

Carbon Dioxide Sequestration in Coal at the Illinois Basin Tanquary Site

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The potential for sequestering CO₂ in the largest bituminous coal reserve in the United States (Illinois Basin) is being assessed in southeastern Illinois as part of the DOE's Regional Sequestration Partnership program. The main objectives of this test are to determine CO₂ injection rates and storage capacity. At the Tanquary site, the Springfield Coal is 7 ft thick, 900 ft deep, and has a coal gas content of 150 to 195 scf/ton (dmmf). Desorbed Springfield Coal gases (normalized air-free vol %) are 88-96% methane, 2-9% nitrogen, 1-3% CO₂ and trace amounts of C₂₊. The carbon and hydrogen isotopes of the methane indicate primarily a biogenic origin. Results of injecting up to 600 tons of gas-phase CO₂ over a period of 40-80 days are presented. Pre-injection DST's, pressure transient analyses, and pulse tests indicate initial coal permeability averages 6 md. COMET 3 reservoir simulation was used to determine well spacing, track anticipated CO₂ movement and to evaluate enhancing coalbed methane recovery potential. Based on tests and model results, one injection and three observation wells oriented relative to the cleat directions and spaced approximately 50 to 100 ft apart, were drilled, cased and perforated. Lab measurements of CH₄, CO₂ and N₂ adsorption capacities, as well as coal shrinkage and swelling accompanying methane removal and CO₂ adsorption, respectively, have been completed. In addition, changes in the mesopore and micropore characteristics (specific surface areas, volumes, and size distribution) as a result of CO₂ adsorption have been analyzed in coals of varying petrographic composition.