

Shale-oil/gas potential of the Jurassic Sargelu and Naokelekan Formations in southern Iraq

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ABSTRACT

The Middle Jurassic Sargelu and the overlying Upper Jurassic Naokelekan / basinal Najmah Formations could represent the best potential shale-oil/gas plays in southern Iraq. In addition to their organic richness and favourable maturity, the presence of lower (Mus and Adaiyah) and upper (Gotnia and Hith) evaporites can act as fracture barriers and regional seals for these unconventional reservoirs.

This study is an attempt to quantify the Sargelu and Naokelekan formations with respect to their thickness, lateral extent, organic richness and petroleum generation potential in southern Iraq. It investigates their thermal and maturity evolution and the timing of petroleum generation with a 3D petroleum-systems modelling, in order to estimate the generated, retained and expelled volumes of petroleum. The main criteria for shale-oil/gas plays were considered to be: organic richness; kerogen type; maturity; thickness; mineralogy (fracability and natural fracturing); the presence of upper/lower barriers and the concept of the amount of retained (or unexpelled) oil and gas.

In Iraq, for example, the area of wet-gas mature Sargelu is close to the Iranian border, within a 30–90 km-wide zone running from the Basra/Amara fields in the southeast towards the central Iraq fields, with a total area of around 20,000 sq. km. The depth of burial in this zone is between 5,300–6,500 m. On the other hand, the area of oil mature section is around 60,000–75,000 sq km, representing a 120–170 km-wide zone to the west of the previous zone. The peak oil (0.7–1.0 %Ro) to late oil (1.0–1.3 %Ro) mature area includes the southern Basra area, the areas between Nasiriyah and Wasit provinces, and towards the north up to the Hamrin field. The oil-mature section is at 3,300–5,300 m depth in the Mesopotamian Foredeep Basin, representing a potential shale oil play.

Although the unexpelled oil-in-place is difficult to estimate with high accuracy, the oil-mature areas of the Sargelu in Iraq may contain un-expelled oil-in-place of 1,300–2,500 BBOE using an expulsion efficiency of between 40-75%.