

The Duvernay and Muskwa Shale Play Fairways: Variation in Reservoir Quality, Pressure, and Hydrocarbon Yield, and Well Performance in Emerging Sweet Spots

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An estimate of total growth potential of the Duvernay – Muskwa shale play can be made by assessing the reservoir parameters and production characteristics of several sweet spots within the fairway.

The Duvernay – Muskwa shale fairway extends northwards from the East Shale Basin in Alberta to the Liard basin of British Columbia and the Northwest Territories, a distance of greater than 1,000 km. Production tests have demonstrated that there are producible hydrocarbons across the majority of this fairway, though not always in paying quantities. Variations in shale thickness, mineralogy, maturity, depth and pressure are the key variables which define and characterize the sweet spots that have emerged along this fairway. These sweet spots occur in the Horn River Basin, Cordova Embayment, Rainbow sub-basin, greater Wild River sub-basin and in the southeastern portion of the West Shale Basin, generally identified as greater Pembina.

The definition of these sweet spots are not unique, but can be characterized by a gradual decrease in quality of the aforementioned key variables. Sweet spots will also change with time, as product prices change and the available infrastructure evolves. The majority of horizontal wells targeting this zone have been drilled in areas with at least 20 meters of net organic-rich shale, indicating a general industry consensus that areas thinner than this may currently lack sufficient hydrocarbon volumes to provide positive economics. In addition, the increased presence of carbonate and clay-rich mineralogy along the edges of these sweet spots further reduces the net thickness and prospectivity of these areas.

In terms of depth, the majority of drilling is focused in the range of 2,000 to 3,700 meters, with the exception of activity in the Rainbow sub-basin and the Cordova Embayment where drilling occurs throughout a depth range of 1,300 to 1,800 meters. The deeper limit of this depth range is a consequence of higher costs and a greater prevalence of dry gas which is currently less attractive from a price perspective. The shallow limit in liquids-rich areas is due to the corresponding lower reservoir pressure which results in difficulties in maintaining liquids yields with time. Although dependent on the PVT conditions of the fluid, shallower wells typically demonstrate a drop in liquid yield with time, whereas deeper, and more over-pressured wells demonstrate a greater ability to maintain steady yield.

When considering the total resource in place, in conjunction with recent well results, it is clear that the combined Duvernay-Muskwa shale fairway is one of the largest and most exciting play trends in North America.