

The Large but Unrecognized Potential in Ordovician Carbonate Plays in North Texas and South Oklahoma

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Abstract

Carbonate E&P in Asia has provided new information on carbonate heterogeneity that has led to significant challenges and new approaches to current theories and practices in carbonate reservoirs, especially facts related to Palaeozoic carbonates, such as:

- Cavernous reservoirs could be detectable as double-point bright spots in seismic data.
- Large cavities (vugs to caverns) are extensively distributed in carbonates down to more than 7000 m as the main producing reservoirs in tight carbonates, many of them far from unconformities and faults.
- Extremely high carbonate heterogeneity has led to complex reservoir compartments and different fluid contacts, resulting in highly productive wells (up to 5.3 MMBO or 300 BCF) very close to dry holes within producing fields.
- A large potential for hydrocarbons (up to 90%) have been left in many mature fields and areas. Re-examining a 3D seismic survey in North Texas with the above knowledge, we observed large potential in Lower Ordovician Ellenberger/Arbuckle carbonates.

Cavernous reservoirs are evident and extensive, unevenly distributed in a thrust-faulted uplift within an area of 60,000 acres and a thickness of about 3000 ft. With few penetrations, these thick and highly-heterogeneous carbonates become a deeper frontier play that lies under shallower mature fields. Like cases in Asia, the potential could be >20MMBO recoverable in this area with well flow rates of >1MBO/D and cumulative >1MMBO. The cave features are relatively subtle in other areas of the 3D due to poor seismic quality and possibly less cave distribution. In addition, the overlaying mature play in the Upper Ordovician Viola carbonates still has moderate potential due to limited

seismic quality, complex thrust faulting, highly variable thickness (0 to 1000 ft) and strong reservoir heterogeneity (tight to cave). These two plays provide highly economic targets for drilling in North Texas and South Oklahoma which are basically unrecognized due to dated knowledge and approaches on carbonate heterogeneity. Carbonate-targeted seismic and drilling strategies developed in Asia focus for revealing and characterizing the heterogeneity, reducing drilling and completion cost, and optimizing production and recovery efficiency, are effective solutions to efficiently monetize this large, but complex, potential.