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Stacked hydrocarbon reservoirs in a low relief trap — Baram Delta

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The Baram Delta province hydrocarbon exploration began at the turn of 20th century onshore Miri. So far the onshore successful results are from Miri oil field itself and Asam Paya as well as those prolific giants made in neighbouring Brunei. Exploration activities moved offshore in 1957 with Siwa-1 well following the advent of marine seismics. Obviously then all the exploration targets were focused on large rollovers and hanging/footwall closures with large

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vertical reliefs exceeding 100 m and in some to more than 500 m. After many big oil discoveries, such as Baronia, Baram, Tukau, West Lutong, to name a few, these simple and big structural traps are practically exhausted. Hence, further potential in the delta requires exploring subtle traps.

Tukau Timur prospect is located between the oil producers Tukau and West Lutong (Fig. 1). The prospect was previously identified on vintage seismics by Sarawak Shell Bhd. A large swath of new 3D seismics acquired in 1999 by current operator Petronas Carigali Sdn. Bhd. and partner Sarawak Shell Bhd has further enhanced the trap configuration. The prospect comprises of three mapped culminations, one of which is a low relief fault bounded 3-way dip closure. This easternmost culmination ranked top among the three in terms of its trap integrity, resources volume as well as support of direct hydrocarbon indications. This low relief trap has a maximum vertical saddle-spill closure of less than 70 m and is named the Eastern Culmination.

The exploration well discovered stacks of hydrocarbon reservoirs of well developed sandstones. Down to total depth, 16 reservoirs are found to contain about 200 m nett interpreted hydrocarbons with average porosity and hydrocarbon saturation of 14% and 45%, respectively. A 600 m deeper and possibly overpressured section is expected to contain a further 3 to 6 hydrocarbon reservoirs. These reservoirs were deposited in a coastal fluvio-marine deltaic system within the West Baram Delta (Fig. 2). A majority of the hydrocarbon-bearing reservoirs are filled down to structural spill limit. A thick shaly foreset package in the upthrown fault block is believed to enhance the fault lateral sealing capacity. Excellent vertical retention is provided by intra-formational shales, some at only 2 m thick, within the closure.

The Western and Far-West culminations of the Tukau Timur complex are fault intersection traps with lateral seal risks (Figs. 3 and 4). These geological risks are further reduced based on positive results of the drilled Eastern culmination (Figs. 5, 6 and 7). These traps are expected to be drilling candidates in the nearby future.