

Categorization of Unconventional Tight Light Oil Plays of the Western Canada Sedimentary Basin

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The last years have seen a large increase in the exploration and exploitation of unconventional low-permeability (tight) light oil reservoirs. The development of multistage hydraulic fractured horizontal wells technology unlocked these reservoirs and they have emerged as very attractive economic plays in North America. These low-permeability oil plays exhibit a wide variety of reservoir and production characteristics, requiring different drilling and completion strategies to exploit them. We propose for unconventional light oil reservoirs a play type categorization analogous to that used for unconventional gas reservoirs, i.e. based on reservoir/fluid properties and completion/stimulation styles. We propose the term “Unconventional Light Oil” (ULO) to capture the spectrum of play types and to distinguish them from unconventional heavy (high viscosity) oil plays. We further propose the following categories of ULO:

1. **“Halo Oil”** – light oil plays where the source \neq the reservoir, and matrix permeability is relatively high (> 0.1 md) compared to the other play type categories. Halo Oil plays represent portions of conventional light oil pools that do not meet traditional petrophysical cutoffs and pay criteria, and may be clastics or carbonates. E.g. Cardium, Viking, etc.
2. **“Tight Oil”** – light oil plays where the source \neq the reservoir, and matrix permeability is low (< 0.1 md). These plays are analogous to tight gas plays and may be clastics or carbonates. E.g. Bakken (Viewfield), Montney, etc.
3. **“Shale Oil”** – light oil plays where the source = the reservoir, matrix permeability is very low, and organic matter content may be high. These plays are analogous to shale gas plays. E.g. 2nd White Speckled Shale, Duvernay, Muskwa, etc.

We will for all three light oil play categories present examples from the Western Canada Sedimentary Basin of the geological, reservoir and production characteristics based on core, well logs and production data to infer the primary controls on production performance in each play type. The above listed examples of tight oil sandstone and carbonate reservoirs span a wide age span and range of depositional settings and thereby very different reservoir geometries and lateral extent. Establishment of an Unconventional Light Oil play classification scheme facilitate distinguish of the broad range of light oil plays and better use as proper use of analogs for new light oil plays. We note that the same stratigraphic unit might in different part of a basin fall into different categories depending on geologic setting, reservoir type, fluids and pressure.