

Applying Sequence Stratigraphy to Unlock New Sub-Play Concepts in the Early Cretaceous Lekhwair-Habshan-Salil (LHS), North Oman

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Abstract

The last major rifting of Pangea in Oman was completed in the Early Cretaceous, forming a passive margin into the Neo-Tethys sea trending North-Northwest of Oman and setting up the development of the Rayda Basin. The first phase of deposition corresponds to widespread and condensed carbonate hemipelagic units, known as the Rayda Formation. In a second phase, the Rayda Basin was filled by the Lekhwair–Habshan–Salil (LHS) carbonate deposits.

The Early Cretaceous LHS system has been an exploration target for many years. Habshan exploration wells have found geologic success, however, unlocking commercial success in the LHS system has been challenging. To further understand failures in targeted closures, we propose an integrated play analysis that combines published papers, outcrop, and all subsurface data to update our LHS depositional models, define the plays/sub-plays, and de-risk the petroleum system elements.

Mass flow deposits, which are platform-derived material re-deposited in the toe of slope/basin, are one of the more interesting new sub-plays generated from the integrated analysis. Generally, past prospects targeted grain- dominated platform margin deposits, but due to the overabundance of good reservoir quality rock and the lack of any sealing facies, these prospects all failed due to containment issues. Targeting reservoir-quality sediments in the toe of slope environment will reduce the risk of containment failure.

Upcoming exploration wells targeting this sub-play will provide data to constrain the geologic model and improve the understanding of its economic potential.