

"Optimizing Carbon Capture and Storage in the Illinois Basin Decatur Project: A Comprehensive Study of Reservoir Capacity, Injection Strategies, and Risk Mitigation to Prolong Project Lifespan."

Exploring additional opportunities for carbon capture and storage (CCS) in the Illinois Basin Decatur Project (IBDP) is essential for extending project life. Site characterization was conducted between 2007 and 2011 with injections in two phases, the first from 2011 to 2014 by IBDP and the second from 2017 to 2022 in a second well by Illinois Industrial Carbon Capture and Sequestration (IL-ICCS). The primary objective of our assessment is to optimize reservoir storage capacity, leveraging publicly available data to develop an incremental injection plan using existing infrastructure.

The basin contains a saline reservoir with a maximum storage capacity of 109 billion metric tons, which is hosted in the Mount Simon Formation of sandstones, with a regional seal of the Eau Claire Formation of limestones and siltstones. Injection was performed in two sections within the Mount Simon Formation, the first at the base of the formation, with maximum effective porosity of 28% and maximum permeability of 477 mD. The second injection phase in a second well was in a shallower zone in the Mount Simon with maximum permeability of 1016 mD and maximum effective porosity of 28%. Petrophysical properties of the reservoir were calculated from the well logs and key horizons and faults were reinterpreted. A static geocellular model was constructed to illustrate the distribution of facies, effective porosity and permeability within the reservoir.

An injection history was conducted to determine the current dynamic conditions of the reservoir, wherein the movement of the CO₂ plume was subsequently simulated over a 33-year projection (9-year injection and 24-year post-injection). The model allowed for the illustration of the behavior of the CO₂ captured and stored in the Mount Simon formation. Risk analysis, factoring in events probability and severity, informed the development of a comprehensive prevention and mitigation plan. Finally, the costs associated with various project variables were calculated.

In conclusion, the analyzed data indicates low CO₂ leakage probability, and the reservoir exhibits additional storage capacity. Consequently, proposing to inject 2000 tn/day exclusively in the second area ensures a maximum pressure increase of 990 psi, well below the EPA-prescribed limit, and minimizes overall costs. Additionally, the implementation of similar methodologies in Argentina could set an important precedent and thus contribute to global efforts to address climate change.