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

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The Lower and Middle Triassic Montney and Doig formations have been primary reservoir intervals in the British Columbia part of Western Canada Sedimentary Basin for several decades. Until recently exploration targets consisted primarily of conventional fine-grained sandstone and coquina (bioclastic grainstone) units deposited in a variety of shallow marine (eg. barrier island shoreface, tidal inlet channel, etc.) and deep marine (eg. turbidite fan) depositional settings. Despite considerable success with these plays, the exploited lithologies comprise but a small fraction of the stratigraphic interval occurring as decameter-scale units within a stratigraphic interval several hectometers thick. Recently, resource exploration has shifted focus to the finer grained 'host' lithology, the Montney and Doig 'shale' gas plays. These plays (particularly Montney 'shale' gas) have become one of Canada's premier unconventional gas plays. Thick deposits of fine-grained (shale/siltstone) host an estimated 1.5 trillion meters2 of natural gas. Despite the significance of this play the location and thickness of the best reservoir intervals remains contentious, in large part because the lithologic variability and geochemistry of this interval are not adequately characterized.

This study uses an integrated approach to characterize the Montney Formation and to augment existing correlation techniques (well log correlation, core analyses, petrography, organic geochemistry) with other alternatives. In particular two techniques have proven very valuable: (1) Elemental whole-rock geochemical analyses provide a means to better define reservoir lithologic characteristics and greatly facilitate regional correlation of optimum intervals; and, (2) Micro-CT (computed tomography) scans provide crucial data on the petrophysical properties of optimum reservoir lithologies and are proving to be an essential tool in identifying the optimum lithologies. Micro-CT images acquired from specimens of the Montney drill cores show that producing intervals are characterized by a homogeneous distribution of small pores (generally approximately 100 micron diameter). The interconnected pores are present as an isotropic network (i.e. Kv = Kh).