INTERIM FINAL TECHNICAL REPORT
September 1, 2002, through August 31, 2003

Project Title: **VIABILITY OF CO_2 SEQUESTRATION AND METHANE PRODUCTION IN ILLINOIS COAL**

ICCI Project Number: 02-1/6.1A-4
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ABSTRACT

This research study started by obtaining information from the Illinois State Geological Survey about gas content data gathered from their initial drilling program and, using GIS, superimposing the drill-hole locations and gas data, along with locations of mines, on a digital map of Illinois. Next, blocks of coal were obtained from a mine in Southern Illinois for the experimental phase of the study. Rectangular specimens and powdered samples were prepared to measure the response of coal structure when exposed to different gases, and establish sorption isotherms. All test samples were equilibrated with moisture prior to testing and stored in an environmental chamber. The experimental work started by establishing sorption isotherms using methane and carbon dioxide. The results show that the sorptive affinity of coal for carbon dioxide is significantly greater – as much as five times – than that for methane clearly suggesting that the potential for CO_2 sequestration in Illinois coal is excellent. The second part of the sorption experiments was to evaluate the impact of CO_2 injection after recovering most of the sorbed methane. The results show that injection at high pressures does not release additional methane and is, therefore, not favorable to enhanced recovery. However, low pressure injection results in earlier recovery of methane although this conclusion is somewhat premature, and requires rigorous analysis of the results using thermodynamics. The second phase of the experimental work involved measurement of the volumetric strain induced in solid coal matrix as a result of sorption of methane/CO_2. This required sealing the test samples in airtight high pressure containers, and measuring the strain while exposing them to different gases at increasing and decreasing pressures. Since it takes a very long period of time for the coal to equilibrate when exposed to sorptive gases (methane/CO_2), these experiments have not been completed. However, results obtained to date show that the induced strain is much higher for CO_2 than for methane. This is as expected since CO_2 is significantly more sorptive. These results suggest that desorption of methane and adsorption of CO_2 would result in an overall increase in the volume of coal matrix, thus resulting in a reduction in the fracture aperture and, hence, a decrease in the overall coal permeability. Once again, these results advocate that injection pressure, in the case of CO_2 sequestration scenario, should be maintained as low as practical. Finally, using the experimental results, a simulation exercise is being currently carried out to evaluate the potential of CBM production from Illinois coalbeds, and enhanced gas recovery potential by CO_2 injection in deep coal.

This abstract summarizes the project results through August 31, 2003. Since the project was granted a "no-cost extension", the final report will be available on April 1, 2004.