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A New Lower Cretaceous Seismo-Stratigraphic Depositional Model for the Witch Ground and Eastern Central Grabens of the Central North Sea

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SUMMARY

The Lower Cretaceous interval (Ryazanian-Albian) of the North Sea is poorly sampled by well data and as a result, both its geology and hydrocarbon prospectivity are poorly understood on a regional basis. Where a large number of wells have been drilled such as in the Witch Ground Graben, significant fields have been discovered. However it is fair to say that most discoveries have been unintentional!

There remains a large area of the Central North Sea (CNS) where the early Cretaceous depositional system, and therefore hydrocarbon potential, is effectively unknown. Sand fairways are contentious and no consistent depositional model exists away from the Witch Ground Graben area

This study has used the laterally extensive PGS CNS MegaSurvey 3D seismic volume and all available released exploration and appraisal wells (over 600 wells) to create a systematic seismo-stratigraphic model for the Witch Ground and Eastern Central Grabens of the Central North Sea. As part of this study, all project wells have been re-examined to create a standardised tops, sands and shows database. At the same time significant geological intervals have been correlated with the seismic data and new structural surfaces produced, so that a consistent set of depositional models can be displayed for the Lower Cretaceous interval. These data have been integrated using GIS processes to create a powerful new tool for analysing fairways and helping determine hydrocarbon prospectivity.

A total of five discrete but basin-wide deposystems have been recognised for the Lower Cretaceous interval. These show considerable translocation with time on both local and regional scales, controlled by episodic transpression and related halokinesis. This results in a correspondingly dramatic switch in sand distribution and a progressive change from local to long distance sediment provenance.

The seismic response of likely prospective fairways is highly variable; dependant largely on carbonate content, depth to fairways and overpressures. Despite this, there is a high degree of confidence with mapping new fairways into the Eastern Central Graben and upgrading our current knowledge of the Witch Ground Graben plays.

Future work is planned to include the extension of derived geophysical mapping models into the South Halibut to Western Central Graben area, the deep southern Central Graben play (UK, Norway & Denmark) and the Viking Graben system.