Unconventional Resource Potential of the Intermontane Basins, British Columbia

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Abstract

Conventional petroleum resource assessments of the Intermontane basins of the Canadian Cordillera have suggested combined potential resources of 6.6 x 1011 m^3 (23.26 trillion cubic feet) of gas and 12.1 x 108 m^3 (7.62 x 109 BBL) of oil in conceptual plays (Hannigan et al, 2001a, b, c). The risk is large in these relatively rugged and remote regions and as such they have received only sporadic exploration activity over the years.

Beginning in 2002, the British Columbian and Canadian governments commenced a program towards obtaining new geocience information that would lead to a new resource assessment. Part of this project focused on characterizing any potential source horizons as they would be a key component to the understanding any petroleum systems in the basins.

Early workers of the Intermontane basins had locally recognized organic-rich source beds of Lower to Middle Jurassic age. Lower to Middle Jurassic clastic sequences are widespread within the interior of the Canadian Cordillera. These successions cap waning Jurassic volcanism in many Cordilleran arc terranes and are succeeded by clastic sequences of the Intermontane basins. These clastic sequences are characterized by fine grained, carbonaceous lithologies, which locally contain elevated levels of organic carbon. These successions underlie Jura-Cretaceous clastics of the northern and western Bowser Basin (Spatsizi and Smithers formations, respectively), are found in central Quesnellia where they are represented by the Ashcroft Formation and underlie the Tyaughton-Methow basin (Last Creek Formation and Junction Creek unit).

These rocks locally contain meter thick sections with total organic carbon (TOC) levels greater than 5 wt. % and others have thicknesses approaching 100 m with TOC between 3 to 5 wt. %. Thermal maturation levels are high in many sections suggesting original organic contents were greater and that these rocks may have been excellent source beds. Associated bitumen in these successions, together with Mesozoic oil in some overlying Intermontane clastics, also suggests these sequences may have been effective oil source rocks.

Total organic carbon levels, thermal maturity and thickness of some sections are comparable with shale gas sequences being exploited elsewhere in North America. TOC concentrations within these rocks, together with other elemental abundances, indicate anoxic conditions during deposition. The age of these clastics brackets the global Toarcian anoxic event and that of other organic-rich sequences in North America (i.e. Fernie Formation).

The widespread nature and overall characteristics of these Jurassic organic-rich sequences suggests the potential for hosting shale gas resources.

References

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