

**FINAL REPORT/ONE-PAGE SUMMARY**

**CONTRACT NO.:** R-038-047  
**PROJECT NAME:** “Integrated Carbon Capture and Storage for North Dakota Ethanol Production – Phase III”  
**PROJECT PERIOD:** 12/01/2018 – 05/31/2020  
**CONTRACTOR:** EERC  
**PRINCIPAL INVESTIGATOR:** Kerryanne M. Leroux  
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**PARTICIPANTS**

<b>Sponsors</b>	<b>Cost Share</b>
North Dakota Industrial Commission (cash)	\$500,000
Red Trail Energy (cash/in-kind)	\$1,750,000
U.S. Department of Energy (cash)	\$400,000
<b>Total</b>	<b>\$2,650,000</b>

<b>Project Deliverables</b>	<b>Dates</b>	<b>Complete</b>
Quarterly Report	12/01/18 – 12/31/18	X
Quarterly Report	01/01/19 – 03/31/19	X
Quarterly Report	04/01/19 – 06/30/19	X
Quarterly Report	07/01/19 – 09/31/19	X
Quarterly Report	10/01/19 – 12/31/19	X
Quarterly Report	01/01/20 – 03/31/20	X
Final Report	12/01/18 – 05/31/20	X

<b>Project Schedule</b>	<b>Date</b>
Contract Date	11/28/2018
Start Date	12/01/2018
Completion Date	05/31/2020

**PROJECT DESCRIPTION:**

The Energy & Environmental Research Center (EERC), in partnership with Red Trail Energy, LLC (RTE), a North Dakota ethanol producer; the North Dakota Industrial Commission (NDIC); and the U.S. Department of Energy (DOE), executed several efforts to advance carbon capture and storage (CCS) implementation for the RTE case study. The project technical team comprised the EERC, RTE, and Trimeric Corporation. Using the RTE facility near Richardton, ND, as a case study, this project was the third phase (Phase III) of a multiphase research and development effort to create the first integrated carbon capture and storage (CCS) system in ND for the reduction of carbon emissions from ethanol production and capitalize on evolving low-carbon fuel (LCF) markets.

**OBJECTIVE / STATEMENT OF WORK:**

Objectives for Phase III were to collect the data necessary to advance the RTE case study to the next phase of development and ultimately create the first integrated CCS facility in ND, maximizing the market potential of ND ethanol production through CCS incentive programs. The Phase III project initiated field research plans developed during previous phases.

**PROJECT RESULTS, WORK ACCOMPLISHED:**

Several guidance documents were generated: CO<sub>2</sub> Capture Process Design Package, North Dakota Geologic CO<sub>2</sub> Storage Permits Template, and Public Outreach Package for CCS in North Dakota ([www.nd.gov/ndic/renew-project.htm](http://www.nd.gov/ndic/renew-project.htm)). CO<sub>2</sub> capture process designs were prepared to provide the foundation for a formal engineering design of the CO<sub>2</sub> capture system and other CCS infrastructure. Near-surface baseline monitoring and characterization data (seismic survey) were collected to support characterization, permitting, and operational CCS-monitoring activities in future phases. Provisional ND permitting documents for CO<sub>2</sub> geologic storage were created. Evolving LCF and other incentive programs were assessed for their financial and regulatory impact on potential CCS implementation. Execution of outreach plans created in Phase II engaged stakeholders and communities regarding CCS integration with ND ethanol production.

**CONCLUSIONS, RECOMMENDATIONS:**

The results of Phase III allowed project partners to move closer to implementing the first integrated ethanol–CCS effort in North Dakota in order to capitalize on evolving incentive programs. Specific outcomes included 1) a process design package produced for CO<sub>2</sub> capture integrated with North Dakota ethanol production, 2) baseline monitoring and characterization data required for geologic CO<sub>2</sub> storage permits, 3) a template for a North Dakota CO<sub>2</sub> storage facility permit (SFP) application, 4) an implementation plan to satisfy the requirements of North Dakota regulations as well as out-of-state low-carbon fuel markets and/or other incentive programs, and 5) CCS outreach for stakeholders and western North Dakota communities.

A stratigraphic test well is the recommended next step to acquire the remaining data necessary to qualify the site for CCS and develop a North Dakota CO<sub>2</sub> SFP application. RTE completed drilling a stratigraphic test well in April 2020, providing downhole data at the site to 1) develop a North Dakota CO<sub>2</sub> SFP application, 2) finalize the CO<sub>2</sub> liquefaction facility design, and 3) develop a certification application under the LCFS CCS Protocol.

**POTENTIAL APPLICATIONS OF THE PROJECT:**

Public–private partnerships with NDIC and DOE have resulted in foundational technical and regulatory knowledge, growing stakeholder confidence, and a pathway to implementation that enables similar industrial CCS projects in the region to advance. The RTE CCS case study is demonstrating how small-scale commercial CO<sub>2</sub> emitters might economically implement and operate CCS infrastructure and engage in the CCS industry in North Dakota. The RTE CCS case study therefore provides a road map toward successful integration of commercial-scale CCS with small-scale industrial fuel production.