Assessment of Geological Carbon Storage Capacity in the Cambrian Mt Simon Sandstone; Regional Assessment to Site Characterization and Feasibility, an Example from the Michigan Basin

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Geological carbon storage (GCS) capacity in the Michigan basin, in excess of 86 billion metric tons of CO_2, was reported in the DOE/NETL ***Carbon Sequestration Atlas of the US and Canada (CSAUS&C)***. Investigations were undertaken to refine estimates in the Cambrian Mt Simon Sandstone and establish the feasibility of GCS for a large, stationary emissions source, although capture facilities are not now in place. The Mt Simon may have little effective porosity in the central basin below approximately 1.8 to 2.0km due to diagenetic alteration. Lateral and vertical facies changes in the basin also result in substantial variation in fundamental rock properties and petrophysics. Using methodology modified from the ***CSAUS&C,*** estimates of storage capacity of the Mt. Simon Sandstone in Ottawa Co. are between 5000 and 14000 metric tons per acre. Numerical simulations of CO_2 injection were conducted using the STOMP-CO_2 simulator to assess the potential for geologic sequestration at maximum theoretical injection rates. Injecting CO_2 for 4 years at a rate limited by a fracture pressure gradient of 0.8 psi/ft results in injection rates that vary between 16 and 29 MMT/yr. After 4 years, the total amount of CO_2 injected is 102.7 MMT, with 99 MMT as supercritical CO_2 and 3.7 MMT dissolved into the brine. After 4 years of injection, the maximum radius of the supercritical CO_2 is 3 km and injection pressures at the bottom of the caprock (Eau Claire Formation) are below the fracture pressure limit. Although these results suggest that the Mt. Simon has the capacity to accept the large volume, CO_2 output of a typical coal-fired power plant in a small number of injection wells, further sensitivity analysis and field validation will be needed before such high injection potential can be verified.