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Multidisciplinary Determination of the Key Drivers in the Delaware Wolfcamp Formation and the Duvernay Formation

**Bryn Davies, Kay-Cee Hermanson, Denise Yee, Darrel Koo, Ryan Luther, Abbie Rolf von den Baumen
RS Energy Group*

Summary

The Western Canadian Sedimentary Basin's Duvernay Formation and the Delaware Basin's Upper Wolfcamp Formation have been gained momentum in recent years as unconventional drilling technology improved. The Devonian Duvernay and Permian Wolfcamp share similar geological characteristics such as porosity, TOC and hydrocarbon composition. This study uses a statistical multidisciplinary approach to discern the similarities and differences between these plays. The analysis relates the geological parameters to completion, production and economic data to identify factors making these plays successful in a relatively low commodity price environment.

Introduction

The Permian Basin of west Texas and southeast New Mexico is the most active play for drilling in the L48, accounting for about 40% of all horizontal rigs running, of which 60% are in the Delaware. This is the only North American play to increase in activity through the recent downturn, mainly a result of favorable economics. The Duvernay in Alberta extends approximately 2.5 times the area of the Delaware, covering approximately 130,000 km², and has seen a recent uptick in activity with the slow recovery of commodity prices. Both basins were initially developed as conventional plays: the Delaware targeting basin-fringing carbonates and the vertical clastic Delaware Mountain Group play, while the Duvernay targeted the Leduc reefs. Today, both plays are in early days of unconventional development.

Theory and/or Method

A regional stratigraphic framework and petrophysical analysis was developed using public well data, using about 550 wells with digital curves in the Delaware and 250 penetrating the Duvernay. Data was integrated from the geological interpretations, completion and production datasets including porosity, TOC, carbonate thickness, lateral lengths, and well spacing. A multivariate analysis was performed, and key drivers for enhanced well performance were determined. This analysis focuses on the rapidly-developing Upper Wolfcamp Formation where testing the optimal combination of completion designs and the targeted geological parameters are yielding annual improvement in well results. By comparing analogous driving factors between the formations, insight can be gained into productivity increases and well optimization in the Duvernay.

Conclusions

Despite the Duvernay being deposited 120 million years prior and 3000km north of the Delaware Basin, today these shale plays exhibit geological similarities that contribute to their successes as petroleum producing plays. The Duvernay is a high-cost play, therefore identification of optimization techniques such as porosity, lateral length, and well spacing can be learned from the low cost Wolfcamp. If operators can leverage the proven techniques in the Wolfcamp, then the Duvernay may be a more viable economic target.