

New Insights From a Regional and Reservoir Level Interpretation in the Mature Central North Sea (CNS)

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ABSTRACT

In this study we revisit the working reservoir units of a 23,650 km² area of the CNS, covered by a merged regional PGS 3D MultiClient seismic dataset (MegaSurveyPlus) and its pre-stack derivatives, including several recent 3D broadband dual-sensor towed streamer surveys (GeoStreamer). This region of the CNS is characterized by a high well density (54 exploration wells / km²), yielding a total of 17.4 Billion boe total recoverable reserves. Nevertheless, the CNS is still expected to contain around 4.5 Billion boe of yet to find resources, locked in near-field pools and deeper reservoirs that have historically been challenging to image and characterize. The regional 3D dataset has been utilized to directly highlight sediment distribution of all Palaeogene reservoir units and has identified potential leads. The following steps have been followed: (a) extracted stratal slices were chronostratigraphically calibrated by integrating well and field data; (b) a maximum amplitude extraction has been performed through chronostratigraphic windows, highlighting possible sandstone-versus mudstone-prone areas; (c) closures have been observed within the sandstone-prone areas, which constitute un-tested leads; (d) where possible, pre-stack derivatives (relative V_p/V_s and relative acoustic impedance) were utilized to characterize the elastic reservoir properties of some of these leads. All likely sandstone-prone areas of each chronostratigraphic interval mirror the sediment distribution maps of the Millennium Atlas (2003), validating this seismically-driven methodology. Furthermore, the regional 3D dataset has been utilized as a consistent regional “screening tool” to locate areas where Mesozoic and Paleozoic plays are visible, and compare them to existing deep discoveries. In addition, a pre-stack seismic simultaneous inversion of the 3D dual-sensor data has been performed over some fields and leads in order to better understand the distribution of reservoir-scale elastic properties, thereby fully utilising the pre-stack broadband AVO compliance of this data. Leads, prospects, plays and migration pathways in the mature CNS Basin have been consistently delineated at the regional scale on the 3D regional dataset. In addition, the pre-stack 3D broadband seismic enhances reservoir-scale interpretation for near field exploration to field development for both shallow and deeper horizons, enabling a significant improvement in our subsurface reservoir understanding.