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ABSTRACT

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New Insight into the Petroleum System in the East Java – South Makassar Area

The paper contemplates a vast area; from the West Sulawesi Foldbelt and South Makassar Basin in the eastern part of the area to the North East Madura Platform, and Bali/Lombok Sub-basins in the southwestern part of the area. Except for an area around the Pagerungan Gas Field (2-3 tsf), the area is largely under-explored to non-explored, and it is believed that in spite of a relatively high number of unsuccessful wells over the last 30 years, the area may still have considerable hydrocarbon potential.

The sub-basins of the East Java Sea and South Makassar area are part of an extensive and complex system of basins, which have developed around the SE margin of the Sunda Platform. Over a large part of the studied area the underlying Pre-Tertiary basement comprise igneous intrusives, altered volcanics and highly deformed meta sediments. The age of the basement rocks range from Jurassic-Late Cretaceous and which locally are up to 4-5 km thick. A back-arc extension, in Paleocene-Eocene times, formed a series of basins around the SE part of the Eurasian Plate in which three distinct trends are recognized. Firstly, in the South Makassar-Central Deep area, the main fault systems are orientated in NE-SW direction, whereas, in the central southern part of the area, along the Sakala-Lombok Ridge, the fault-systems are predominantly E-W trending. Finally, the area offshore SW Sulawesi is characterized by an overall NW-SE fault trend.

An important phase of inversion, in particular along the Madura/Kangean wrench zone, was initiated probably as early as the Early Miocene, by reactivation of the older extensional faults, where some of the Eocene basins became inverted. Other areas like South Makassar Basin where little affected by the inversion. The inversion happened in several phases through Mid/Upper Miocene and Pliocene, to present time, where the Flores Sub Basins represent an active back arc development today.

A large number of leads are identified, such as; Ngimbang carbonate and clastic plays over the Lombok Sub Basin; promising Eocene clastics and potential Late Oligocene carbonates plays in the South Makassar area, which are defined by extensional fault blocks, as well as mildly deformed inversion structures; and low relief basement plays to the north and east of the Sakala Fault system. Viable source rock kitchens, with the capacity to generate sufficient hydrocarbons, as well as lateral migration represent one of the main challenges and uncertainties in this area. Some areas like the South Makassar and part of Lombok Basins are believed to have

viable source rocks present locally, while other areas are dependant, to varying degrees, on long distance migration. The discovery of the Bukit Tua oil and gas field on the Ketapang PSC, as well as gas (and some fluids?) in the old JS5-1 well on the NE Madura Platform demonstrates that long distance migration can take place if carrier beds are present. Some of the dry wells in this area also reflect a problem with the timing of the generation of hydrocarbons and the timing of the formation of the traps. Both lateral and top seal represent an additional element of risk in this area, as demonstrated by several dry wells such as the Crytsal-1 and ST Alpa-1.