

The Late Neoproterozoic to Lower Cambrian Hydrocarbon Potential of Northern Saudi Arabia

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ABSTRACT

Sediments of Neoproterozoic and Early Paleozoic age have seen little exploration activity in Saudi Arabia, with only a limited number of wells being drilled to reach these intervals. This is largely due to the perceived exploration risk of these petroleum systems. Recent work in integrating historic field mapping, regional studies, new field work and seismic interpretation, indicates that all the elements required for an active petroleum system exist in Saudi Arabia. Reconstructions of Gondwana suggest that by about 640 Ma (Ediacaran) the present day Arabian Plate had been formed to the northeast of the Arabian Shield. Following this terrain accretion phase, there was a period of extension during which sediments and volcanics were deposited. Preserved Ediacaran aged carbonates, at outcrop within the Arabian Shield, are organic rich and may provide potential source rocks in the subsurface. These sediments are believed to be of a similar age to those preserved in Oman (the Nafun Group). In Oman, extension during the Neoproterozoic-Cambrian resulted in the formation of rifts filled with thick Ara Group sediments, which include evaporites, clastics and siliceous organic-rich laminites. Similar successions have also been encountered in Pakistan and India. There is evidence that similar sedimentary sequences may also have accumulated within Saudi Arabia, although the paucity of subsurface drilling in the Kingdom so far negates a direct analog. By early Cambrian times, uplift of the Arabian Shield resulted in significant erosion and clastic sediment accumulation in depocenters to the east of the shield. The Siq Formation represents the product of braided stream and coastal environments. The overlying Burj Formation represents the first major marine transgression onto the Arabian Shield with marine carbonates accumulating toward the east and continental clastics in the west, proximal to the Arabian Shield. Together, the Siq and the Burj formations have the potential to possess effective reservoirs, and provide source rocks and cap rocks.