Critical Challenges. Practical Solutions.

Energy & Environmental Research Center (EERC)

North Dakota CarbonSAFE Phase III: Site Characterization and Permitting

DE-FE0031889

DOE NETL 2020 Integrated Project Review Meeting – CCUS Integrated Projects

August 17–19, 2020

Wesley Peck

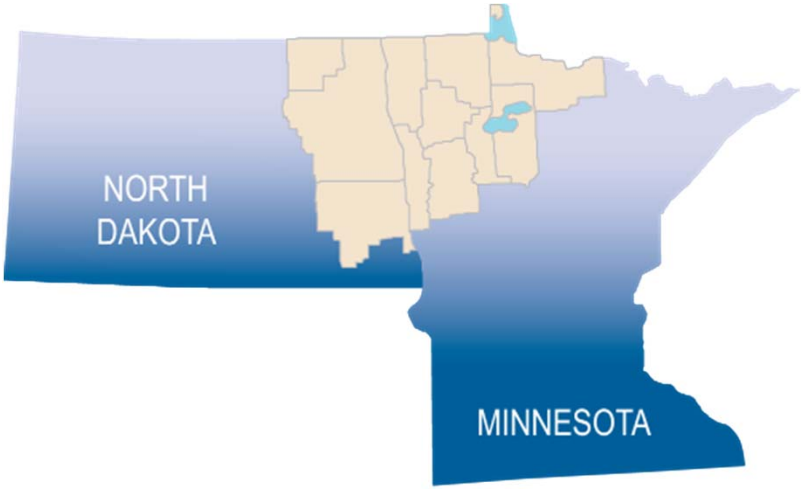
Assistant Director of Subsurface Strategies

Project Overview

- Perform commercial-scale site characterization and permitting of two sites for the geologic storage of over 3 million metric tons (Mt) of CO_2 per year.

- Minnkota Power Cooperative, the North Dakota Industrial Commission's Lignite Research Program, BNI Energy, Computer Modelling Group (CMG), and Schlumberger.

	Federal	Cost Share	Total	Performance Dates
Budget Period 1	$14,832,334	$6,972,533	$21,804,867	9/1/2020 – 8/31/2022
Budget Period 2	$2,141,689	$986,267	$3,127,956	9/1/2022 – 8/31/2022
Total	$16,974,023	$7,958,800	$24,932,823	



PROJECT TUNDRA

Square Butte ELECTRIC COOPERATIVE

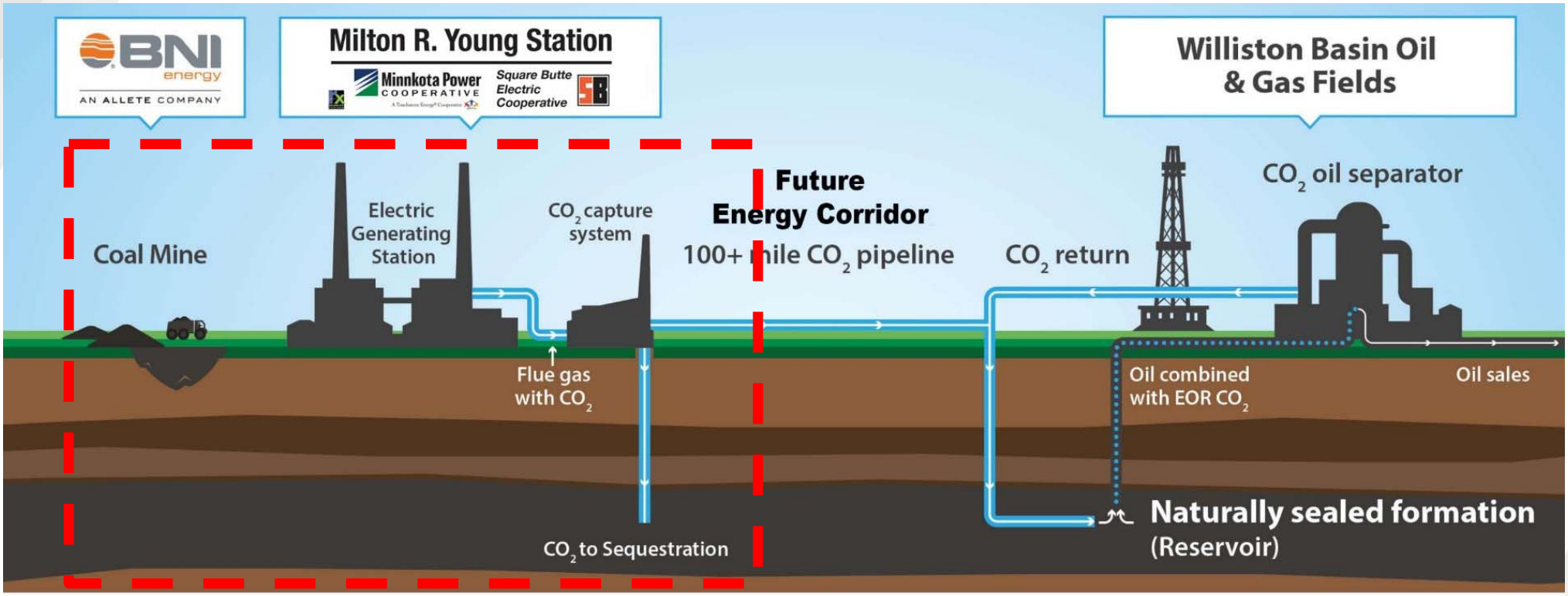
Minnkota Power COOPERATIVE

A Touchstone Energy® Cooperative

EERC | UND UNIVERSITY OF NORTH DAKOTA

Critical Challenges. Practical Solutions.

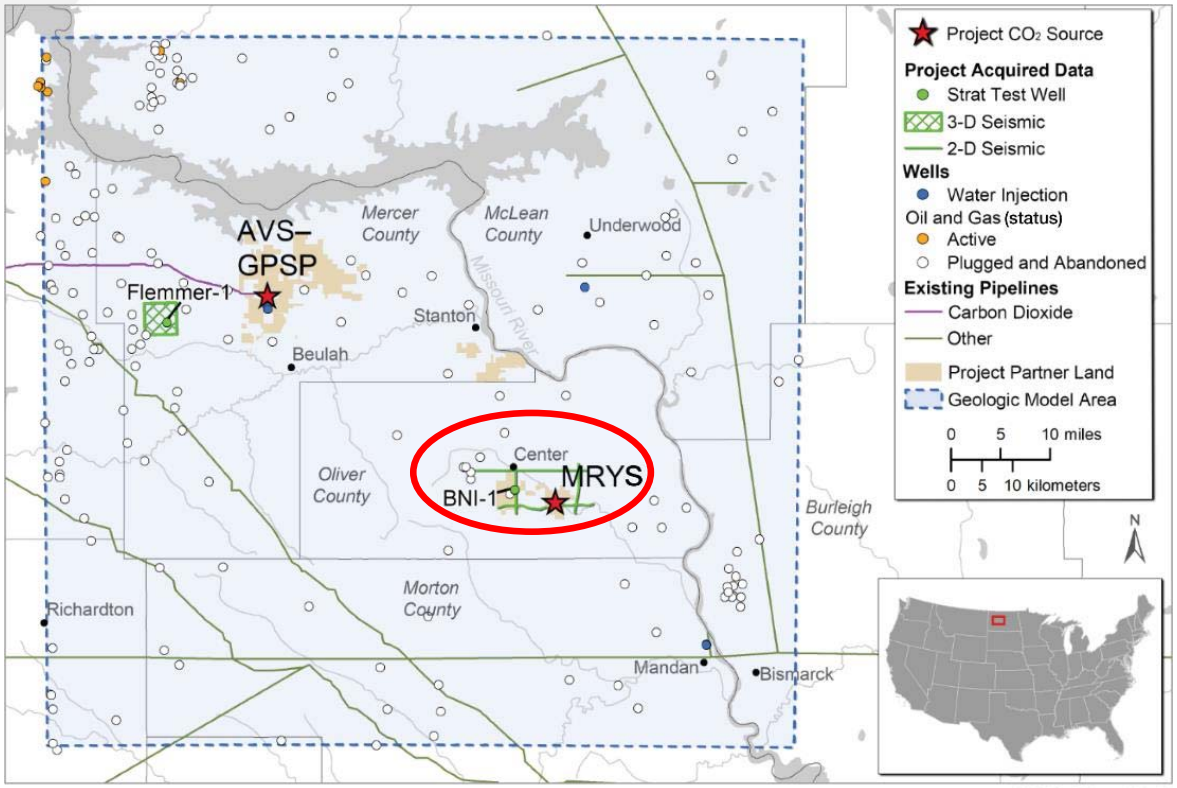
Project Tundra



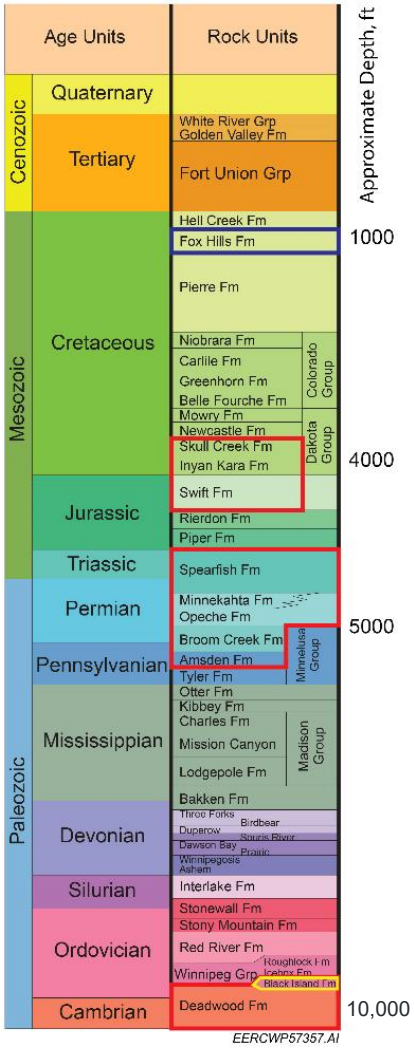
North Dakota CarbonSAFE Phase III: Site Characterization and Permitting

- Identify and characterize two commercial-scale CO_2 stacked storage sites.
- Apply for and obtain approval of multiple North Dakota CO_2 Storage Facility Permits.
- Prepare an Environmental Information Volume (EIV) to assess any NEPA-related issues for the identified capture, transport, and storage sites.

Site Selection and Characterization



EERC WP57129.AI



EERCWP57357.AI

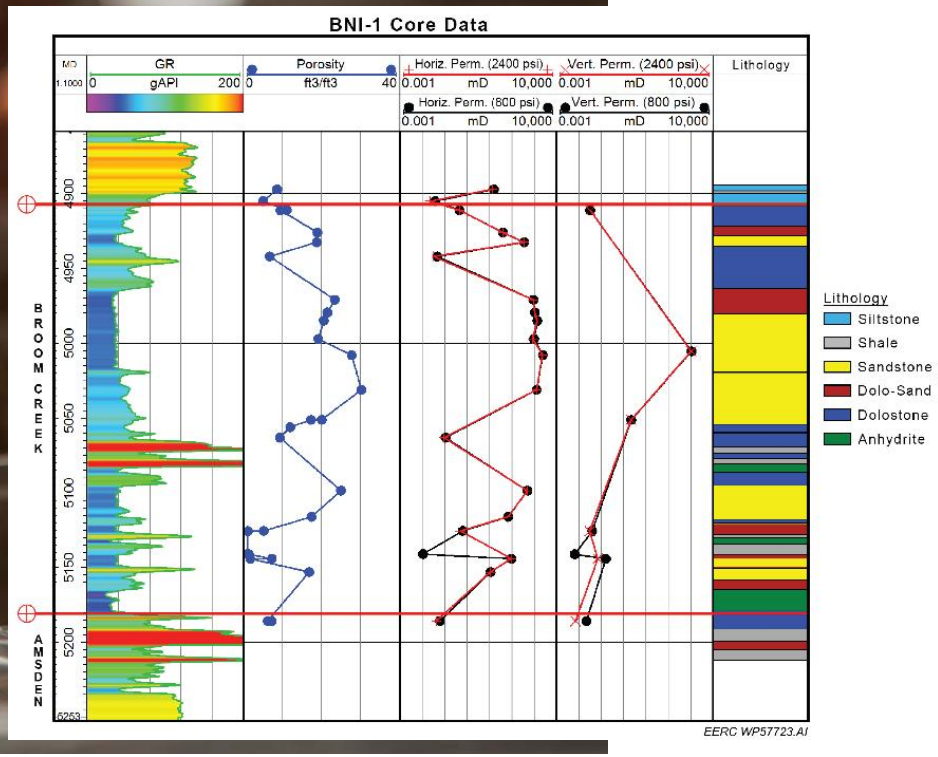

Center, ND
(Pop. 588)
1 mile
J-LOC1
BNI1
~5 miles
J-ROC1 Well
Location
Nelson Lake
Potential Future
Injection Well
Location
Milton R. Young
(MRY) Station


BNI Well
x
CarbonSAFE
Phase III Well
Location
MRY Station

The Core

BNI-1

- Broom Creek thickness: 273’
- Total sand thickness: 124’
  - Intervals: 89’, 19’, 16’



Phase II Accomplishments

- Drilled, cored, logged, and plugged the two stratigraphic test wells.
- Completed laboratory testing of the new core.
- Reprocessed legacy seismic data.
- Built geologic models and reservoir simulation models.
- Ran multiple scenarios of injection, including stack storage options.
- Seismic source test on reclaimed mine land.

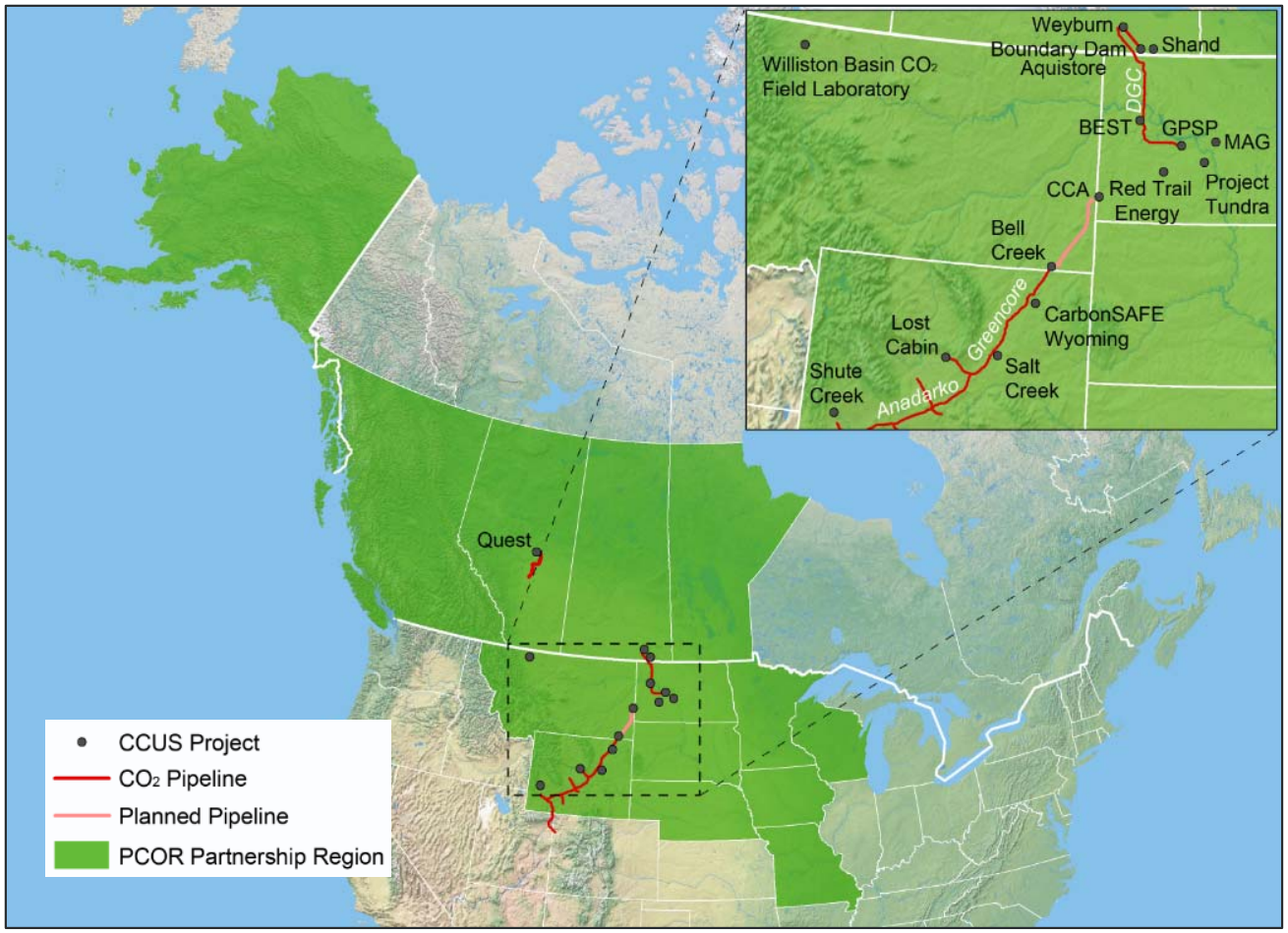
Technical Approach/Project Scope

Major NDIC Permitting Requirements	Major Proposed Characterization Activities										
	Core	Logging	Downhole Testing	Lab Testing	Modeling	Simulation	Seismic	Collection	Baseline	Sampling	New Fox Hills Wells
Determine Plume Extent	X	X	X	X	X	X	X				
Determine Pore Space Amalgamation	X	X	X		X	X	X				
Geologic Properties of Injection and Confining Zones	X	X	X	X							
Regional Faulting Assessment	X						X				
Potential for Seismic Activity			X		X		X				
Geologic Maps and Cross Sections		X			X		X				X
Geomechanics of Confining Zones(s)		X	X	X	X						
Identify and Characterize Secondary Confining Zones		X	X		X		X				
Determine Area of Review		X	X	X	X	X	X	X			X
Baseline Geochemical Data	X			X				X			X
Baseline Water and Soil Data				X				X			X

Major Milestones for Phase III

Milestone	Target Date
Submit Permit to Drill	Q3 2020
Geophysical Data Acquisition Complete	Q4 2020
Injection Simulations Initiated	Q4 2020
Area of Review Determined	Q1 2021
Fox Hills Well Installation Complete	Q2 2021
Storage Facility Permit Development Complete	Q2 2021
NRAP Supplemental Testing Complete	Q3 2022
Machine Learning Algorithm Testing and Evaluation	Q4 2022

Regional Integration



Recent Accomplishments

- J-LOC1 well drilled into the Precambrian basement (10,470 feet).
- 1344 feet of core from three reservoir/seal intervals.
- 6-mi^2 seismic survey.
- Well pad for second well is built.
- Host site access is secured.

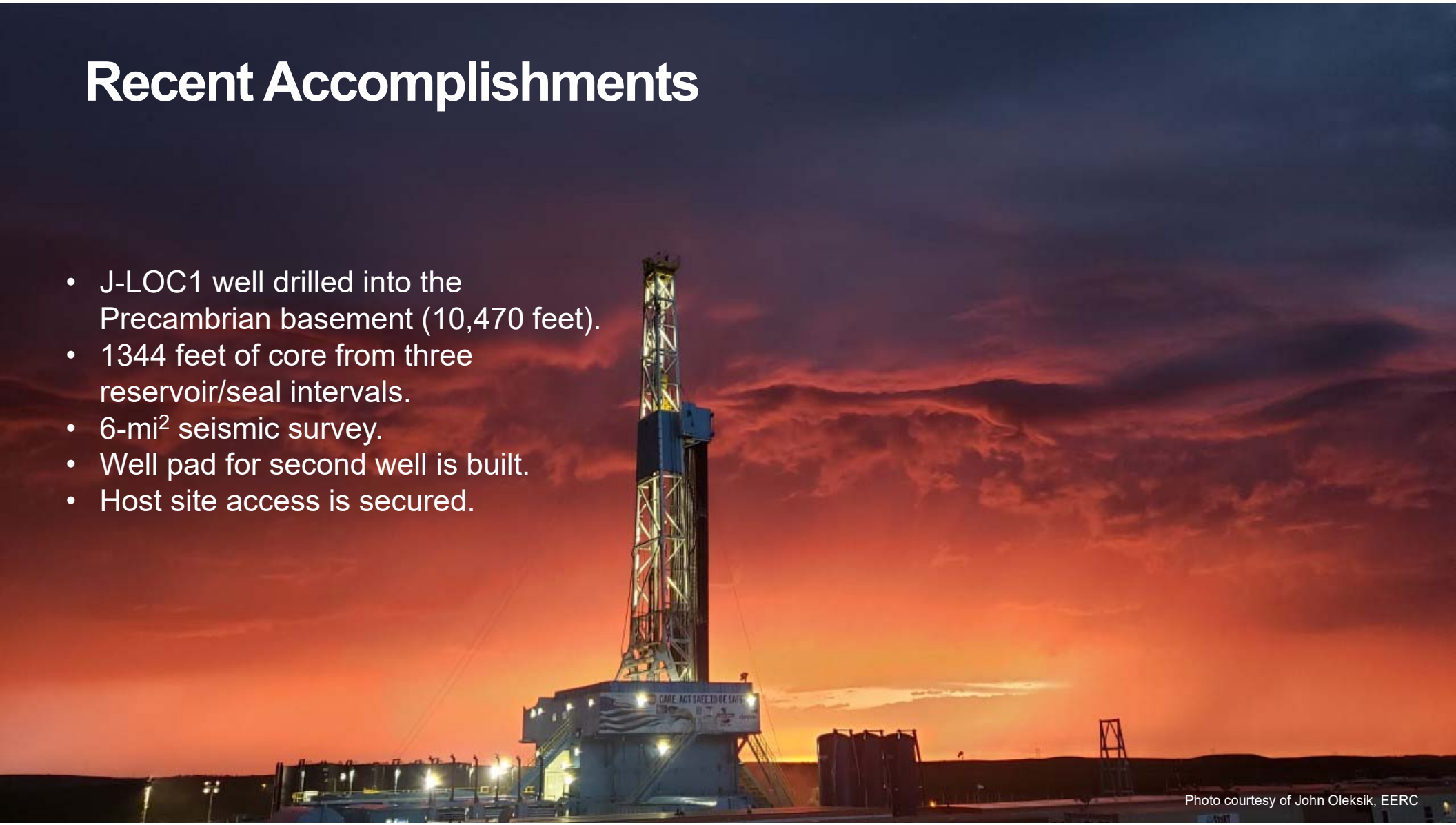


Photo courtesy of John Oleksik, EERC

ND Class VI Program Components

- Storage facility permit
  - Project-specific template
- Permit to drill an injection well
- Permit to inject
- Certificate of project completion

- Accessibility!

Synergy Opportunities

- We are not working in a vacuum. Other CCUS opportunities in the region are developing.
- FEED study at MRY Station.
- PCOR Partnership Initiative
- Contributing to public acceptance of CCUS projects.
- Building a foundation for how states can efficiently permit and oversee commercial-scale CO_2 storage projects.

Summary and Future Plans

- Engaged partners
- Good geology
- Stacked storage
- Site access established
- Minimal CO_2 transport distances
- FEED study under way
- Class VI primacy
- New core in-house ... analysis under way

- Start the project in earnest
- Core analysis
- Model refinement
- Start permit development
- Start the geophysical survey
- Get the second well (J-ROC1) under way
- CO_2 injection tests in the J-LOC1 well

Wesley Peck
Assistant Director of Subsurface Strategies
wpeck@undeerc.org
701.777.5195 (phone)

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

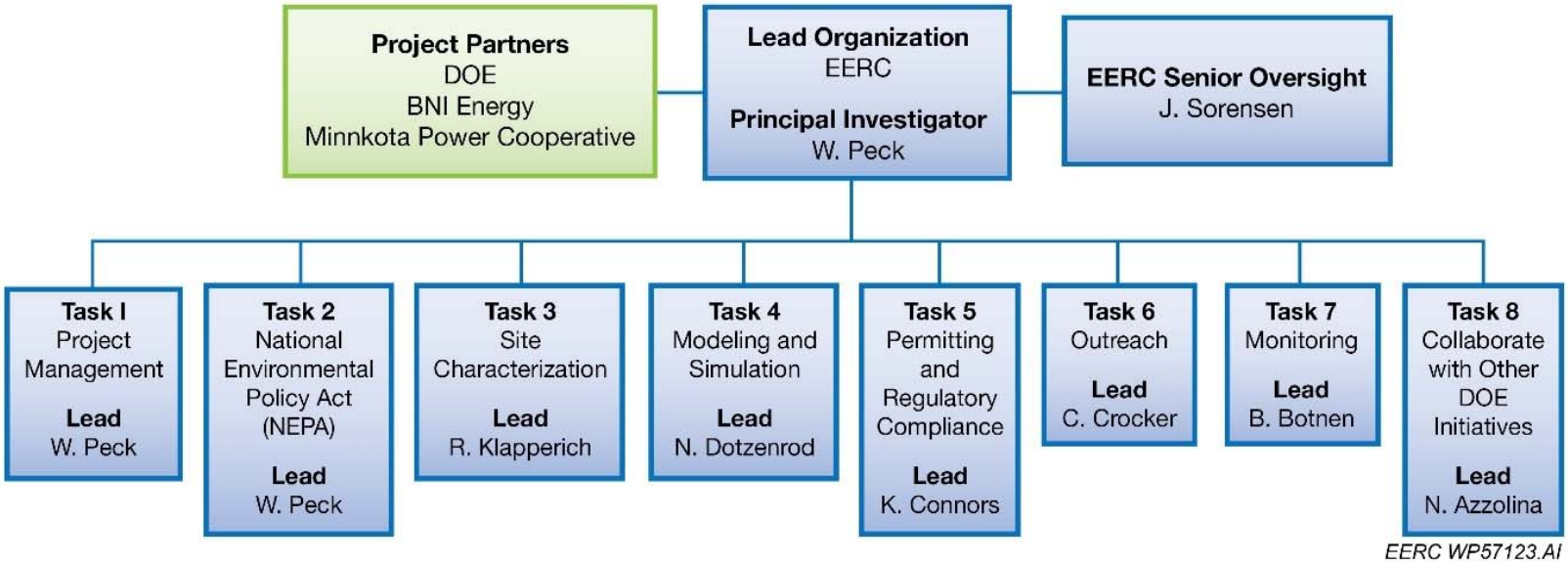
www.undeerc.org
701.777.5000 (phone)
701.777.5181 (fax)

THANK YOU

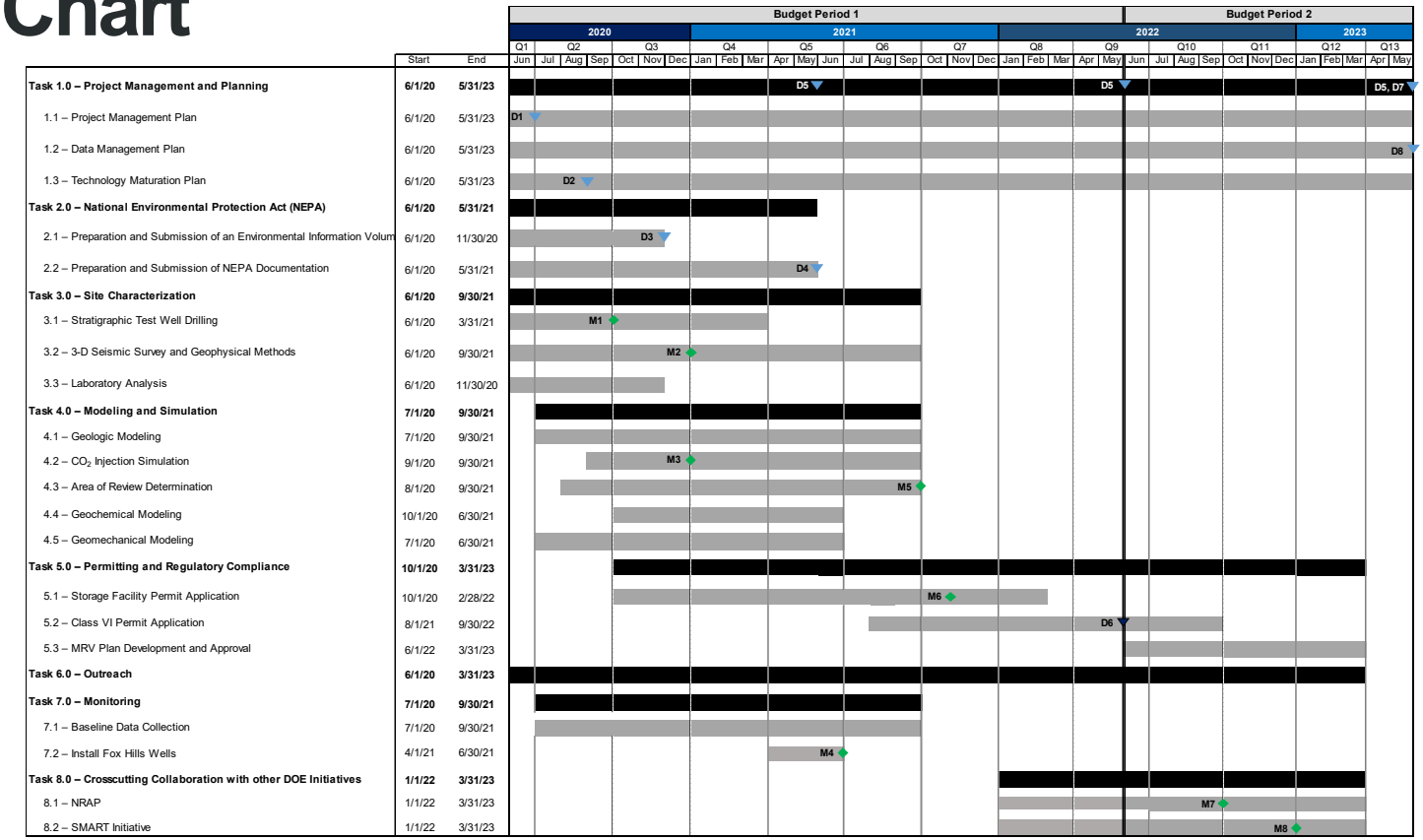
Critical Challenges. Practical Solutions.

Appendix

Organization Chart



Gantt Chart



Deliverables (D)	Milestones (M)
D1 – Project Mangement Plan (PMP)	M1 – Submit Permit to Drill
D2 – Carbon Capture Technology(ies) Maturation Plan (TMP)	M2 – Geophysical Data Acquisition Complete
D3 – Environmental Information Volume	M3 – Simulations Initiated
D4 – NEPA Documentation	M4 – Fox Hills Well Installation Complete
D5 – Geologic Catalog of Materials	M5 – Area of Review Determined
D6 – Application for Underground Injection Control Class VI Permit to Construct	M6 – Storage Facility Permit Application Complete
D7 – Final Technical Report	M7 – NRAP Supplemental Testing Complete
D8 – Data Submitted to NETL EDX	M8 – ML Algorithm Testing and Evaluation