First Oil Discovery of Eocene Meta-Sedimentary Basement, Offshore Sarawak, Malaysia

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Abstract

Basement is a relatively rare exploratory objective due to its complexity and is often economically inviable especially in a deep basin. Taking the advantage of basement-high setting, the first basement exploration campaign in Eastern Malaysia was planned as part of initiatives in testing new plays and reviving the local exploration activities. The prospect is located in Tatau Half-Graben sub-province in offshore Sawarak, a known area for low BTU gas and high concentrations of N_2 and CO_2.

WELL-1 is targeting Eocene fractured metasediments as the primary target and the younger Miocene clastic successions as the secondary target. The basement is believed to be metamorphosed deepwater facies equivalent to the Belaga Formation in onshore Sarawak. Regionally, the area is dominated by a series of NW-SE oriented, half-graben structures bounded by NNW-trending extensional normal faults. The extensional deformation occurred in Early Miocene and this area remained high which provided sediments to neighboring provinces. The area also underwent minor inversion and formed small anticlinal traps which could be additional exploration targets.

WELL-1 was drilled to the planned depth of 1,234 m, penetrating 300 m into the fractured Late Eocene Pre-Cycle I Basement. The well discovered significant oil column in the fractured-Basement, on top of oil and gas discovery with low CO_2 presence in the secondary objectives. Formation evaluation in WELL-1 managed to acquire image logs, pressure data, and most important the first basement oil sample in Eastern Malaysia. Preliminary geochemical analysis suggests a low gravity API of 39.6° API. The image and acoustic logs provide critical information for fracture characterization which include rock texture for facies analysis as well as fractures properties.

Oil discovery in WELL-1 has given several implications for regional and sub-regional exploration understanding by proving the active and working petroleum systems. Presence of oil-prone source rock opens up a new exploration objective in a place known for its gas deposits. Advanced basin modelling would be critical to understand the extension of the oil and finding similar localized half-graben with same capacity as a kitchen.

For an area deemed as not prospective, basement oil discovery will recraft the whole exploration landscape and bringing up the prospectivity to a new level.