Reference Studies: Probability of Shale Gas in Mature Basin, Case Study from Central Sumatra Basin

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ABSTRACT

Shale gas is natural gas that is found trapped within shale formations. It has very low permeability and, without employing fracturing technology, production well flow rates would be minimal. Gas can be stored in the shale by different mechanisms: within the pores of the rock, within naturally occurring fractures, or adsorbed on to the shale minerals and organic matter within the shale.

The Head of Geological Agency for Energy and Mineral Resources Ministry, R. Sukhyar, in September 2011, estimated Indonesia has 574 TCF of shale gas resources (Petromindo,2011), greater than Coal Bed Methane with 453 TCF and conventional natural gas with 153 TCF.

Indonesia has many oil producing mature basins. These basins have thick shales with total organic content (TOC) offer attractive opportunities as unconventional gas for the future. One of big productive basin is Central Sumatra basin. Central Sumatra basin is a complex basin which several lithology shale for develop shale has, lithology shale have been identified: Brown shale formation (Pematang group) and Telisa formation (Sihapas group).

Brown shale formation part of the Pematang group was deposited in a lacustrine environment and has a very narrow activation energy distribution (Sundararaman et al., 1988). Brown shale formation represents a rifting phase that began in the Eocene – Oligocene (Heidrick and Aulia, 1993). Shale in Brown shale formation have potential to develop shale gas based on geochemistry data. Total organic carbon value around 2%-11%, hydrogen index 300-700 (kerogen type I and II), oxygen index 15-35, Temperature max 430degc – 445degc.

Telisa formation part of Sihapas Group represents a regional marine transgression that began in late Oligocene-Early Miocene, after deposition of the Pematang. Telisa Formation has been suggested as a source for Central Sumatran oil (Roezin,1974 and Wongsosantiko, 1976). It was deposited during a period of maximum marine transgression. It predominantly consists of shales that were depositional environment toward a shallower marine environment in the relative “middle’ of the basin (Darji Noeradi, et al., 2010). Based on data geochemistry, TOC contents 0.9-1.2 wt.% with S2 yields for immature samples typically being less than 3 mg HC/g rock, although an occasional sample may achieve a yield slightly greater than 4 mg HC/g rock. Vitrinite reflectance (Ro) 0.42-0.9%. The kerogen contained in these shales is largely gas-prone (type III), with some samples containing a mixture of type II-III kerogen.

Based on geochemistry data from brown shale formations and Telisa formations, Brown shale formations has a better potential to develop shale gas than Telisa formation. However, to make sure this statement, there must be additional data (vitrinite reflectance, clay content, and brittleness) from data shale in Brown shale formation to be more convincing.

In this study using reports and literature study from several papers and various journal related to shale gas and geochemistry data of Brown shale formation and Telisa formation, Central Sumatra Basin for references.