

An Emerging Unconventional Hybrid Light Tight Oil Play within the Southern Alberta Bakken-Exshaw Petroleum System: a Comparison between the Williston and Southern Alberta Basins

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Abstract

The Alberta Bakken Petroleum System (ABPS) is one of the latest play areas being evaluated in the quest to capture early entry, contingent, light tight oil (LTO) resources. The structural fabric of the Williston Basin and the foreland basin of southern Alberta and Northern Montana is dominated by the presence of large scale divergent wrench fault systems that were initiated at early Proterozoic time and continue to be active throughout the tectonic history of these basins. These structures are characterized by the presence of several pull-apart basins that acted as the focal point for the deposition of thick sections of the Bakken/Three Forks and Exshaw/Big Valley packages. These unique structural features form the prime location for the exploitation of these emerging resource plays. The main basinal difference is that the ABPS is part of a thermocline stratified ramp whereas the Williston Basin is part of low energy interior basin setting.

The ABPS comprises, from base to top, consists of a 0–50m thick mixed carbonate and clastic interval of Devonian and Mississippian Stettler/Big Valley – Exshaw – Banff Formations. The ABPS is a proven play based on production and is characterized by: pervasive petroleum saturation; abnormal pressure (high); lack of down dip water; low permeability and low matrix porosity reservoirs; and is self-sourcing. The play can be divided into a continuous resource play in the deeper part of the trend and as a conventional migrated oil play at shallower depths, similar to the Williston Basin.

The Deep Basin or Basin Centered ABPS is characterized by a continuous accumulation of hydrocarbon found in the Basal Banff limestone, Exshaw (Middle Bakken) siltstone to silty dolomitic unit or overlying Big Valley (Lodgepole). The analogue to this play is the North Dakota Bakken and Three Forks/ Sanish (T/FS) play. The Shallow Exshaw (Bakken) conventional play with local accumulations of oil either stratigraphically or structurally trapped in porous Banff limestone, Exshaw siltstone or Big Valley limestone. Expected to be normally pressured, but above-average dolomitization and/or porosity development and/or fracturing could lead to high-rate wells. The analogue to this play is Saskatchewan's Viewfield Bakken area.

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