Contract No. R-043-053
“Research in Support of Integrated Carbon Capture and Storage for N.D. Ethanol Production”
Submitted by EERC
Principal Investigator: Kerryanne Leroux

PARTICIPANTS

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<tr>
<th>Sponsor</th>
<th>Cost Share</th>
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<td>Red Trail Energy</td>
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Sponsor: Red Trail Energy

Cost Share: $700,000

Subtotal Cash Cost Share: $700,000

North Dakota Industrial Commission

Cost Share: $500,000

Total Project Cost: $1,200,000

Project Schedule – 18 months

Project Deliverables:

- Progress Report for 6/20 – 9/20: 10/31/2020 ✓
- Progress Report for 10/20 – 12/20: 1/31/2021 ✓
- Progress Report for 7/20 – 9/21: 10/31/2021 ✓
- Final Report: 11/30/2021 ✓

OBJECTIVE/STATEMENT OF WORK:
The objective of this project is to create a blueprint for the 1st integrated ND ethanol and CCS facility, compliant with ND Class VI regulations, to strategically maximize the marketability of ND ethanol through evolving CCS incentives. Tasks include:

- A summary of site-specific geologic evaluation steps necessary to finalize CCS designs that ensure safe injection and storage
- Contrast & compare the federal and state incentive requirements with the ND Class VI program, to establish potential business cases and ensure economic viability.
- Detailed interpretations and documentation needed to ensure regulatory compliance for CO2 injection and storage.
- Community engagement and information dissemination, and impact assessment to ensure public knowledge sharing. A CCS Outreach Tool Kit will be developed to assist others interested in moving forward.
- Compilation of a CO2 Storage Facility Permitting Guidance Document to assist implementation of CCS by other ND renewable energy or biofuel producers.

STATUS:
The contract has been fully executed.

December 2020

Actions completed for June – September include:

- Completed Milestone 1 (M1) – Core Received by UND EERC
- Completed preliminary geologic characterization and evaluation, which continues to support that the Broom Creek Formation provides adequate injectivity, capacity, and containment at the RTE CCS site, and that sufficient data and information have been collected to complete the North Dakota CO2 Storage Facility Permit (SFP) application.
- Completed the static geologic model for the RTE CCS site, incorporating logging data and updated seismic interpretation, and began incorporating core analysis data (e.g., porosity, permeability, etc.) for generating CO2 simulation forecasts.
• Completed revised material packets for Stark and Richardton Commissions to provide an RTE CCS Project update via e-mail (August 24), particularly with regard to RTE’s second well drilling (RTE-10.2).

Additional details available in the full report.

January 2021
Actions completed for October – December include:
• Completed Milestone 2 (M2) – Laboratory Analyses Complete
• Completed geologic evaluation: Results support interpretation that adequate injectivity, capacity, and containment are present to implement the RTE CCS project and that sufficient data/information are available to complete a North Dakota CO2 storage facility permit (SFP) application.
• Completed draft geologic exhibits and area of review (AOR) portions of a North Dakota CO2 SFP application as detailed in North Dakota Administrative Code §43-05-01, which the North Dakota Department of Mineral Resources (DMR) will review for compliance; ultimately, the information will be integrated into Deliverable (D) 1, CO2 Storage Characterization Methodologies Report.
• Completed drafts of the Supporting Permit Plans and the Injection Well and Storage Operations portions of a ND CO2 SFP application, to also be provided for comment to the North Dakota DMR for compliance and ultimately integrated into D3, CO2 Storage Facility Permitting Guidance Document.

Additional details available in the full report.

May 2021
Actions completed for January – March include:
• RTE submitted a North Dakota CO2 storage facility permit (SFP) application to North Dakota Department of Mineral Resources (DMR) on February 9, 2021; a compliance review by DMR commenced in coordination with the North Dakota Department of Environmental Quality.
• Finalized geologic exhibits, area of review, supporting plans and the injection well and storage operation components of the North Dakota CO2 SFP application, incorporating comments following compliance review by the North Dakota DMR.
• Prepared draft outlines for the following Deliverables (D) to describe the processes for developing these components and summarized requirements for a North Dakota CO2 SFP:
  o D1. CO2 Storage Characterization Methodologies Report
  o D3. CO2 Storage Facility Permitting Guidance Document
• A virtual meeting was conducted in March with California LCFS (Low-Carbon Fuel Standard) staff to discuss its CCS protocol requirements and application process.

Additional details available in the full report.

August 2021
Actions completed for April – June include:
• DMR has scheduled a public hearing as part of the compliance review for RTE’s submitted North Dakota CO2 SFP application. The hearing is scheduled for August 12, 2021 (www.dmr.nd.gov/oilgas/dockets/2021/docket081221.pdf).
• Outlines were completed for the following Deliverables (Ds), with content begun to describe the processes for developing these components and summarized requirements for a North Dakota CO2 SFP:
  o D1 – CO2 Storage Characterization Methodologies Report
  o D3 – CO2 Storage Facility Permitting Guidance Document
• A draft crosswalk table was completed comparing the requirements for a North Dakota CO2 SFP application to those for CCS incentive programs (e.g., California’s LCF Standard), with the goal of highlighting overlaps and differences.
• Next quarter, all technical work will be completed or near completion, the D1 report will be submitted on schedule, and planning will begin for a community open house to occur in Quarter 4 2021.

Additional details available in the full report.

**November 2021**

Actions completed for July – September include:

• Participated in the North Dakota Department of Mineral Resources public hearing as part of the compliance review for RTE’s submitted North Dakota CO2 storage facility permit application on August 12, 2021.
• Started drafts for the remaining deliverables:
  o D2 – CCS Business Crosswalk
  o D3 – CO2 Storage Facility Permitting Guidance Document
  o D4 – CCS Outreach Tool Kit
  o D5 – Final Report
• Will hold the next RTE CCS community open house virtually on November 10, 2021.
• Will complete all technical work next quarter, with all deliverable reports submitted on schedule. The project is anticipated to be completed on schedule by November 30, 2021.

Additional details available in the full report.

**January 2021**

Actions completed for October – November include:

• The formal storage facility permit was approved by NDIC on October 19, 2021.
• An EERC–RTE virtual open house was held on November 10, 2021, to inform the community and region of the RTE CCS project status.
• The following deliverables were submitted:
  o D2 – CCS Business Crosswalk
  o D3 – CO2 Storage Facility Permitting Guidance Document
  o D4 – CCS Outreach Tool Kit
  o D5 – Final Report

This project resulted in a package that details effective approaches and lessons learned, including any public materials generated through the following deliverables: D1 – CO2 Storage Characterization Methodologies Report, D2 – North Dakota CCS Regulatory-Incentives Crosswalk, D3 – North Dakota CO2 Storage Facility Permit (SFP) Guide, and D4 – North Dakota CCS Outreach Tool Kit. These documents were developed to serve as standalone guides with detailed topic discussion, as well as together (i.e., combined in the D5 – Final Report) for a comprehensive package, for the reduction of carbon emissions from ethanol production and to capitalize on evolving CCS incentive programs.

This contract is now closed with a returned commitment of $991.05.

Updated 1/27/22