# IEAGHG INVESTIGATION OF EXTRACTION OF FORMATION WATER FROM $CO_2$ STORAGE

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The Energy & Environmental Research Center has investigated the proposed practice of formation water extraction from $CO_2$ storage reservoirs for the purpose of enhancing $CO_2$ storage. The project was performed under joint sponsorship from the IEA Greenhouse Gas R&D Programme and the U.S. Department of Energy. The concept of extracting saline waters from storage formations has been proposed as a means of managing storage formation pressures, improvement of reservoir storage volume, enhanced management of storage reservoir pressure, and/or the generation of new sources of water that may be treated for a variety of surface uses. The potential rates of water extraction from deep saline formations (DSFs), with respect to $CO_2$ storage, are not well understood. These extraction rates will depend on site-specific factors such as geologic structure, permeability and heterogeneity, and project design features (i.e., the desired $CO_2$ injection rate or well spacing).

The impacts of formation water extraction were tested through geologic modeling and dynamic simulations. Heterogeneous geologic models were developed for four case study sites which represented a range of geologic storage targets, formation water qualities, injectivities, climates, local populations, and beneficial water use opportunities. Reservoir-scale dynamic simulations were conducted to investigate the impact formation water extraction could have on storage capacity and reservoir management and to determine effective water extraction rates for those purposes.

Storage capacity was increased through water extraction at all test sites, generally doubling available storage. Tests with a closed system resulted in a 13-fold increase in storage capacity. Use of extracted water was also found to be effective for reservoir pressure management and plume control. Analysis of the resulting water quality and quantity, available treatment technologies, and potential transportation costs reveals there is likely to be limited potential for the beneficial use of extracted water from CCS facilities. Ideal circumstances of relatively high quality reservoir water and highly stressed or limited regional water resources will need to coexist before beneficial use of extracted water may be considered.