

Carbon Sequestration Potential of the Cambrian and Ordovician of the Illinois Basin

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The Cambro-Ordovician strata of the Illinois and Michigan Basins encompass most of the states of Illinois, Indiana, Kentucky, and Michigan. This interval underlies much of the Midwest of the United States and, for some areas, may be the only available target for geological sequestration of CO₂. We evaluated the Cambro-Ordovician strata above the basal Mt. Simon Sandstone reservoir for sequestration potential. The two targets were the Cambrian carbonate intervals in the Knox Group and the Ordovician St. Peter Sandstone.

The evaluation of these two formations was accomplished using wireline logs, core data, pressure data, and seismic data from the USDOE-funded Illinois Basin Decatur-Project being conducted by the Midwest Geological Sequestration Consortium in Macon County, Illinois. Interpretations were completed using log analysis software, a reservoir flow simulator, and a finite-element solver that determines rock stress and strain changes resulting from the pressure increase associated with CO₂ injection.

Results of this research suggest that both the St. Peter Sandstone and the Potosi Dolomite (a formation within the Knox) reservoirs may be capable of storing up to 2 million tonnes of CO₂ per year for a 20-year period. Reservoir simulation results for the St. Peter indicate good injectivity and a relatively small CO₂ plume. While a single St. Peter well (200 feet thick) is not likely to achieve the targeted injection rate of 2 million tonnes/year, results of this study indicate that development with three or four appropriately spaced wells may be sufficient. Reservoir simulation of the Potosi suggest that much of the CO₂ flows into and through relatively thin, high permeability intervals, resulting in a large plume diameter compared with the St. Peter.