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Abstract

Exploration within a mature basin poses many challenges, not least how to best utilise resources and time to maximise success. Usually, the key decision point in most exploration portfolios is not which prospects to drill, it is which blocks or licenses you should focus your efforts on and ultimately which ones to participate or take equity in. OMV NZ and later SapuraOMV used the play based exploration (PBE) approach in a structured, calibrated and documented way to delineate the underexplored Cretaceous play fairway in the Taranaki Basin resulting in the award of licence PEP60093 from the 2015 New Zealand Licence Round and ultimately the drilling of the Toutouwai-1 discovery in early 2020. Toutouwai is an example of a classic play opening discovery and exemplifies why play analysis is absolutely central to exploration success.

The Taranaki Basin contains the majority of the discovered hydrocarbons within New Zealand and has been the focus of exploration for over four decades. Historically, economically important hydrocarbon discoveries have been made solely in the Paleogene and Neogene. Prospectivity was elusive in the Late Cretaceous synrift sediments of the Pakawau Group which are directly linked and influenced by tectonic activity. The tectonic history of the Southern Taranaki Basin is characterized by two distinct rift episodes within a single rift, separated by tectonic quiescence stages. Extension was initiated on NE-SW trending faults during the Santonian (Piripauan) and sequential dip-slip movement-controlled deposition of the syn-rift infill of the Pakawau Group. These syn-rift deposits contain thick coaly intervals within coastal to fluvial-plain environments that form excellent source rocks for significant hydrocarbon fields and discoveries in the Taranaki Basin. Interbedded shallow- to marginal-marine and fluvial sandstones, and marine and non-marine mudstones, provide potential reservoir and seal facies respectively; although commercial oil and gas accumulations in Taranaki Basin had only been discovered in overlying Palaeogene and younger reservoir sequences - until Toutouwai-1.

Incorporating and integrating play-based exploration methodologies by utilizing modern 3D seismic, log and biostratigraphy data, as well as structural, geochemical and petroleum system modeling, including consistent well failure and hydrocarbon show analysis and gross depositional environment maps enabled the challenging of many existing dogmas about exploring the synrift successions of the Late Cretaceous sediments in the Taranaki Basin.

The resulting integrated, robust and unbiased prospectivity model led directly to the first play-opening discovery in New Zealand in over 20 years, and revitalised exploration in a basin long regarded as well understood.