

Sequence Stratigraphic Framework and Exploration Concepts of Upper Jurassic Carbonate Reservoirs along the South Gotnia Margin, Northeastern Saudi Arabia

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ABSTRACT

The Gotnia Intraself Basin is characterized by multiple salt intervals and tight muddy carbonates from the latest Jurassic time. These massive salt beds (Gotnia Formation) are underlain by Najmah source rock organic- rich facies, and overlain by Hith Formation anhydrite deposits. A shallow-water carbonate platform was developed along the south Gotnia margin, where grainier carbonates and intercalated evaporates (e.g., anhydrite) were deposited. The proven source rocks to the north (Gotnia Basin) laterally changed into updip carbonate reservoirs to the south, making the carbonate shelf edge a highly prospective area for hydrocarbon exploration.

This paper presents a sequence stratigraphic framework that resulted from well-derived isopach and petrophysical mapping, seismic interpretations and attributes mapping, and core sedimentological data. Gross depositional environment (GDE) maps of the Upper Jurassic formations have been reconstructed by integrating core/drill cutting sedimentology, well log signatures, and seismic attributes. These GDE maps depict evolving depositional environments of Arab-C, B and A members, and pervasive Hith anhydrite deposits. An alternative correlation of Gotnia salts to the north and platform carbonates and evaporates to the south has been proposed based on interpretation of regional seismic traverses, well and core data.

This integrated stratigraphic framework provides great insights for exploration concepts of the Upper Jurassic petroleum systems. It is essential for unlocking the hydrocarbon potential and new exploration opportunities (e.g., stratigraphic traps) along the south Gotnia margin.