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UNDERGROUND STORAGE OF PRODUCED NATURAL GAS: CONCEPTUAL EVALUATION AND PILOT PROJECTS (HB 1014)

Oil & Gas Research Council Proposal Review Meeting
Bismarck, North Dakota
July 22, 2019

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BACKGROUND

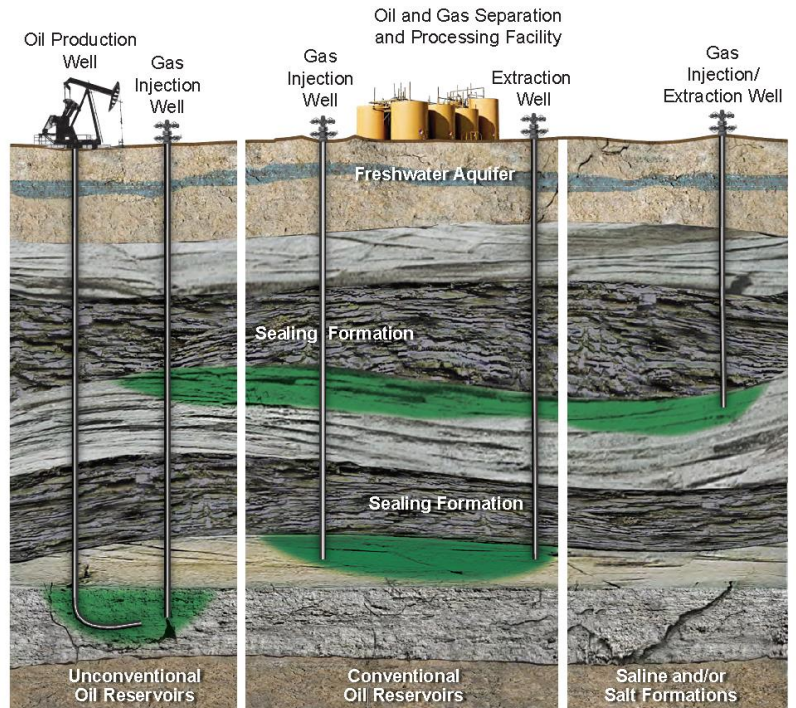
- The EERC proposes to address the intent of Section 25 of House Bill 1014 of the Sixty-Sixth Legislative Assembly of North Dakota, which states that \$6MM will be made available to the Energy & Environmental Research Center (EERC) “for pilot projects relating to the underground storage of produced natural gas.”
- Goal: To partner with North Dakota oilfield producers on up to three 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.



Source: North Dakota Department of Health

POTENTIAL GAS INJECTION SCENARIOS

- Gas storage into a saline aquifer (or salt for future recovery and use).
- Injection into conventional or unconventional hydrocarbon reservoirs for pressure maintenance and/or enhanced oil recovery (EOR).



SCOPE OF WORK

- Collaboration with the project partner and the North Dakota Industrial Commission Department of Mineral Resources to:
 - Define the key regulatory considerations for the pilot project(s).
 - Assist with project permitting.
 - Define and implement site monitoring techniques.
- Laboratory-based activities to:
 - Characterize the gas storage potential of each target.
 - Predict gas injection rates.
 - Evaluate the optimal pressure required for incremental oil recovery based on the gas composition and the temperature of the injection target.

SCOPE OF WORK (CONT.)

- Geologic modeling and reservoir simulation of the injection targets to estimate:
 - Target injectivity.
 - Gas storage potential and plume extents.
 - Gas recovery rates.
 - Associated water production, handling, and reinjection rates.
 - Incremental oil recovery (if applicable).
- Assistance with surface facility planning, including identification and pricing of:
 - Gas-conditioning and compression components.
 - Brine disposal options.
 - Stored gas recovery system (if applicable).
 - Other surface-related infrastructure.



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SCOPE OF WORK (CONT.)

- Site support:
 - Assistance with site engineering and design, implementation, and operation
 - Site monitoring
 - Sample collection and analysis
- Site performance assessment:
 - Compilation and analysis of relevant data and results
 - Evaluation of the overall technical and economic performance of each site



EXPECTED RESULTS

To provide the state, the oil and gas industry, and other interested parties with the key information 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.



DELIVERABLES

A final report that includes:

- A summary of each pilot project that describes the permitting process and other regulatory considerations, site characterization and validation activities, necessary equipment, and other key considerations to implement each scenario.
- A techno-economic assessment of each scenario.
- 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 projects for future development efforts.

ESTIMATED PARTNER COST-SHARE CONTRIBUTION

Saline Formation Gas Storage: Total Estimated Costs for Equipment and 1 year of Operation

	Purchased Equipment, million \$	Rented Equipment, million \$
Total Equipment Costs	7.8	3.8
Total Operational Costs for 1 year	2.6	2.6
Total Costs	10.4	6.4

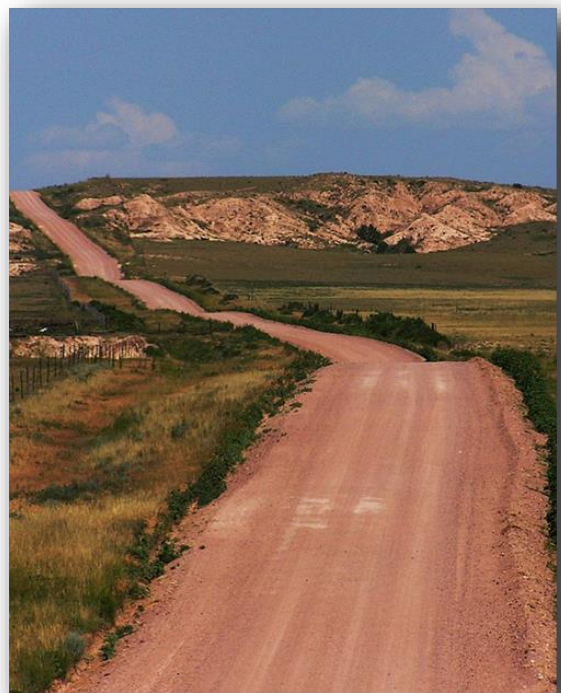
Gas Injection for EOR: Total Estimated Costs for Equipment and 1 year of Operation

	Purchased Equipment, million \$	Rented Equipment, million \$
Total Equipment Costs	6.7	2.7
Total Operational Costs for 1 year	2.6	2.6
Total Costs	9.3	5.3

**Estimated Range of Cost Share for Implementation of Three Injection Scenarios:
\$17MM–\$29MM**

MOVING FORWARD

- The specific injection scenarios, project time line, and cost-share contributions will be determined once a project partner (or partners) have been finalized.
- Currently, XTO Energy has expressed a strong interest in pursuing one or more of the proposed injection scenarios, with assistance from the EERC.





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