



Energy & Environmental Research Center (EERC)

BAKKEN PRODUCTION OPTIMIZATION PROGRAM (BPOP) 5.0

Presented to Oil & Gas Research Council

Bismarck, North Dakota

October 17, 2025

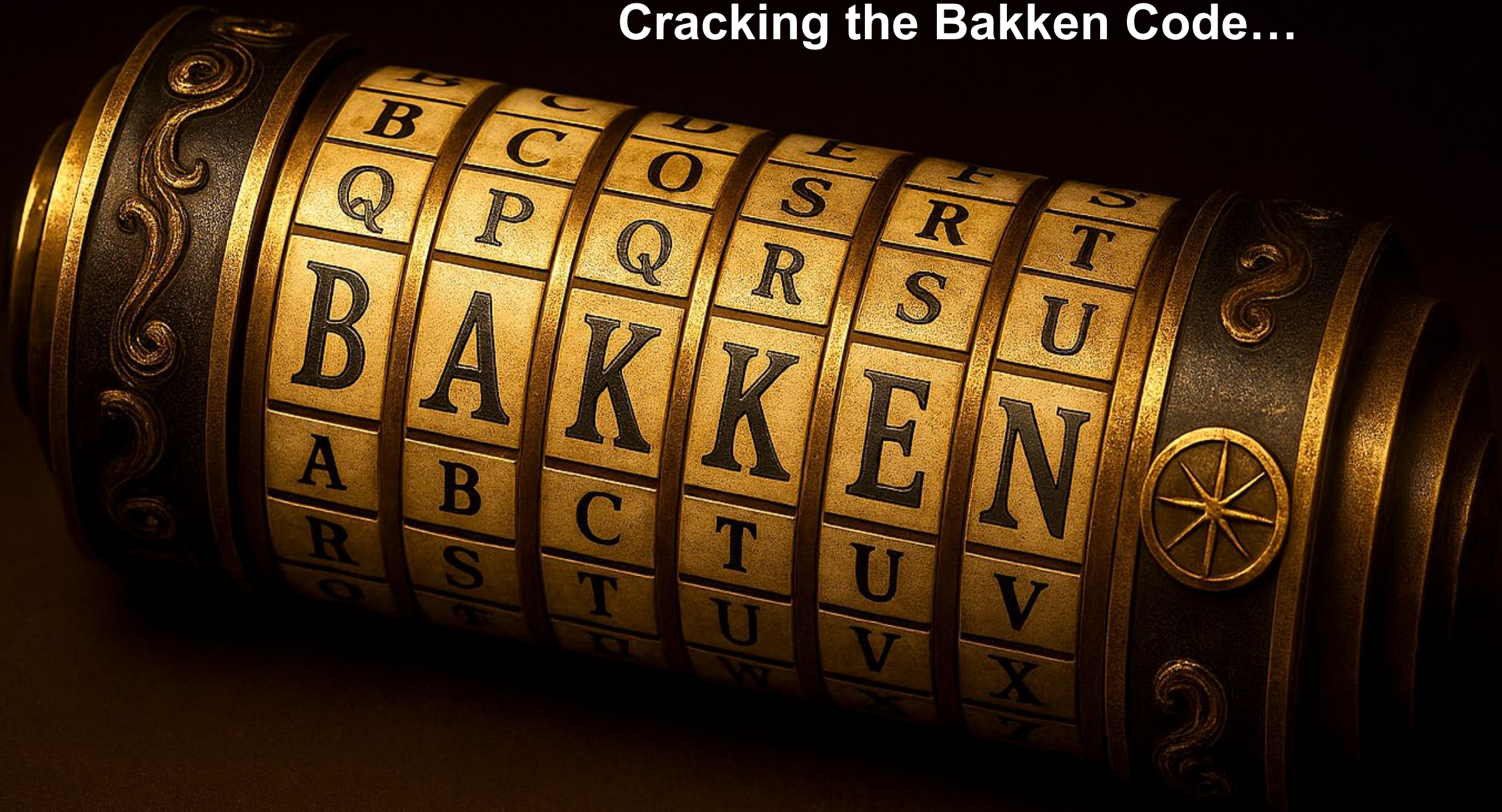
James A. Sorensen

Director of Subsurface Research and Development

Thank You to the 2023-2025 BPOP 4.0 Partners!



**BPOP is one of the keys to
Cracking the Bakken Code...**



BPOP 5.0 Key Focus Areas to Help Crack the Code



Bakken Enhanced Oil Recovery (EOR)

- Support next stage of EOR pilot deployment through Bakken EOR Field Lab with co-funding from DOE and in-kind contribution from Chord.
- Coordination of State Funded EOR Pilots

Benchmarking Lease Operating Expenses (LOE)

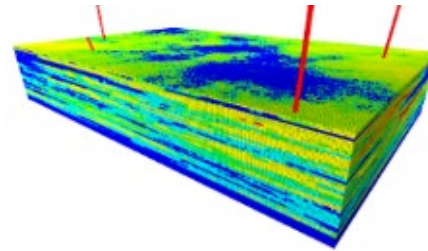
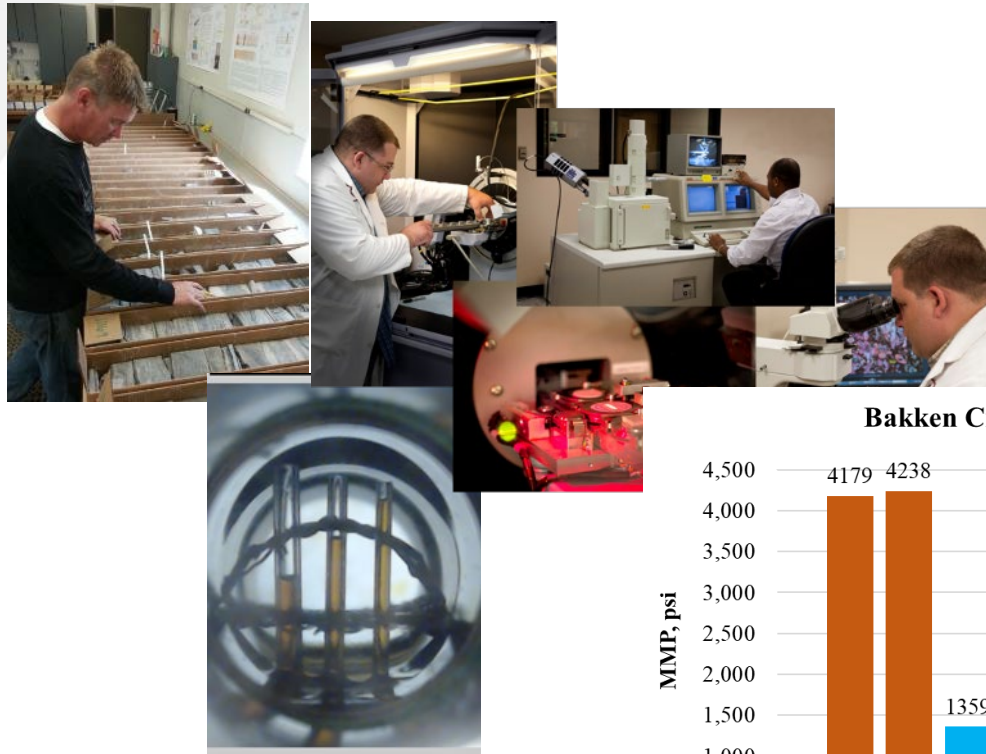
- AI-based evaluation of Bakken LOE with data provided by BPOP members

Deployment of Innovative Gas Capture Tech

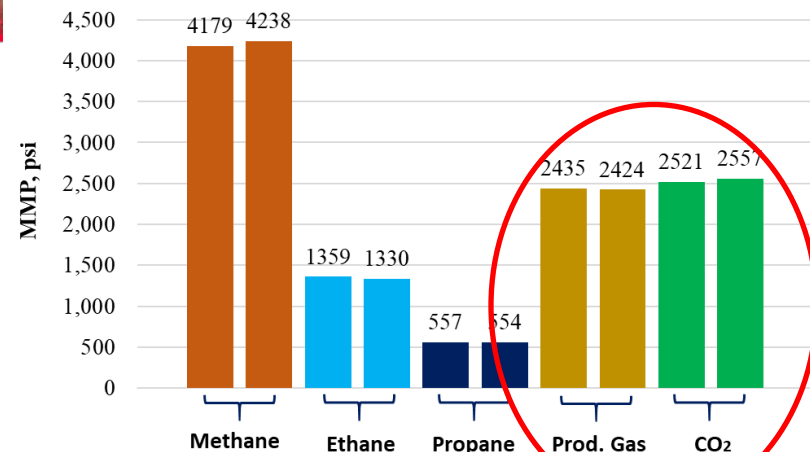
Well Completion & Production Data Analytics

Focus on EOR

EERC laboratory, modeling, and field test activities focused on CO₂ and rich gas for Bakken EOR, with flexibility to evaluate other injectates.



Bakken Crude Oil MMPs, 230 F



BPOP EOR Pilot History

Bear Creek

2017

Small-scale CO₂ injection test **demonstrated** ability of CO₂ to mobilize stranded oil in the Bakken.

Stomping Horse

2018 - 2019

Multi-well rich gas EOR pilot demonstrated ability to **build reservoir pressure and keep the injected gas in the drill spacing unit.**

East Nesson (2 Pilots)

2021 - 2024

1st used rich gas rapidly pulsed with freshwater and surfactant. 2nd used alternating rich gas and produced water. Both **demonstrated clear evidence of several thousand barrels of incremental oil over the pilot period of performance.**



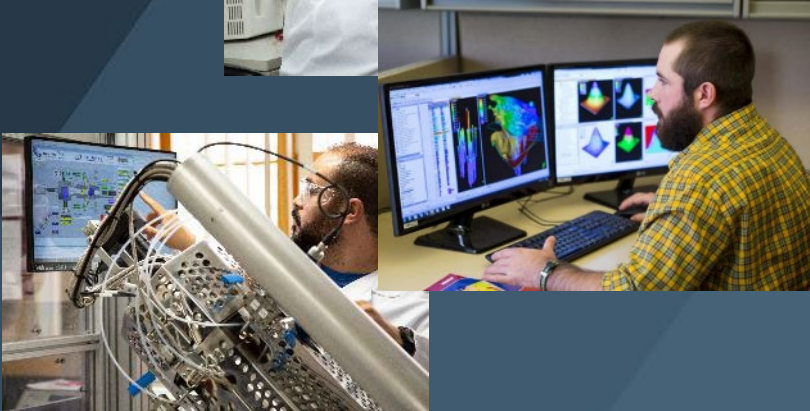
Bakken CO₂ EOR and Storage Field Lab



Supporting the design and execution of first ever large-scale EOR pilot in partnership with Chord Energy.

Lab testing, modeling & simulation, infrastructure, reservoir surveillance.

\$11.6 MM DOE
cash over 4 years.



Benchmarking of Lease Operating Expenses (LOE)

Using AI to evaluate and compare LOE across the Bakken play

- Comparisons between:
 - Tier 1, 2, & 3 acreages
 - Well drilling and completion
 - Production approaches
 - Workover histories
 - Other key variables
- Results will identify:
 - Areas for improvement in efficiency
 - Opportunities to strategically cut costs



**Improve the financial competitiveness of the Bakken
as a world class petroleum play!**

Polar Bear – Reduce Flaring and Add Value with New Technology

Awarded 9 Patents

Manufactured in North Dakota (Steffes)

First Oil-less Nat. Gas Compressor

First 5 units currently in the field

Additional units to be deployed

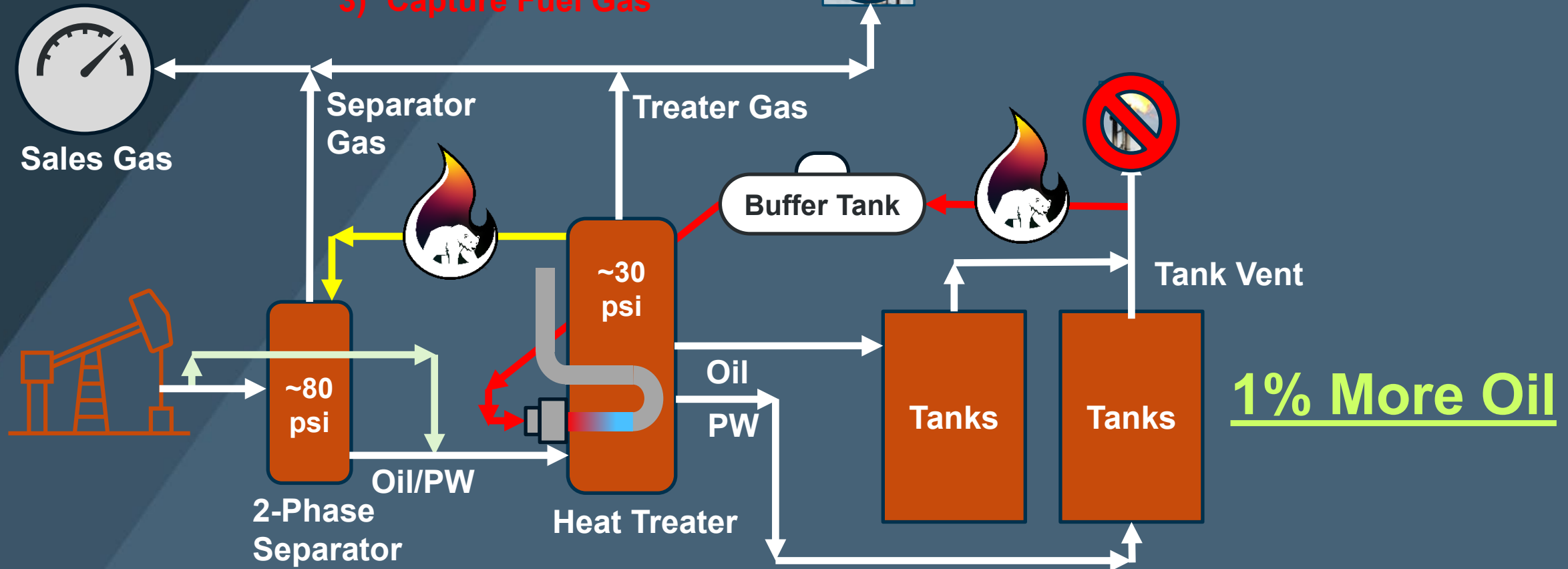
Performance assessment of deployed units



Polar Bear Technology Adding Value to the Bakken

6% More Gas

- 1) Treater Gas Recycle
- 2) 2-Phase By-Pass
- 3) Capture Fuel Gas



Tech Transfer Activities

BPOP Website (bpop.undeerc.org)

- Searchable product access

- Analytics Well Completion & Production Dashboard

- Bakken Geological Cluster Analysis Tool

- Carbon Intensity Calculation Tool

Webinars presenting timely results of technical work

- 11 Webinars during BPOP 4.0 (~1 every 2 months)

Conference papers & presentations

- Williston Basin Petroleum Conference

- Unconventional Resources Technology Conference (URTeC)

- SPE Annual Technology Conference & Exhibit (ATCE)

- North Dakota Petroleum Council Annual Meetings

**Participation in North Dakota Petroleum Council's TSG
(Technical Solutions Group)**

- Two-way exchange of industry needs and BPOP results



Economic Impact of Past BPOP Work – Two Examples

Decline Curve Analysis of Refracs

If all 341 evaluated refrac wells only realized the low range incremental EUR, the total value of the incremental oil produced would be >\$3.5 billion.

These results have incentivized Bakken producers to continue their refrac efforts.

DSU Setback Study

Results led to DMR changes to setback rules, allowing infill drilling between DSUs, and enabling production of oil otherwise left behind.

The estimated increase in tax revenue from the revised setback rules is approximately \$1.27 billion.

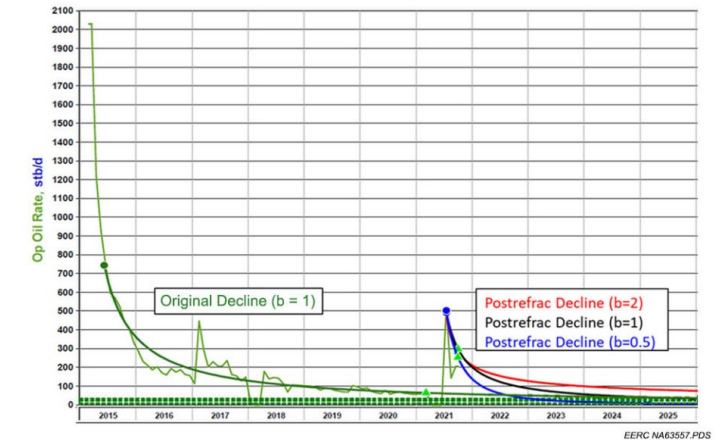
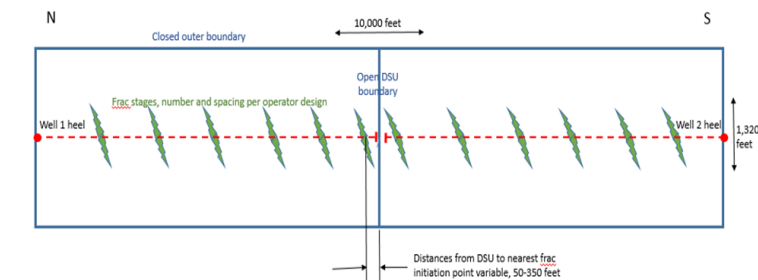


Figure 8. An example of forecasting the incremental EURs using three different b values for the postrefrac decline-curve analysis: $b = 0.5$, $b = \text{prerfrac } b$ (1 in this example), and $b = 2.0$.

Bakken-Three Forks DSU Offset Simulation Problem
(Schematic Plan View- Not to Scale)



BPOP 5.0 Funding Breakdown

\$3,305,774 DOE Cash for Bakken CO₂ EOR Field Lab

\$380,000 Chord In-kind for Bakken CO₂ EOR Field Lab

\$1,144,432 DOE Cash for Innovative Gas Capture Tech Demo

\$1,200,000 Industry Member Cash Contributions

= \$6,030,206 TOTAL DOE and Industry Cost-Share (minimum)

+ \$6,000,000 NDIC-OGRP Cash

\$12,030,206 = TOTAL BPOP 5.0 Project Value (minimum)

Support Letters



August 12, 2025

Dr. John Harju
Energy & Environmental Research Center
University of North Dakota
15 North 23rd Street, Stop 9018
Grand Forks, ND 58202-9018

Subject: Steffes – Letter of Support
Program (BPOP) 5.0”

Dear Dr. Harju:

Steffes wishes to express our appreciation for the EERC's proposed Bakken Production Optimization Program (BPOP) 5.0. We value the collaborative, data-driven research and innovative emissions control technology that is part of the state's and industry's efforts to improve the Bakken's status as a world class petroleum resource through effective, practical research and development. We look forward to continuing our relationship with EERC through participation in BPOP 5.0.

Steffes appreciates the EERC's continued leadership and support in the practical solutions to the oil field. We look forward to continued engagement with the EERC team and our fellow partners in this important initiative.

Sincerely,

Todd C. Mayer, Co-President
Steffes, LLC



Petro-Hunt , L.L.C.
P.O. Box 935
Bismarck, ND 58502
Phone (701) 255-5666 Fax (701) 258-1562
Toll Free 888-224-8620
e-mail - jherman@petro-hunt.com

August 11, 2025

Dr. John Harju
Energy & Environmental Research Center
University of North Dakota
15 North 23rd Street, Stop 9018
Grand Forks, ND 58202-9018

Subject: Petro-Hunt LLC – Letter of Support for the Project Entitled “Bakken Production Optimization Program (BPOP) 5.0”

Dear Dr. Harju:

Petro-Hunt LLC sincerely offers our support for the Energy & Environmental Research Center's (EERC) proposed Bakken Production Optimization Program (BPOP) 5.0. Through our many years of previous participation in BPOP we have come to recognize the tremendous value that the EERC's BPOP activities and results have provided to its industry and government partners. We have found the results of the research conducted by the EERC under BPOP to be invaluable to our understanding of how to get the most value out of the Bakken. In particular, we appreciate the practical results-focused webinars, in-person technical meetings, and web-based data analytical tools that are hallmarks of BPOP.

Petro-Hunt is excited to engage with the EERC through BPOP 5.0 over the coming years as they focus on increasing the ultimate recovery of Bakken resources through a wide variety of innovative activities. We appreciate the EERC's goal of maintaining the Bakken's status as a world class petroleum resource through effective, practical research and development. We look forward to continuing our relationship with EERC through participation in BPOP 5.0.

Sincerely,

Jeff Herman
Region Manager



1001 Fannin Street, Suite 1500
Houston, TX 77002
O 281.404.9500
F 281.404.9501

August 14, 2025

Dr. John Harju
Energy & Environmental Research Center
University of North Dakota
15 North 23rd Street, Stop 9018
Grand Forks, ND 58202-9018

Dear Dr. Harju:

Chord Energy LLC (Chord) strongly supports the Energy & Environmental Research Center's (EERC's) continued collaboration with the State of North Dakota, the U.S. Department of Energy (DOE) to address key challenges in the oil and gas industry. We are pleased to support the EERC's proposal for Bakken Production Optimization Program (BPOP) 5.0. Since joining BPOP in 2020, Chord has remained committed to advancing practical, research-driven solutions for the Bakken. We are proud to be part of the development and deployment of enhanced oil recovery (EOR) technologies that hold the potential to unlock otherwise unrecoverable oil.

Chord is currently collaborating with the EERC under a DOE Office of Energy Efficiency and Carbon Management funded project focused on advancing EOR in the Bakken (DE-FE0032514). This ongoing effort directly supports BPOP objectives. The DOE-funded project will provide cost share to the BPOP Industrial Commission (NDIC) proposal, further aligning state, federal, and industry priorities.

As part of the BPOP 5.0 effort, Chord is committed to working closely with the EERC to perform robust laboratory, modeling, and field injection activities to optimize potential for Bakken EOR and support the broader goal of transitioning to a commercial scale deployment. We anticipate showing a minimum of 50% cost-share in the form of technical staff labor and/or field labor over the course of the BPOP 5.0 program. We value our continued partnership with the EERC and are committed to supporting research that enhances resource recovery, improves efficiency, and ensures responsible energy development in North Dakota.

Sincerely,

Arvo Q. Buck
Director – New Ventures



August 12, 2025

Dr. John Harju
Energy & Environmental Research Center
University of North Dakota
15 North 23rd Street, Stop 9018
Grand Forks, ND 58202-9018

Subject: Advanced Flow Solutions – Letter of Support for the Project Entitled “Bakken Production Optimization Program (BPOP) 5.0”

Dear Dr. Harju:

Advanced Flow Solutions (AFS) supports the Energy & Environmental Research Center's (EERC) proposed Bakken Production Optimization Program (BPOP) 5.0. We value the collaborative, data-driven research and innovative emissions control technology that is part of the state's and industry's efforts to improve the Bakken's status as a world class petroleum resource through effective, practical research and development. We look forward to continuing our relationship with EERC through participation in BPOP 5.0.

AFS appreciates the EERC's continued leadership and support in the practical solutions to the oil field. We look forward to continued engagement with the EERC team and our fellow partners in this important initiative.

Sincerely,

John Hays
Business Line Leader – Pumps & Compressors

August 14, 2025

Dr. John Harju
Vice President for Strategic Partnerships
Energy & Environmental Research Center
University of North Dakota
15 North 23rd Street, Stop 9018
Grand Forks, ND 58202-9018

Subject: Devon Energy Corp. – Letter of Support for the Project Entitled “Bakken Production Optimization Program (BPOP) 5.0”

Dear Dr. Harju:

Devon Energy strongly supports the EERC's proposal to conduct a range of research activities as part of the Bakken Production Optimization Program (BPOP) 5.0. We recognize the value this longstanding program has brought to Bakken stakeholders. The BPOP consortium, led by the EERC, has a proven track record for developing practical knowledge and technical tools that optimize oil production and enable continued sustainable development of Bakken resources. In particular, Devon Energy has great interest in EERC's efforts under BPOP to advance Bakken EOR towards commercialization, develop innovative approaches to improved oil recovery, and apply the latest advances in artificial intelligence to improving the efficiency of Bakken operations, including benchmarking lease operating expenses across the play. We believe BPOP 5.0 will contribute to meaningful technical insights and help address key challenges facing operators across the play. We look forward to continued engagement with the EERC team and our fellow partners in this important initiative.

Sincerely,

Bryan Bugg
Director of Production, Facilities, and Infrastructure

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Advanced Flow Solutions
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corken.com



Critical Challenges. Practical Solutions.

BPOP 5.0 Results Will...

- Provide technical solutions and tools that optimize Bakken oil production.
- Support broad deployment of EOR and gas capture technologies.
- Maintain the Bakken as a world class petroleum resource, fueling the North Dakota economy.
- Enable knowledge sharing through a variety of tech transfer activities and tools.





James A. Sorensen
Director of Subsurface R&D
jsorensen@undeerc.org
701-777-5287

**Energy & Environmental
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A wide-angle photograph of a university campus during autumn. In the foreground, there is a green lawn. To the left, a large tree with yellowing leaves frames the scene, with the sun shining through its branches. In the background, there are several large, multi-story brick buildings, likely university halls or research facilities, and a parking lot filled with cars. The sky is clear and blue.

THANK YOU

Critical Challenges. Practical Solutions.

Explanation of Bakken CO₂ EOR Field Lab Funding

DOE Bakken CO₂ EOR Field Lab
Funding Total Project
Sept. 2024 to Aug. 2028

Total Value = \$14,500,000

– **\$11,600,000 DOE Cash**

Distribution of DOE cash:

- ♦ **\$5,800,000 DOE to Chord** for field infrastructure & operation expenses
- ♦ **\$5,800,000 DOE to EERC** for lab, modeling & simulation, operational design support, reservoir surveillance, reporting

– **\$2,900,000 Non-Federal Cost Share**

- ♦ Combination of Chord & NDIC-OGRP shown over the 4 year period of performance, including BPOP 4.0 and proposed BPOP 5.0.

DOE Bakken CO₂ EOR Field Lab
Funding Breakdown under BPOP 5.0
Nov. 2025 to Oct. 2027

- \$3,305,774 DOE Cash
- \$1,000,000 NDIC-OGRP Cash to EERC
- \$380,000 In-kind from Chord (minimum)