

Communicating Exploration Uncertainty in Frontier Regions - West Greenland Case Study.

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Summary

Hydrocarbon exploration can be described as frontier if it is remote, far from market, has little infrastructure, has harsh climates or difficult to work in environments, little, if any, previous drilling, sparse seismic acquisition and / or no proven petroleum system. West Greenland is all of this and yet the potential is immense. Cairn Energy drilled eight wells over the 2010-2011 season and while not obtaining commercial success did encounter key aspects of the petroleum system. The wells targeted a variety of plays and while they all had a low overall geological chance of success the probability assigned to each of the elements (source, reservoir, trap, seal, timing) ranged significantly.

In this presentation we compare and contrast the risks assigned to these two wells, and discuss how these were communicated. We also consider possible improvements to the evaluation and communication of risk in such frontier settings.

Exploration History

Offshore exploration drilling by Total, Chevron and Mobil first occurred in the late 1970s with limited success (i.e. Aram, 1999). Qulleq-1 drilled by Statoil in 2000 targeted a large tilted fault block with a cross-cutting reflector that was hypothesised to be a hydrocarbon contact. Pegrum et al. (2001) describe the results of the well and surmised that the CCR was the result of an opal CT to microquartz transition. Although the prognosed reservoir section contained only shale, reservoir quality Cretaceous sand was encountered near the base of the borehole.

Over the following decade many companies acquired exploration acreage and progressed the regional geological understanding using gravity, magnetic, seismic and CSEM data (i.e. Cooper et al., 2006; Lovantini et al., 2009). In 2010-2011, Cairn Energy embarked on an ambitious drilling campaign to open new basins offshore West Greenland, with each well targeting a different play concept. In this presentation we focus on two wells, Gamma-1 and AT7-1, drilled in 2011.

Gamma-1 and AT7-1

The Gamma-1 well completed in 2011 targeted a Tertiary basin floor fan down-dip from the 2010 T8-1 well that encountered gas shows. Reservoir risk was evaluated as being low compared to other elements of the petroleum system given the favourable geometry of the fan-like lobate body. No reservoir or hydrocarbon was encountered at the Gamma-1 location.

Conversely, the Atammik well AT7-1 completed in November 2011, targeted three prospective intervals: Paleocene, Cretaceous and older pre-rift. Reservoir risk was considered to be significant with the composition and quality assessed as highly uncertain. That said, the well encountered a 113m gross interval with 53m of net reservoir quality sands of Cretaceous age, with minor hydrocarbon shows.

By comparing and contrasting the risks assigned to these wells, we consider possible improvements to the evaluation and communication of risk in frontier environments.

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