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[PS]Geological Sequestration Capacity in the Cambrian Mount Simon Sandstone: Assessment and Feasibility in the Michigan Basin, USA*

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Abstract

Geological sequestration (GS) potential in the Cambrian Mt. Simon Sandstone is substantial in the Midwest, USA, with tens of billions of metric tons of CO_2 storage capacity estimated in recent studies conducted throughout the region. This study presents the results of ongoing assessment of the Mt. Simon Sandstone Geological Sequestration System (GSS) in the Michigan basin, USA. Investigations were undertaken to refine regional GS capacity estimates using subsurface geological data and establish site specific characteristics and feasibility of GS for large, stationary emission sources in Michigan, although no capture facilities are now in place. Although the Mt. Simon constitutes a major GS resource in much of the state, this injection zone may have little effective porosity in the central Michigan basin below approximately 1.8 to 2.0 km due to complex diagenetic alteration. Lateral and vertical facies changes in the basin also result in substantial variation in fundamental rock properties, petrophysics, and storage capacity.

Using methodology modified from the Carbon Sequestration Atlas of the US and Canada (CSAUS & C), estimates of storage capacity of the Mt. Simon Sandstone in the most prospective areas of Michigan are as high as 14,000 metric tons of CO_2 per acre. Numerical simulations of CO_2 injection were conducted using the STOMP-CO_2 simulator to assess the potential for large volume GS in one of

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these most promising areas of the state using existing core and well data from waste injection wells. Using numerical injection simulation model parameters including: 1) injection rate of 10 MMT/yr for 50 years, 2) recovery period of 50 years, 3) injection interval between 1574-1768 m, 4) well diameter of 8 5/8" casing, 5) hydrostatic gradient of 0.49 psi/ft, 6) temperature of 50C, 7) brine composition of 300,000 ppm TDS; the resulting model predicted: 1) ½ space 2D Plume Dimensions after 100 years (50 years active injection, 50 years recovery) equal to ~9 km (5.4 mi), 2) active injection flow rate of ~160m/yr, and 3) Recovery flow rate of ~20 m/yr. Although these results suggest that the Mt. Simon GSS has the capacity to accept the large volume, CO_2 output of a typical coal-fired electric 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.

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