Fractured Basement in Mature Basin Exploration: New Play Analog in Central Sumatra Basin

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ABSTRACT

Basement rocks are any metamorphic or igneous rocks, regardless of age, which are unconformably overlain by a sedimentary sequence. Basement rocks led by faults to creation of fracture network underlying a sedimentary basin are fractured basements. Most mature basins in Indonesia are assumed to have little to no potential since they have reached their peak and start to decline in production. To mention, several basins in Indonesia categorized as mature are Kutai, West Natuna, South Sumatra, and Central Sumatra. As the result, a number of abandoned mature basins are increasing along with the depletion of national fossil fuel production. Fractured basements, however, are possibly to bear significant amount of hydrocarbon under the right condition. Though hydrocarbon is not in the rocks, it will be accumulated in the cracks between the rocks. Thus, exploration and exploitation of hydrocarbon in fractured basements of Indonesia mature basins are compulsory. Basement rock considered as a non-productive reservoir because of its limited data. Reservoir in the basement is one type of reservoir that begins to be seen and is of particular concern in the oil and gas exploration because it has proven its success. Central Sumatra basin is one of the mature basins that have made the oil production. One example of field in Central Sumatra basin is Beruk Northeast field. The Beruk Northeast oil field in Central Sumatra was discovered in 1976 by the drilling of Beruk Northeast No. 1 which tested 1680 BOPD from Pre-Tertiary basement. Beruk Northeast shows that pre-tertiary basement is a feasible exploration objective especially mature basin exploration in Indonesia. Central Sumatra basements rocks are uppermost Devonian unmetamorphosed greywackes (“pebbly mudstones”) containing abundant angular to subrounded clasts of grantic (Uppermost Devonian), volcanic, and metamorphic composition; Late Carboniferous granite containing muscovite, albite, and microline (Eubank and Makki, 1981). Several scientific publications and literatures were collected to gain the information about fractured basement characteristics, chiefly Central Sumatra’s. This paper centers on Central Sumatra basin as an analogue to other mature basins in Indonesia. Central Sumatra basin is believed to be an ideal analogue due to its age that indicates good maturity level and occurence of the hydrocarbon in its fractured basement. Central Sumatra basin as the subject of analogue will provide important information about basement configuration. Basement configuration data that are used as analogues include age of rocks, lithology, and fault. The use of basement configuration as analogue data is intended as an alternative way for exploration and exploitation considerations due to the lack of basement rock data. The use of these data is discussed with reference to selected previous papers. Decision of abandoning mature basins in Indonesia is needed to be re-examined since under the right condition, mature basins will most likely to have hidden potential of hydrocarbon in their basement rocks. Hydrocarbon bearing basements are always incidental, however, by analoging fractured basements of mature basins with proven hydrocarbon reserves to target mature basins, the level of certainty to keep exploring, developing, and exploitating particular mature basins will guarantee the decision-making.