

Zama Acid Gas EOR: CO₂ Sequestration and Monitoring Project

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Abstract

The Energy & Environmental Research Center (EERC), through the Plains CO₂ Reduction (PCOR) Partnership, one of the U.S. Department of Energy's (DOE) National Energy Technology Laboratory's Regional Carbon Sequestration Partnerships, is working with Apache Canada Ltd. to determine the effect of acid gas (H₂S and CO₂) injection for the simultaneous purpose of disposal, sequestration of CO₂, and enhanced oil recovery (EOR). Since December 2006, a stream of acid gas has been injected into a Devonian pinnacle reef structure in the Zama oil field in northwestern Alberta, Canada. The injection has been conducted at an average rate of approximately 1 million cubic feet of acid gas a day, which includes approximately 50 tons of CO₂ a day. To date, there has been over 20,000 tons of acid gas injected into the structure. The project includes a variety of efforts focused on examining the effects that high concentrations of H₂S can have on EOR and carbon sequestration operations, particularly with respect to monitoring, mitigation, and verification. Research activities are being conducted at multiple scales of investigation in an effort to predict and ultimately verify the fate of the injected gas. Geological, geomechanical, geochemical, and engineering data are being used to fully describe the injection zone, overlying seals, and other potentially affected strata. Validating the integrity of the anhydrite sealing formation and determining the nature of potential geochemical and geomechanical changes that may occur because of acid gas exposure are primary goals of the research. Challenges in dealing with acid gas as a miscible fluid for EOR and sequestration have been identified and examined. Lessons regarding the use of acid gas for EOR and sequestration may be widely applicable, as the exploitation of deeper sour gas pools increases throughout the world.