

Tight Gas Reservoir Characterization in Montney Formation and Lower Doig Formation, Northeastern British Columbia, Western Canada

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The Triassic strata of Western Canada Sedimentary Basin are a major hydrocarbon stratigraphic interval in British Columbia and Alberta Province. The Triassic deposits are comprised of siliciclastic, carbonate, and evaporites. The Montney Formation is the basal stratigraphic unit in the subsurface of Western Canada, which rest unconformably in most areas, upon carbonate strata of Carboniferous to Permian age, separated from the overlying Doig Formation by a strongly radioactive, phosphaterich interval known informally as the “Doig Phosphate Zone”. The Montney and Doig formations are lithologically characterized as a siliciclastic dominant succession comprised of siltstone and shale lithologies. Although oil and gas have been produced conventionally for over a decade from shoreface sandstones, shelf siltstone to finegrained sandstones and turbidites of the Montney and Doig formations, the new challenge is to understand the geology and geochemistry of the unconventional silt/shale/ gas reservoir play, and the geological dynamics evolving from the phosphate zone within the Doig Formation.

The evaluation of these stratigraphic intervals utilized numerous core data, well logs, and oil and gas production history. The approach of this study involves integration of sedimentology, geochemistry and reservoir engineering analyses with the following objectives: (1) To study lithofacies characteristics; (2) To determine the depositional framework, diagenesis, and associated porosity and permeability; (3) To evaluate the petrophysical properties within the context of tight gas reservoir characterization; (4) To analyze and ascertain the geochemistry; and (5) To better understand these newly evolving tight gas reservoir play within the Montney Formation and Lower Doig Formation.

The present study has delineated reservoir thickness, lateral continuity in the subsurface, and reservoir heterogeneity of the Montney and Lower Doig formations through well log correlation constrained by geochemistry. With respect to very low porosity associated with tight gas/shale gas reservoirs, 3 D imaging techniques are employed in the analysis of the pore spaces of the rocks from these units. In particular, Computer Tomography (CT) scan and Micro-CTscans have the most potential in the analysis of petrophysical properties of very low porosity reservoirs. This technology further helped to understand details of the porosity characteristic to the Montney and Lower Doig formations in terms of their reservoirs potential and quality.