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Estimating 'Gas Initially in Place' in the Spirit River Formation, and Relationships to Production and Economics – From Brazeau to Wapiti, Alberta

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Summary

This is a regional study combining geological and engineering data to better understand Gas Initially in Place (GIIP) estimates and its relationship to deliverability for reservoirs of the Spirit River Formation in the Deep Basin of Western Canada. Understanding this relationship is important for commercial viability, reserves and resource evaluation, and development planning.

Before 2010, most production from the Spirit River Formation came from vertical wells completed in numerous Falher cycles of conventional clastic reservoir typified by the Elmworth Field. To the south of Elmworth, the Spirit River Formation covers a large area of the Deep Basin but the majority of the fairway was not a significant producer from vertical wells due to lower quality reservoir.

Over the last 5 years, the Spirit River Formation has become a major gas play as advancements in horizontal well drilling and completion technology have allowed for commercial exploitation of the Spirit River Formation from Brazeau to Wapiti. Multi-stage fracturing operations are unlocking gas in tighter, shalier rock. Horizontal wells drilled into the Spirit River Formation have increased from less than 50 in 2010 to approximately 2500 in 2017. Recent peak production of 2.6 Bcf/day, solely from horizontal wells, makes this one of the most prolific and economic gas plays in Western Canada. As the Spirit River continues to be developed, there is a need to better understand GIIP both for future well development and for accurate reserve and resource bookings.

GLJ Petroleum Consultants have undertaken a regional project to quantify GIIP across the basin for the Spirit River Formation. The project combines published regional geology work, publicly available log and core data and petrophysical analysis. We have also attempted to incorporate the extensive production database and completion data to improve our understanding of the variation in well performance across the area.

A petrophysical methodology has been established that allows us to estimate GIIP that correlates well with performance. The methodology allows for regional variations in some of the petrophysical input parameters if there is core data to support it. Analysis of the technological advancements in hydraulic fracturing indicates an upward trend in estimated ultimate recoveries (EUR), resulting in higher recovery factors and improved economics.