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ORAL PRESENTATION

The Greater Tarakan Basin Area - New Plays and New Opportunities

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The greater Tarakan Basin area, including the Tidung, Berau and Muara sub-basins, has long been seen as a second-tier hydrocarbon province when compared to both the Kutei Basin / Mahakam Delta area to the south and the basins of Northwest Borneo: the Luconia and Baram-Balabac Basins. While it is unlikely that the Tarakan Basin area resources will ever eclipse those two large hydrocarbon provinces, a continuing string of modest discoveries does suggest that the Tarakan Basin area has more potential than previously believed. The focus of this presentation will be on highlighting the potential of a possible new play in the Tarakan Basin using plate tectonic models, regional geology, and global analogs.

The greater Tarakan Basin area is thought to have formed in the Early Eocene in response to back-arc extension driven by Pacific slab rollback [1]. This same tectonic event also caused the opening of the Makassar Straits / proto-Sulu Sea and the formation of the Kutei Basin. However, compared to the largely orthogonal extension associated with the Kutei Basin formation, current plate models along with supporting regional geologic data suggest a slightly oblique or transtensional opening of the greater Tarakan Basin Area.

Basins that form through pure transtensional extension typically have dip profiles with abrupt changes in beta factor and associated narrow shelves with steep slopes. The narrow shelf with limited extension provides for only minor accommodation space for post-rift sediments. This geometry lends itself to the formation of thick turbidite deposits on the mid and lower parts of the paleo-slope if sufficient clastic supply is present. The steep slope can result in turbidite sands becoming detached from their (subsequently) mud-filled feeder systems, leading to more effective traps. While the Tarakan Basin does not appear to have a purely transtensional origin, similar depositional patterns can be expected from basins with more oblique opening styles.

The historic play-type for the Tarakan Basin has been oil and gas reservoired in topset fluvio-deltaic sands belonging to the Late Miocene Tabul and Plio-Pleistocene Tarakan formations [2], sealed by interbedded deltaic shales in a variety of largely structural traps, often where growth faults are heavily modified by later wrench-induced uplift and inversion [3]. Hydrocarbon charge has been linked to Middle to Late Miocene age paralic coals and mudstones with some lacustrine influence [4]. The more recently opened deepwater play in the Tarakan basin has (so far) been focused on turbidite reservoir equivalents of the shelf play, targeting foldbelt traps with reservoirs in either pre / syn-kinematic or onlapping post-kinematic deposits. Hydrocarbon charge in the deepwater play is thought to be similar to the historic shelf play, though calibration is lacking.

Outside of the Muara sub-basin, the pre-Late Miocene section beneath the shelf and slope of greater Tarakan Basin is generally poorly imaged on seismic and has almost no well penetrations. However, using plate models and well data from the inner shelf and onshore, a history of the area can be described. The post-rift phase from Middle Eocene through to approximately Early Miocene was a period of relative quiescence dominated by carbonate formation and deposition on the shelf and minor shale and marl deposition on the slope and abyssal plain. The tectonics of the region changed in the early Middle Miocene with the onset of collision of the northern extension of Australia with Sundaland and the uplift and inversion of Borneo, including the Sabah Orogeny [5]. This tectonic activity is illustrated in the Tarakan Basin by a Middle Miocene clastic pulse (Meliat / Latih Formations) and the development of at least one, if not multiple unconformities. Whilst not constrained by the limited well data for the Middle Miocene, it is reasonable to assume that as in other narrow shelf basins, the Middle Miocene and subsequent clastic pulses would have delivered turbidite sands onto the paleo-slope. Hydrocarbon charge for these speculative turbidites could come from redeposited time-equivalent coals documented updip in the Berau Basin [6].

Later tectonic activity in the greater basinal area, especially the onset of collision of the Sulu-Zamboanga Arc with Borneo (Semporna and Dent Peninsulas) beginning in the Late Miocene, could be a positive for the pre-Late Miocene turbidite play by creating structural traps on what may have been a largely unstructured paleo-slope. However, excessive tectonic activity could result in trap breach or highly faulted highs, at least in certain locations. Historic earthquake data highlights the ongoing tectonics in the greater Basin area and suggest that trap integrity will need to be reviewed carefully.

Reservoir quality will also be an area that needs careful and localized (space and time) review as the provenance of Tarakan Basin clastics varied with changes in onshore tectonics. Work on outcrops of the Middle Miocene Latih Formation sandstones in the Berau sub-Basin [7] indicates that these potential updip equivalents of outboard turbidites are predominately litharenites with moderate to low porosity.

While the area where this new (paleo-)slope structured onlap turbidite play may be present is not large, global analogs suggest that If all play elements are present then significant volumes may still be waiting to be found. As part of this play could exist in present-day shelf water depths, the economics for future development of any discoveries would be favorable.

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