



Energy & Environmental Research Center

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October 29, 2020

Ms. Karlene Fine
Executive Director
North Dakota Industrial Commission (NDIC)
600 East Boulevard Avenue, Department 405
State Capitol, 14th Floor
Bismarck, ND 58505-0840

Dear Ms. Fine:

Subject: Quarterly Progress Report for the Period of July 1 – September 30, 2020,
“Underground Storage of Produced Natural Gas – Conceptual Evaluation and Pilot
Project(s) (HB 1014)” ; Contract No. G-049-092; EERC Fund 23984

Attached please find the Energy & Environmental Research Center (EERC) Quarterly
Progress Report for the subject project. If you have any questions, please contact me by phone at
(701) 777-5050 or by e-mail at bkurz@undeerc.org.

Sincerely,

DocuSigned by:

Bethany Kurz

1518154149DD485...

Bethany A. Kurz
Assistant Director for Integrated Analytical
Solutions

BAK/kal

Attachment

c: Brent Brannan, NDIC



UNDERGROUND STORAGE OF PRODUCED NATURAL GAS – CONCEPTUAL EVALUATION AND PILOT PROJECT(S) (HB 1014)

Quarterly Progress Report

(for the period July 1 – September 30, 2020)

Prepared for:

Karlene Fine

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

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October 2020

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UNDERGROUND STORAGE OF PRODUCED NATURAL GAS – CONCEPTUAL EVALUATION AND PILOT PROJECT(S) (HB 1014)

Quarterly Progress Report

July 1 – September 30, 2020

EXECUTIVE SUMMARY

The Energy & Environmental Research Center (EERC) is performing a project to directly address the intent of Section 25 of House Bill 1014 of the Sixty-Sixth Legislative Assembly of North Dakota as signed into law by Governor Burgum, which states that funding will be made available to the EERC for “pilot projects relating to the underground storage of produced natural gas.” The overall goal of the proposed effort is to demonstrate the techno-economic feasibility of produced natural gas (“produced gas”) injection into non-hydrocarbon-producing subsurface formations in the Williston Basin for future recovery and use or for pressure maintenance and/or enhanced oil recovery in a conventional or unconventional oil reservoir. To achieve the project goal, the EERC will partner with North Dakota oilfield producers on up to three pilot project efforts to define and assess the key technical, economic, and regulatory components of each approach. This progress report presents an overview of activities from July 1 through September 30, 2020.

In July 2020, XTO Energy stopped work on evaluation of two pilot projects indefinitely as a result of the downturn in oil prices. A report highlighting the results of the EERC’s evaluation is being written.

Moving forward, the EERC has been approached by four Bakken operators, including two large publicly traded companies and two smaller private equity-backed companies, who have expressed interest in partnering on potential gas storage/injection pilot projects. The EERC drafted a presentation and document summarizing a path forward. That plan will be presented to the Oil & Gas Research Council on October 8, 2020, for approval and/or modification prior to bringing the plan forth to the North Dakota Industrial Commission during its meeting on October 22, 2020.

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.

**UNDERGROUND STORAGE OF PRODUCED NATURAL GAS – CONCEPTUAL
EVALUATION AND PILOT PROJECT(S) (HB 1014)
Quarterly Progress Report
July 1 – September 30, 2020**

INTRODUCTION

The Energy & Environmental Research Center (EERC) is performing a project to directly address the intent of Section 25 of House Bill (HB) 1014 of the Sixty-Sixth Legislative Assembly of North Dakota as signed into law by Governor Burgum, which states that funding will be made available to the EERC for “pilot projects relating to the underground storage of produced natural gas.” The overall goal of the proposed effort is to demonstrate the techno-economic feasibility of produced natural gas (“produced gas”) injection into non-hydrocarbon-producing subsurface formations in the Williston Basin for future recovery and use or for pressure maintenance and/or enhanced oil recovery (EOR) in a conventional or unconventional oil reservoir. To achieve the project goal, the EERC will partner with North Dakota oilfield producers on up to three pilot project efforts to define and assess the key technical, economic, and regulatory components of each approach.

The primary project objectives are to evaluate the viability of various subsurface formations as storage and/or injection targets, document the facilities and equipment needs and costs for produced gas injection, predict the subsurface storage footprint of the injected gas plume over time, predict gas recovery efficiencies, develop a monitoring plan, and summarize the required regulatory considerations for different injection/storage scenarios. The above information will be obtained from a combination of research activities performed at the EERC and from up to three pilot projects performed in partnership with and including substantial financial investment from oilfield operating companies.

ACCOMPLISHMENTS DURING REPORTING PERIOD

Program Management and Reporting

The EERC will be responsible for managing and reporting of its activities with respect to the implementation and assessment of the pilot projects. Quarterly reports will be submitted to the North Dakota Industrial Commission (NDIC) 1 month after the end of each calendar quarter to provide timely highlights of ongoing research activities. At least one report will be provided to legislative management regarding the results and recommendations of the pilot project(s).

In addition to progress reporting, the relevant data and results needed to assess the overall technical and economic performance of the approach will be compiled and analyzed. The results of the gas injection scenarios that are technically and economically feasible will be used to develop an implementation plan that highlights optimal locations and scenarios for produced gas storage, recovery, and reuse throughout the oil and gas production regions of North Dakota. Key lessons learned from the pilot project(s) will be incorporated into that plan for future development efforts.

In July 2020, XTO Energy (XTO) stopped work on evaluation of both pilot projects (referred to as the Minnelusa gas storage and Bakken EOR projects) indefinitely as a result of the downturn in oil prices. A report highlighting the results of the EERC's evaluation is being written.

Moving forward, the EERC has been approached by four Bakken operators, including two large publicly traded companies and two smaller private equity-backed companies, who have expressed interest in partnering on potential gas storage/injection pilot projects. There is also potential for field-scale demonstration of a technology that may drastically reduce the compression and raw gas requirements needed for subsurface produced gas injection while providing a mechanism to more rapidly build pressure in unconventional targets for the purpose of EOR. In all but the proposed technology demonstration project, the companies would like the EERC to assist with the technical evaluation of the concepts, as well as with the permitting process, project implementation, and plume monitoring if the concepts appear technically and economically viable. Each of the proposed efforts would help build our knowledge of the technical and economic feasibility of various produced gas storage/injection approaches, given the diverse injection scenarios proposed by each company. The EERC compiled a document and presentation summarizing the proposed path forward with each of these potential partners to share with the Oil & Gas Research Council (OGRC) and the NDIC for approval.

Minnelusa Group Gas Storage Pilot

The key results, conclusions, and lessons learned from the evaluation of XTO's proposed produced gas storage pilot project are being summarized into a final report that will be provided to the NDIC during the next quarter.

Bakken EOR Pilot

The key results, conclusions, and lessons learned from the evaluation of XTO's proposed produced gas EOR pilot project are being summarized into a final report and a journal manuscript that will be provided to the NDIC during the next quarter.

FUTURE ACTIVITIES

The planned activities for the next quarter are detailed as follows.

Program Management and Reporting

A report highlighting the key findings and lessons learned from the evaluation of the XTO pilot projects will be completed. It is also anticipated that one or more presentations summarizing the key results of the evaluations will be prepared and given to the NDIC and members of the legislature (as requested).

The EERC drafted a presentation and document summarizing a path forward involving partnership with four new industry partners to evaluate different aspects of produced gas

injection for geologic storage and/or EOR. That plan will be presented to the OGRC on October 8, 2020, for approval and/or modification prior to bringing the plan forth to the NDIC during its meeting on October 22, 2020.

PARTNERS AND FINANCIAL INFORMATION

The project is sponsored by the NDIC Oil and Gas Research Program. Table 1 shows the budget of \$6,000,000 from NDIC, as listed in HB 1014, and expenses through the reporting period. Once specific pilot project(s) are identified, attendant detailed budgets will be developed. It is expected that pilot project partner(s) will provide substantial cost share that will be documented to the greatest degree possible.

Table 1. Budget and Expenses to Date

| Sponsors | Budget | Actual Expenses as of 9/30/2020 | Balance |
|--------------------------|---------------------|--------------------------------------------|---------------------|
| NDIC | \$6,000,000 | \$584,033 | \$5,415,967 |
| Industry Share – In-Kind | \$6,000,000 | \$1,028,120 | \$4,971,880 |
| Total | \$12,000,000 | \$1,612,153 | \$10,387,847 |

* As XTO and the EERC are currently conducting initial exploratory activities to determine whether XTO will participate as a collaborator for one or more produced gas injection pilot projects, an estimate for the total expected in-kind cost share from XTO is not available. XTO will periodically report actual costs to the EERC, which will subsequently present them in the quarterly report.