Economic Analysis of Undiscovered Petroleum Resources in the Arctic:
Case Norway - Barents Sea, Southeast

Benvenutta Henriksen
Mari Kvaløy
Terje Sørenes
Norway as an oil and gas exporter 2012

**Oil**

- Saudi Arabia: 432.6 Mill. tonnes oe
- Russia: 351.4 Mill. tonnes oe
- UAE: 126.6 Mill. tonnes oe
- Kuwait: 117.8 Mill. tonnes oe
- Nigeria: 110.0 Mill. tonnes oe
- Iraq: 109.1 Mill. tonnes oe
- Iran: 91.7 Mill. tonnes oe
- Angola: 86.8 Mill. tonnes oe
- Venezuela: 83.5 Mill. tonnes oe
- Norway: 82.2 Mill. tonnes oe

**Gas**

- Russia: 158.4 Mill. tonnes oe
- Qatar: 117.8 Mill. tonnes oe
- Norway: 99.6 Mill. tonnes oe
- Canada: 50.3 Mill. tonnes oe
- Algeria: 45.5 Mill. tonnes oe
- Turkmenistan: 37.0 Mill. tonnes oe
- Indonesia: 31.7 Mill. tonnes oe
- Malaysia: 28.7 Mill. tonnes oe
- Netherlands: 24.7 Mill. tonnes oe
- Australia: 21.2 Mill. tonnes oe
Norwegian Continental Shelf

- Areas closed for petroleum activity:
  - Barents Sea North
  - Jan Mayen area
  - Lofoten area

- Areas inaccessible due to lack of technology:
  - Sub basalt areas in the Norwegian Sea.
  - Barents Sea Southeast
The treaty with Russia on maritime delimitation in the Barents Sea - 7 July 2011
The geology of Barents Sea Southeast

- Five main geological structures
  - Two platforms – Finnmark Platform in the south and Bjarmeland Platform in the north
  - Two Basins – Nordkapp Basin and the Tiddlybanken Basin
  - Fedynsky High

- The Bjarmeland Platform
  - Few but large structures that are important as oil and gas traps.
  - The main uncertainty is the number and size of segments, which will have considerable impact on
    - the discovery size
    - the total recoverable resources
    - thus the profitability of development for the whole area
The estimates of the resources in Barents Sea Southeast

- Bimodal distribution
- The possible outcomes on the Bjarmeland Platform contribute to the high resource potential
- The Barents Sea Southeast is assumed to be a gas province
The Scenario Approach and Real options

• Exploration consists of sequential decisions based on new information that is obtained through exploration activities.

• As decisions can be made sequentially, this creates options or possibilities to customize activity based on new information and thus yield added value to the resource potential.

  • The outcome of the exploration of the Bjarmeland Platform is critical to the development of the Barents Sea Southeast

  • The profitability of small gas discoveries in the Barents Sea Southeast area are dependent on available capacity in gas networks.

  • Only a large gas discovery will provide an economically viable case for the development of a gas infrastructure

  • The probability of a large gas discovery is assumed to be significant only on the Bjarmeland Platform

• The main options, that are critical to the value of the area, are important to identify, expose and model in the value calculations.

• The scenario approach is used to identify these options.
The scenario approach in the stochastic calculation of the net present value of exploration in Barents Sea Southeast Development in Barents Sea Southeast

Barents Sea Southeast

Volumes on Bjarmeland Platform

- Few and large segments
- Medium numbers and medium sized segments
- Many and small segments

Development in Barents Sea Southeast

- Shared gas infrastructure
- Pipeline and onshore facilities
- Subsea offshore

- Shared gas infrastructure or Stand alone solutions with CNG ships
- Stand alone solutions with CNG ships
The net present value of exploration in the Barents Sea Southeast

The mean is approx. 9000 billion US$

P05 about 31000 billion US$
Conclusion

• A combination of the scenario approach and stochastic modelling provides a better fundament on which to base decisions, compared to applying only one method.
  • The Scenario approach revealed the main real options. This approach identified the importance of the outcome of the exploration of the Bjarmeland Platform.
  • The stochastic calculation shows that there may be considerable value to be gained through opening the Barents Sea Southeast for petroleum activities.

• A step-by-step exploration of the area, starting with exploration of the Bjarmeland Platform, will serve as a robust strategy for clarifying the potential and the profitability of the resources.
Selected references


Thank you!

www.npd.no
Barents Sea South-East
The opening process

Konsekvensutredning - vedlegg til melding til Stortinget om åpning av Barentshavet sørosten for petroleumsvirksomhet

Åpningsprosess for petroleumsvirksomhet i Barentshavet sørosten
Konsekvensutredning etter petroleumsloven vedlagt innkommende høringsaftalelser

Kartlegging og ressursberegning, Barentshavet sørosten
The analysis

• There is a set of technical and economic assumptions, including the year for open Barents Sea South-East to petroleum activity, exploration activity and development solutions.

• Market price assumptions: The long-term oil price forecast is set to USD 122 per barrel. Based on this oil price, the assumed gas price is 2.14 NOK per Sm3.

• Environmental assumptions

• Time schedule

• Development solutions

• Discount rate: In the analysis we have used a real discount rate of 4%, as was done by the Ministry of Finance (2009) and recommended by the Ministry of Finance (2005).
The estimates of the resources in Barents Sea Southeast