



Energy & Environmental Research Center (EERC)

UNDERGROUND STORAGE OF PRODUCED NATURAL GAS: PROJECT UPDATE AND PROPOSED PATH FORWARD

Update with the Oil and Gas Research Council
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2019 LEGISLATION

- Section 25 of House Bill 1014 states that \$6MM will be made available to the EERC “for pilot projects relating to the underground storage of produced natural gas.”
- Goal is to partner with North Dakota oilfield producers on pilot projects to define and assess the key technical, economic, and regulatory components of produced natural gas (“produced gas”) injection into geologic targets in the Williston Basin.



Photo: Grand Forks Herald

EXPECTED OUTCOMES

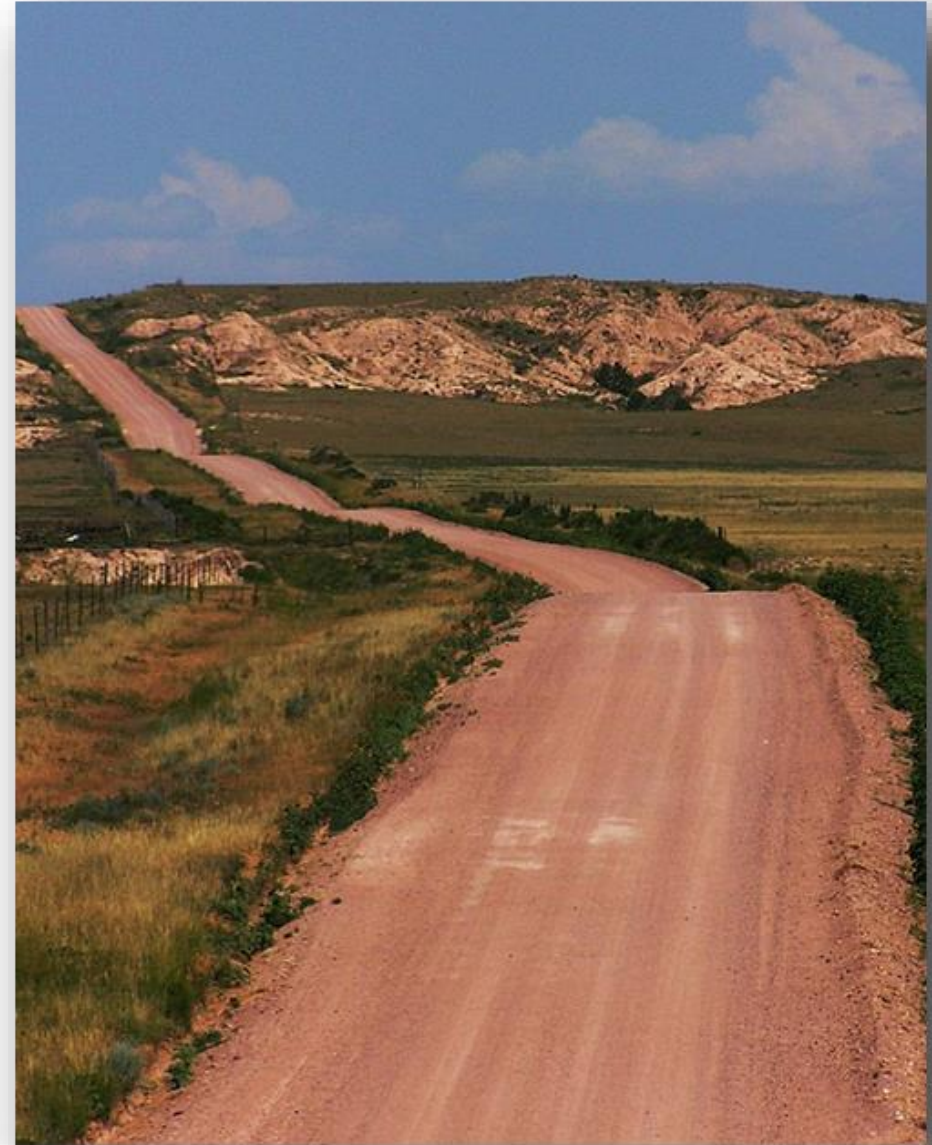
- Demonstration of up to 3 different produced gas injection concepts:
 - Temporary gas storage in saline formations.
 - Gas injection into a conventional oil field.
 - Gas injection into the Bakken/Three Forks.
- Provision of key information to the state, the oil and gas industry, and other interested parties needed to assess the techno-economic viability of produced gas storage and/or injection into the subsurface as a means of:
 - Achieving gas capture requirements.
 - Expanding Bakken oil production.
 - Conserving the state's resources.



Critical Challenges. Practical Solutions.

PROGRESS TO-DATE

- The EERC partnered with XTO Energy on an assessment of two gas injection concepts, including:
 - Temporary produced gas storage in the Broom Creek Formation.
 - Produced gas injection in the Bakken/Three Forks for EOR.
- Due to the oil price decline, XTO decided to put the projects on hold indefinitely.
- Key findings, including recommendations for consideration during the next legislative session are being summarized into presentations and a report, which are imminent.



WHERE WE ARE AT AND NEXT STEPS

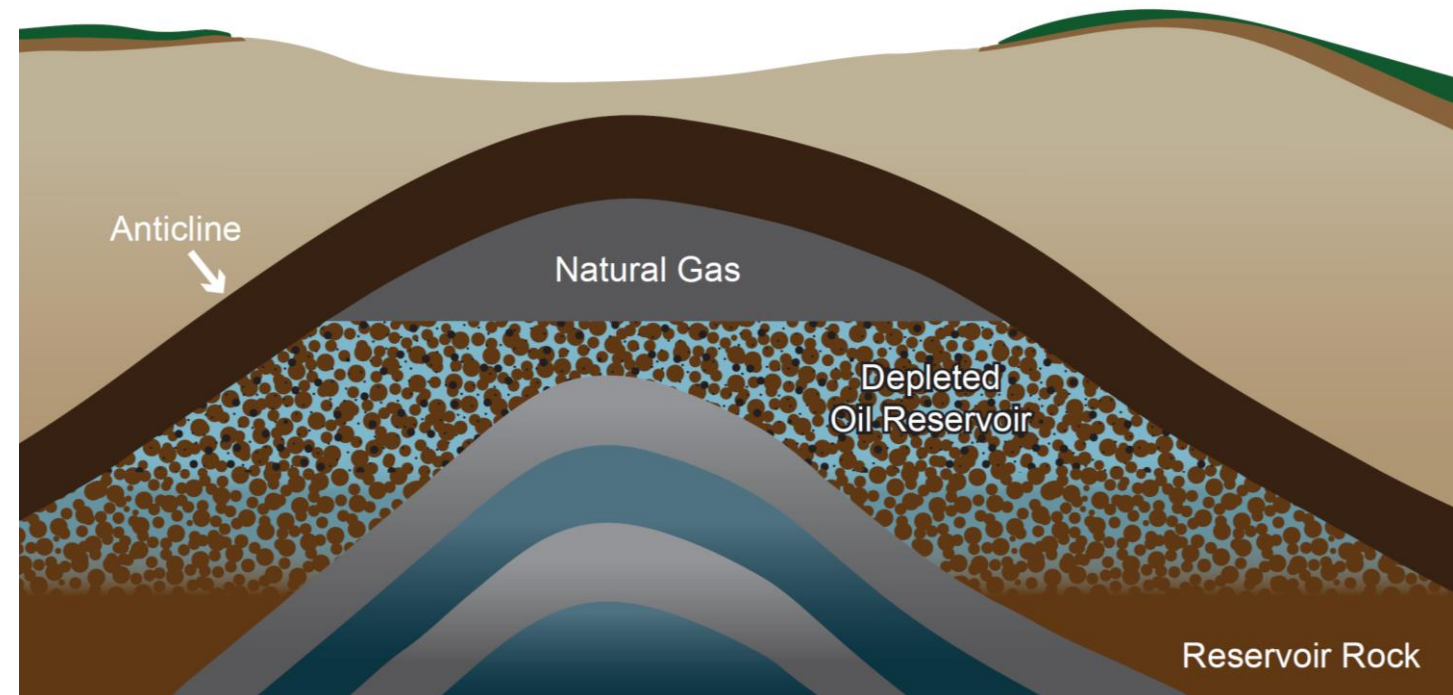
- We are seeking the OGRC’s recommendation to the NDIC of a proposed path forward for the EERC that entails using the allocated NDIC funds to partner with 2 large, publicly-traded companies and 2 smaller, private equity-backed companies on various gas storage/injection pilot projects.
- The diverse injection scenarios proposed by each company would build our knowledge of the technical and economic feasibility of various produced gas storage/injection approaches in the Williston Basin.

Budget and Expenses to Date			
Sponsors	Budget	Actual Expenses/Cost Share as of 9/30/20	Balance
NDIC	\$6,000,000	\$608,300	\$5,391,708
Industry Share – In-Kind	TBD	\$1,028,120	TBD
Total	TBD	\$1,636,412	TBD

GAS STORAGE IN A CONVENTIONAL RESERVOIR

- Partner: A large, publicly-traded company.
- Goal is to investigate the feasibility and possible implementation of temporary produced gas storage in a depleted conventional reservoir.
- Focus is on storage, not EOR.
- The proposed location has a structural feature that will help prevent the lateral migration of the injected gas and, thereby, improve gas recovery.

Example of an anticlinal oil and gas trap.



Modified from the following: <https://www.uncoverenergy.com/ideas/hail-to-the-shale/>

GAS STORAGE IN THE BAKKEN

- Partner: A large, multinational, publicly-traded company.
- Goal is to evaluate gas reinjection strategies into the Bakken Petroleum System (BPS) as a mechanism to mitigate flaring.
- Although EOR impacts will be evaluated, the focus will be on low P gas reinjection to mitigate flaring, not optimization for EOR.
 - Compression requirements are anticipated to be much lower than for EOR.



Image courtesy of Prairie Public.

GAS STORAGE IN CONJUNCTION WITH SWD

- Partner: Small, private equity-funded company.
- The project entails co-injection of gas in conjunction with saltwater disposal (SWD) in the Inyan Kara Formation (Dakota Sandstone) at a location that appears to have structural closure.
 - The concept is that the gas would gravity separate and be trapped by the structural closure to allow for effective gas recovery.
- The company's goal is to temporarily store gas to bring additional BPS wells online at a location that currently has limited gas takeaway capacity.
 - Gas would be recovered and sold at a later date when pipeline capacity becomes available.



Source: University of Melbourne

DEMONSTRATION OF A TECHNOLOGY TO BETTER ENABLE GAS INJECTION

- Partner: Small, private equity-funded company.
- Goal is to demonstrate a new approach to gas injection that entails co-injection of water and gas to reduce the compression requirements needed for gas injection.
 - Reduces the compression requirements by a factor of five to ten because it uses the “weight” of slugs of water in the borehole to help pressurize the formation and injected gas.
 - Eliminates the need for high-pressure, expensive compressors that are typically needed for high pressure gas injection.
 - The technology will be demonstrated and evaluated on a BPS well owned by the company as a mechanism to more effectively build reservoir pressure and improve sweep efficiency for EOR.

MOVING FORWARD

- The EERC is seeking input and approval from the OGRC on the proposed pilot projects to continue evaluating the feasibility of temporary subsurface gas storage as a means of mitigating flaring in North Dakota.
- The EERC is requesting that the OGRC make a recommendation to the NDIC in support of the proposed plan to move forward.
- Due to the impacts of the COVID19 pandemic complete testing of the proposed projects may require carryover of appropriated funding into the 2021-2023 biennium.



Source: National Park Service

PROGRAM PRODUCTS

- Interim Products (October/November 2020):
 - Presentations updating the OGRC and Industrial Commission of the EERC's progress.
 - Identification of regulatory uncertainty regarding:
 - ◆ Pore space and notification of surface owners (with lack of regulatory clarity, current assumption is 100% notification/concurrence).
 - ◆ Timing of tax and royalty payments (prior to injection or following recovery).
 - A report detailing the work performed with XTO.
- Presentation of current findings to the 2021 Legislative Assembly.
- Final Products:
 - Lessons learned and a roadmap for future implementation.
 - Recommendations for additional legislative action and/or regulatory clarity.



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A wide-angle photograph of a university campus at sunset. The sun is low on the horizon, casting a warm glow over the scene. In the foreground, there are large trees with some yellowing leaves. In the background, several multi-story brick buildings and a parking lot with many cars are visible.

THANK YOU

Critical Challenges. Practical Solutions.