COAL GEOLOGY AND ITS ROLE IN CBM EXPLORATION AND DEVELOPMENT IN ALBERTA

R.J. Richardson¹, D. Chen, Alberta ²

¹Consulting Geologist
²Geological Survey

The first recorded discovery of coal in Alberta was along Kneehills Creek near Drumheller in 1793, by Peter Fidler, a Hudson's Bay surveyor. Long before that, however, native people had known about and used the coal. The local Blackfeet used it in making face paints but had taboos about using it as a fuel; carbon monoxide poisoning or fears of underground spirits may have been the reason. European settlers had no such fears and the early settlement of Alberta was closely tied to locally available coal. Coal geology studies began even before the settlement of the Canadian west by the Geological Survey of Canada in the middle to late 1800’s and by the Alberta Geological Survey from the early 1920’s. Data on coal occurrences, thickness, rank, quality and geologic settings has steadily been collected and analyzed as the primary interest has expanded from heating through transportation (steam trains), thermal electric power, and steel making to most recently CBM production.

The coal-bearing strata of Alberta were deposited in a sedimentary basin along the eastern edge of the evolving Rocky Mountains (Figure 1). They form part of a clastic wedge ranging in age from late Jurassic to mid-Tertiary (Figure 2). Total resources of coal (thermal and metallurgical) in Alberta have been broadly estimated at 2.5 trillion tonnes. The energy in this resource is roughly 8 times that available in the province's substantial remaining reserves of conventional oil and gas, and nearly 2.5 times that of the Alberta's massive oil sands deposits. For economic and environmental reasons it is likely that only a small portion of that energy resource will ever be mined and thus there is a huge potential for CBM.

The rank of coal in Alberta ranges from very low (lignite), to high (anthracite). Coal near the surface in the Plains is generally of sub-bituminous rank, with lignite occurring in the north and northeast part of the Plains, and high volatile bituminous C in the northwest and southwest areas of the Plains. Coals near the surface in the Foothills generally are of high volatile bituminous C, with minor amounts of high volatile bituminous B and A – rank coals in some areas. In the Mountains area west of the Foothills, coal ranks of medium and low volatile bituminous rank occur, with local occurrences of anthracite near the Canmore area.

With a very large coal resource in Alberta and a substantial body of coal geology information it was not surprising that CBM development has had a long history in the Province; CBM exploration first undertaken near Canmore in the late 1970’s. However it wasn’t until the late 1980’s to early 1990’s that serious exploration activity, driven by the San Juan Basin success in the USA, took place in the Plains and Foothills of Alberta. During that time about 60 wells were evaluated primarily from the thick Ardley and Mannville coals. In the mid to late 1990’s low gas prices hindered CBM development but since 2000, CBM exploration has resurged in Canada (mainly Alberta), due to: