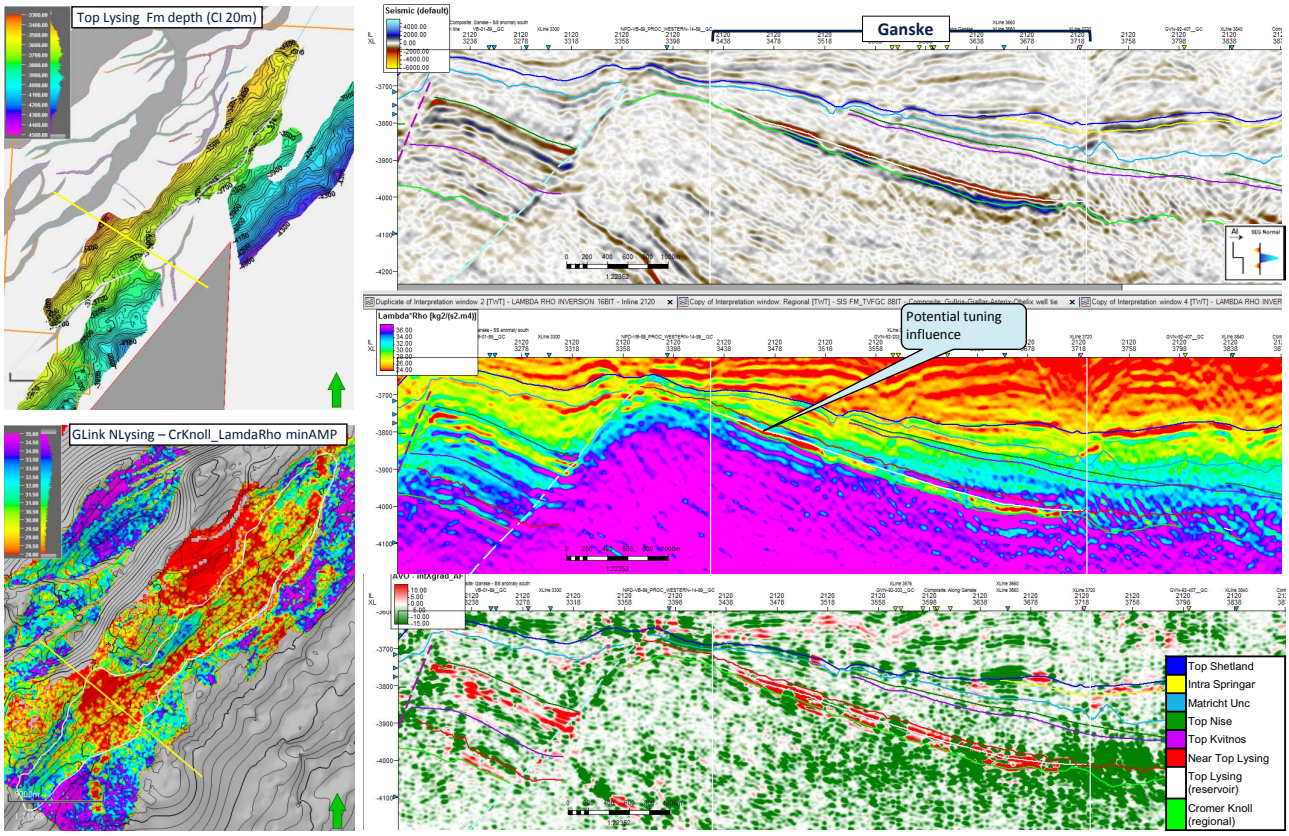

Figure 4.2 Top Lysing Formation depth map and seismic cross-sections through the Ganske prospect

is close to the tuning thickness in parts of the up-dip part of the prospect and hence up-dip delineation is somewhat uncertain. Source and migration are considered low risk since prospect has access to the down-dip Vigrid Syncline, thought to be the kitchen (Lange FM Shales) for the nearby Asterix discovery. The final geological chance of success is 19.6%. Table 4.2 summarizes the changes in resource volumes and probability estimates for the Ganske prospect.

Table 4.2. Revised prospect data for the Ganske prospect (NPD's Table 5). Updated data in the table are highlighted in yellow color.

Block	6705/11 & 6705/12	Prospect name	Ganske	Discovery/Prosp/Lead	Prospect	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	Repsol Norge AS	Reference document				Assessment year	2016
This is case no.:	1 of 1	Structural element	Gjallar Ridge	Type of trap	Stratigraphic	Water depth [m MSL] (>0)	1400	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)								
	Gas [10^9 Sm^3] (>0.00)	6.09	8.30	19.85	39.93				
Recoverable resources	Oil [10^6 Sm^3] (>0.00)					0.12	0.16	0.38	0.75
	Gas [10^9 Sm^3] (>0.00)	4.02	5.54	13.33	26.98				
Reservoir Chrono (from)	Turonian	Reservoir litho (from)	Lysing Fm.	Source Rock, chrono primary	Cenomanian-Turon	Source Rock, litho primary	Lange Fm.	Seal, Chrono	Santonian
Reservoir Chrono (to)	Coniacian	Reservoir litho (to)	Lysing Fm.	Source Rock, chrono secondary	Oxfordian-Ryazania	Source Rock, litho secondary	Spekk Fm.	Seal, Litho	Kvitnos Fm.
Probability [fraction]									
Technical (oil + gas + oil & gas case) (0.00-1.00)	0.20	Oil case (0.00-1.00)		Gas case (0.00-1.00)	1.00	Oil & Gas case (0.00-1.00)			
Reservoir (P1) (0.00-1.00)	0.70	Trap (P2) (0.00-1.00)	0.70	Charge (P3) (0.00-1.00)	0.80	Retention (P4) (0.00-1.00)	0.50		
Parametres:	Low (P90)	Base	High (P10)	*Comments*					
Depth to top of prospect [m MSL] (> 0)	3270	3270	3270						
Area of closure [km^2] (> 0.0)	10.4	15.9	22.3						
Reservoir thickness [m] (> 0)	17	23	30						
HC column in prospect [m] (> 0)	233	319	420						
Gross rock vol. [10^9 m^3] (> 0.000)	0.276	0.831	1.617						
Net / Gross [fraction] (0.00-1.00)	0.50	0.65	0.80						
Porosity [fraction] (0.00-1.00)	0.15	0.18	0.22						
Permeability [mD] (> 0.0)	100.0	200.0	400.0						
Water Saturation [fraction] (0.00-1.00)	0.40	0.30	0.20						
Bg [Rm3/Sm3] (< 1.0000)	0.0037	0.0035	0.0033						
1/Bo [Sm3/Rm3] (< 1.00)									
GOR, free gas [Sm^3/Sm^3] (> 0)									
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)	0.60	0.68	0.75						
Recov. factor, liquid ass. phase [fraction] (0.00-1.00)	1.00	1.00	1.00	For NPD use:					
Temperature, top res [°C] (>0)	120			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)	410			Dato:	NPD will insert value	Registrert Dato:	NPD will insert value	Kart dato	NPD will insert value
Cut off criteria for N/G calculation	Porosity of 0,1	Vshale of 0,5	3.					Kart nr	NPD will insert value

5 Technical Evaluations

Technical and economic analysis was initially carried out to determine what the minimum commercial resource volume would be for development of a discovery in the Ganske prospect. Hydrocarbon properties were extrapolated from the discoveries in the area. Production profiles were established using the GAP software suite based on mass balance and assumed minimum arrival pressure at the processing and exports host platform. The Ganske fluid was assumed to comprise mainly gas with a minor condensate yield of 39 Sm^3 per million Sm^3 gas. The field would be produced on depletion drive.

The infrastructure in the area is the Polarled gas export pipeline and with the Aasta Hansteen processing and exports platform (SPAR) to be installed at Vøring in the second half of 2018. The gas from the Polarled pipeline will be routed to the Nyhamna terminal for further processing and into the Norwegian gas transport network. The condensate from Aasta Hansteen will be exported via offshore loading. The Aasta Hansteen facilities will be the first deepwater development in the Vøring Basin and will become a hub for other fields. The host platform has a capacity of 23 million Sm^3/day of gas.

Due to the proximity to the Aasta Hansteen SPAR platform the development concept assumed is a subsea tieback. The mean of the commercial resource range was assumed developed using two production wells. The wells would be tied back via a subsea template and a single flow line (typ) to the Aasta Hansteen platform. To control the wells and the subsea manifolds a control cable would be required from the host platform. It is assumed that the arrival pressure at Aasta Hansteen will be reduced over time. All wells would be remotely operated and include down-hole reservoir monitoring and flow control. The extent to which the well potential can be utilized will depend upon available ullage and required minimum delivery pressure at the host platform. The plateau flow rate is 10 million Sm^3/day of gas. Flow assurance issues stemming from hydrate formation can be expected. Effective schemes for hydrate management are well known and typically these would include balancing of chemical injection with level of flow line insulation.

A major uncertainty for a development in this area is the time for when capacity ullage opens up at the Aasta Hansteen platform. Volumes published for Aasta Hansteen suggest that there will be no ullage the first four years of production. After that it depends on the development of other discovered resources in the area, such as in Asterix, Ivory, Roald Rygg and Snefrid Nord. The production rate assumed for Ganske has been adjusted to the expected spare capacity of Aasta Hansteen.

The calculated investment level for a Ganske development, assuming resources of 18.3 billion Sm^3 of gas and 0.5 million Sm^3 of condensate is NOK 7 billion (2017). The estimated development time from PDO to first gas is 36 months.

6 Conclusions

Four Cretaceous prospects and one lead were identified within PL802. Based on the results from the technical evaluation the Ganske prospect was considered the main prospect and the best candidate to be drilled. The hydrocarbon type in Ganske was expected to most likely be dry gas with some condensates with mean recoverable resources of 13.33 billion Sm^3 gas and 0.38 million Sm^3 of condensate respectively. The geological chance of success was 19.6%.

The results from the economic evaluation of the Ganske prospect showed a potentially viable economic case. However, the risk was considered too high and it was recommended to wait for the Stordal well in PL705 to integrate results, calibrate seismic and further de-risk the prospects within the license. The other prospects did not support further investments in the license. The operator's recommendation to partners was to apply for an extension of the drill decision. However, the proposal lacked majority support in the license. Therefore, the operator recommended relinquishing the license which was unanimously approved by partners.