

March 24, 2005

Regional underpressure and gas saturation in the Upper Cretaceous and Tertiary of Central Alberta

SPEAKER

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The Upper Cretaceous and Tertiary sandstones of Central Alberta (Paskapoo, Scollard, Edmonton, Horseshoe Canyon, and Bearpaw) form a major shallow, low-pressure gas resource. Potential sources of this gas are from associated coal seams and bacterial activity at the water/gas contact. These zones were initially bypassed due to formation damage and low gas prices.

A hydrostatic water gradient is up to 350% overbalanced in some of these formations. A detailed examination of over 800 pressure tests confirmed that the Scollard member and Edmonton Group are pervasively gas saturated. Formation pressures decrease with proximity to formation outcrop along the Red Deer River. Conventional hydraulic head calculations using these data result in an east-west hydraulic gradient.

The extreme underpressures in these zones have been attributed to pore volume expansion associated with erosional unloading. This paper proposes an alternate hypothesis. Gas pressure gradients show a predominantly west-to-east gradient. The lowest measured formation pressures (<200 kPa) were usually found within 20 km of the formation outcrop. It appears that the bulk of the gas is migrating up-dip in response to the regional gas pressure gradient. Post-Tertiary methane desorption has decreased coal gas content. Lateral migration of gas towards outcrop along the Red Deer River Valley is proposed as a mechanism to create underpressures in the Upper Cretaceous and Tertiary sandstones in Central Alberta.

BIOGRAPHY

Jim Letourneau, B.Sc., P.Geol. is the Principal of Big Picture Geoscience Inc. and the Publisher of the Big Picture Speculator investment newsletter and weblog. His current interests are applying petroleum hydrogeology and geochemistry to characterize basin-centered gas systems.

Jim was a co-chair of the 1997 AAPG Hedberg Conference on Applied Petroleum Hydrogeology in Exploration and he has presented numerous research papers on the geochemistry and migration of natural gas. He recently served as an expert witness on unconventional gas accumulations for a National Energy Board hearing.

Jim received the CSPG Tracks Award in 1996 and the APEGGA R.M. Hardy Graduate Scholarship in 1999. He is a member of the CSPG, AAPG, APEGGA, CSUG, CSTA, and Toastmasters International.