

**Contract No. G-054-104**

**“Field Study to Determine the Feasibility of Developing Salt Caverns for Hydrocarbon Storage in Western North Dakota”**

Submitted by: Energy and Environmental Research Center

Principal Investigator: Steven A. Smith

**PARTICIPANTS**

<b>Sponsor</b>	<b>Cost Share</b>	
Bakken Energy	\$500,000.00	(Cash)
North Dakota Industrial Commission/OGRC Funding	\$9,500,000.00	(Cash)
Total Project Cost	\$10,000,000.00	

Project Schedule – 24 months  
Contract Date – Oct. 25, 2021  
Start Date – July 1, 2021

Project Deliverables:		
Status Report 1:	October 31, 2021	✓
Status Report 2:	January 31, 2022	✓
Status Report 3:	April 30, 2022	✓
Status Report 4:	July 31, 2022	
Status Report 5:	October 31, 2022	
Status Report 6:	January 31, 2023	
Status Report 7:	April 30, 2023	
Final Report:	June 30, 2023	

**OBJECTIVE/STATEMENT OF WORK:**

The objective of this project is to study the feasibility of developing salt caverns in geologic formations in North Dakota for underground storage of energy resources, including natural gas, liquified natural gas and hydrogen. This study was authorized by the Legislature in Senate Bill 2014 (2021 Session). The EERC, in partnership with Bakken Energy, Neset Consulting Services and the University of North Dakota Department of Petroleum Engineering will validate the suitability of salt formations for cavern development and provide stakeholders with information needed to assess the techno-economic viability of storing hydrocarbons and hydrogen in engineered salt caverns in North Dakota. This study follows a preliminary evaluation of the potential of salt cavern development completed by the EERC in December 2020. The 2020 study identified three salt formations deemed worthy of further investigation for characterization activities to inform future cavern development studies.

The goal of this field study is to validate the depth, thickness, and geologic and geomechanical suitability of the North Dakota salt formations for salt cavern development. The anticipated outcome is key information, needed by the state, the oil and gas industry, and other interested parties, to assess the techno-economic viability of storing hydrocarbon gases and hydrogen in engineered salt caverns.

This project will incorporate field, laboratory, modeling/simulation, and engineering analysis and design to determine the potential for salt cavern development in North Dakota. The work will be conducted in seven tasks.

The Industrial Commission directed that an industry advisory group be established consisting of at least two experienced companies in the construction and operation of underground salt caverns for hydrocarbon and/or hydrogen storage.

Deliverables will include:

- Assessment of the presence, depth, and composition of identified salt formations;
- Sealing potential of overlying and underlying geologic strata;
- Geomechanical stability modeling and simulation;
- Site-specific engineering design recommendations for future cavern development pilot studies.

## **STATUS**

Contract has been executed.

### **October 2021**

Status Report has been received. The executive summary states:

- The project kickoff meeting was held on September 9, 2021. The project goal, objectives, scope of work, deliverables, timeline and project resources were reviewed with the EERC and UND Petroleum Engineering teams.
- Nondisclosure agreements were executed with project partners and industry advisors to discuss sites and salt cavern opportunities.
- Discussions occurred with all potential Industry Advisory Board members. At present, Lonquist, Pivotal, ATCO, ONEOK, Mitsubishi Power, and Lane have agreed to participate.
- Eight geologic cross sections were prepared to screen for Dunham, Pipe, Opeche, and Charles salt formations using 61 wells across the Williston Basin.
- Four areas were targeted for potential drilling. Work has begun to refine the understanding of the geology around the targeted areas.
- Initial planning and discussion with Bakken Energy have been ongoing during the preaward phase, with the goal of expediting the site-selection process and advising on optimal site locations for drilling.
- EERC personnel traveled to Tioga, ND to meet with Neset representatives. The purpose of the meeting was to develop preliminary well design plans for the stratigraphic test well.
- A drill rig with availability in Quarter 1, 2022 was identified.

### **January 2022**

Status Report has been received. Key updates include:

- Lonquist, Pivotal Energy, ATCO, Catahoula Resources, OneOk, Mitsubishi Power, Texas Brine Company and Lane Power and Energy Solutions agreed to join the industry advisory board
- 6 potential sites in McKenzie County were identified as potential locations for drilling a stratigraphic test well through the Dunham, Pine and Charles salts
  - Initial review included 61 wells in McKenzie County
  - Geologic review was further refined using data from 248 wells
  - Screening criteria included salt thickness and depth, proximity to roads, distance from surface water and water disposal wells, and excluding federal lands
- Subcontracted with Neset Consulting to execute drilling and coring activities, targeted for Quarter 2 of 2022
- Completed general well design with a coring, logging and testing schematic
- Eliminated Opeche salts from project consideration due to anhydrite concentrations, which are difficult to dissolve and may not be conducive for cavern development
- Added Charles salts to project consideration, as recent technological advancements may not preclude their depth from salt cavern development

## **April 2022**

Status report has been received. Key updates include:

- Added Neset and WSP members to the industry advisory board
- Held kickoff meeting with the industry advisory board to outline the effort, progress, and expectations of the board
- An existing wellpad (NDIC Well File No. 15879) was chosen as the location for the stratigraphic test well
  - Wellpad was confiscated by NDIC for plugging and abandoning
  - Expected to expedite surface leasing process and save in pad development and roadwork costs
- Began drafting drill permit application and surface use agreements
- Finalized drilling and coring plan
- Developed initial logging plan
- Set stratigraphic well spud date of May 23, 2022
- Modeling team began pulling available data sets from nearby wells for model-building effort
- Performed initial salt cavern engineering analysis, including stored fluids, capacities, facility equipment, supporting infrastructure, operation, injection/withdrawal cycle, and maintenance

Updated 7/19/2022