



Energy & Environmental Research Center (EERC)

PRAIRIE COMPASS DIRECT AIR CAPTURE HUB DE-FE0032390

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Energy & Environmental Research Center (EERC)

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PRESENTATION OUTLINE

- Project Overview and Proposed Partners
- DAC Hub Location
- CCUS Projects in Hub Location
- Hub Expansion



PROJECT OVERVIEW

- Objective - Demonstrate lower-cost DAC at megaton scale to catalyze and guide socially responsible development of commercial DAC facilities across the northern Great Plains and beyond
 - >1,000,000 tonnes per year of CO₂ removal by 2032
- TA-2 DAC Hub focused on a FEED study with an existing permitted Class VI injection well.
- General project schedule
 - Tentative start in Sept 2024 (awaiting contract signing)
 - 2-year schedule for completion in Aug 2026

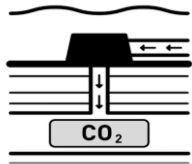
PROPOSED PARTICIPANTS



Prime applicant, project management, community engagement, technical support



Technology developer, first anchor tenant for DAC Hub



Host site, CO₂ storage operator



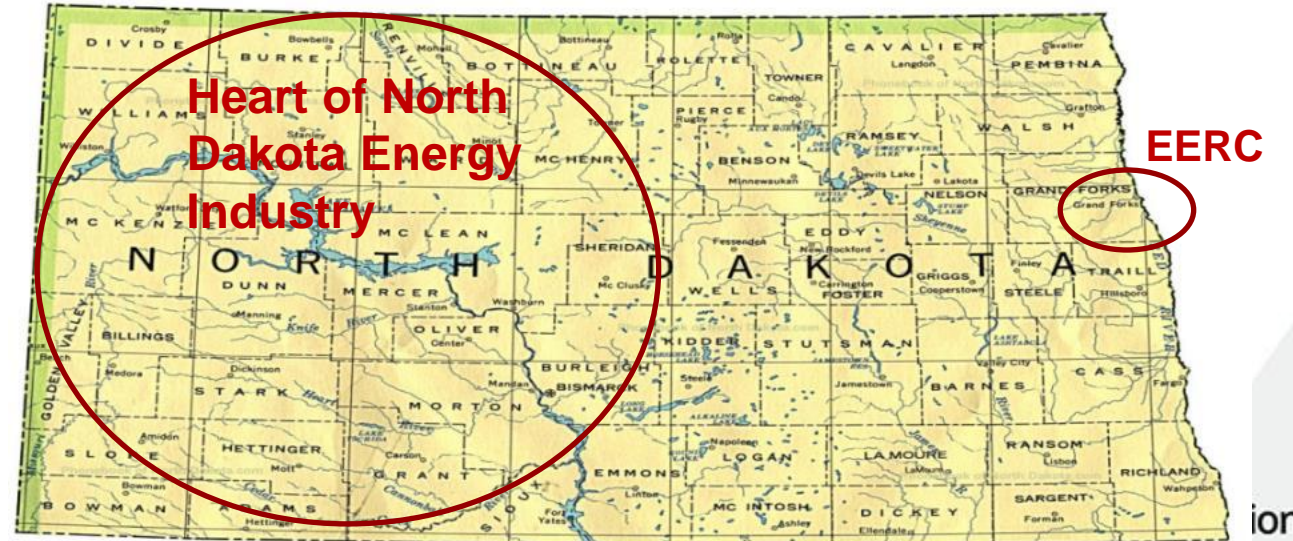
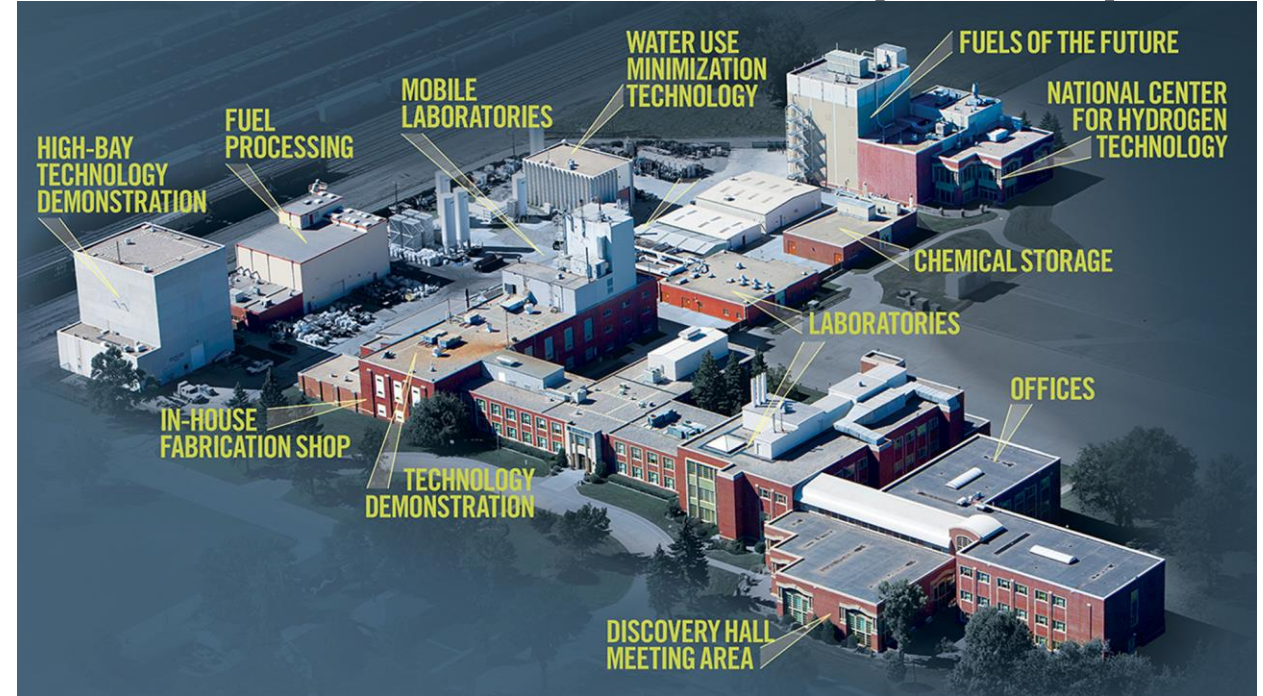
Overall Hub direction and project sponsor



FEED study, permitting

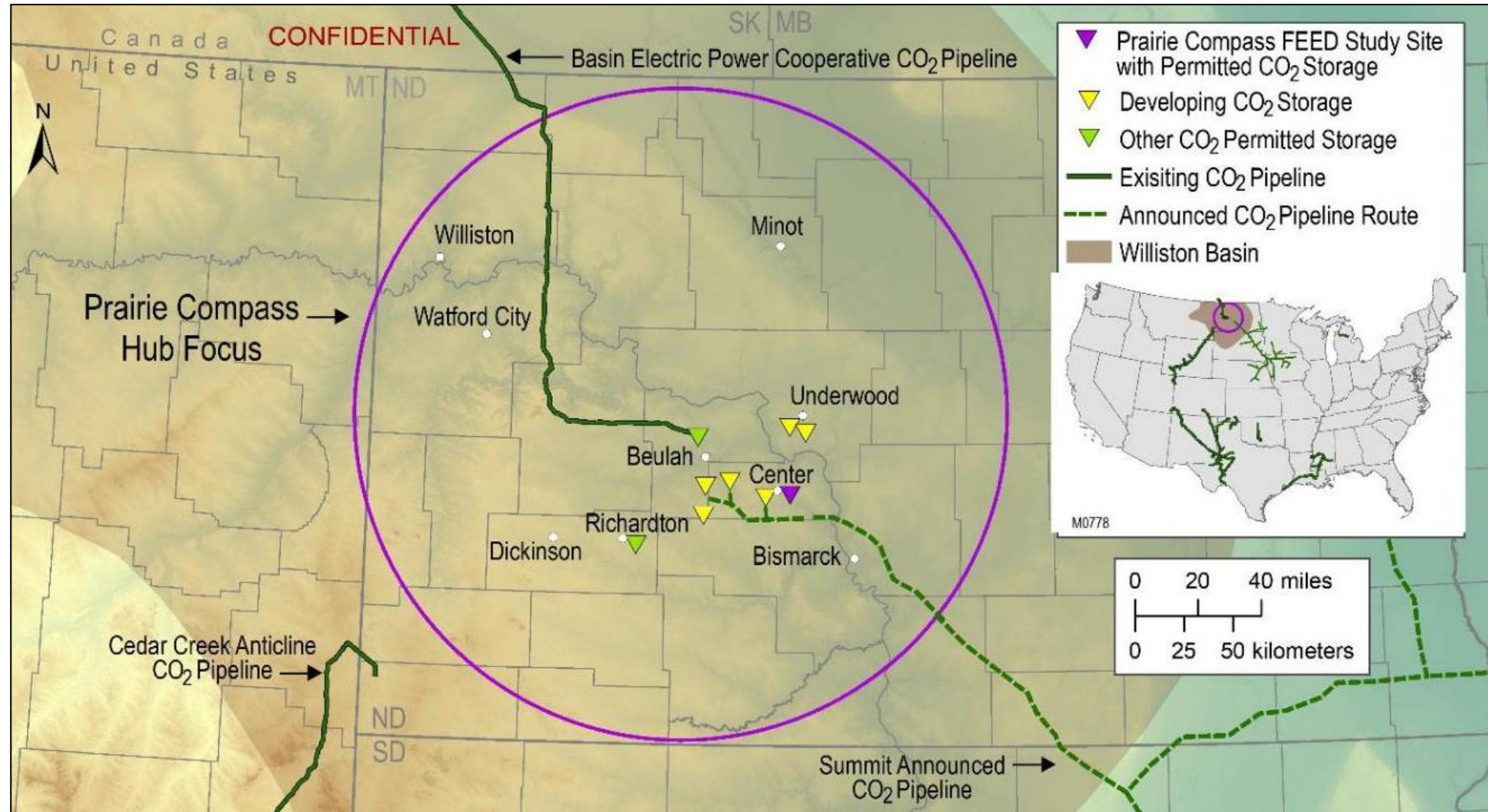
ENERGY & ENVIRONMENTAL RESEARCH CENTER (EERC)

- Nonprofit branch of the University of North Dakota.
- Over 270 employees focused on energy and environmental solutions.
- More than 254,000 square feet of state-of-the-art laboratory, demonstration, and office space.



PRAIRIE COMPASS DAC HUB ADVANTAGE

- Utilizes existing UIC Class VI permitted CO₂ storage site
- Proximity to existing and planned CO₂ pipelines
- Additional expansion and build-out to increase capacity and recruit additional DAC technology providers



PCOR PARTNERSHIP

2003–2005 – PCOR Partnership: Characterization

2005–2008 – PCOR Partnership: Field Validation

2007–2019 – PCOR Partnership: Commercial Demonstration

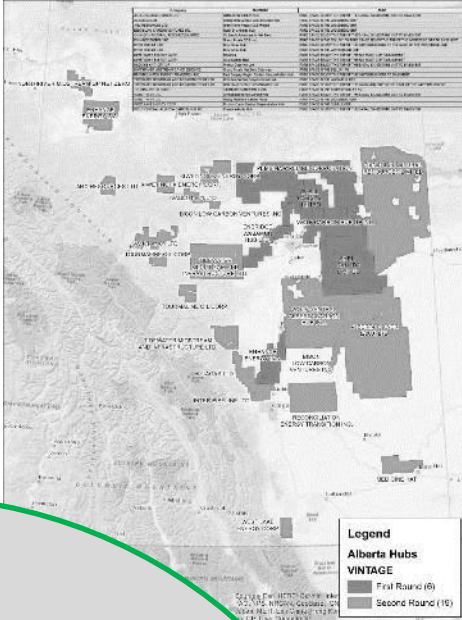
2019–2024 – PCOR Partnership Initiative: Commercial Deployment



Image credit – EERC

0 500 1,000 kilometers





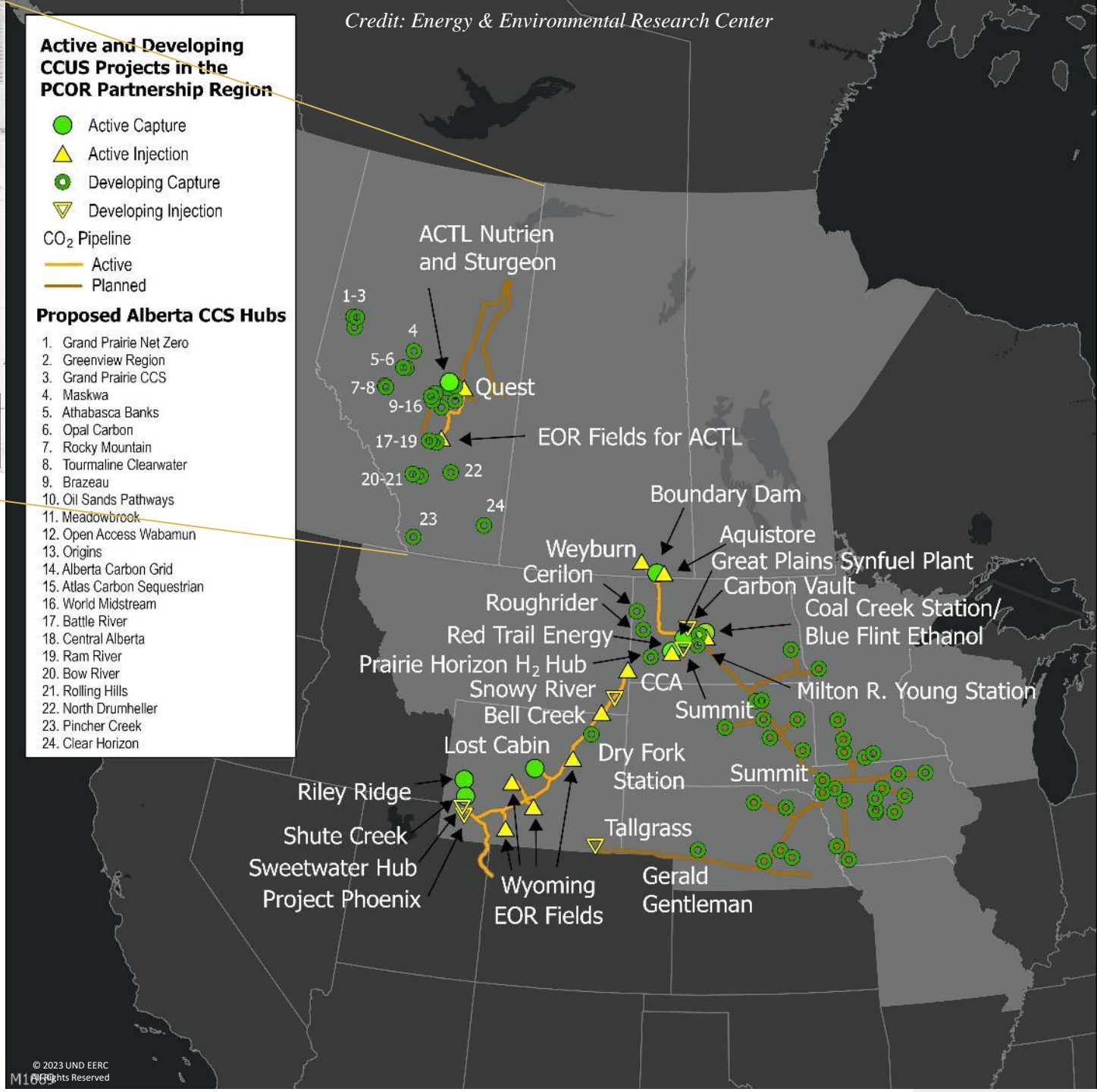
Active and Developing CCUS Projects in the PCOR Partnership Region

- Active Capture
- ▲ Active Injection
- Developing Capture
- ▼ Developing Injection

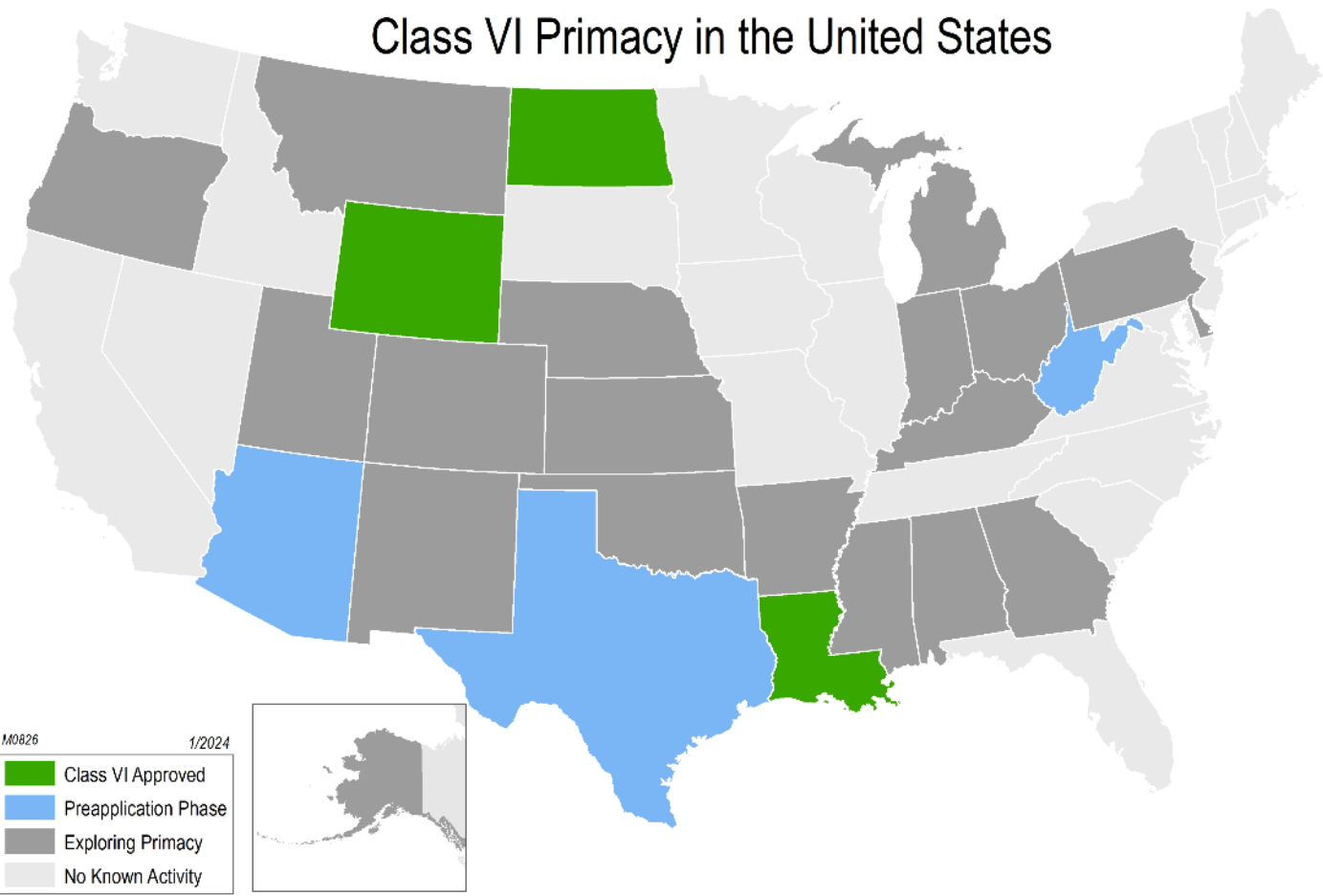
- CO₂ Pipeline
- Active
 - Planned

Proposed Alberta CCS Hubs

1. Grand Prairie Net Zero
2. Greenview Region
3. Grand Prairie CCS
4. Maskwa
5. Athabasca Banks
6. Opal Carbon
7. Rocky Mountain
8. Tourmaline Clearwater
9. Brazeau
10. Oil Sands Pathways
11. Meadowbrook
12. Open Access Wabamun
13. Origins
14. Alberta Carbon Grid
15. Atlas Carbon Sequestrian
16. World Midstream
17. Battle River
18. Central Alberta
19. Ram River
20. Bow River
21. Rolling Hills
22. North Drumheller
23. Pincher Creek
24. Clear Horizon



Underground Injection Control (UIC) Class VI Primacy



Class I	Class II	Class III	Class IV	Class V	Class VI
Hazardous and nonhazardous fluids (industrial and municipal wastes).	Brines and other fluids associated with oil and gas production, including CO ₂ EOR.	Fluids associated with solution mining of minerals.	Hazardous or radioactive wastes. This class is banned by EPA.	Nonhazardous fluids into or above a USDW and are typically shallow.	Injection of CO ₂ for long-term storage.

ANCILLARY REGULATORY MECHANISMS FACILITATE INDUSTRIAL CCUS

Carbon dioxide storage facility administrative fund (\$0.01/ton): administer program.

Carbon dioxide storage facility trust fund (\$0.07/ton): post-injection compliance and long term liability.

Amalgamation of pore space (forced @ 60%)

Final decision issued within 12 months of the date a submitted carbon storage facility permit application is deemed complete.

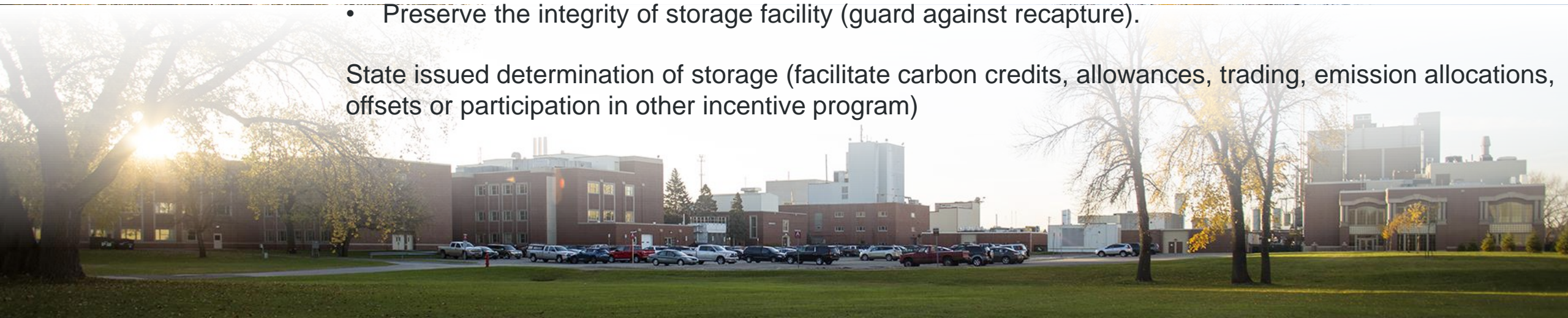
State issues certificate of project completion (all criteria met – at least 10 years postinjection)

- Releases responsibility, regulatory requirements, and bonds
- Transfer of title and custody to storage facility and stored CO₂ to state
- State oversees/responsible for monitoring and managing the storage facility until such time as federal government assumes responsibility (assures site access/confidence)

State retains all authority to regulate future mineral and UIC activities

- Preserve the integrity of storage facility (guard against recapture).

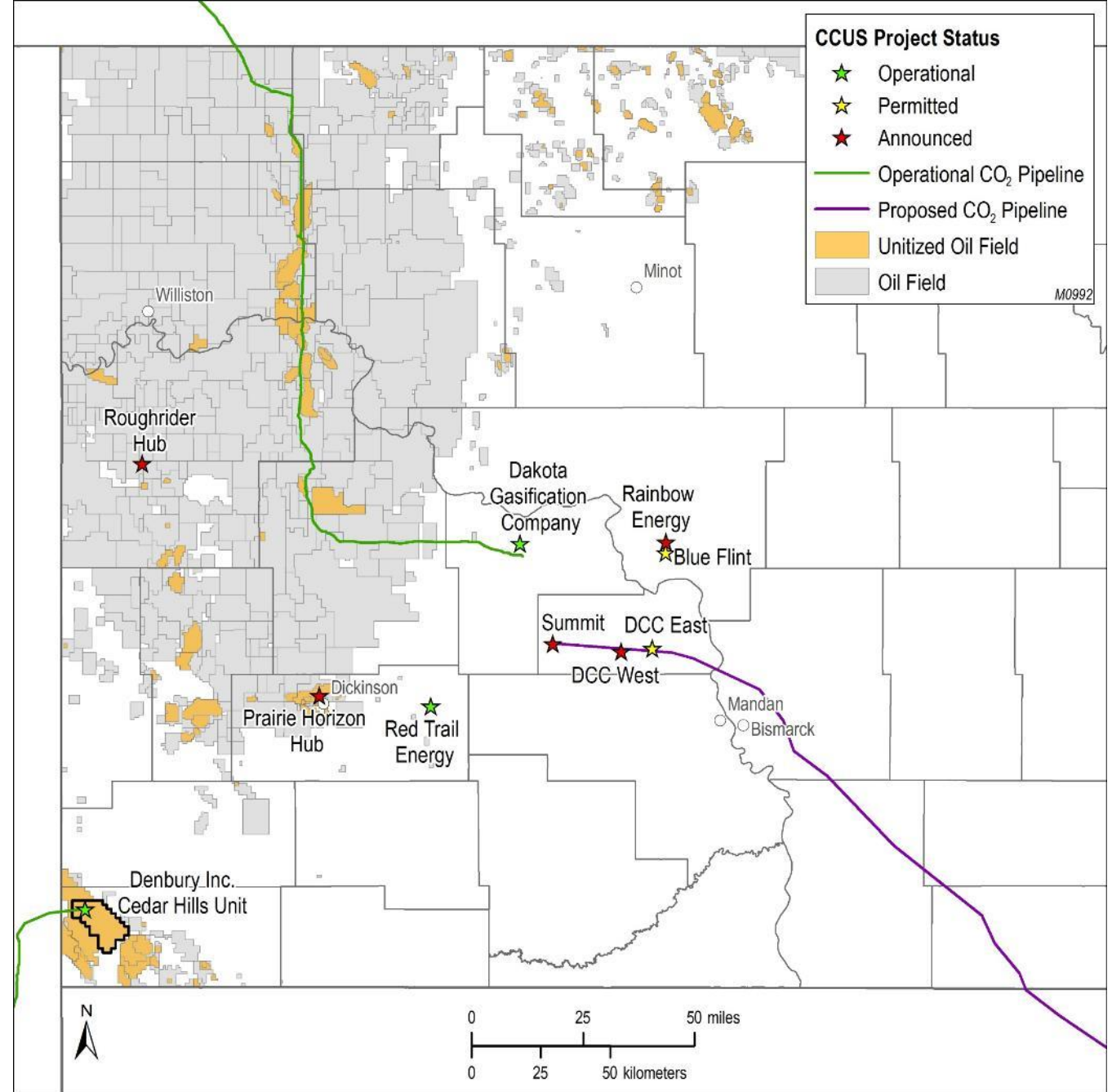
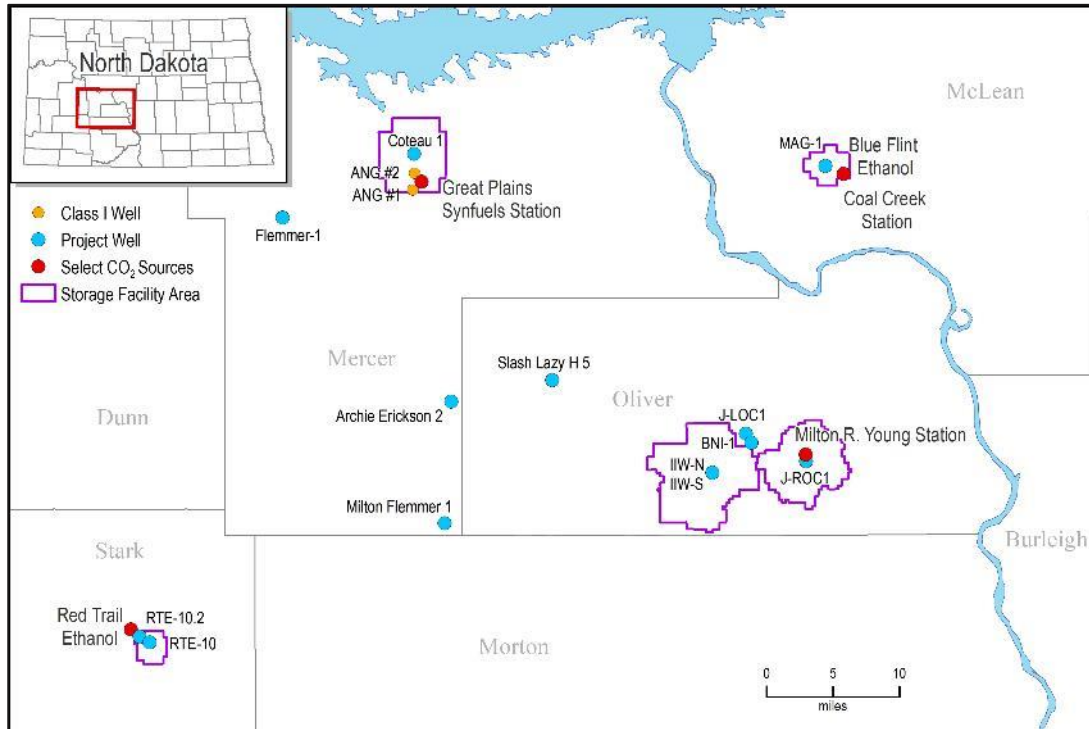
State issued determination of storage (facilitate carbon credits, allowances, trading, emission allocations, offsets or participation in other incentive program)

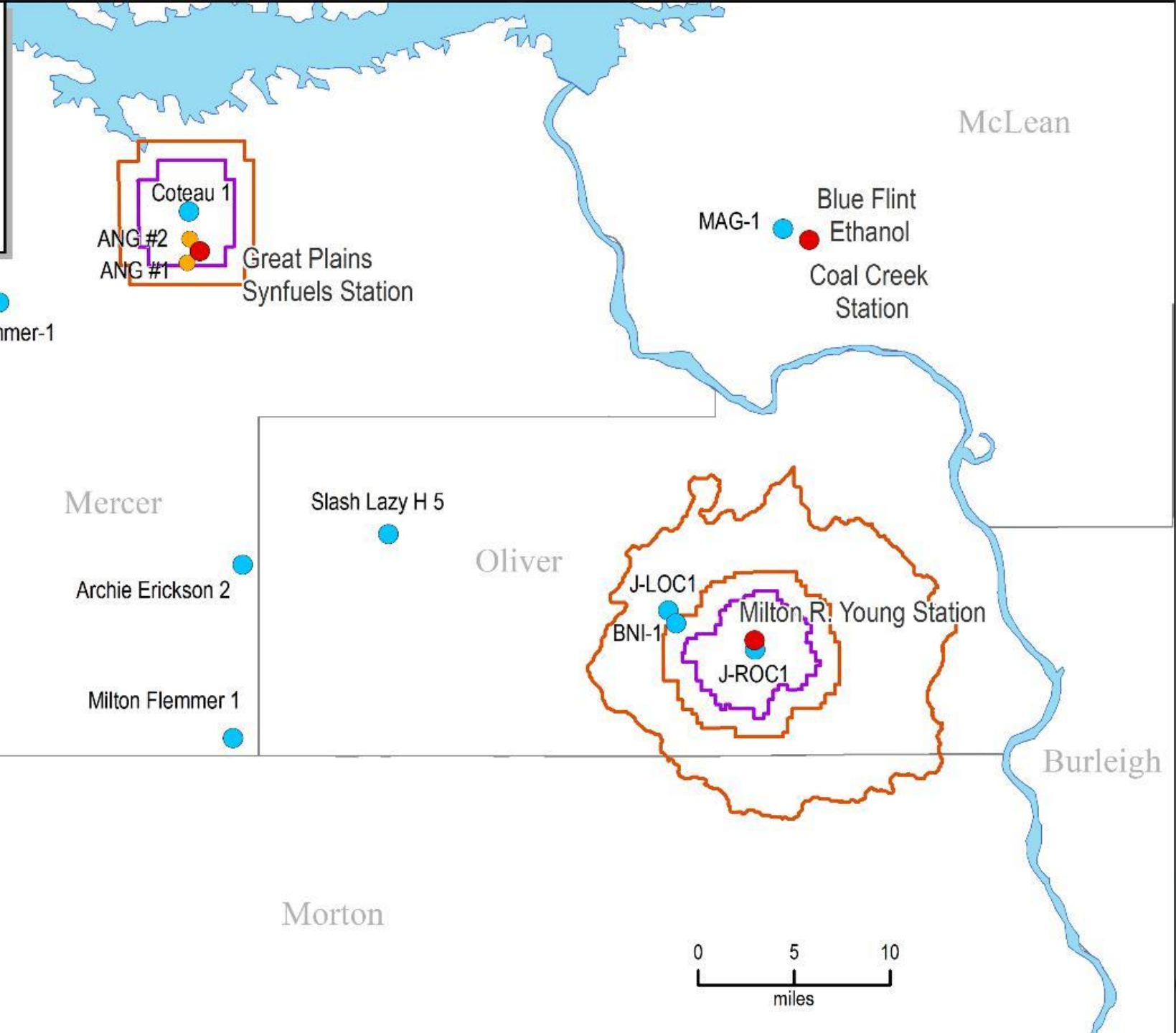
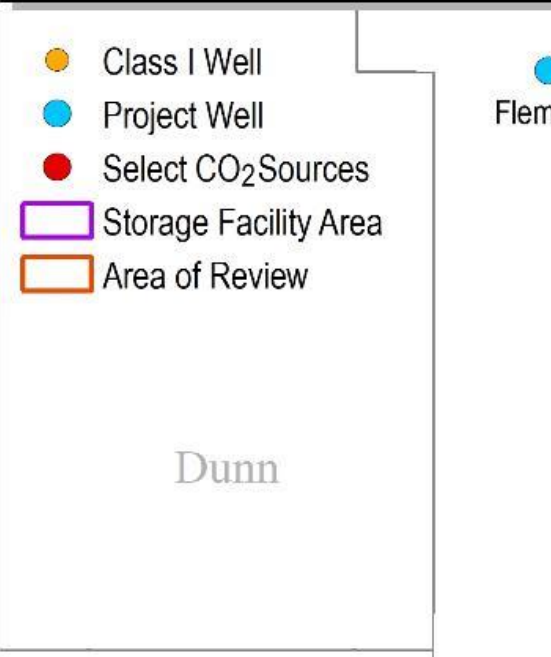


North Dakota CCUS Projects

Announced, Permitted, and Operational

~250 million tonnes of CO₂ Storage Permitted





GREAT PLAINS SYNFUELS PLANT HAS BEEN SEQUESTERING CO₂ FOR NEARLY 25 YEARS.

Capacity to capture and store over 3 million tons per year of CO₂

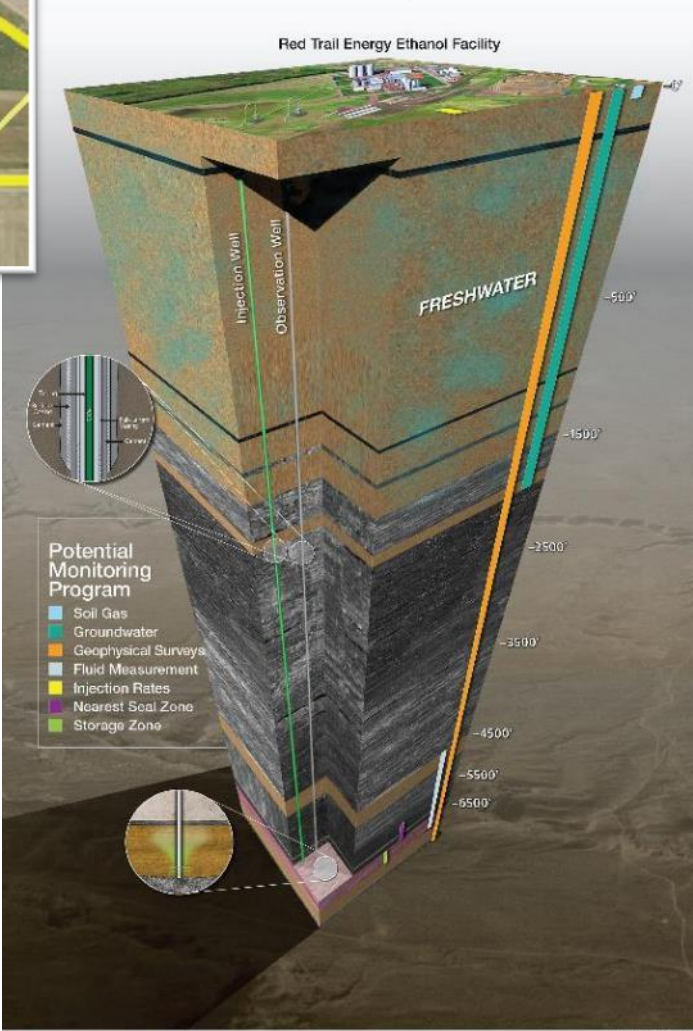
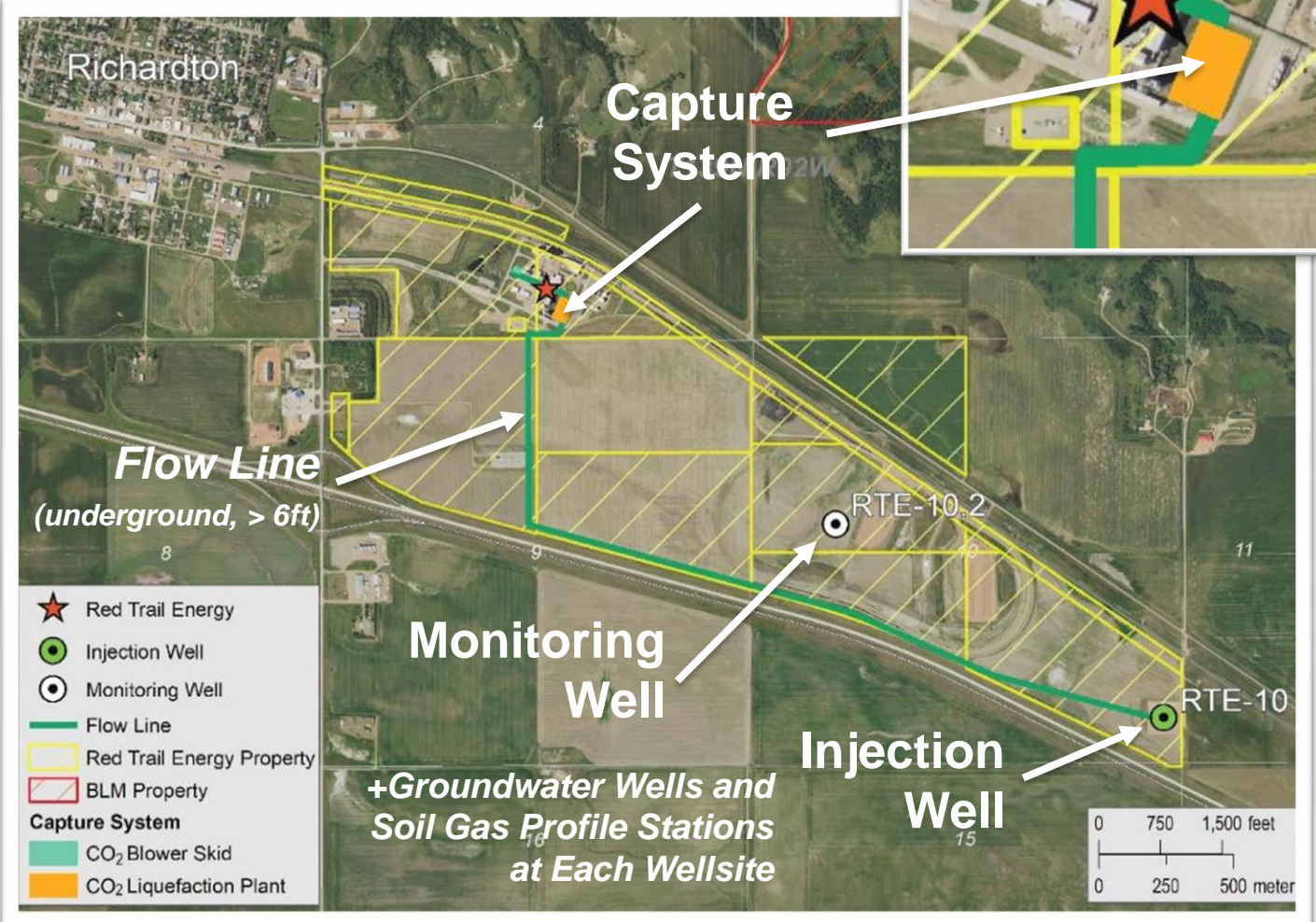


Image from dakotagas.com

Critical Challenges. Practical Solutions.

RED TRAIL ENERGY CCS IS COMMERCIAL.

~180,000 metric tons per year since June 16, 2022



COMMUNITY BENEFITS PROGRAM (CBP) OVERVIEW

Prairie Compass DAC Hub CBP helps identify ways to provide societal benefit while minimizing negative impacts to workers and communities through a set of four core policy priorities:

- Engaging communities and labor
- Investing in job quality and a skilled workforce
- Advancing Diversity, Equity, Inclusion, and Accessibility (DEIA)
- Implementing Justice 40

Direct Air Capture
RESEARCH AND DEVELOPMENT OF DAC

EERC
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PRAIRIE COMPASS DAC HUB
TOWARD NET ZERO THROUGH INNOVATION

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UNIVERSITY OF NORTH DAKOTA

A NEW FRONTIER IN NORTH DAKOTA
Direct Air Capture technology that uses fans and filters to remove CO₂ from the atmosphere. Second, the captured CO₂ is captured from the atmosphere and pumped underground through sequestration. Over time, the captured CO₂ is stored in the earth's crust, removing it from the atmosphere and preventing it from contributing to climate change.

WHAT IS DIRECT AIR CAPTURE (DAC)?
DAC is a technology that captures existing carbon dioxide (CO₂) directly from ambient air. Direct air capture and permanent storage, or DAC+S, work together to address the historic CO₂ emissions already in the atmosphere as well as hard-to-abate (residual) CO₂ emissions. By removing atmospheric CO₂ and permanently storing it deep underground, DAC+S is designed to be a negative-emissions technology. The Energy & Environmental Research Center (EERC) and Climeworks, the DAC technology provider, along with other project partners have created the Prairie Compass DAC Hub, which will determine the feasibility of DAC in North Dakota.

HOW DOES IT WORK?
Direct Air Capture technology that captures historic CO₂ from the atmosphere and stores it underground.

- 1 Fans draw ambient air into the DAC process.
- 2 Air with recirculated CO₂ molecules.
- 3 Once saturated, the air is heated.
- 4 Heated CO₂ is collected and ready to be stored.
- 5 The captured CO₂ is stored permanently.

The DAC process allows for the intensity of distributed sources and CO₂ removal deployment.

AN EVOLVING INDUSTRY
Following the Infrastructure Investment and Jobs Act (IIJA), the U.S. Department of Energy (DOE) is funding the development of four domestic regional DAC hubs. Our goal is to bring one of these hubs, including the associated jobs and manufacturing opportunities that will be created, to North Dakota.

The Prairie Compass DAC Hub will combine Climeworks' DAC technology with permitted geologic CO₂ storage facilities in North Dakota to demonstrate commercial-scale DAC+S consistent with DOE's Carbon Negative Shot goal. The first phase of the project includes:

- An initial engineering study on the potential to economically scale DAC technology in North Dakota.
- Studying the number of direct U.S. jobs and other economic opportunities that the Prairie Compass DAC Hub would create.
- Initial feasibility work focused on Minnkota Power Cooperative's (Minnkota's) permitted CO₂ storage facility near Center, North Dakota.
- The potential for Minnkota to provide support services to the project.

If successful, DOE funding for future phases will support DAC+S deployment to capture and store 1 million metric tons of CO₂ annually by 2030. The project will deploy advanced, commercial-scale DAC infrastructure and operate it under the wide annual temperature range found in North Dakota to demonstrate successful CO₂ removal deployment.

PUTTING NORTH DAKOTA FIRST
As the home to a wealth of natural resources, North Dakota has been a proud leader in carbon management. This is a historic opportunity for North Dakota to once again host cutting-edge technology that will efficiently manage CO₂ emissions. Significant federal investment will be leveraged and matched with large private investments. This project will also foster multiple co-benefits locally, including:

- Fueling new permanent jobs.
- Leveraging a highly skilled workforce.
- Supporting apprenticeships.

This will include nearly 900 construction jobs during peak construction and nearly 50 permanent operations jobs while further assembling a supply chain around large-scale industrial projects and accelerating the commercialization of the carbon management industry in North Dakota, including the processing, transport, and secure geologic storage of CO₂ captured from the atmosphere.

DAC projects can generate billions of dollars of investment that will benefit the existing energy industry, create jobs, and diversify the economy.

CRITICAL CHALLENGES | PRACTICAL SOLUTIONS

COMMUNITY ENGAGEMENT



Advisory Board

- Periodic meetings (frequency TBD)

Community Open Events & Fact Sheets



Virtual Listening Sessions

Public Questionnaire

More Opportunities to Provide Feedback:



PRAIRIE COMPASS HUB EXPANSION PLANS

- Hub expansion plans are required for TA-2 DAC Hubs
- EERC is actively seeking expansion partners for the hub
- TA-2 Attributes:
 - Have demonstrated 1000 tpa DAC technology
 - Have completed a pre-FEED study on the DAC system
- Minimum attributes:
 - Plan for scale up to 1000 tpa by 2026, or
 - Pathway to commercial operations by 2030.



PROJECT SUMMARY

- The EERC has partnered with the U.S. Department of Energy Office of Clean Energy Demonstrations and Climeworks to determine the feasibility of deploying megaton-scale DAC technology in North Dakota.
- Existing permitted Class VI wells in ND provide an excellent resource for early movers in JDAC technology deployment.
- We are working on the HUB expansion plan, and we would like to engage with technology developers that meet the criteria of a TA-1 or TA-2.



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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 yellowing leaves. In the background, there are several large, multi-story brick buildings, likely university halls or administrative buildings. A parking lot with several cars is visible in the middle ground.

THANK YOU

Critical Challenges. Practical Solutions.