



April 30, 2020

Ms. Karlene Fine
Executive Director
North Dakota Industrial Commission
State Capitol, 10th Floor
600 East Boulevard Avenue
Bismarck, ND 58505-0310

Dear Ms. Fine:

Subject: Quarterly Progress Report Entitled “Integrated Carbon Capture and Storage for North Dakota Ethanol Production – Phase III”; Contract No. R-038-047; EERC Fund 23627

Attached is the subject report for the period of January 1, 2020, through March 31, 2020, that shows the progress that has been made with partners of this project.

Thank you for funding this work. If you have any questions, please contact me by phone at (701) 777-5013 or by e-mail at kleroux@undeerc.org.

Sincerely,

Kerryanne M. Leroux
Principal Engineer, Subsurface R&D

KML/kal

Attachment

c/att: Andrea Holl Pfennig, NDIC



INTEGRATED CARBON CAPTURE AND STORAGE FOR NORTH DAKOTA ETHANOL PRODUCTION – PHASE III

Quarterly Progress Report

(for the period of January 1, 2020, through March 31, 2020)

Prepared for:

Karlene Fine

North Dakota Industrial Commission
State Capitol, 14th Floor
600 East Boulevard Avenue, Department 405
Bismarck, ND 58505-0840

Project Period: December 1, 2018 – May 31, 2020
Contract No. R-038-047

Prepared by:

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April 2020

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INTEGRATED CARBON CAPTURE AND STORAGE FOR NORTH DAKOTA ETHANOL PRODUCTION – PHASE III

EXECUTIVE SUMMARY

The Energy & Environmental Research Center (EERC), in partnership with the North Dakota Industrial Commission (NDIC), North Dakota ethanol producer Red Trail Energy (RTE), and the U.S. Department of Energy (DOE), is conducting the third phase (Phase III) of a multiphase research and development effort to create the first integrated carbon capture and storage (CCS) system in North Dakota for the reduction of carbon emissions from ethanol production and capitalize on evolving low-carbon fuel (LCF) markets. The ultimate goal of this effort is implementation of a small-scale (<200,000 metric tons, or tonnes, CO₂ per year) commercial CCS system at an industrial fuel production facility to generate a reduced-carbon ethanol fuel applicable for LCF programs.

This progress report presents a summary of activities conducted from January 1, 2020, through March 31, 2020.

Actions this quarter toward supporting continuation of the CCS effort at the RTE site include the following:

- Completed the draft North Dakota CO₂ Geologic Storage Permits Template document (Deliverable [D] 2, due April 30) and the draft Final Report (D4, due May 31).
- Completed landowner packets, providing individual results from RTE Sampling Event 3 (final sampling event).
- Technical assistance regarding RTE's Design-Based Pathway (DBP) application led to final approval by California LCF Standard (LCFS) authorities on February 28, 2020.
- Completed D3: Public Outreach Package for CCS in North Dakota, submitted to NDIC on February 28, 2020.

Next quarter, remaining deliverables will be finalized: D2 – North Dakota CO₂ Geologic Storage Permits Template and D4 – Final Report.

The EERC holds an unwavering commitment to the health and well-being of its employees, partners and clients, and our global community. As such, precautionary measures have been implemented in response to COVID-19. Staff continue to carry out project-related activities remotely, and personnel supporting essential on-site laboratory and testing activities are proceeding under firm safety guidelines. Travel has been minimized, and protective measures are being undertaken for those who are required to travel. At this time, work conducted by EERC employees is anticipated to progress with minimal disruption. Challenges posed by economic variability will be met with open discussion between the EERC and project partners to identify solutions. The EERC is monitoring developments across the nation and abroad to minimize risks, achieve project goals, and ensure the success of our partners and clients. In the event that any potential impacts to reporting, scope of work, schedule or cost are identified, they will be discussed and addressed in cooperation with the project partners.

INTEGRATED CARBON CAPTURE AND STORAGE FOR NORTH DAKOTA ETHANOL PRODUCTION – PHASE III

ACCOMPLISHMENTS

SUMMARY

The Energy & Environmental Research Center (EERC), in partnership with the North Dakota Industrial Commission (NDIC); North Dakota ethanol producer, Red Trail Energy (RTE); and the U.S. Department of Energy (DOE); is conducting the third phase (Phase III) of a multiphase research and development effort to create the first integrated carbon capture and storage (CCS) system in North Dakota for the reduction of carbon emissions from ethanol production and capitalize on evolving low-carbon fuel (LCF) markets. The ultimate goal of this effort is implementation of a small-scale (<200,000 metric tons, or tonnes, CO₂ per year) commercial CCS system at an industrial fuel production facility to generate a reduced-carbon ethanol fuel applicable for LCF programs. Actions this quarter toward supporting continuation of the CCS effort at the RTE site include the following:

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- Next quarter, remaining deliverables will be finalized: D2 – North Dakota CO₂ Geologic Storage Permits Template and D4 – Final Report.

Major Goals of the Project

The ultimate goal of this effort is implementation of a small-scale (<200,000 tonnes CO₂ per year) commercial CCS system at an industrial fuel production facility to generate a reduced-carbon ethanol fuel applicable for LCF programs. To achieve that goal, the EERC, in partnership with NDIC; North Dakota ethanol producer, RTE; and DOE, is the third phase (Phase III) of a multiphase research and development effort to create the first integrated CCS system in North Dakota for the reduction of carbon emissions from ethanol production and capitalize on evolving LCF markets.

Accomplishments under These Goals (for the reporting period)

Specific research objectives for this project are to 1) generation of site-specific CO₂ capture process designs to obtain engineering design bids, 2) collection of baseline monitoring and site characterization data to determine potential future well locations, 3) creation of draft CCS North Dakota permitting documents, 4) maintaining up-to-date understanding of requirements from evolving CO₂ markets/incentives, and 5) execution of county- and community-level outreach to support stakeholder and community acceptance of implementing an integrated CCS effort.

In summary, Phase III will generate CO₂ capture process designs, conduct baseline monitoring and reservoir characterization, conduct outreach activities, draft permits related to the North Dakota Class VI program, and continue assessment of evolving CO₂ markets. This will facilitate the collection of the data necessary to advance the RTE case study to the next phase of development toward CCS implementation.

Task 1.0 – Develop CO₂ Capture Process Design Package (PDP)

A PDP was prepared for a potential CO₂ capture facility integrated with industrial fuel production at the RTE site. Project partner Trimeric Corporation (Trimeric) generated the PDP, which includes process flow diagrams, heat and material balances, and piping and instrumentation diagrams. Trimeric then used these data to develop facility costs and vendor recommendations.

Significant accomplishments for Task 1.0 during the reporting period include the following.

- Completed draft final report summary of findings.

Task 2.0 – Initiate Monitoring and Characterization Plans

Defining the natural variability of near-surface environments assists in generating formal monitoring plans. Improving structural characterization aids in determining potential well locations. These activities reduce geologic uncertainty of the storage complex for the preparation of a compliant CCS permit package.

Significant accomplishments for Task 2.0 during the reporting period include the following.

Subtask 2.1 – Near-Surface Monitoring

- Completed all analyses from RTE Sampling Event 3 (conducted in November 2019); results have been evaluated and landowner reports were prepared.
- Completed draft final report summary of findings.

Subtask 2.2 – Reservoir Characterization

- Completed draft final report summary of findings.

Task 3.0 – Prepare CCS Permit Application Package

Draft documentation is being prepared to satisfy a storage facility permit and a permit to drill (a stratigraphic test hole) compliant with North Dakota regulations. The storage facility permit covers multiple design aspects such as technical evaluation, AOR (area-of-review) delineation, a corrective action plan, an emergency and remedial response plan, a casing and cementing program, a testing and monitoring plan, a well-plugging plan, and a postinjection site care and facility closure plan. Pertinent storage facility permit sections are being addressed using data available. The permit to drill a stratigraphic test hole was prepared with project data such that drilling can commence at the onset of potential Phase IV.

Significant accomplishments for Task 3.0 during the reporting period include the following:

- Completed draft North Dakota CO₂ Geologic Storage Permits Template document (D2, due April 30).
- Completed draft final report summary of findings.

Task 4.0 – Evaluate Economic Viability

The status of LCF programs and other evolving incentives is being assessed. A cost–benefit analysis is being performed to determine the impact of CCS-related incentives and/or LCF programs with CCS integration. Requirements from LCF/incentive programs and how they can potentially be incorporated into CCS permits is being evaluated to inform how project state regulators might enable participation in out-of-state programs.

Significant accomplishments for Task 4.0 during the reporting period include the following:

- Reviewed and evaluated Internal Revenue Service (IRS) issued guidance in February 2020 that addresses the definition of beginning of construction (IRS Notice 2020-12) and revenue procedure on partnerships (IRS Revenue Procedure 2020-12) for the Enhancement of Carbon Dioxide Sequestration Credit (a.k.a. Section 45Q) tax program; the IRS anticipates issuing further guidance on issues such as secure geologic storage, utilization qualifications, and recapture of claimed credits.
- Reviewed and evaluated status of other LCF programs in potential development; these include state programs such as in Washington and Colorado, as well as federal programs such as in Canada and Brazil.
- Provided technical assistance in response to Oregon Department of Environmental Quality’s “Notice of Proposed Rulemaking” (released December 2019); RTE submitted the final letter January 28, 2020.
- Provided technical assistance with the RTE-related DBP materials generated by California LCFS authorities and respective public comments; California LCFS approved RTE’s DBP application on February 28, 2020.

- Completed draft final report summary of findings.

Task 5.0 – Execute Public Outreach Plan

Public outreach provides informational and educational materials related to the proposed characterization and monitoring activities as well as support local public acceptance of a potential CCS effort at the RTE site. Specific stakeholder groups are being targeted for engagement such as landowners and residents, local and regional officials, and educators.

Significant accomplishments for Task 5.0 during the reporting period include the following:

- Completed D3: Public Outreach Package for CCS in North Dakota, submitted to NDIC on February 28, 2020.
- Completed landowner packets for the RTE Sampling Event 3, to be disseminated by RTE.
- Finalized drilling activity FAQs (frequently asked questions) and talking points for RTE in preparation for future city/county commissions meetings, media or landowner inquiries, etc.
- Completed draft final report summary of findings.

Task 6.0 – Management and Reporting

This task includes managing project activities and ensuring coordination and planning of the project with participants and sponsors.

Significant accomplishments for Task 6.0 during the reporting period include the following:

- Two project-related presentations were provided on January 23, 2020, at the 2020 CCS Technical Workshop in Tokyo, Japan:
 - “Scaling Up to Industrial CCUS Projects: A Regional Perspective, North Dakota, USA,” presented by John Hamling, EERC Assistant Director for Integrated Projects (Figure 1).
 - “Red Trail Energy (RTE) Carbon Capture and Storage (CCS) Project,” presented by Dustin Willett, RTE Chief Operating Officer (Figure 2).
- Completed draft Final Report document (D4, due May 31).

Plan for the Next Reporting Period to Accomplish the Goals

Activities will progress toward project closing. Remaining deliverables will be finalized: North Dakota CO₂ Geologic Storage Permits Template and Final Report.



Figure 1. John Hamling (EERC Assistant Director for Integrated Projects) presenting in Tokyo, Japan.

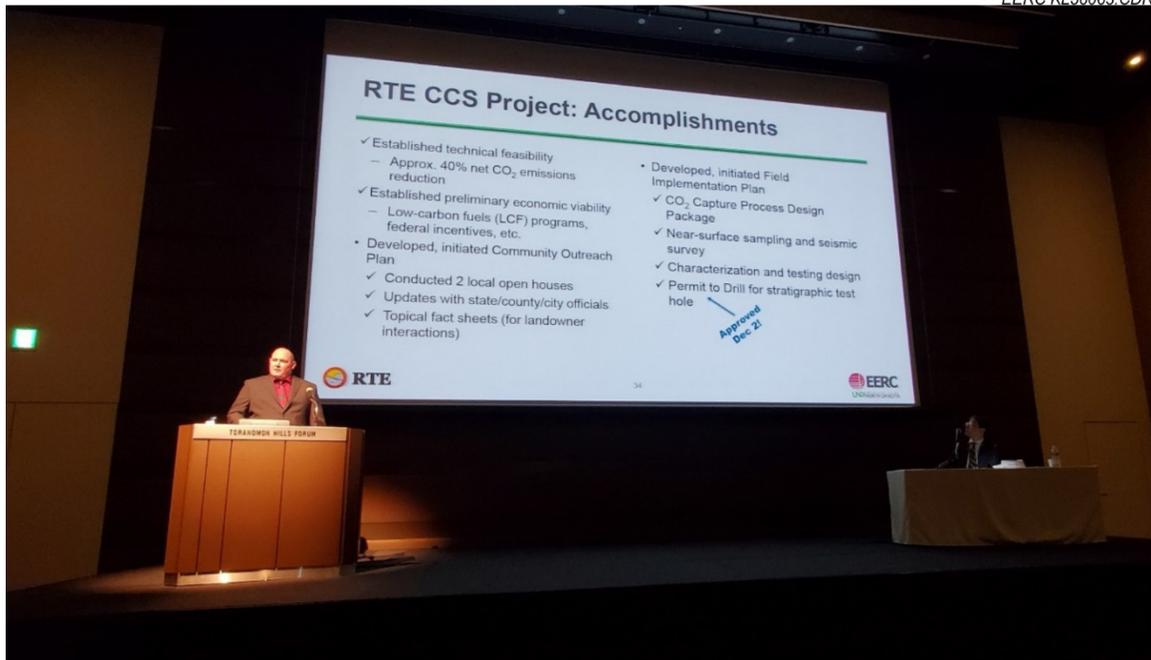


Figure 2. Dustin Willett (RTE Chief Operating Officer) presenting in Tokyo, Japan.

PARTNERS AND FINANCIAL INFORMATION

This project is sponsored by the NDIC Renewable Energy Program, RTE, and DOE. Table 1 shows the budget of \$2,650,000 for this project and expenses through the reporting period.

Table 1. Budget and Expenses Through the Reporting Period

Sponsor	Budget	Expenses through Qtr. Ending 3/31/20	Remaining Balance
NDIC, Cash	\$500,000	\$494,948	\$5,052
U.S. Dept. of Energy, Cash	\$400,000	\$353,499	\$46,501
Red Trail Energy, Cash	\$950,000	\$906,192	\$43,808
Red Trail Energy, In-Kind	\$800,000	\$761,610	\$38,390
Total Project	\$2,650,000	\$2,516,249	\$133,751

PRODUCTS

Publications, Conference Papers, and Presentations

- Two presentations (EERC and RTE) were provided at the 2020 CCS Technical Workshop on January 23, 2020, in Tokyo, Japan.

Website(s) or other Internet Site(s), Technologies or Techniques, Inventions, Patent Applications, and/or Licenses

- Updated the project web page to reflect current status, including the updated drilling FAQs fact sheet: www.undeerc.org/RedTrailEnergy.