Precambrian Plays in Africa: The Ignored Exploration Targets

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ABSTRACT

In this study, we discuss all proven Precambrian-age reservoirs identified to date in Africa with the aim of establishing analogs between them and other geological provinces within the continent. Two play types are distinguished within the Precambrian-age reservoirs: the Fractured Basement Play and the Neoproterozoic Carbonate/Sandstone Play. The presence of hydrocarbons has already been established in both plays. Current estimations indicate that the reserves discovered to date in these plays are not negligible compared to the total recoverable reserves in Africa. Fractured Basement Plays in Africa are developed locally, mostly in rift basins, which rest unconformably on the basement or above a very thin pre-rift section. The best examples are the Gulf of Suez Basin in Egypt, the Sirte Basin in Libya, the Bongor Trough in Chad, the Melut Basin in Sudan, East African Rift System (Western Branch) in Uganda and the Lower Congo Basin in Angola. The reservoirs consist of fractured and weathered granitic rocks, sealed and sourced by the overlying pre-rift and syn-rift sequences. Production has been established in Egypt, Libya and Chad. Despite limited reserves, basement reservoirs have recently been considered as important targets in countries such as Chad and Sudan. Therefore, more exploration activity can be expected within the Cretaceous rift basins of Chad and Sudan, and Tertiary rift basins of Uganda and Kenya (EARS). The Neoproterozoic Carbonate/Sandstone Plays are only proven in the Taoudeni Basin, where the reservoirs are fractured stromatolitic carbonates of the Atar Group. Source rocks and seals are provided by the intraformational shales of the Atar Group. Analog plays might be developed in other intracratonic basins, such as the Taoudeni, Zaire, Voltaian, Okavango, Owambo and Nama-Kalahari basins. Indeed, good indications, such as oil seeps, hydrocarbon shows, gas blow-out in one well and analysed samples suggest the possibility of working petroleum systems in some of these basins. In addition to the proven carbonate reservoirs, sandstones also occur. However, they are in places too indurated to form satisfactory reservoirs except where fractured. These basins are frontier areas and, therefore, they will carry the challenges related to high geological risk and high exploration/development cost.