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PS Fractured Carboniferous Limestone Sealed by a Volcanic Ash - A New Play in the East Midlands UK*

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Abstract

The Strelley-1 encountered a minimum 27 m hydrocarbon column in significant karstic porosity and permeability that occurs within the brittle Carboniferous/Dinantian Limestone beneath a thick, low velocity, relatively ductile volcanic ash seal. This volcanic ash is a widespread, previously unrecognised sealing unit that forms a significant new play where it overlies fractured limestone along the northern flank of the Widmerpool Gulf, which also contains proven significant source rocks.

The influx of meteoric water and dolomitisation, occurring along the northern edge of the Widmerpool Gulf, probably had a structural control and has created a fracture set capable of producing over 2000 BOPD per vertical well. A horizontal well is planned to intersect fractures within the oil column. Understanding the structural history and fracture development of the area is thus very important.

Fault population analysis of previous detailed fault mapping in the Nottinghamshire coal field and the application of 3D fault plane modelling in the Strelley area have revealed: (1) N-S Dinantian rifting, which caused syn-depositional normal faults related to previous Caledonian structural grain; (2) Late Westphalian / Stephanian NNE-SSW extension, which caused conjugate normal faults and fracturing; (3) Late Westphalian / Stephanian NW compression, which caused dextral strike slip on the basement related Caledonian / Dinantian weaknesses and local extension and reactivation of NNW-SSE faults; (4) Late Westphalian / Stephanian

compression, which caused a series of NW-SE trending interference related anticlinal domes that may be widespread along the northern edge of the Widmerpool Gulf.

Forward modelling to predict fracture orientation needs to be confirmed within an exploration well before a horizontal well is planned. We will present a first pass fracture model based on elastic dislocation theory and fault interpretation derived from the predicted structural evolution of the area.

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