**The Cretaceous Petroleum System of the Norwegian Sea – An Integrated Study**

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The Mid-Norwegian segment of the Norwegian Continental Shelf, between 62° and 67° N, includes a Berriasian to Paleocene basin fill of >12.5 km thickness. The area of deposition covers several major basins including the Møre and Vøring basins and adjacent terraces. Although the area contains the large Ormen Lange and Aasta Hansteen gas fields, the discovery density in post-Jurassic strata is not comparable with the Jurassic petroleum play on the Halten and Dønna terraces.

To fully re-assess the Cretaceous petroleum system, an integrated petroleum systems analysis study was performed including i) sequence stratigraphy, ii) advanced digital Rock Eval evaluation, iii) geophysical well evaluation, iv) organic geochemistry on fluids, shows, and shales, v) regional PVT evaluation, vi) biostratigraphy and trace fossil evaluation, vii) regional seismic mapping, viii) source rock from seismic, ix) structural balancing, x) source rock modeling, xi) advanced temperature modeling, xii) regional RMS-amplitude mapping, and xiii) large scale petroleum systems modeling.

Shale evaluation has shown a constantly elevated accumulation of gas prone OM in Cretaceous shales with background values of 1-2wt% in the entire basin fill. Organic lean successions are represented by CORB. OM-rich shales with predominantly gas generation potential have been observed as E-units in turbiditic sections. Rich oil prone shales occur in transgressive systems tracts contemporaneous with Cretaceous anoxic events (Weissert to OAE-3 events).

OM-rich zones show low acoustic and AVO Class 4 impedance responses but can still be difficult to detect seismically due to resolution tuning and an AVO character similar to normal shale-shale reflections. Fluid evaluation points to the presence of saturated gases in areas classified as gas provinces indicating the possibility of potentially overseen oil provinces. The observation is supported by the results of stable carbon isotope analysis.

Multiple parameter age-specific biomarker evaluation allowed high-resolution petroleum source rock correlation. It has been assessed that apart from gas discoveries the portion of Cretaceous sourced oil discovered in the Norwegian Sea exceeds 500 MMbbl.

Petroleum systems modeling has shown that pre-Coniacian source rocks have reached peak-oil window maturity prior to the Mid-Miocene which marks a major trap formation event. Coniacian to Maastrichtian shales are in an optimal position for hc generation at present day.