Could New Zealand Join OPEC?

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Petroleum exploration started in 1866 in Taranaki which subsequently became New Zealand's only producing basin. For more than twenty years, the giant Maui field has been the mainstay of the New Zealand petroleum industry providing up to 50% of its oil and nearly all gas needs. Efforts to emulate the success of Maui have been hampered by the proximity of the plate boundary that forms the backbone of New Zealand. Many spectacular structures have been drilled and found to be dry as they have been compromised by Neogene tectonics. Equally important factors are New Zealand's remoteness from large markets and a perception that New Zealand is gas prone.

Recent work in deeper waters of Taranaki and adjacent Northland and the Great South and Canterbury basins to the east suggest that trapping structures are likely to be large and intact away from the plate boundary. Recent developments, including the Maari, Tui, Amokura and Pateke oil fields outboard of Maui, show that oil is likely to be encountered in deeper waters.

New Zealand is surrounded by sedimentary basins in water depths of 500 to 1500 metres which have only been lightly surveyed and hardly drilled at all. The New Zealand government has been providing free data to show that those basins contain all the essential geological ingredients. The remaining essential factors are substantial commitment and investment. New Zealand may well qualify to join OPEC if the investment eventuates. This paper will discuss the geological factors for success.

Hydrocarbon Charge Modelling of the Outer Taranaki Basin

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The Outer Taranaki Basin is one of New Zealand's promising deepwater basins. A pseudo-3D basin model has been used to define source kitchens and to assess charge potential in the basin and adjacent shelf areas. Three source rocks have been simulated: the proven Wainui Member and Rakopi Formation coals, and a speculative mid-Cretaceous source rock. Migration has been simulated on the base Paleocene sandstone carrier using a ray trace methodology. The model was calibrated to offset wells. Rakopi Formation and Wainui Member source rocks are mature for oil generation on the shelf regions of the study area, but are immature in the deepwater areas of the study region, as these areas lack adequate overburden for maturity. The speculative mid-Cretaceous source rock modelled is mature for gas generation over much of the study area, and is over mature in the deepest areas of the Outer Taranaki basin. Areas on or close to the shelf are prospective for significant oil discoveries (>200 MMstb OIIP), sourced from Rakopi Formation source rocks. Charge is modelled as a significant risk for structures distal from the mature Rakopi Formation source kitchen, and the potential of the outer basin for significant (>1 Tscf GIIP) gas discoveries relies on the presence of deeper mid-Cretaceous source rocks that are evident on seismic, but are as yet unproven.

Seismic Identification of Facies within the Kapuni Group, Taranaki New Zealand

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Within the Kapuni Group of the Taranaki Basin, shoreface sands have the best reservoir potential as a result of better poroperm and more favourable reservoir geometry. Fields where these sands provide reservoir include the Maui Field, which came on line in 1978, as well as Pohokura and Tui, both of which are currently under development.

Routine seismic methods have proven to be useful in identifying the extent of shoreface sands at different levels, including the F Sands, D Sands and C Sands. The presentation will show how these methods have variously been applied.

The Canterbury Basin Petroleum System and Recent Exploration Results

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Two of the four wells drilled in the Canterbury Basin, offshore New Zealand were non-commercial gas-condensate discoveries, which not only prove an active petroleum system, but also suggest possible hydrocarbon source limitations. The Galleon-1 well revealed that the Galleon structure was not filled to spill and it also intersected intrusive volcanics at total depth. The extent of source and reservoir facies within the basin was not well constrained and neighbouring structures were complicated by possible intrusive volcanic cores. Mapping of these structures also was hindered by overlying, deep seafloor canyons and an inadequate seismic velocity dataset. In order to address these various issues and better define the prospectivity of the basin, a comprehensive geological and geophysical study was initiated. Existing marine seismic and magnetic data from the Canterbury Basin were reprocessed and interpreted in concert with geological and petrophysical constraints from the wells within the basin. These data provide for improved imaging of the Late Cretaceous coal measure source and reservoir facies, overlying strata and basement structure. Analyses include time and depth mapping of key seismic events, paleogeographic mapping, potential field modeling and inversion, and basin modeling. Results of these studies have advanced two prospects, Barque and Cutter, to drillable status. Barque is a giant structure in deep water with multi-billion barrel potential. Cutter is due to be drilled first in mid 2006 given its shallow water location and current rig contraints. Results of this well will have significant implications for the exploration potential of the basin.

Petroleum potential of the Great South Basin, New Zealand

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The large area of the Great South Basin (100,000 sq. km) and promising results from four of the eight petroleum wells make it one of the most prospective frontier basins around New Zealand. We present an overview of the tectonic setting

of the basin, including reconstruction of its Cretaceous rift position adjacent to the Canterbury, Taranaki and Gippsland basins; we summarise results from previous exploration and discuss the implications for basin architecture and petroleum potential; and we present new seismic reflection data from the basin. We conclude that large volumes of gas, condensate and oil have been generated within the basin and petroleum is likely to be trapped in some large accumulations.