# Exploration Potential in an Enigmatic Pre-Triassic Sub-Basin in the Norwegian-Danish Basin

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## ABSTRACT

The deep structure of an un-tested pre-Triassic sub-basin (hereafter called the PT sub-basin) in the Norwegian Danish Basin (NDB) to the east of the Coffee Soil Fault (CSF) has been illuminated on recent seismic data. This basin has not previously been an exploration target and as a result there was limited seismic data available. However, a series of recent broadband PSDM surveys stretching from north of the Norwegian-Danish border to the centre of the Tail End Graben reveals internal structures that may be of interest for hydrocarbon exploration. The PT sub-basin trends N-S, parallel to the Coffee-Soil-Fault Complex, and extends from the Ringkøbing-Fyn High in the south where a basement high defines the southern limit of the basin to the Åsta Graben in the north. The structural style changes from the south to the north. On the Ringkøbing-Fyn High the sediment package is onlapping onto the basement and the Paleozoic succession terminates against the Base Cretaceous Unconformity suggesting a passive depositional setting. Northwards, in the Åsta Graben, the style shows rift geometries with rotated fault blocks displaying pre- and syn-rift characteristics which are overlain by possibly Permian to Triassic formations. The top of the PT sub-basin lies at approximately 2,600 to 4,000 meters depth and the base at approximately 3,000 to 5,500 meters with the deeper levels towards the North where more stratigraphy is preserved, suggesting the basin is at favorable levels for hydrocarbon generation as well as reservoir quality preservation. Opportunities for both stratigraphic and structural traps exist within this PT sub-basin. Stratigraphic traps are bounded up-dip by unconformity subcrop geometries or by juxtaposition against the basement. To the north trapping potential is also seen in a series of pre-Triassic rotated fault blocks. Based on seismic characteristics from nearby analogues there is a high likelihood for reservoirs being preserved in sandstone layers of Permian and Triassic ages. Different traps could potentially be charged by hydrocarbons generated and expelled from Carboniferous coals, and the dipping geometry of the basin provides an excellent conduit for hydrocarbons to migrate laterally into potential traps. If these key play elements are in place there is the potential of a self-contained functioning petroleum system within the sub-basin.