Risk Reduction on the Ivory Prospect via Geologically Constrained Non-Parametric Inversion and Bayesian Uncertainty Estimation on a Fault-Bounded Reservoir

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ABSTRACT

In 2014 Centrica Energy operated the Ivory Exploration well (6707/10-3 S) in 1420m of water in the Norwegian Sea within the PL528B license. Gas was found in turbidite sandstones of the uppermost Kvitnos formation (informal 'Delfin Member'). The Ivory structure is a fault bounded, three-way dip closure situated on the Nyk High. The well is located about 20km north east of the Aasta Hansteen gas development, which is expected to begin producing in 2018. The Nyk High is located in the north-eastern part of the Vøring Basin, which has been tectonically active in several phases, from Carboniferous to Late Pliocene time, with the main tectonic phases in Late Paleozoic, Late Mid-Jurassic-Early Creataceous and Late Cretaceous-Early Tertiary times. The tectonics of the Late Cretaceous and Tertiary periods were controlled by the relative movements along plate boundaries, with the last rift phase ending with continental breakup at ~54Ma followed by seafloor spreading. During the last phase of intra-continental rifting and separation, uplift, erosion and increased clastic input in the Vøring Basin occurred. The present configuration of the Nyk High mostly dates from the Late Cretaceous to Earliest Tertiary and probably involved both extension and compressional/transpressional reactivation. Prior to the formation of synclines and highs the area probably constituted a single broad Early Cretaceous Basin where deposition of Kvitnos and Nise formation turbiditic sandstones took place. The main challenge in mapping the extent of the Ivory discovery has been seismic imaging at the crest of structures bound by major faults (e.g. fault shadow effects), together with depth conversion uncertainty and a poor well to seismic tie. To address the uncertainties associated with these issues, a new pre-stack depth migration was run using a dataset re-processed with the latest demultiple and deghosting technology. From this final migrated volume, structural uncertainty was then estimated using a Bayesian statistical analysis of the tomographic resolution matrices in conjunction with prior uncertainty estimates.