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Coalbed Methane Producibility in the Cretaceous Succession of the Alberta Basin as Affected by Hydrogeology and Stress Regime

Coal permeability and the hydrogeology of the coal-bearing strata are critical factors in coalbed methane (CBM) producibility. The pressure regime in the formation water affects the coal gas content and exsolution during production. Water salinity affects the amount of gas dissolved in formation waters and water disposal strategies. Permeability affects production rates of both gas and water. In the absence of direct data, the stress regime is a good regional-scale indicator of areas with enhanced permeability.

Currently, intense exploration activity is underway for CBM in Cretaceous strata in the Alberta basin, which contain extensive, thick beds of lignite-subbituminous to high-volatile A bituminous coal. The formation water in the Upper Cretaceous succession is relatively fresh (TDS < 20 g/l), and the flow is driven mainly by topography. In the Lower Cretaceous succession the formation water is very saline (TDS up to 160 g/l), and the flow is driven by erosional rebound in thick intervening shales. Both successions are underpressured. Estimates of vertical and minimum horizontal stress magnitudes and their directions indicate that coal face-cleat fractures will likely be vertical and aligned perpendicular to the deformation front. Stresses vary from < 5MPa in the NE to > 70 MPa in the SW near the deformation front. The pressure and stress regimes in the coal-bearing Cretaceous strata in the Alberta basin suggest that, on a regional scale, the most prospective areas for CBM production are in central-eastern Alberta, if all other factors, such as coal characteristics and gas content, are equal.