

New Tectono-Stratigraphy Based Plays in Eastern Saudi Arabia with Large Petroleum Potential

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ABSTRACT

Numerous main and complementary plays in the Arabian petroleum basin achieved a breakthrough in mapping large petroleum resources to bring eastern Saudi Arabia into a new exploration phase. The basin is characterized by multi-basement terranes separated by main faults. This created sub-basins with different subsidence rate above terrains. Mild extension tectonic phases in a wide passive margin setting created wide varieties of basin topographic complexities to control deposition of different facies simultaneously. Understanding and resolving the challenges of basin segmentation into mini-basins and superimposed tectono-stratigraphy created multi-opportunities of charge, reservoir and seals that in-turn unlocked a wide inventory of new plays. Integration and analysis of seismic data, particularly new attributes for identifying lineament and reservoir bodies, potential fields, and well data, led to this new paradigm. Results include tectono-stratigraphic plays along relay ramps in carbonate and clastic entry points, intra-source and seal subtle opportunities, pinch-outs of clastic reservoirs below sealing source rock, mega Paleozoic incised paleo-valleys, and high permeability fractures fault corridors. The uplift of the Arabian Basement Shield since middle Lower Cretaceous introduced a major delta plays of clastic reservoir laid in distal paleo-lows outside existing fields. These deltas are subject to bend folding orthogonal to regional east-west compression. A rim carbonate reservoir play surrounding fold traps created during Lower Cretaceous in the southeastern part of Saudi Arabia with a complex pattern due to differential subsidence. This play forms a unique tectono-stratigraphic opportunity sourced by hydrocarbons from the footwall basin of the Oman's convergent plate boundary. In conclusion, a new phase of implementing cutting-edge technologies in data analysis and integration led to adding large petroleum resources.