

Brine Extraction and Treatment Strategies to Enhance Pressure Management and Control of CO₂ Plumes in Deep Geologic Formations

Award Number: DE-FE0026136

Project Summary:

The goal of the project was to develop and validate pressure management and carbon dioxide (CO₂) plume control strategies that can address technical and economic barriers to commercial deployment of CO₂ storage technologies, based on computational and field demonstration work at two Illinois CO₂ storage sites. New and existing wells were used to investigate field-ready development and monitoring strategies to manage pressure and control CO₂ plumes. The effort evaluated extraction well placement, brine-extraction-to-CO₂-injection ratios, extraction well completions, and brine treatment and handling options. The sensitivity of pressure changes and CO₂ plume movements to extraction well location and brine-extraction-to-CO₂-injection ratio was evaluated via reservoir simulations. Both storage efficiency and a differential pressure index were used for selecting effective brine extraction strategies. Brine treatment and handling methods that account for safe handling of brine from extraction through treatment and eventual use in industrial settings (water life-cycle analysis) were considered.

Prime Performer:
Illinois State Geological Survey

Principal Investigator:
Dr. Roland Okwen

Project Duration:
9/1/2015 – 3/31/2017

Performer Location:
Champaign, Illinois

Program:
Carbon Storage

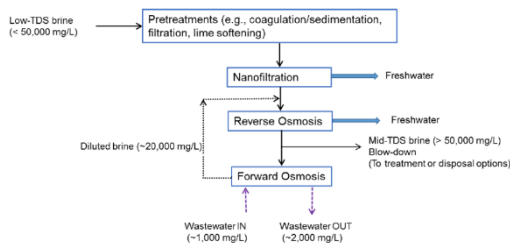


Figure 1: Proposed method to treat brines with Total Dissolved Solids (TDS) concentrations below 50,000 parts per million.

Project Outcomes:

The Illinois State Geological Survey designed a brine extraction storage test (BEST) that could be completed in two phases. In phase I, several brine extraction and treatment scenarios were tested, simulated, and analyzed for their effectiveness in extracting brine. Researchers recommend two brine extraction pilot test design options: (1) a horizontal extraction well at the base of the middle Mount Simon formation; or (2) a vertical extraction well perpendicular to the direction of high hydraulic connectivity. Managing pressure and the CO₂ plume distribution via brine extraction creates the challenge of handling and treating the extracted brine. There were three options for brine disposal: (1) an Underground Injection Control Program regulated disposal well, (2) brine treatment and industrial use, and (3) brine pretreatment and discharge into municipal wastewater system. Successful development and demonstration of these strategies reduces CO₂ storage risk at commercial-scale projects.

Presentations, Papers, and Publications

Final Report: [Brine Extraction and Treatment Strategies to Enhance Pressure Management and Control of CO₂ Plumes in Deep Geologic Formations](#) (March 2017) Roland Okwen, Scott Frailey, Seyed Dastgheib