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Petroleum Generating Potential And Maturation History Of Merlinleigh Sub-Basin, Carnarvon Basin, Western Australia

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Extensive geochemical analyses combined with detailed thermal history modelling have confirmed the presence of source rocks in the Devonian and Lower Permian of the Merlinleigh Sub-basin.

The widespread, organic-rich shales of the Lower Permian (Artinskian) Wooramel Group are the best source rocks in the sub-basin. They have very good to fair, predominantly gas-generating potential in the northern sub-basin, which gradually decreases southwards. Potential source rocks are also found in organic-rich shales of the Bulgadoo and Quinlan shales within the Artinskian Byro Group. Limited data indicate the Upper Devonian Gneudna Formation is an oil source with fair to good, but spatially variable, generating potential.

The Wooramel Group is marginally mature in the northwest, mature to overmature in the centre and immature in the south. Abnormally high thermal maturity of the Wooramel Group is found in Kennedy Range 1, at the centre of the sub-basin, where thermal modelling and a co-incident aeromagnetic anomaly suggest unpenetrated intrusives as the cause of the overmaturity. The Gneudna Formation is immature along the outcrop belt on the eastern margin of the sub-basin, but overmature on Quail 1 on the deeply buried western margin.

Thermal modelling has also enhanced prospectivity of the Merlinleigh Sub-basin by demonstrating favourable timing of petroleum system events as rates of source rock burial, maturation and petroleum generation peaked during Permian times, post-dating regional Permo-Carboniferous structuring.