Day: Wednesday 26 April **Session: 1**
Time: 09:45am

Petroleum Exploration Offshore Myanmar: History and Future Potential

Andy Racey
Andy Racey Geoscience Ltd

Offshore Myanmar covers an area of 447,033 sq km and is subdivided by MOGE into three main east-west trending areas: the Rakhine, Moattama and Tanintharyi. Myanmar is the largest country in mainland Southeast Asia with a land area of 676,577 sq km and an offshore area to the 200km territorial limit of 510,355 sq km (Fig. 1). Hydrocarbon exploration offshore did not start until 1969 and much of the offshore, especially the deep water is unexplored. Significant breaks in exploration activity caused by a combination of factors including economic sanctions and lack of access to technology have led to both limited stratigraphic penetration and, to very little deep water exploration. Four large gas fields are currently producing offshore Myanmar (Zawtika, Shwe/Shwe Phyu/Mya, Yadana and Yetagun) with another (Aung Sinkha) under development and these occur in four different geological settings. The locations of the main gas and oil fields are shown in Figure 2 together with the main regional tectonic elements.

Two large Neogene tropical deltas drain into offshore Myanmar. The Ayeyarwady Delta currently drains around 66% of onshore Myanmar and drains southwards into the Gulf of Martaban whilst the Ganges/Brahmaputra delta forms the Bengal Fan in the offshore and covers an area of around 171,361 sq km of the Rakhine Basin offshore Myanmar. Both deltas are virtually unexplored beyond the 200m isobaths whilst dry biogenic gas is the likely dominant phase especially the deeper water as evidenced by the Shwe Field and recent Shwe Yee Htun-1 and Thalnwin-1 discoveries in the Rakhine offshore. The offshore yet-to-find resources may be hundreds of TCF if comparisons with other Neogene deltas such as the Nile are considered valid.

The Rakhine deep-water area is mostly unstructured and is filled with sediments input from the Brahmaputra river and, from the uplifted Indo-Burman Ranges to the east. Biogenic gas is produced from Early Pliocene deep marine sandstones in the Shwe, Shwe Phyu and Mya fields and has recently been discovered in the Thalin-1 discovery. In the south, biogenic gas has been discovered in the Shwe Yee Htun-1 and Pyi Thar-1. In the shallow (shelfal) Rakhine the key issues/risks are likely to be small trap sizes due to recent structuring and significant inversion. The deep-water area is mainly unstructured away from the base of slope and traps (if present) would likely be stratigraphic or subtle stratigraphic/structural traps whilst the reservoir risk is likely to increase with increasing distance from shore.

The Moattama region can be subdivided from west to east into four broadly N-S trending sub-regions. (i) the southern continuation of the Rakhine Basin, (ii) a western basement structural volcanic high area which includes the Yadana and M8 Highs and the Preparis and Cocos sub-basins, (iii) the Martaban Basin and (iv) an eastern basement high (Tanintharyi Shelf). The main depocentre is the Martaban Basin where biogenic gas charges shallow

Pliocene and lower Pleistocene sandstones in the Zawtika Field and its nearby satellites where the delta sequence is thickest. Thermogenic gas charges Lower Miocene shallow marine carbonates in the Yadana Field to the west on the volcanic high at the edge of the Martaban Basin. Reservoir presence/quality is a risk in the central and southern parts of the main Martaban Basin whilst in the northern part excessive sand presence may represent a seal risk. In the western Moattama source charge is a risk for structures located too far from the main mature Martaban Basin source kitchen area to the east.

The Tanintharyi region is bordered to the east by the Thai-Myanmar Peninsula and to the west by the dextral Sagaing Fault system. It comprises an inboard Late Oligocene rift system overlain by Miocene-Recent clastic sediments, whilst the deep water basinal section of the Martaban Basin towards the west is undrilled and poorly known. The upper part of the sequence (Upper Miocene to Recent) likely comprises fine-grained distal Thanlwin/ Ayerawaddy delta sediments. The Yetagun Field is located on the shelf, and produces thermogenic gas and condensate from Lower Miocene shallow marine sandstones. The shallow water Tanintharyi shows little evidence of a working source rock south of Yetagun whilst the deep-water Tanintharyi is undrilled with the most likely exploration targets being deep marine fans where a key risk will be reservoir presence /effectiveness due to the distal nature of the sediments.

The success of the recent 2013 licence round and the subsequent large amount of 3D seismic being acquired (especially in the deep water) coupled with the drilling of recent deep water exploration wells is set to bring about a step-change in our knowledge and geological understanding of this region. Recent successes in the Rakhine Basin include the Thalin gas discovery in the AD7 Block west of the Shwe Field at the northern end of the basin in 836m of water (TD 3,034m) and the Shwe Yee Htun gas discovery in the A6 Block at the southern end of the basin in around 2000m water depth (TD 5,366m).

For a more detailed overview of the offshore petroleum geology the reader is referred to Racey & Ridd, (2015a-e) whilst the onshore including the fields shown onshore in Figure 2 are discussed in Ridd & Racey (2015a-b).

Racey, A. & Ridd, M.F. 2015a. Chapter 6 Myanmar Offshore Petroleum Overview. In: Racey, A & Ridd, M.F. Petroleum Geology of Myanmar, Geological Society of London Memoir, 45, 57-62.

Racey, A. & Ridd, M.F. 2015b. Chapter 7 Petroleum Geology of the Moattama Region, Offshore Myanmar. In: Racey, A & Ridd, M.F. Petroleum Geology of Myanmar, Geological Society of London Memoir, 45, 63-82.

Racey, A. & Ridd, M.F. 2015c. Chapter 8 Petroleum Geology of the Tanintharyi Region Offshore Myanmar. In: Racey, A & Ridd, M.F. Petroleum Geology of Myanmar, Geological Society of London Memoir 45, 83-92.

Racey, A. & Ridd, M.F. 2015d. Chapter 9 Petroleum Geology of the Rakhine Region, Offshore Myanmar. In: Racey, A & Ridd, M.F. Petroleum Geology of Myanmar, Geological Society of London Memoir, 45, 93-108.

Ridd, M.F. & Racey, A. 2015. Chapter 4 Onshore Petroleum Geology of Myanmar: Central Burma Depression. In: Racey, A & Ridd, M.F. Petroleum Geology of Myanmar, Geological Society of London Memoir, 45, 21-50.

Ridd, M.F. & Racey, A. 2015. Chapter 5 Frontier Onshore Petroleum Basins of Myanmar.

In: Racey, A & Ridd, M.F. Petroleum Geology of Myanmar, Geological Society of London Memoir, 45, 51-56.

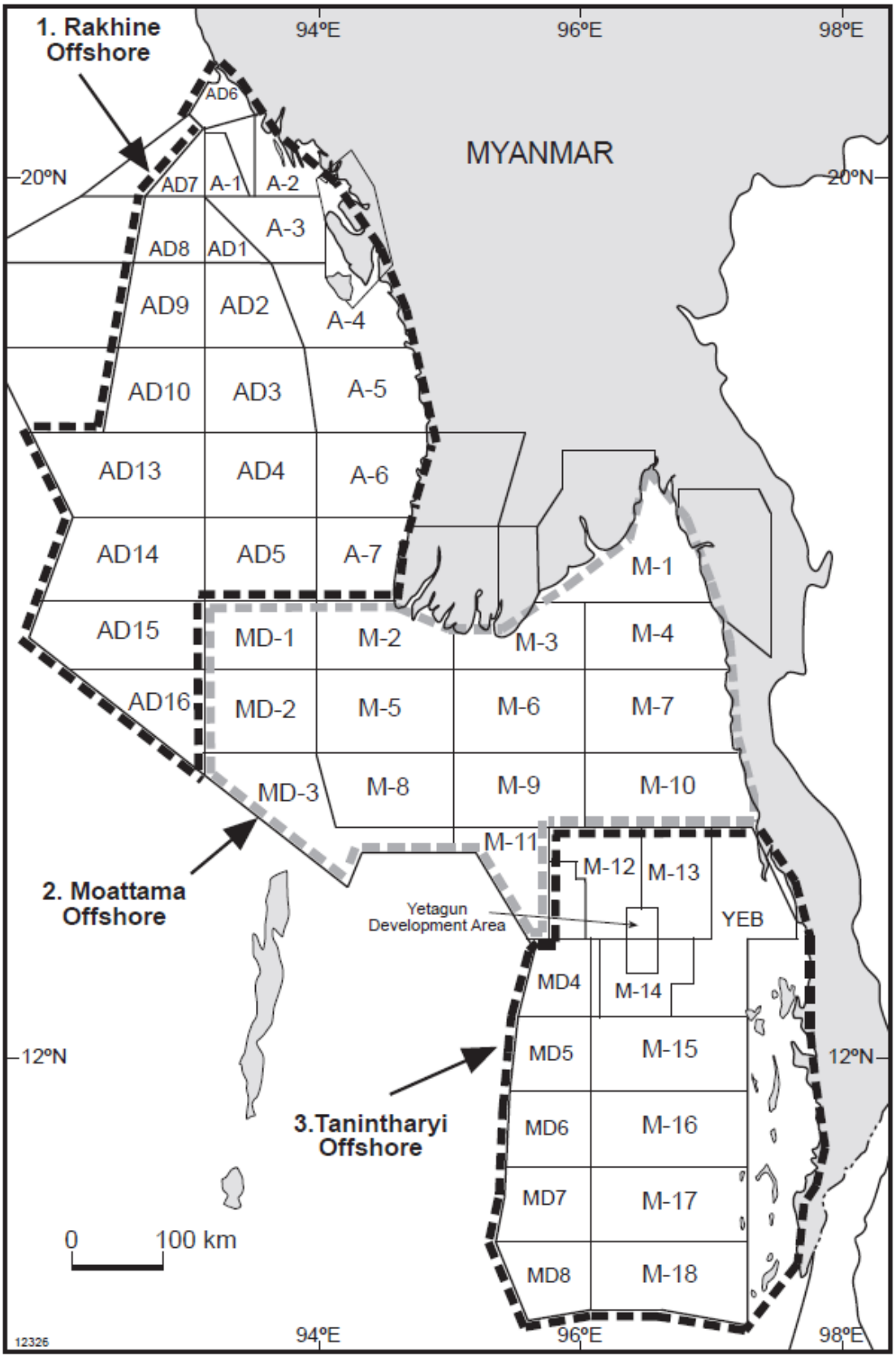

Figure 1: Offshore Myanmar offshore regions and blocks (from Racey & Ridd, 2015)

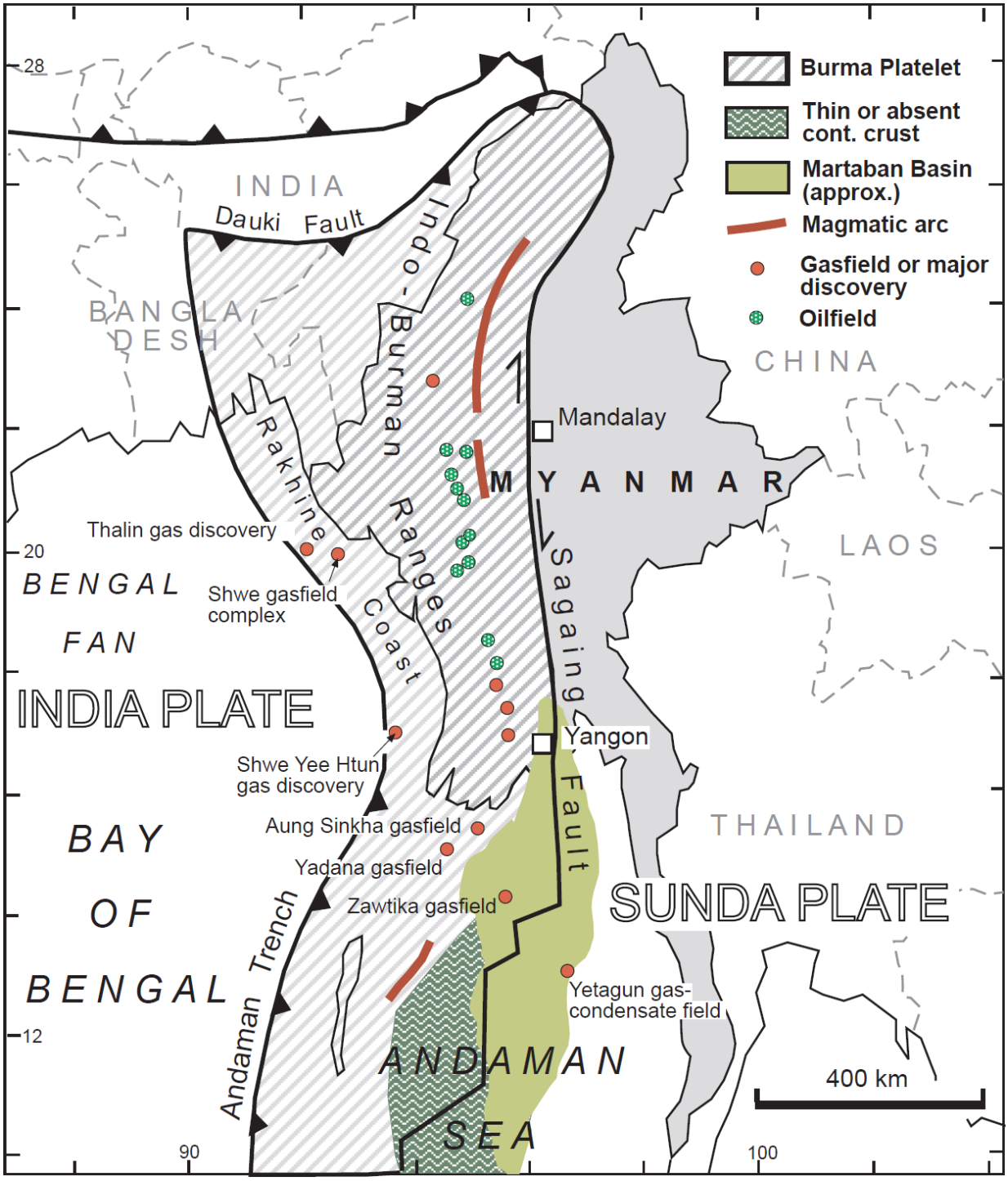

Figure 2: Myanmar tectonic elements and main onshore and offshore hydrocarbon fields (modified from Racey & Ridd, 2015).