



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

Quarterly Progress Report

(for the period of October 1, 2017, through December 31, 2017)

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

ACCOMPLISHMENTS

Major Goals of the Project

The ultimate goal of this effort is implementation of a small-scale (<200,000 metric tons, or tonnes, CO₂ per year) commercial carbon capture and storage (CCS) system at an industrial fuel production facility to generate a reduced-carbon ethanol fuel applicable for low-carbon fuel (LCF) programs. To achieve that goal, 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 a continuation study to reduce knowledge gaps in regulatory, processing, and financial requirements for implementing commercial CCS at a North Dakota ethanol production facility and proximate geologic injection site.

Accomplishments under These Goals (for the reporting period)

Specific research objectives are to 1) establish the permitting pathway for geologic storage of CO₂ for a North Dakota ethanol producer, 2) understand LCF program approval pathways for CCS (and any anticipated future guidelines), 3) collect and analyze gas composition data, 4) refine the Phase I project design, 5) improve the Phase I economic analysis, and 6) develop a community outreach plan for a CCS project at the RTE facility.

Task 1.0 – Establish Permitting Pathways

This task will continue collaboration with the California Air Resources Board (ARB) and the Oregon Department of Environmental Quality (DEQ) to understand qualification requirements for their respective LCF programs, using CCS as a means to reduce CO₂ emissions, as well as work with the North Dakota Department of Mineral Resources (DMR) to establish the appropriate compliance criteria for a Class VI injection well permit under North Dakota primacy. Permitting time lines and activities outlined in the field implementation plan (FIP) developed during Phase I will be revised if needed.

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

LCF Programs

- Participated in the November 6, 2017 Public Workshop to discuss ARB's 2018 Low Carbon Fuel Standard (LCFS) Preliminary Draft Regulatory Amendment Text.
- Upon request from ARB, the EERC reviewed the document and provided a list of technical comments, questions, and concerns, focused on incorporation of CCS into the ARB LCFS Program.

North Dakota Class VI Program

- Communicated with DMR concerns regarding the ARB document creating complexities between state entities with regard to regulating CCS efforts.

Update Phase I FIP

- These activities have not yet begun.

Task 2.0 – Update Infrastructure Design

The focus of this task is to reduce uncertainty in the designs of capture technology, pipeline, and injection wells through sampling and analysis of fermenter gas. A gas-sampling program will be conducted to define variability in the CO₂ stream. The results of the gas composition measured will be used to inform and revise project infrastructure design. The life cycle analysis (LCA) conducted during Phase I will be revised if needed.

No significant accomplishments for Task 2.0 have been conducted during the reporting period, as these activities will begin in the next quarter.

Task 3.0 – Update Economic Analysis

Revision of the economic assessment refines the estimated costs and benefits of combining commercial CCS with ethanol production at the RTE site conducted during Phase I. These updates will be based on any changes in CCS implementation requirements and related costs or potential revenue through developing LCF programs, derived from the outcomes of Tasks 1.0 and 2.0, as well as detailed costs not considered during Phase I.

No significant accomplishments for Task 3.0 have been conducted during the reporting period, as these activities will begin in the next quarter.

Task 4.0 – Develop Community Outreach Plan

This task will assess the population characteristics in and around the RTE site to develop a project-specific outreach plan. These efforts will provide a model for outreach that can be applied at other facilities and, when carried out, will contribute to public understanding and acceptance of CCS implementation.

No significant accomplishments for Task 4.0 have been conducted during the reporting period, as these activities will begin in the next quarter.

Plan for the Next Reporting Period to Accomplish the Goals

All technical work will begin in the next reporting period. Specifically, the updating of the infrastructure design and the economic analysis activities will start. In addition, analysis of

community characteristics at the RTE site will also be conducted for development of the Community Outreach Plan.

PARTNERS AND FINANCIAL INFORMATION

This project is sponsored by the NDIC Renewable Energy Program, DOE, and RTE. Table 1 shows the budget of \$690,000 for this project and expenses through the reporting period.

Table 1. Budget and Expenses Through the Reporting Period

Sponsor	Budget	Expenses	Remaining
NDIC Cash	\$345,000	\$-	\$345,000
DOE Cash	\$200,000	\$13,317	\$186,683
RTE In-Kind	\$145,000	\$-	\$145,000
Total Project	\$690,000	\$13,317	\$676,683

PRODUCTS

Publications, Conference Papers, and Presentations

A press release was written summarizing Phase II efforts and published on December 21, 2017.

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

None.

CHANGES/PROBLEMS

None.