

**AAPG International Conference
Barcelona, Spain
September 21-24, 2003**

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Silurian Basin-Center Gas Petroleum Systems of the Arabian Peninsula

Large volumes of conventional petroleum resources are attributed to the Lower Silurian Qusaiba-Total Petroleum Systems; i.e. Silurian Qusaiba, Central Arabia Qusaiba-Paleozoic, Paleozoic Qusaiba/Akkas/Abba/Mudawwara, and Paleozoic Permian-Triassic TPS, of the Arabian Peninsula. The mean estimate of undiscovered resources reported by the USGS in 2000 for these four TPS are 35.5 billion barrels of oil (BBO), 808 trillion cubic feet (TCF) of gas and 54.2 billion barrels of natural gas liquid. Basin-center gas accumulations in these petroleum systems are known to be present in Jordan and Saudi Arabia. In eastern Jordan, the Risha gas field is reservoirized in the Ordovician Dubaydib Formation. Hydrocarbon charge takes place along faults or on horsts from overlying Silurian shales, the Mudawwara Shale in Jordan but elsewhere in Saudi Arabia called the Qusaiba Shale Member, the so-called "hot shale". At the Risha field, natural gas production is from low-porosity, fractured sandstone of the Risha Member of the Dubaydib Formation. Reservoirs at both North and South Risha field demonstrate characteristics of continuous basin-center gas accumulations; reservoirs are under-pressured and have no well defined gas/water contact and are low-porosity and very low permeability, gas shows are pervasive in all wells, and production profiles are relatively constant. Fracture density and orientation are controlling production parameters. In Saudi Arabia, siltstone and fine-grained sandstone intervals adjacent to the Qusaiba Shale appear to be basin-center gas accumulations as well. Given the magnitude of undiscovered resources in the conventional Silurian petroleum systems, and demonstrated economic viability of basin-center gas at Risha (estimates range from 0.5 to 3 TCF), the opportunity for basin-center gas potential additions to reserves in Qusaiba petroleum systems is probably substantial.