

## **Mesoproterozoic Unconventional Plays in the Beetaloo Basin, Australia: The World's Oldest Petroleum Systems**

Matthew Silverman<sup>1</sup> and Thomas Ahlbrandt<sup>2</sup>

<sup>1</sup>Robert L. Bayless, Producer, Denver, CO.

<sup>2</sup>Falcon Oil and Gas Ltd., Denver, CO.

Unconventional oil and gas shale plays have been mapped and confirmed by recent drilling by the Shenandoah well in the depocenter of thick Precambrian rocks in the Beetaloo Basin, Northern Territory, Australia. Only 12 wells have been drilled in the entire basin. Total depths rarely exceeded 2000 m, though at least 3000 m of potentially prospective section is present. Structural traps and conventional sandstone reservoirs have also been identified, as has a pervasive tight-sand gas play near the basin center.

Reinterpretation of the basin's burial history based on new and existing 2-D seismic data has revealed substantial exploration potential from plays and leads that were not evaluated by earlier drilling. Highly encouraging shows were noted in several of these wells. Any production to be established would be among the oldest in the world.

Organic-rich shales and quartzose sandstones in the upper portion of the Mesoproterozoic Roper Group (~1.4 Ga) are the key objectives. Work on the burial history of these strata suggests that peak hydrocarbon generation may have occurred in the Jurassic, much later than previously thought, greatly increasing the potential for preserved traps.

The Shenandoah-1 was drilled by PetroHunter Energy in 2007 to a total depth of 1550 m. The well noted hydrocarbon shows in the Hayfield Sandstone at a depth of 780 m. This zone and significant oil pay zones in the upper Kyalla Shale at depths of 943 to 1020 m are regarded as highly prospective, with about 40 m considered to be an oil pay upon subsequent stimulation. The top of a Basin Centered Gas Accumulation (BCGA) was penetrated at the mid- Kyalla Sandstone at 1464 m with numerous gas shows.

Falcon Oil & Gas deepened this well as the Shenandoah-1A in 2009 to 2714M. Multiple gas zones in the lower Kyalla Shale, Moroak Sandstone and Velkerri Shale were noted. These include gas shows in the lower Kyalla from 1500-1718 m, a Moroak conventional gas play from 1717 to 2060M with the upper 88 meters indicating high permeability; also intermittent gas shows in Moroak sandstones to 2200 m and a Mid-Velkerri gas shale play from 2400 to 2558 m. Results of the planned 2010 completion of this well will be discussed.