Stratigraphy, Depositional Environments, and Coalbed Gas Potential of Middle Pennsylvanian (Desmoinesian Stage) Coals – Bourbon Arch Region, Eastern Kansas

By

Troy Anthony Johnson
B.S., Kansas State University, 2001

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Committee Members

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for the Department

Date Submitted_____

ABSTRACT

Troy Anthony Johnson
Department of Geology, August 2004
University of Kansas

The Cherokee and Marmaton groups (Desmoinesian Stage) of Kansas contain numerous thin coals within mixed siliciclastic and carbonate cyclothems. Coals rank from high volatile C- to A-bituminous and are less than ideal for coalbed methane production. However, coalbed gas across the Bourbon arch may be a viable energy resource given the shallowness of the coals, sufficient overburden and overlying seals of thick shale, and high probability of encountering multiple coal beds within a single well. Expansion into the Bourbon arch from a developing coalbed gas play in southeastern Kansas is hindered by the lack of data and clear resource evaluation. The objectives of this study—mapping coal extents and thicknesses; evaluating coal gas contents, trends, and quality; outlining geologic factors contributing to coalbed gas production; and estimating coalbed gas resource—will aid in northward expansion of coalbed gas development.

The possible geologic controls on coalbed gas content were studied through core description and interpretation, well-log correlation, digital subsurface mapping, and coal gas desorption and quality analysis. Results were used for depositional and stratigraphic interpretation of coals and surrounding strata. The variability of coal thickness, extent, and continuity can be understood within a sequence stratigraphic context. Maximum-flooding-surface (MFS) coals are thickest and best developed, while transgressive- and highstand-systems-tract coals are more localized. Peat-forming environments of Bourbon arch coals include coastal plain and estuarine

systems, and peats associated with marine regression and pre-Pennsylvanian topography.

Gas contents in the Bourbon arch range from 5 to 143 scf/ton (as received) and 17 to 181 scf/ton (moisture-, ash-free). Estimated gas resource is 2.1 tcf. Increasing gas content is directly related to increasing depth. No conclusive relationship exists between gas content and sequence stratigraphic position, or depositional environment. Average gas content does increase with increasing average coal thickness, which is influenced by proximity to the MFS, but MFS coals do not necessarily have the highest average gas contents. Higher gas contents are also associated with coastal plain and pre-Pennsylvanian topographic-controlled coals. However, depositional settings are biased towards relative position within the Desmoinesian and subsequently greater depths within the study area.

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