A New Framework for Predicting and Evaluating Sweet Spots in United Kingdom Onshore Continuous Resource Plays

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ABSTRACT

The current exploration effort in the UK to evaluate effectively untested unconventional reservoirs requires a reliable predictive tool that can predict sub-surface conditions away from existing borehole control points. UK onshore exploration to date has focused almost entirely on conventional reservoir targets in traditional structural-closure trapping geometries. Very few wells are situated over basin depocentres or penetrate deeper shale-prone sections, and only limited sub-surface data have been collected for candidate unconventional plays. Thus, the distribution of potential 'shale' sweet spots are poorly constrained within the available exploration database and their distribution must be predicted through extrapolation away from the wellbore. This study presents a new detailed tectonostratigraphic basin modelling framework and regional play fairway analysis, that has been produced for use in the evaluation of unconventional continuous resource plays in the UK and in predicting the occurrence of prospective 'shale' play sweet spots. The new framework leverages the wealth of public domain data on UK surface and sub-surface geology in combination with rigorous application of best-practise approaches to produce models that are sufficiently detailed whilst being internally consistent and appropriately constrained by geological data. The new basin modelling scheme has been applied to the Carboniferous basins of the English East Midlands and has produced outputs that very accurately replicate available subsurface data. This new scheme, in conjunction with regional play fairway and common risk segment mapping for multiple UK Carboniferous unconventional reservoirs, provides a framework that can be readily and rapidly developed for application throughout the UK.