Hydrocarbon Potential in Offshore Bangladesh: Current Status and Future Prospects

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Introduction

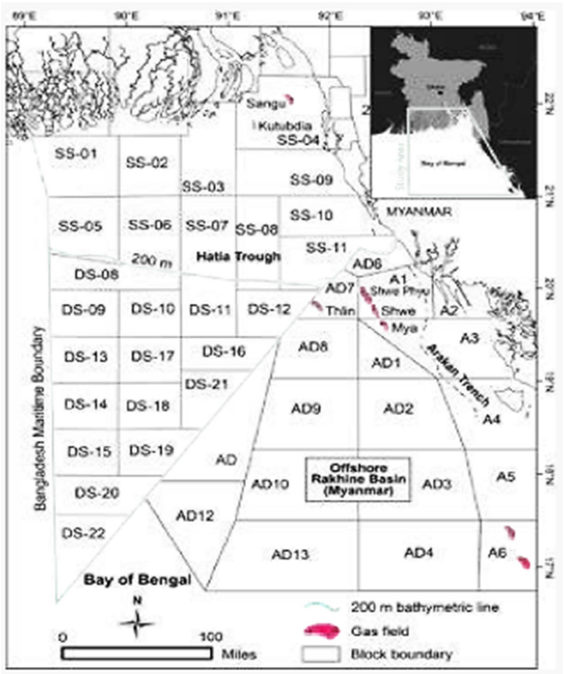
The Bay of Bengal, one of the largest bays in the world is surrounded by several petroliferous basins in India to the west, Myanmar to the east and Bangladesh to he north. Among these petroliferous basins, the Krishna-Godavari and Mahanadi offshore basins are located along the eastern coast of India, the Rakhine offshore basin on the western coast of Myanmar and the Bangladesh offshore basin along the southern coast of Bangladesh. Although the Krishna-Godavari Basin in India and the Rakhine offshore basin in Myanmar have been extensively explored and are well known for their prolific hydrocarbon (i.e., oil and gas) reserves, Bangladesh offshore basin has been little explored and yet discovered it’s full petroleum potential (Shamsuddin, 2022). Exploration drilling in offshore Bangladesh is almost nonexistent and the exploration data is not sufficient to analyze the hydrocarbon reserve. However, from the similar deltaic nature, depositional history and close vicinity of Indian and Myanmar's offshore basins, it seems that Bangladesh's offshore areas might be rich in hydrocarbon. Nevertheless, as the sole national exploration company-Bangladesh Petroleum Exploration and Production Company Limited (BAPEX) cannot explore hydrocarbon offshore, Bangladesh entirely relies on the international oil companies (IOC). The efforts to attract IOC companies for offshore (i.e., shallow and deepwater) explorations in Bangladesh part were not fully materialized for two important reasons. One is the low hydrocarbon price in the international market in the last few years discouraged IOC companies from expanding exploration in Bangladesh's offshore territories. The second important issue is the maritime boundary dispute between Bangladesh and Myanmar in the east and between Bangladesh and India in the west deterred the IOC companies from carrying out full-scale exploration near the disputed water previously. As the

maritime boundary disputes were settled through the International Tribunal for the Law of the Sea (ITLOS) in 2012 and 2014 with Myanmar and India, respectively, Bangladesh now has undisputed rights to the natural resources beneath the seabed out to 200 nm and beyond. Within its maritime boundary (1,18,813 sq. km) in the Bay of Bengal, Bangladesh divided the area into 26 blocks (Figure 1). Among these offshore blocks, 11 are in shallow water with a water depth up to 200 m, and 15 are in deepwater with a water depth of more than 200 m to a maximum water depth of about 2500 m (Chowdhury et al., 2022).

Current State of Offshore Hydrocarbon Exploration

In terms of the petroleum system, the northern offshore part of the Bay of Bengal within the Bangladesh territory is mostly covered by the Hatia Trough, which is a proven petroleum province (Hossain et al., 2019). Not all the anticlinal and stratigraphic traps of the offshore part of the Hatia petroleum system have been explored yet, and the western part of the system is completely unexplored. In the Bangladesh offshore part, the first exploration project was launched in early 1974 and several IOCs were engaged in exploration in the offshore blocks. In 1978, the IOCS abandoned the blocks and left after only a very small gas field discovery (ie., Kutubdia) and returned after decades. So far, two offshore gas fields have been discovered in the eastern offshore part of Bangladesh and these are the Kutubdia (1976) and Sangu (1996) gas fields. A total of 21 exploratory wells were drilled in the offshore area of Bangladesh by the end of 2020 and all these wells were drilled by the IOC in the shallow water (Imam, 2022).

The Kutubdia gas field is located in the offshore shallow water block SS-04. The gas field is estimated to have recoverable gas reserves of around 45.50 BCF, but an inadequate gas demand at the time of discovery might have prompted the IOC to leave the field undeveloped, which is yet to be developed. The Sangu gas field located in block SS-04 was the first offshore and is the only offshore gas field in the country which has been produced



and had a calculated initial confirmed GIIP of 1612 BCF (Shahriar et al, 2020). This gas field is a large-scale anticline trap cut by numerous channels and canyons. After having produced about 487 BCF of gas, the field was shut down in 2013 due to unexpected low reservoir pressure. However, recently the exploration data has been re-evaluated and re-interpreted to assess the total number of reservoir horizons and the hydrocarbon volumes remains and to decide whether it is possible to further production from this field in the future (Shahriar et al., 2020). The results suggest that the recoverable reserves remain about 358 BCF and could be produced by employing advanced hydrocarbon production techniques. The results also indicate that the reservoirs in this field may be compartmentalized by channels or

faulting, thus limiting the drainage areas. Hence, a 3D seismic survey is necessary to accurately map this gas field and locate the future. development/ production wells. Recently, the government of Bangladesh is planning to convert this offshore gas field (i.e., Sangu) into an underground storage area for the imported liquid natural gas (LNG), where 487.91 billion cubic feet of gas can be stored (Khan, 2022).

Prospects in Deepwater Blocks

As of today, 15 deepwater blocks are covered by very limited 2D seismic surveys without any explosatory drilling. On the other hand, exploration activities in the adjacent deepwater areas of the Rakhine Basin of Myanmar and the Krishne Godavari Basin of India, started quite a long ago and have significant success with oil and gas discoveries (Shamsuddin 2022). The northern part of the Bay of Bengel is home to the largest flio-detaio-slope fan complex in the world known as the Bengel Fan. Bangladesh's 15 deepwater blocks covered the north-central part of the Bengel Fan. The Rakhine Basin of Myanmar and Krishna Godavari Basin of India are located on the east and westem peripheries of the Bengal Fan respectively Several major discoveries have been made in the Rachine Offshore Basin Among them. Shwe Phyu Shwe and My shallow water and Thin (deepwater as divers are prominent. All these gas fields are adjacent to Bangladesh deepwater block 06-12. Though seated by the nationa boundary, the geology of the most ofshore blocks of the Rakhine Basin is genetically similar to the southeastern offshore blocks of Bangladesh (Bowes et al, 2019). Similar play fairway thands and deepwater architectural elements are most likely to be present in adjacent Bangladesh’s deepwater blocks. These deepwater architectural elements include submarine chanels, confined slope channel complex systems, isolated channels, aggradational channel levee complexed frontal splays and mass-transport complexes (Ma et al., 2020). All such similarities and available geological evidence suggest that Bangladesh shallow and deepwater blocks have a good to excellent potential of being gas-rich, particularly in the area adjacent to the Rakhine Basin of Myanmar.

Both thermogenic and biogenic gas is present in the offshore area of Bangladesh Naturally occurring oil seeps have been identified on St. Martin's Island and multiple gas chimneys have been recognized in seismic surveys in the offshore area as indicative of an active petroleum system (Shamsuddin 2022). Furthermore, the initial results of a recent study suggest evidence of gas hydrate occurrence in offshore Bangladesh at depth 250-440 m below the seafloor where water depth ranges from 1300-1900 m (Monteleone et al, 2022). Further research and exploration in tatives need to be taken to identify new gas hydrate reservoirs, their spatial distribution and the quantity of the total reserves within the Bangladesh meritime boundary. Against the backdrop of depleting gas reserves, hardly any new discoveries and ever-increasing energy demand, is hydrates represent a potential prospects for the future energy security of Bangladesh. Now, the time has come to focus on hydrocarbon exploration in the vast offshore and accordingly, the government is awarding deepwater blocks to 10C to boost hydrocarbon explosion and production.

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