Integrating Geologic And Hydrologic Information to Identify Coalbed Methane Sweet Spots in The Southern Raton Basin, New Mexico

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Predicting hydrocarbon potential in newly developed basins requires the integration of geologic and hydrologic data. This is especially true of coalbed methane (CBM) operations, which typically reveal little about long-term gas recovery in the early stages of production. An ongoing research project at Sandia National Laboratories, in cooperation with El Paso Production Company, is addressing the influence of hydrodynamics, geologic structure, and natural fracture systems on CBM and water production in the Raton Basin. Spatial variability in gas and water production within the New Mexico portion of the basin suggests that stratigraphic heterogeneity, fracture-enhanced permeability, and perturbations in hydraulic head may all influence coalbed methane potential. Regional groundwater flow generally follows the west to east topographic gradient, and is likely assisted by an E-W system of extension fractures. However, local variations in structure, fracture density, and aquifer communication may be responsible for the large difference in gas and water production characteristics. Among ~300 wells within a four-township area, gas to water ratios (GWR) span more than four orders of magnitude. The most salient geologic structure in this area is a northwest-trending anticline that separates high GWR wells from low GWR wells, and suggests a separation of aquifer systems. Differences in recharge capabilities on one flank of the anticline may also contribute to the high volumes of produced water in the low GWR region. Further integration of geologic and production data should yield more insight into the hydrogeologic controls on CBM potential in this portion of the Raton Basin.