

The Jurassic Shales of Southern England: Similarities, Differences and Oil In-Place Resource Estimation

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ABSTRACT

Onshore UK has a long history of conventional hydrocarbon exploration and production, and there has been recent success in the Kimmeridge micrite hybrid play in the Weald Basin, however exploration for unconventional resources in England remains in its infancy. The British Geological Survey (BGS) has, on behalf of the Oil and Gas Authority (OGA, formerly DECC), completed preliminary assessments of the potential distribution and in-place shale oil and shale gas resource for four onshore regions in the UK. The most recent report covered the main Jurassic shale intervals of the Wessex area, undertaken as an addendum to the Weald study (Andrews, 2014); the similarities and differences between these two areas in terms of stratigraphy, tectonic history, source rock quality, and prospectivity are considered here. The study areas are comprised of several fault-controlled sub-basins and highs, developed during episodic pulses of Permo-Triassic to Cretaceous extension, and have subsequently experienced significant uplift and erosion. Several horizons of the Wessex area and Weald Basin have been identified to contain volumes of potentially productive shale. The Kimmeridge Clay and lower Oxford Clay have the best shale-oil potential in the Weald Basin, in terms of source rock richness and maturity. To the west, into the Wessex area, these horizons are organic-rich, but major erosion during the Aptian-Albian and Tertiary has limited their present-day extent and maximum burial depth. In the Wessex area, the Lower Lias appears to be the only interval with shale oil potential, in a localised area largely south of the Purbeck-Isle of Wight Disturbance where a full Jurassic section is preserved. However, this interval decreases in source rock quality to the east, and is considered too lean to have any significant prospectivity in the Weald Basin. The Wessex and Weald studies offer a combined range of total oil in-place resource estimates for the Jurassic shales of southern England of 2.4 - 5.5 - 11.4 billion bbl (P90 - P50 - P10); there is no significant shale gas potential. The assessments are of the hydrocarbons present in the shale strata and do not include volumes which have migrated into potential tight conventional or hybrid plays, and further resources may exist in other shale units not evaluated here. Production data, as yet unavailable for the study areas, are required before a reliable estimate of the shale oil reserves can be made.