

August 15, 2025

Mr. Jordan Kannianen
Deputy Executive Director
North Dakota Industrial Commission
ATTN: Oil and Gas Research Program
State Capitol – 14th Floor
600 East Boulevard Avenue, Department 405
Bismarck, ND 58505-0840

Dear Mr. Kannianen:

Subject: Chord Energy Proposal Entitled “Large-Scale Hydrocarbon Gas Injection EOR Pilot to Inform Future CO₂ EOR in the Bakken” in Response to the North Dakota Industrial Commission (NDIC) Oil and Gas Research Program (OGRP) Enhanced Oil Recovery Grant Program

Chord Energy is pleased to submit the subject proposal to the Oil and Gas Research Program. The \$100 application fee is provided through ACH transaction number 8980400226JO. Chord Energy is committed to helping the state improve oil recoveries through EOR and other techniques.

If you have any questions, please contact me by telephone at (281) 404-9500 or by email at arvo.buck@chordenergy.com.

Sincerely,

A handwritten signature in black ink, appearing to read 'A. Buck', with a stylized flourish at the end.

Arvo Buck
Director of New Ventures

AB

Attachments

c/att: Erin Stieg, NDIC OGRP

Oil and Gas Research
Program:
Enhanced Oil Recovery
Grant Program
North Dakota

Industrial Commission

Application

Project Title: Large-Scale Hydrocarbon Gas
Injection EOR Pilot to Inform Future CO₂ EOR in
the Bakken

Applicant: Chord Energy

Principal Investigator: Arvo Buck

Date of Application: August 15, 2025

Amount of Request: \$13,998,200

Total Amount of Proposed Project:
\$38,632,967

Duration of Project: 24 months

Point of Contact (POC): Arvo Buck

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Houston, TX 77002

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ABSTRACT

Objective: The “Bakken CO₂ EOR and Storage Field Laboratory” (BCO₂EORFL) was established in September 2024, to conduct lab, modeling, and field-based activities to show that CO₂ injected into a Bakken reservoir will result in incremental oil recovery. The center piece of the original BCO₂EORFL work plan is an 18-month CO₂ injection pilot for EOR. This pilot is the first to comprehensively address all technical and operational challenges that limited previous pilots full potential. The objective of this proposal is to provide additional resources that will enable Chord Energy to fully achieve the BCO₂EORFL goal of demonstrating commercial viability of Bakken EOR. This EOR pilot is the fastest and surest path to economic EOR success for North Dakota and its O&G Operators. Unfortunately, to achieve the pilot’s ambitions, Chord had to adjust from a CO₂ injection plan to a mostly a hydrocarbon based injectable solution due to lack of available CO₂ supply. Hydrocarbon injectant and CO₂ are similar enough for EOR to allow for the results from a hydrocarbon-based EOR pilot to be calibrated to predict the effects of CO₂ under the same reservoir conditions. This indicates that the results of an EOR pilot that uses hydrocarbons can be directly applied to predicting the results of future EOR operations that use CO₂. In addition to higher injectable fluid costs, base costs for the project have fundamentally exceeded original expectations. This is largely due to refining/changing scope now that a drilling spacing unit (DSU) has been chosen. Chord is currently working through understanding surface processes and necessary surface facilities to successfully execute this EOR pilot. **Expected Results:** Execution of the pilot test activities will help demonstrate a pathway towards commercial-scale deployment of Bakken EOR for hydrocarbon and CO₂ injectates. **Duration:** 24 months (January 1, 2026 – December 31, 2027). **Total Cost:** The total value of the project is \$38,632,967. The OGRP request is for \$13,998,200. Chord Energy will provide cost-share commitments. **Participants:** Chord Energy and EERC.

PROJECT DESCRIPTION

The passing of Senate Bill 2014 by North Dakota's 69th Legislative Assembly establishes an EOR grant program and appropriates funds to the North Dakota Industrial Commission Oil and Gas Research Program (NDIC OGRP) for projects that demonstrate approaches for commercially viable improved oil recovery that can be deployed throughout the Bakken play, as well as the state's wide variety of conventional reservoirs. In September 2024, with primary funding from an award of \$11,600,000 by the U.S. Department of Energy (DOE), the "Bakken CO₂ EOR and Storage Field Laboratory" (BCO₂EORFL) was established by Chord Energy and the Energy & Environmental Research Center (EERC). The purpose of the BCO₂EORFL is to conduct laboratory, modeling, and long-term, large-scale injection activities to investigate the concept that CO₂ injected into a Bakken reservoir will result in incremental oil recovery. The centerpiece of the original BCO₂EORFL scope of work is an 18-month CO₂ injection program for EOR. However, due to difficulties with cost-competitive CO₂ sourcing at the required scale, Chord intends to pivot from a CO₂-based injectate to a hydrocarbon gas-dominated injectate, which past studies indicate will provide a similar EOR response as CO₂. It is anticipated that the hydrocarbon gas stream used for the pilot will include a minor concentration of CO₂, which will satisfy the contractual obligation to DOE to evaluate the potential effects of CO₂ injection on a Bakken reservoir. Past laboratory testing and modeling exercises indicate that the results of a hydrocarbon-based EOR pilot can be calibrated to inform the successful design and operation of future commercial-scale CO₂-based EOR operations. The EOR pilot will be located in the Indian Butte Area of the Bakken, McKenzie County, North Dakota. The proposed project intends to use pairs of wells for injection, oil production, and reservoir surveillance throughout the project. Additional offset wells will be monitored for production responses after injection commences. The two HnP wells along with the other four wells on the DSU pad are currently drilled and will be completed and put in production prior to the injection project commencing.

A multiwell cyclic gas injection (also referred to as huff 'n' puff [HnP]) design will be employed to perform the EOR pilot test. Hydrocarbon gas will be injected into the reservoir through the two wells, alternating in each HnP cycle: when one well is in injection stage, the other will be in soaking and/or production stage and vice versa. Currently 18 months of injection are planned over a 20-month field test period with a currently planned hydrocarbon gas injection volume of 6,566 MMscf. Initial simulation results indicated that high-pressure HnP through hydrocarbon gas injection could yield 30% more oil than pressure depletion over three years of operation, provided consistent, sufficient gas volume is available. Unconventional EOR analogues from other basins show incremental recoveries of 30 -70% over primary. This is the first EOR pilot in the Bakken that will comprehensively address these operational and technical challenges. Success will have tremendous effect on the economic trajectory of the Bakken and North Dakota supplementing primary production and decreasing drilling inventory in the basin.

The current funding profile for the original BCO₂EORFL budget over the course of a four-year period of performance includes contracted funding from the U.S. DOE (\$11,600,000, of which \$6,750,000 is budgeted to go to Chord), NDIC OGRP funding through the EERC's Bakken Production Optimization Program (\$2,000,000 over four years which is budgeted to pay for EERC activities), and in-kind contributions from Chord (minimum of \$900,000).

In this proposal, Chord Energy and EERC are seeking incremental funding through the NDIC-OGRP Enhanced Oil Recovery Grant Program¹ to incorporate the use of hydrocarbon-based fluids as a primary component of the injectate stream to make up the shortfall in cost-competitive pure CO₂ availability. These funds would be used to offset costs associated with the planning and operational activities of the pilot using a hydrocarbon injectate stream. Specific components of the incremental activities will include

¹ The ND legislature appropriated an additional \$25 million to the NDIC-OGRP specifically for the purpose of advancing EOR (SB 2014).

adapting surface infrastructure to manage the hydrocarbon injectate, and modifying the modeling and simulation, scheme design, operational planning, permitting, and reservoir surveillance activities. A portion of the incremental NDIC-OGRP EOR Grant funding will be used by Chord to purchase equipment and supplies, including the injectate, necessary for the successful execution of the pilot.

Objectives: Complete the necessary modifications to the originally planned EOR modeling and simulations, injection scheme design, operational planning, permitting, and reservoir surveillance to successfully transition from a purely CO₂ injectate stream to a hydrocarbon gas stream for a 20-month multiwell, multicycle EOR pilot as part of the BCO₂EORFL.

Methodology: Chord Energy will work with the EERC to complete the following tasks.

1.0 – Project Management and Reporting: In this task, Chord and EERC management will ensure all project activities stay within budget and on schedule and all project objectives are achieved. Chord and EERC staff will meet frequently as necessary throughout the duration of the project. Activities under this task will ensure all technical activities are coordinated effectively between Chord and EERC teams. This task will encompass the development of contractually required project reports to the NDIC as well as periodic project update meetings with members of the Oil and Gas Research Council.

2.0 – Modeling, Simulation, and Design of Hydrocarbon Gas Injection and Production Schemes:

This task includes performing iterative reservoir simulations using industry standard software to support designing optimum hydrocarbon-based injection and production schemes for the pilot DSU. Production history matching and predictive simulations will be conducted throughout the duration of the project to aid in interpretation of EOR pilot performance and guide pilot operation. Activities under this task will support the design and operational planning for the EOR injection and production cycle scheme, as well as engineering support for near-real-time operational performance evaluation and troubleshooting during the execution of the pilot project.

3.0 – Reservoir Surveillance and Evaluation: This task includes the development and implementation of a reservoir surveillance scheme that will gather data necessary to evaluate the response of the Bakken reservoir to hydrocarbon gas injection operations. This task will include the assessment, selection, and installation of reservoir surveillance equipment (i.e. downhole gauges, surface gauges, flowback fluid sampling and analysis) as well as the interpretation of the collected data. Data collected through this task will be incorporated into the iterative reservoir simulations that will be performed through Task 2.0.

4.0 – Surface Facility Planning and Design, Injectate Procurement, and Permitting: Surface infrastructure needs will be evaluated to ensure compatibility to manage the hydrocarbon injectate and anticipated fluid flowback operations during production. Additional surface equipment and surface equipment installation services will be purchased by Chord Energy with project funds. Specific examples of surface equipment include high pressure production separators, automated well manifolds, and compressor installation. Additionally, project funds from this task will be utilized to cover the incremental cost of purchasing hydrocarbon-gas injectate as opposed to CO₂. During the original BCO₂EORFL proposal process the price for CO₂ was assumed to be \$1.50/Mcf (based on publicly available CO₂ price estimates in literature). After the BCO₂EORFL was selected by DOE for award, Chord began the process of seeking to contract a source of CO₂ to supply the planned pilot injection. During that process it became clear that cost-competitive CO₂ in the volumes necessary for a successful pilot were not going to be available in the necessary timeframe. The cost of hydrocarbon gas in quantities necessary to conduct the pilot is \$2.00/Mcf. The incremental cost to purchase the necessary volume of hydrocarbon gas is estimated to be \$3,283,200.

The necessary permits will be developed and submitted to the North Dakota Department of Mineral Resources (DMR) to conduct the EOR pilot. Additionally, this task will include the development and submission of any sundry notices to the DMR that may be associated with the pilot.

Anticipated Results: The data generated from this project and the associated infrastructure changes will allow for the design and execution of a hydrocarbon gas HnP pilot, supporting the successful execution of a long term, large scale Bakken EOR pilot despite the shortfall that exists in available CO₂. Past studies have indicated that injecting hydrocarbon gas will provide a similar EOR response as CO₂ which will enable the results from this pilot to inform the successful design and operation of future commercial-scale CO₂-based and hydrocarbon-based EOR operations in the Bakken.

Facilities, Resources, and Techniques to Be Used and Their Availability and Capability: Chord Energy is the largest Williston Basin operator with approximately 1.3 million net acres in the Bakken Play that currently produces over 250,000 bbl/day gross from over 4500 wells. Chord has a large team of highly trained, qualified, and experienced engineers, geoscientists, and technical field support staff who will be available to work on the project. The design and conduct of all field-based operations will use industry-standard best practices with respect to environmental, safety, and health protocols and performance. All equipment will be procured, installed, and operated according to industry standards and best practices.

The EERC employs a multidisciplinary staff of about 300 and has 254,000 square feet of state-of-the-art offices, laboratories, and technology demonstration facilities, which enable staff to address a wide variety of research topics. The EERC has decades of Bakken-focused geologic modeling, reservoir simulation, EOR facilities design, reservoir surveillance, and data analytics experience.

Environmental and Economic Impacts while the Project is Underway: Environmental impacts will be minimal during the execution of this project. Field-based activities will be conducted on an existing industrial site (well pad with surface facilities). Economic impacts during the project will also be minimal and will not appreciably affect any of the organizations participating apart from regular employment economic effects for those working on the project.

Technological and Future Development Impacts: This project could ultimately increase oil and gas industry operations in North Dakota by increasing estimated ultimate recovery for Bakken DSUs.

Successful EOR operations would extend the lifetime of the Bakken play by multiple decades and could yield billions of barrels of incremental oil and natural gas, which would translate into billions of dollars of economic impact to North Dakota.

Why the Project Is Needed: This project is needed to facilitate the successful adaptation of hydrocarbon-based fluids as the primary injectant in the Bakken CO₂ EORSFL pilot test. This will allow for Chord to leverage the \$10.6 million of DOE funding provided through the Bakken CO₂ EORSFL despite the shortfall that exists in available CO₂. Simulations show that high-pressure HnP through hydrocarbon gas injection could yield +30% more incremental EUR than pressure depletion over several years of operation, provided consistent, sufficient gas volume is available. Unconventional EOR analogues from other basins show incremental recoveries of 30 -70% over primary. Independent studies conducted by the EERC (Sorensen et al., 2015) and Advanced Resources International (Kuuskraa et al., 2020) indicate that estimated ultimate recovery from EOR in the Bakken ranges from 3.2 to 7 billion barrels of incremental oil. Current supplies of hydrocarbon-based injectates (natural gas, rich gas, and natural gas liquids), which are projected by the North Dakota Pipeline Authority (DMR Director's Cut, March 2025) and the U.S. Energy Information Administration (eia.gov, accessed August 1, 2025) to grow over the coming years, could support EOR operations at hundreds of Bakken DSUs. Federal legislation has increased the value of 45Q tax credits for qualifying EOR projects to \$85/tonne of CO₂ stored, which is on par with the value of 45Q tax credits for CO₂ storage in deep saline aquifers. This development is expected to incentivize the capture and availability of CO₂ for use in EOR projects. A combination of currently operating and announced CO₂ capture projects in the region indicate there is the potential to supply over 100 DSUs. The fact that this project is specifically designed to yield results that are applicable to both hydrocarbon gas and CO₂-based EOR means it could provide a path toward

commercial EOR at several hundred DSUs across the Bakken within the decade. Successful EOR pilot projects are crucial for unlocking additional resources in the Bakken of North Dakota, and this is the first EOR pilot in the Bakken that will comprehensively address the operational and technical challenges from prior pilots. Success will have tremendous effect on the economic trajectory of the Bakken and North Dakota supplementing primary production and decreasing drilling inventory in the basin.

STANDARDS OF SUCCESS

Success will be measured in this project's ability to generate key data and insights that will influence the design, planning, and execution of future commercial-scale EOR projects in the Bakken. This project will take essential steps on the path to unlocking the vast potential of EOR in the Bakken and to ensure the continued success of the oil and gas industry in North Dakota. A strong oil and gas industry contributes to a robust state economy, which includes the creation and continuation of jobs that support or are positively impacted by oil and gas development in the state. As a measure of success, the current NDIC OGRP-approved process of reporting will be employed to deliver results. High-level progress updates will be provided in semiannual reports to OGRP for inclusion on the OGRP website for immediate access by the public. A final report summarizing project outcomes will be prepared and delivered to OGRP at the end of the project.

BACKGROUND/QUALIFICATIONS

Chord Energy is the largest Williston Basin operator with approximately 1.3 million net acres in the Bakken play that currently produce over 250,000 bbl/day gross from over 4500 wells. Chord has a large team of highly trained, qualified, and experienced engineers, geoscientists, and technical field support staff who will be available to work on the project. Mr. Arvo Buck, Director New Ventures for Chord Energy, will serve as the project manager. Mr. Buck has over 18 years of oilfield industry experience. Mr. Victor Barcot, Vice President, New Ventures for Chord Energy, will serve as a senior project advisor. Mr. Barcot has over 20 years of advisory and M&A experience, exclusively within the Energy sector. The

EERC is a nonprofit branch of the University of North Dakota and has been intimately involved in the planning and execution of four previous Bakken pilot tests. Mr. James Sorensen, Director of Subsurface R&D, will serve as the leader of the EERC team. Dr. John Harju, Vice President for Strategic Partnerships, will serve as a senior project advisor. Both Mr. Sorensen and Dr. Harju have over 30 years of experience working with the oil and gas industry, with an emphasis on EOR over the last 20 years. Other key EERC personnel will include Mr. Mike Warmack, petroleum engineer, Mr. Darren Schmidt, petroleum engineer, and Dr. Lu Jin, reservoir engineer. Resumes of key personnel are provided in Appendix B.

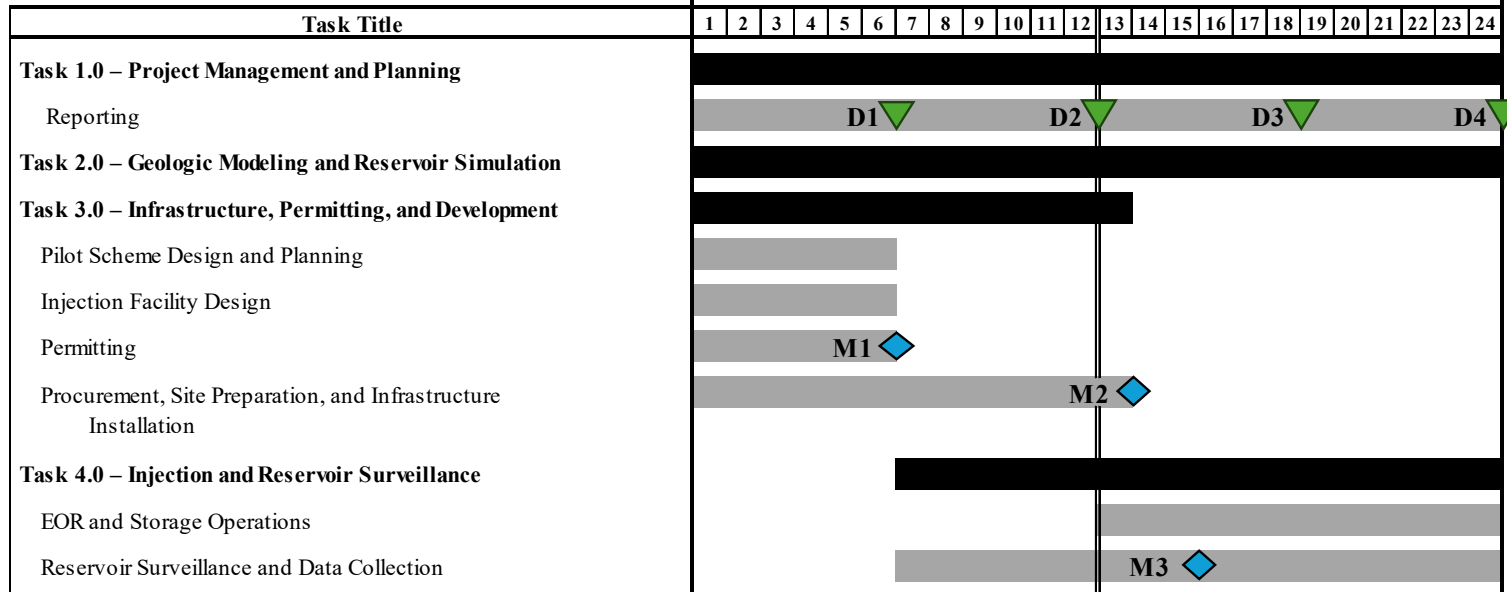
MANAGEMENT

Chord Energy manages approximately 1.3 million net acres in the Bakken play, operating over 4500 wells and associated infrastructure daily. Chord has a large team of highly trained, qualified, and experienced management and support staff who will be focused on project success. Systems are in place to ensure that projects are managed within budget, schedule, and scope. Mr. Buck will oversee the project, with assistance in management of EERC tasks by Mr. Sorensen and Mr. Schmidt. This will involve integration of tasks, project reporting, and collaboration between Chord and EERC personnel. Periodic reports will be submitted to NDIC in accordance with the program requirements.

TIMETABLE

A project term of 24 months is proposed, starting January 1, 2026. The preliminary project timetable is summarized below. Due to the nature of the planned operational period for the pilot being a minimum of 18 months, it is anticipated that the pilot operations will continue beyond June 30, 2027. However, assuming this proposal is selected for award and a contract is negotiated in a timely manner, Chord will make a good faith effort to ensure that any NDIC funding provided under the current OGRP EOR Grant Program will be spent prior to June 30, 2027. Results of the pilot up to that date will be included in the final report deliverable for this project.

**Large-Scale Hydrocarbon Gas Bakken EOR Pilot to Inform Future
CO₂ EOR**



Deliverables

D1 – Biannual Progress Report Submitted
D2 – Biannual Progress Report Submitted
D3 – Biannual Progress Report Submitted
D4 – Final Technical Report Submitted

Milestones

M1 – Injection Permit(s) Submitted to DMR
M2 – Surface Facilities Ready for Injection
M3 – Baseline Monitoring, Reporting, and Verification (MRV) Survey Completed

BUDGET

The total estimated cost for the proposed effort is \$38,500,000. After DOE funding, the remaining exposure to Chord is approximately \$24,600,000. \$13,998,200 is requested from OGRP. This request reflects the scope changes, cost increases, and risk sharing with the state on a project that has basin-wide potential. Cost-share commitments are provided by Chord Energy. The budget breakdown is provided in Table 1. The budget justification can be found in Appendix C.

Table 1. Budget Breakdown

Project-Associated Expense	Chord Share (In- Kind)	NDIC Share (Cash)	Total Project
Subcontractor (EERC)		\$1,510,000	\$1,510,000
Pipeline Costs	\$6,625,000		\$6,625,000
EOR Injectate Costs and Well Preparation			
Gas Injectate Cost	\$9,849,600	\$3,283,200	\$13,132,800
Well Work	\$ –	\$1,600,000	\$1,600,000
Facilities Preparation and Operation			
Power Usage	\$6,662,007	\$ –	\$6,662,007
Facility Installation (Compressor FEED and Install)	\$470,000	\$4,780,000	\$5,250,000
High Pressure Production Separator	\$100,000	\$150,000	\$250,000
Automated Well Manifold	\$ –	\$550,000	\$550,000
Supervisory Control and Data Acquisition (SCADA) System	\$ –	\$100,000	\$100,000
Line Heater	\$ –	\$400,000	\$400,000
Recycle Meter	\$ –	\$50,000	\$50,000
Dehydrator	\$ –	\$1,500,000	\$1,500,000
Power Upgrade	\$ –	\$75,000	\$75,000
Labor			
Technical Staff Labor	\$768,000	\$ –	\$768,000
Field Labor	\$160,160	\$ –	\$160,160
TOTAL:	\$24,634,767	\$13,998,200	\$38,632,967

CONFIDENTIAL INFORMATION AND PATENTS/RIGHTS TO TECHNICAL DATA

This proposal has no confidential information. No patentable technologies are expected to be created.

STATUS OF ONGOING PROJECTS

Chord Energy is actively engaged as a subcontractor to the EERC for the “Injection Testing with Propane to Inform Future Bakken CO₂ EOR Pilot” project (Contract No.: G-061-121).