

LARGE-SCALE CO₂ STORAGE EXPLORATION IN A BASAL SALINE SYSTEM IN CANADA AND THE UNITED STATES

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ABSTRACT

As one of the U.S. Department of Energy's Regional Carbon Sequestration Partnerships, the Plains CO₂ Reduction (PCOR) Partnership is studying the feasibility of large-scale underground CO₂ storage in the basal saline system of central North America. The area of investigation encompasses approximately 1,500,000 km² of the Alberta and Williston Basins located in the provinces of Alberta, Saskatchewan, and Manitoba in Canada and the states of Montana, North Dakota, and South Dakota in the United States. The calculated static storage resource for CO₂ in this saline system is 480 billion metric tons. However, realistic injectivity is highly dependent on the reservoir pressure buildup, which must be considered during CO₂ injection and postinjection for storage resource estimation and risk assessment.

In the study area, the large-scale CO₂ sources emit 106.5 Mt CO₂/year. Twelve scenarios were designed to address the dynamic CO₂ storage capacity and pressure transient. To increase the injectivity and maximize the storage resource use, various strategies were explored, including injection optimization, multiple well patterns, water extraction during CO₂ injection, modifications to rock compressibility, boundary conditions, and relative permeability. This presentation summarizes the results of the scenarios and identifies factors playing significant roles in CO₂ storage regarding capacity and pressure buildup throughout a large-scale geological system. This basic guideline in performing evaluations of large-scale CO₂ storage demonstration projects will specifically answer questions regarding reservoir pressure buildup over the injection and postinjection periods, ultimately tracking the CO₂ as part of the CO₂ monitoring, verification, and accounting process.