EERC - DOE Joint Program on Research and Development for Fossil Energy-Related Resources

Award Number: DE-FE0024233

Project Summary:

This award consists of multiple tasks focusing on research that will assist in meeting requirements for clean fuels, chemicals, electricity, and water resources in the 21st century. Task 1 focused on carbon storage: The objective of this task was to develop and advance the effectiveness of carbon storage technologies, reduce challenges to their implementation, and prepare them for widespread commercial deployment. Research in this area focused on quantifying and optimizing carbon dioxide (CO_2) storage capacity in saline formations, along with conventional and unconventional hydrocarbon reservoirs; risk assessment and mitigation in various storage scenarios; developing and deploying new techniques for monitoring geologic CO_2 storage; and identifying and quantifying residual oil zones and determining the potential for CO_2 storage and enhanced oil recovery (EOR) in these targets.

Prime Performer:
University of North Dakota Energy and Environmental Research Center (UNDEERC)

Principal Investigator:
Lucia Romuld

Project Duration:
6/1/2015 – 5/31/2025

Performer Location:
Grand Forks, North Dakota

Program:
Carbon Transport & Storage

Project Outcomes:

Subtask 1.1- Advanced Characterization of Unconventional Oil and Gas Reservoirs to Enhance CO_2 Storage Resource Estimates: The results of this effort suggest that field emission scanning electron microscopy analysis coupled with advanced image analysis and machine learning techniques are effective in characterizing and quantifying the mineralogy, porosity, fractures, and organic matter content of 2D imagery at the high resolution needed to identify features of interest in tight rocks.

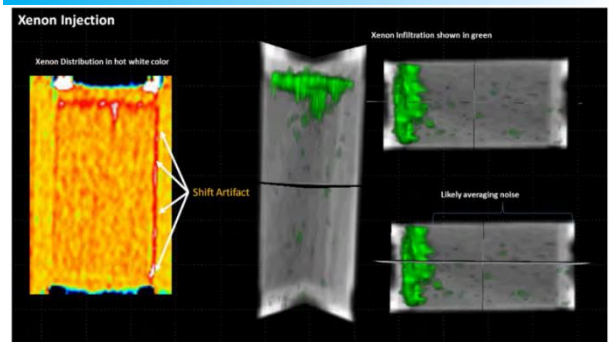

Figure 1: CT scanning images of xenon injection into Bakken core plugs.

Subtask 1.3- Integrated Carbon Capture and Storage for North Dakota Ethanol Production: The largest hurdles for carbon capture and storage (CCS) implementation at small-scale industrial systems are often business/economic-related. Passing the Section 45Q tax credit program improves economic feasibility for CCS but may require external investors for a small business to achieve maximum benefits.

Subtask 1.4- Techno-Economic Assessment of Regional Carbon Utilization Scenarios and Attendant Monitoring Technology: Without consideration for financial feasibility, CO_2-EOR as modeled in this study provides substantial economic benefits to the state. The magnitude of fiscal and economic effects of job creation and government revenues could be substantial, depending on the scale of implementation.

Subtask 1.5- CO_2 Injection Monitoring with an Optimized Scalable, Automated, Semipermanent Seismic Array (SASSA): Researchers conducted a SASSA field test from September 2018 to November 2020 in a portion of the Bell Creek Field in Montana, which implemented new CO_2-EOR field activities during the study period. Lessons learned from a proof-of-concept study were incorporated to improve the data quality of the SASSA method and demonstrate the viability of the technology.

Presentations, Papers, and Publications

Final Reports: Task 1.1 (April 2019)
Task 1.3 (May 2020)
Task 1.4 (April 2019)
Task 1.5 (November 2020)