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DEEPWATER PETROLEUM SYSTEM AND HYDROCARBON POTENTIAL OF DEEPWATER BRUNEI

PGS in co-operation with the Brunei Government is in the process of acquiring a 10,000 sq km Non-Exclusive MC3D seismic survey in the EEZ deep-water area of Brunei. This area is part of Brunei's first deep-water license round that was opened for tender on 29 January 2001. The closing date for submitting bid is 1 November 2001. Seismic acquisition of the 3D survey commenced on 11 August 2000; the first 3000 sq km of the data, which is located in the southeastern part of the survey area was made available from late December. The remaining 7000 sq km will be delivered in part volumes during acquisition with the entire 10 000 sq km being completed in May this year.

A total of 22 wells which have penetrated turbidite reservoirs have been drilled in Brunei waters. Most of these wells were however drilled on the present day shelf setting. The Merpati/Meragi discoveries in 400-500 m water depth represent the only true deep-water wells. These also probably represent the only turbidite discoveries which are commercially feasible to date. The Merpati-1 well proved the presence of a minimum gas column of 605 m, as well as some fluids in a combined structural/stratigraphic trap in 10-15 m thick turbidites of Lower Pliocene age.

The initial review of the first 3000 sq km 3D survey located in an upper slope setting has confirmed the presence of a large number of elongated anticlines in more than 1000 m water depth. These structures appear to have been formed as toe-thrust anticlines, related to growth faulting, influenced by depositional loading along the shelf margin and have several hundred to more than a thousand meters of relief. A few of these structures have also developed into shale ridges, which are piercing or uplifting the seabed. This is caused by mobilization of over-pressured shales. Most of these anticlines define large closed structures, thus representing excellent play types, either in pure structural trap configuration or in combined structural / stratigraphic traps, due to pinch- out, both up-dip and laterally of the reservoirs.

There are further numerous sequences in the data, which exhibit high amplitude characters, suggesting that these represent different types of submarine fan systems. Some of these are, particularly in the shallow section in the southeastern part of the survey area, representative of restricted, ponded type fan systems, deposited in small sub-basins between the ridges. These represent channel-levee complexes, crevasse splay deposits and small fan lobes. The movement on most of the anticlines is very late and it appears that most of the submarine fan complexes pre-date the tectonic movements and are therefore deposited over a large numbers of the highs. Some of these fan complexes also define large, unconfined fan lobes.

The mechanism for hydrocarbon generation and migration remains unclear in the deep water. Nevertheless, the data has revealed the presence of strong amplitude



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anomalies over some of the highs, velocity “sags”, as well as possible DHI's, which indicate the presence of hydrocarbons in the area. Further, the discovery of the Merpati/Meragi, as well as other deep-water discoveries along the Sabah province, such as Kamansu East, Kamansu East Uplift, strongly suggest a working deep-water petroleum system in Brunei. The hydrocarbons are most likely sourced from redeposited coals and other land derived organic matter that have been brought out into deepwater during relative low stand periods. There may also be a contribution from a marine source rock system.