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Early Silurian Qusaiba Source Maturation Modeling on the Arabian Plate

Early Silurian Qusaiba source rocks were deposited over much of the Arabian Plate. The Qusaiba is the probable source for reserves in excess of one quadrillion cubic feet of discovered gas in the Permo-Triassic Khuff, as well as significant discoveries of gas and condensate in several pre-Khuff clastic plays.

An integrated team approach that incorporates plate reconstruction, timing of regional structural events, basement terrain maps, heat flow models, biostratigraphy, sequence stratigraphy, seismic datuming, geochemical fingerprinting and organic “backtracking” of the Qusaiba has been used to better identify and quantify Qusaiba hydrocarbon contributions.

There are four key groups of data that collectively control the quantity, quality and timing of hydrocarbon generation / migration from the Qusaiba. First, is heat flow through time. This is a function of basal heat flow, basement terrain as well as rock and fluid conductivity. Second, post - Qusaiba depositional burial histories, at both on and off structure sites, are critical to maturation timing. Third, the quality and quantity of hydrocarbons generated / migrated by the Qusaiba is a function of organic matter type, thermal maturity and expulsion status. Finally, the original TOC (OTOC) and HI (OHI) values of the “immature” Qusaiba can be reconstructed from present day values using thermal maturity, organic matter type (OMT), pyrolysis and activation energy profile data.

Site specific (1-D) models can provide the assessment team with quantified uncertainty ranges. In more detailed analyses these sites feed into 3-D modeling of volumes, type, timing and drainage at basin, play and prospect level.