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The Northeastern BC Montney Tight Oil Play: Potential and Challenges

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Summary

The unconventional Montney play encompasses a huge area of about 100,000 km^2 across western Alberta and northeastern British Columbia. Historically, the industry initially focused on the highly over-pressured dry-gas to lean wet-gas fairway, but then moved up dip to capture more liquids, due to sustained low gas prices over the past decade. In recent years, operators have been pushing the boundaries, actively testing the Montney tight oil play in western Alberta and looking for the optimal balance between liquid-richness and reservoir pressure, among other parameters. In contrast, the oil maturity window of the Montney play in northeastern British Columbia (NEBC) is still largely under-explored.

In this paper, we investigate the potential and challenges of the vast over-pressured Montney tight oil play of northeastern British Columbia, based on the integration of compositional and reservoir pressure mapping with production and PVT data. Mapping production gas molecular and isotopic compositions clearly delineate the liquids-rich gas fairway and the transition to the volatile oil window. The up-dip limit of the tight oil fairway is defined by the 10 kPa/m pressure-depth ratio bounding the over-pressured deep basin. Apart from the Town-Parkland area that has already produced over 12 million barrels of oil from the Upper Montney, only a few tens of horizontal wells have been tested across the entire NEBC Montney tight oil fairway, with highly variable production gas-oil ratio (GOR) likely due to production fractionation processes. Understanding the key factors controlling this fractionation and the liquid recovery from those wells is paramount to evaluating the upside potential and associated risks in this tight oil fairway.

For a given in-situ fluid composition, initial production GOR from horizontal wells and its evolution through time depends on (1) the ratio of in situ fluid saturation pressure over initial reservoir pressure, (2) the reservoir quality, (3) near wellbore depletion and (4) the stimulation design. Integrating geochemistry, PVT, flow test and production data provides indirect evidence of initial in-situ fluid phase(s), as well as insights on the dominant controls on production fractionation. Our analysis suggests that in the oil window, in-situ fluid under-saturation has a strong influence on liquids recovery due to the high mobility of gas relative to oil. Successful oil wells are initially under-saturated with relatively stable low GOR during flow test, whereas reservoirs with saturated oil show a rapid increase of GOR during flow test and often result in poor gas wells. Although most of the oil production has been coming from the Upper Montney to date, several wells have also demonstrated a high potential for a tight oil fairway in the Middle Montney of NEBC.