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UNIVERSITY OF
NORTH DAKOTA



Critical Challenges. Practical Solutions.



Energy & Environmental Research Center (EERC)

Legal and Regulatory Frameworks for Geologic Storage of Carbon Dioxide

North Dakota Law Review
Energy Law Symposium
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OUR VISION

TO LEAD THE WORLD IN
DEVELOPING SOLUTIONS
TO ENERGY AND ENVIRONMENTAL
CHALLENGES.



OUR FACILITIES

254,000 SQ FT OF FACILITIES

CORE RESEARCH PRIORITIES

Coal Utilization & Emissions

Carbon Management

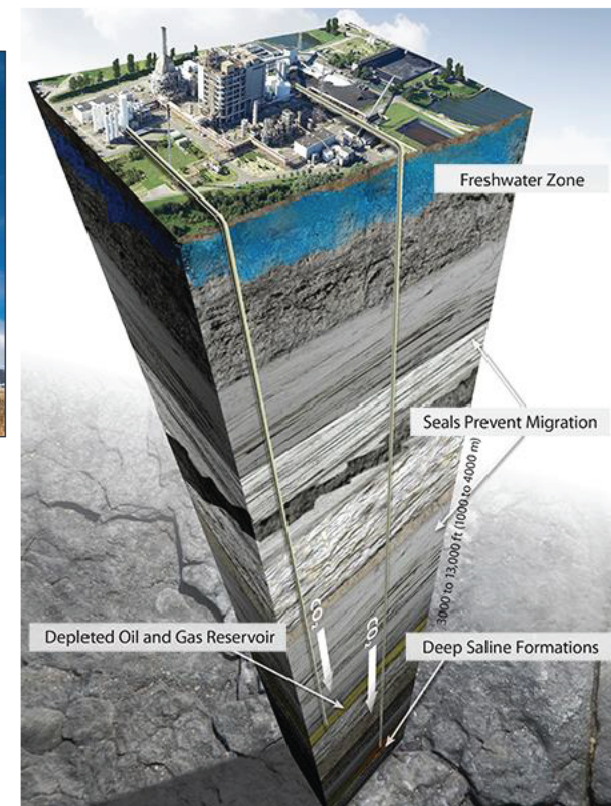
Oil & Gas

Alternative Fuels & Renewable Energy

Energy–Water



CO₂ CAN BE MANAGED



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Carbon Capture and Storage (CCS)

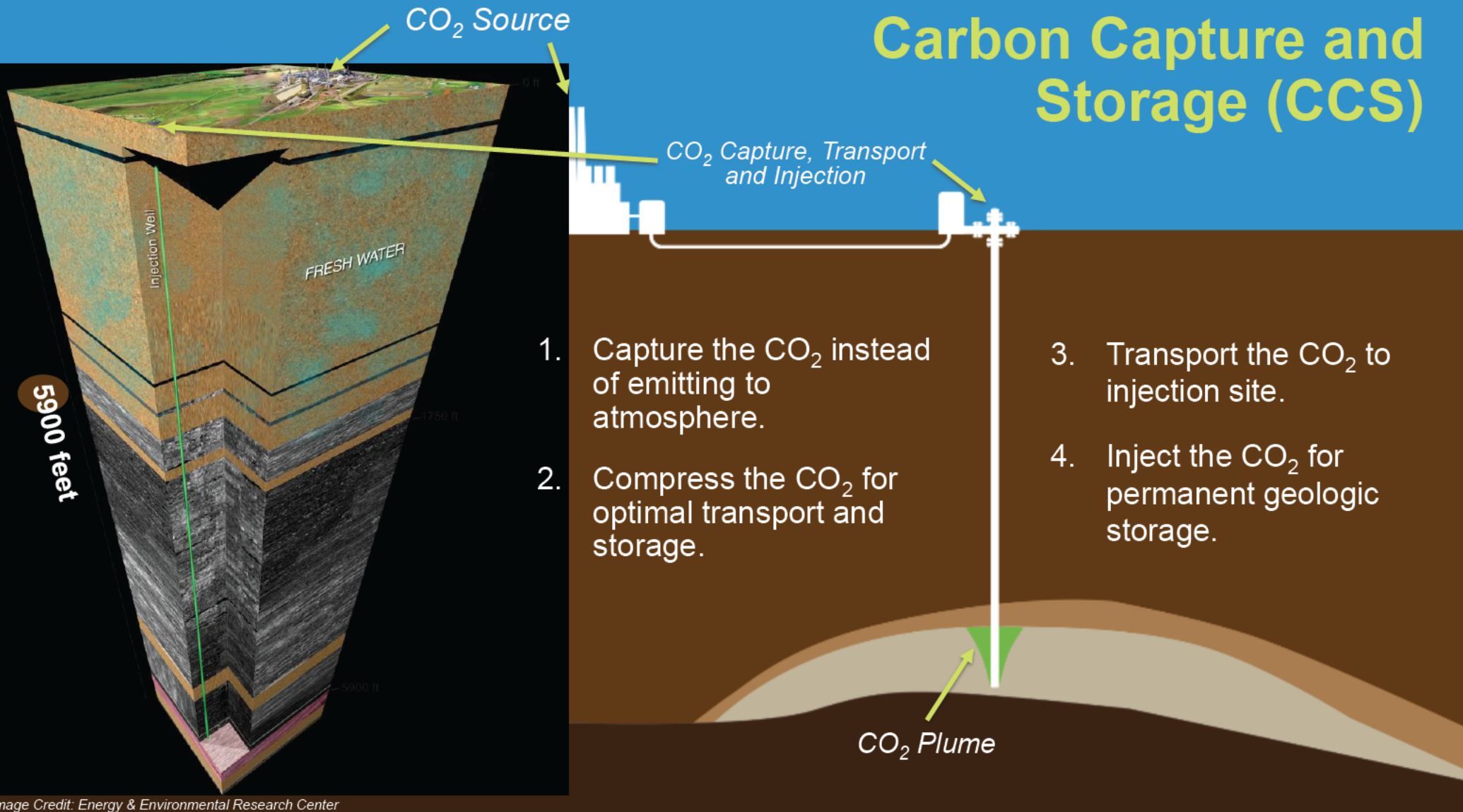


Image Credit: Energy & Environmental Research Center

CRITICAL SUBSURFACE CHARACTERISTICS

- Depth
- Porosity/permeability
- Good cap rock
- Appropriate salinity
- No natural leakage pathways

Depth

- Below approximately 2600 ft, CO₂ becomes a supercritical fluid.
- CO₂ will behave like a liquid.
- High density of the CO₂ allows for more storage in a given volume.

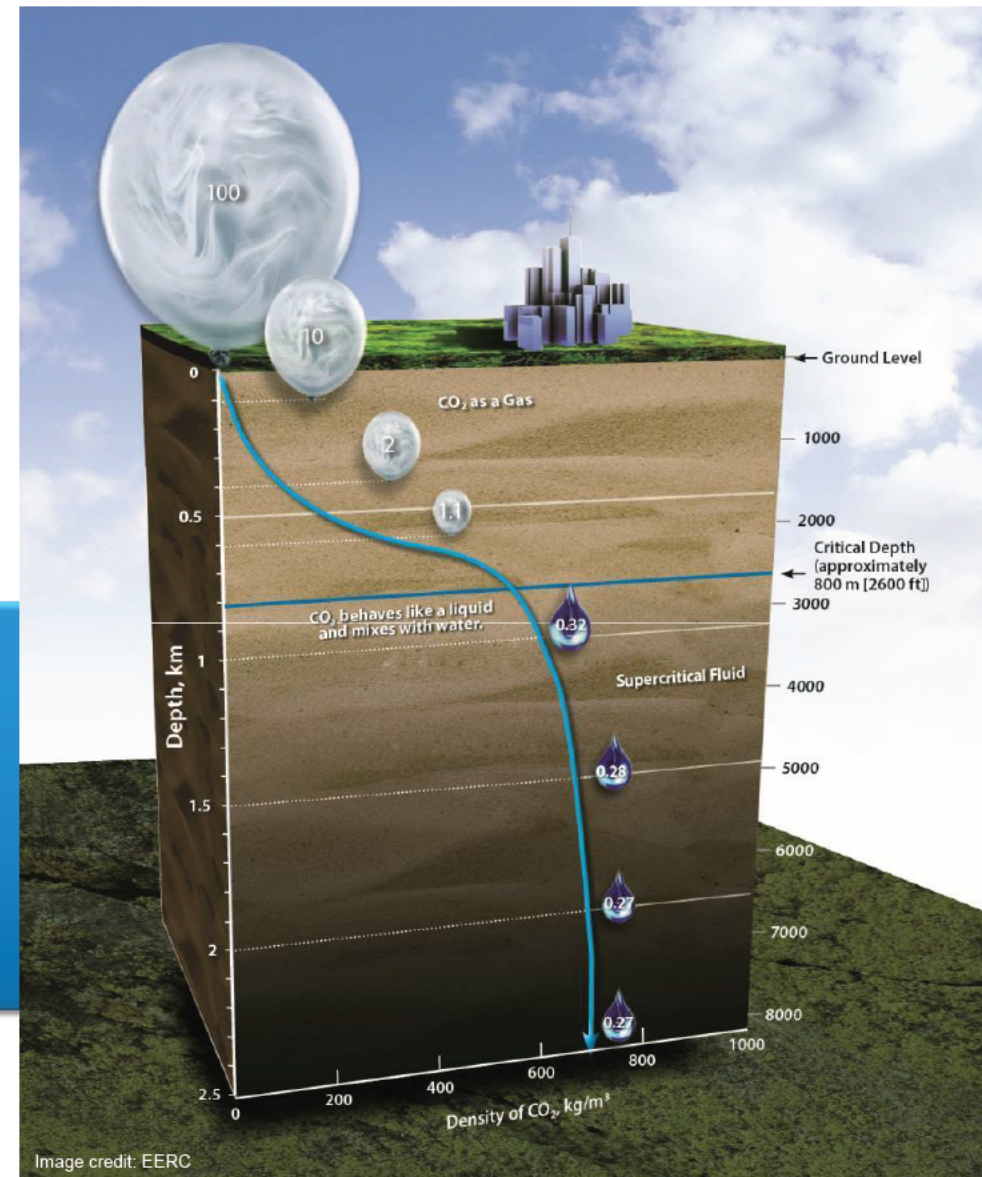
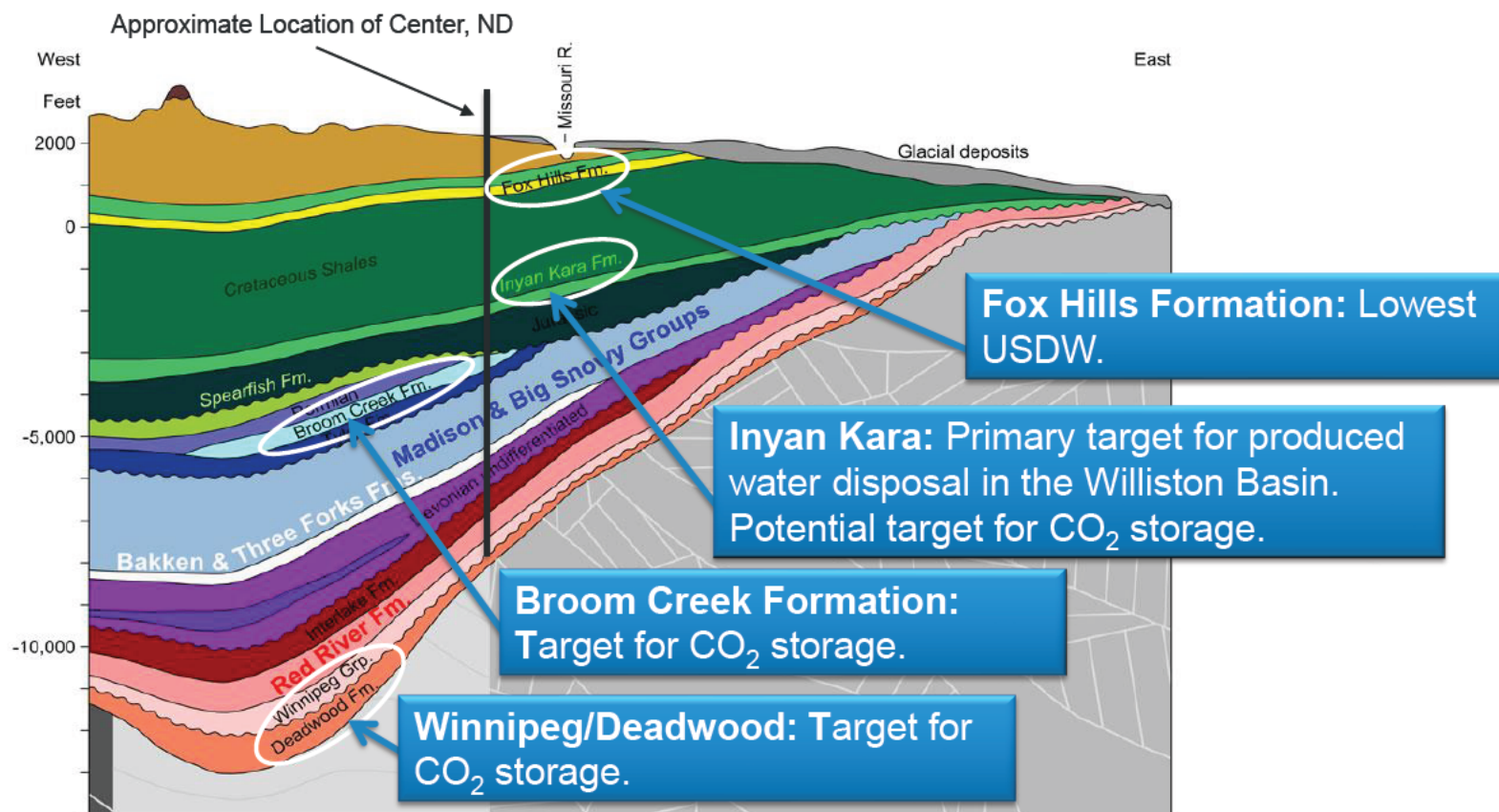


Image credit: EERC

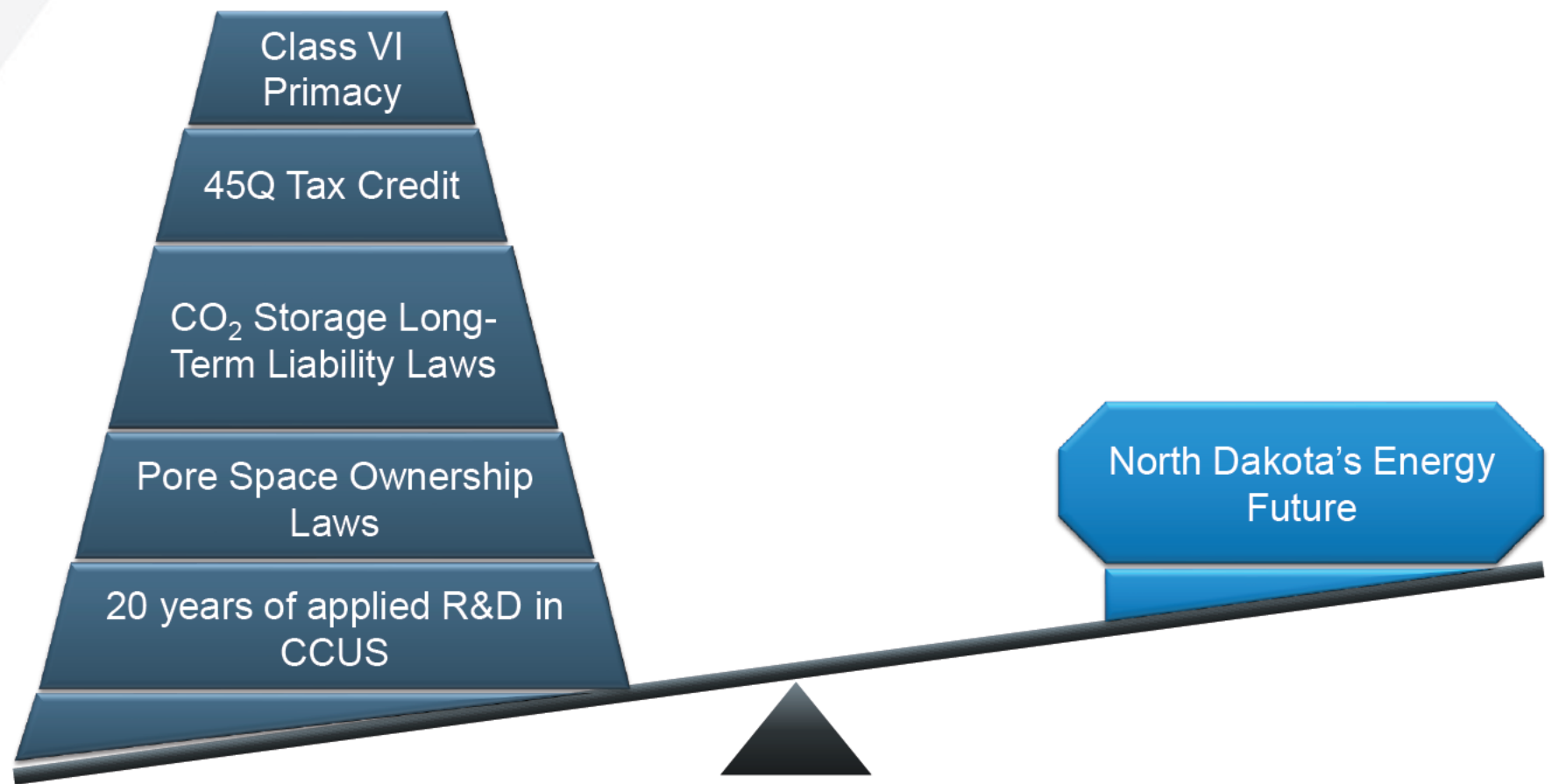
POROSITY AND PERMEABILITY



WILLISTON BASIN SALINE STORAGE OPPORTUNITIES



NORTH DAKOTA'S LEVERAGE



*In February 2002,
President Bush committed
the United States to a
“comprehensive strategy to
reduce the greenhouse gas
emission intensity of the
American economy by
18 percent by 2012”.*



REGIONAL CARBON SEQUESTRATION PARTNERSHIP PROGRAM



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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



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Institute of Northern Engineering
University of Alaska Fairbanks



UNIVERSITY
OF WYOMING

School of
Energy Resources



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PCOR PARTNERSHIP

2003–PRESENT

The PCOR Partnership Initiative addresses regional capture, transport, use, and storage challenges facing commercial CCS/CCUS deployment. The Initiative focuses on:

- Strengthening the technical foundation for geologic CO₂ storage and enhanced oil recovery (EOR).
- Advancing capture technology.
- Improving application of monitoring technologies.
- Promoting integration between capture, transportation, use, and storage industries.
- Facilitating regulatory frameworks.
- Providing scientific support to policy makers.
- Enabling and advancing deployment of CCS/CCUS.



Our Partners inform our priorities.



EERC



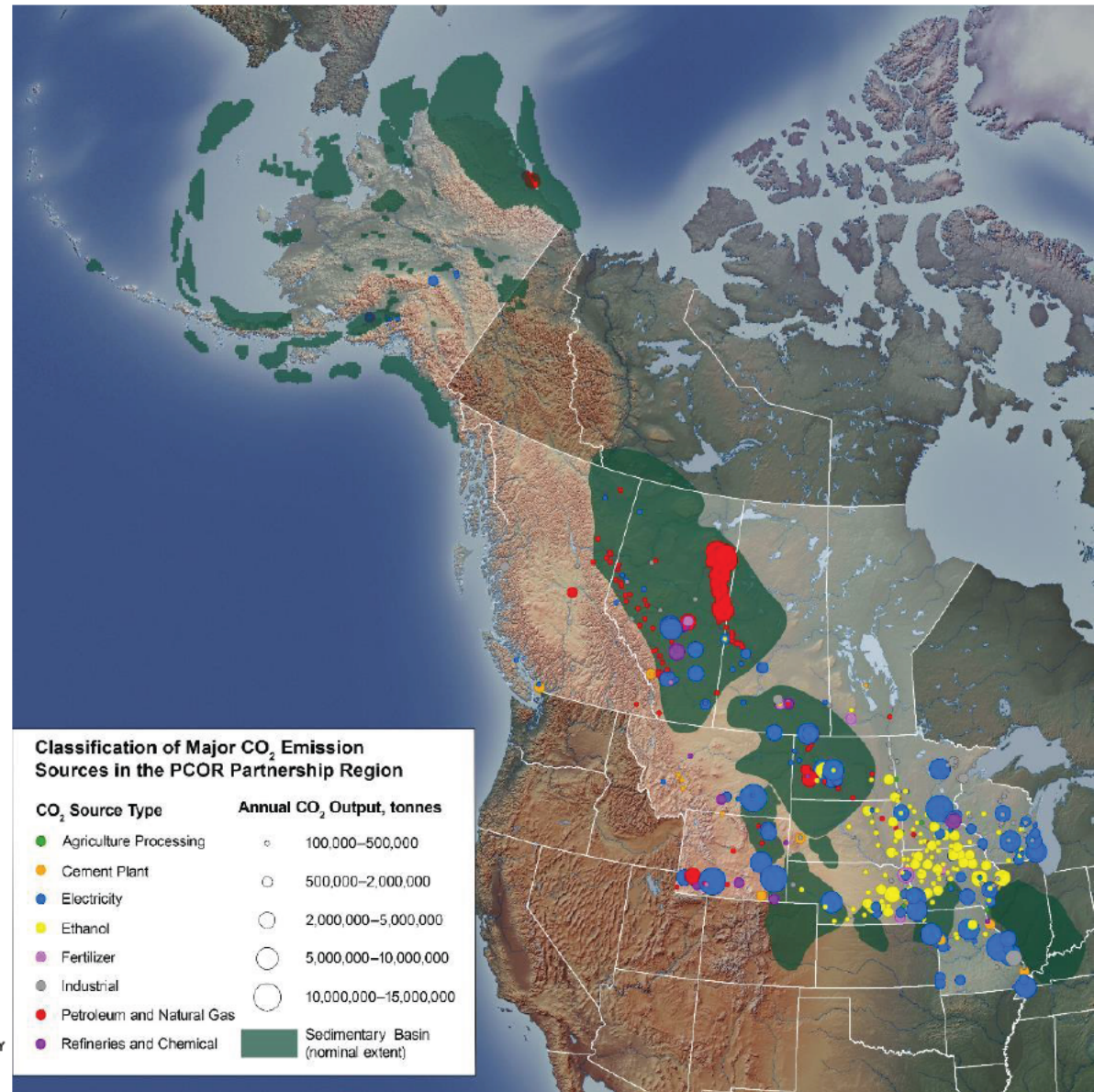
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REGIONAL SOURCES AND SEDIMENTARY BASINS



REGULATING GEOLOGIC STORAGE OF CARBON DIOXIDE

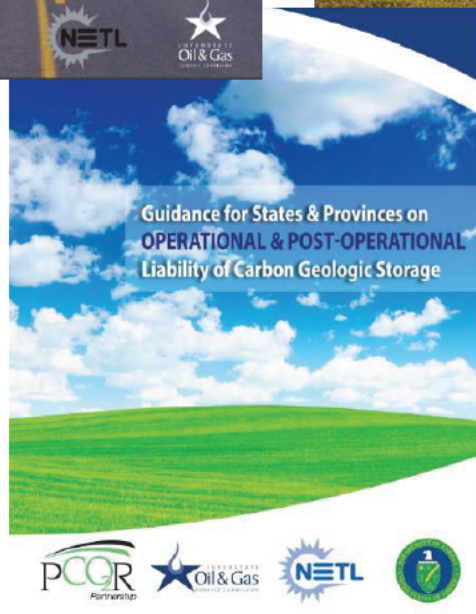
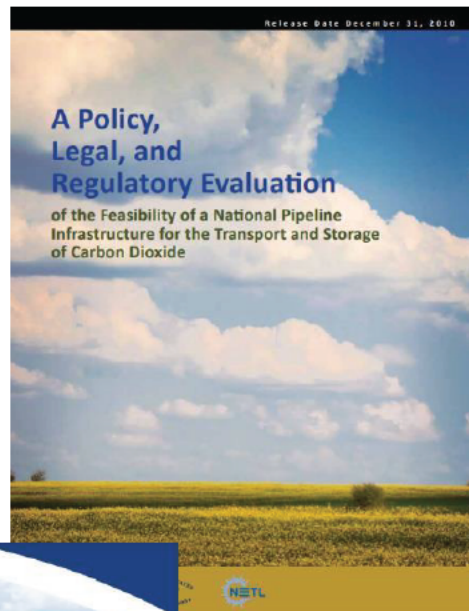
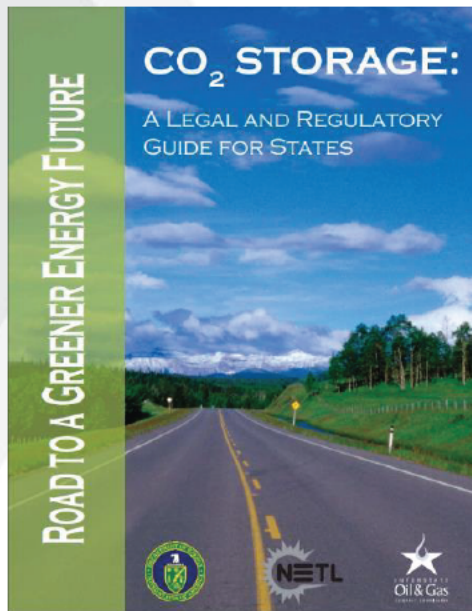


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POLICY AND REGULATORY DEVELOPMENTS

- Pore space Law
- Long-term responsibility
- Class VI primacy
- Regulatory program implementation
- Pathways to permit approval
- Policy/regulatory barriers





IOGCC CARBON GEOLOGIC STORAGE TASK FORCE

Created by the IOGCC Task Force

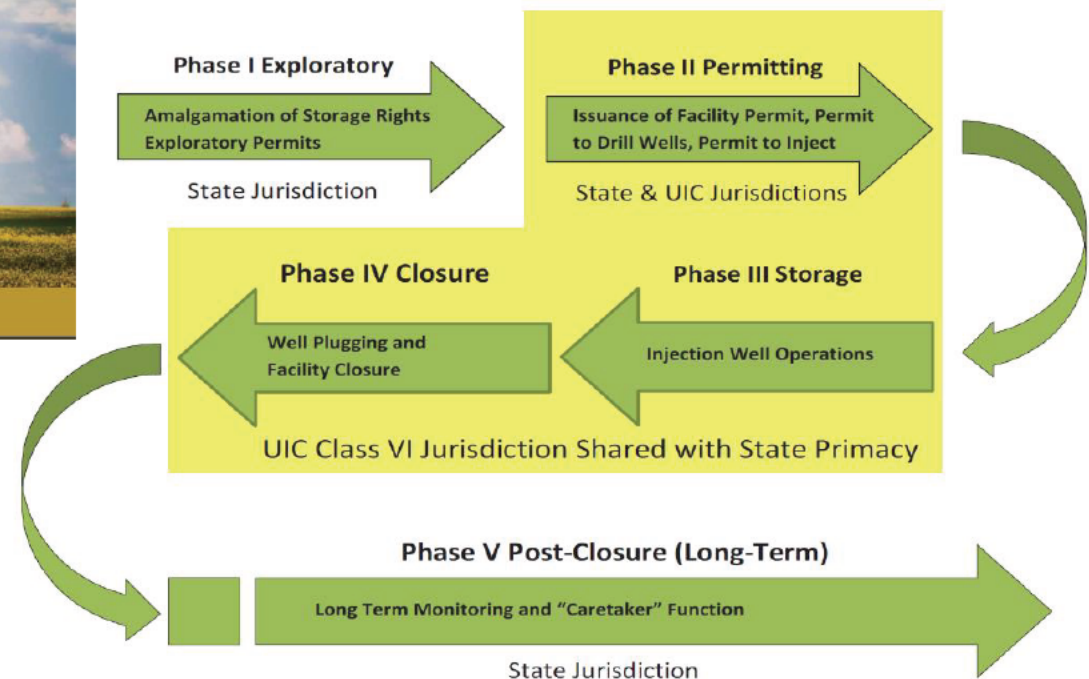


Figure 1-1 CGS Project Flow Diagram

(Yellow boxes show concurrent state and UIC Class VI jurisdiction in Phases II, III, IV. Phase I and V show exclusive state jurisdiction.)

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NORTH DAKOTA 2009 LEGISLATION



- Senate Bill 2095 – Effective July 2009
Established geologic storage of CO₂ statute
 - Granted regulatory authority to the North Dakota Industrial Commission's Oil and Gas Division
 - Created the Carbon Dioxide Trust Fund.
 - Created the Carbon Dioxide Storage Facility Administrative Fund
 - Addressed long-term responsibility
- Senate Bill No. 2139 – Effective April 2009
 - Granted title of pore space to the owner of the overlying surface estate
 - Severing pore space prohibited, leasing pore space not a prohibited severance

RESOURCE MANAGEMENT FRAMEWORK

CARBON DIOXIDE UNDERGROUND STORAGE CHAPTER 38-22

38-22-01. POLICY. It is in the public interest to promote the geologic storage of carbon dioxide. Doing so will benefit the state and the global environment by reducing greenhouse gas emissions. Doing so will help ensure the viability of the state's coal and power industries, to the economic benefit of North Dakota and its citizens. Further, geologic storage of carbon dioxide, a potentially valuable commodity, may allow for its ready availability if needed for commercial, industrial, or other uses, including enhanced recovery of oil, gas, and other minerals. Geologic storage, however, to be practical and effective requires cooperative use of surface and subsurface property interests and the collaboration of property owners. Obtaining consent from all owners may not be feasible, requiring procedures that promote, in a manner fair to all interests, cooperative management, thereby ensuring the maximum use of natural resources.

Source: N.D. Century Code.

- It is in the public interest to promote.
- Benefits the state.
- Prevents waste, maximizes ultimate recovery of oil and gas, protects correlative rights.
- CO₂ is valuable commodity.

CONTROL OF GAS AND OIL RESOURCES CHAPTER 38-08

38-08-01. DECLARATION OF POLICY. It is hereby declared to be in the public interest to foster, to encourage, and to promote the development, production, and utilization of natural resources of oil and gas in the state in such a manner as will prevent waste; to authorize and to provide for the operation and development of oil and gas properties in such a manner that a greater ultimate recovery of oil and gas be had and that the correlative rights of all owners be fully protected; and to encourage and to authorize cycling, recycling, pressure maintenance, and secondary recovery operations in order that the greatest possible economic recovery of oil and gas be obtained within the state to the end that the landowners, the royalty owners, the producers, and the general public realize and enjoy the greatest possible good from these vital natural resources.

Source: N.D. Century Code.



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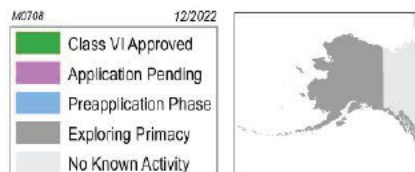
GEOLOGIC STORAGE OF CARBON DIOXIDE

- It is in the public interest to promote geologic storage of CO₂ in order to reduce anthropogenic emissions.
- CO₂ is a valuable commodity.
- The state's pore space should be regulated and managed as a resource under the resource management philosophy as opposed to a waste disposal regulatory framework.

Resource Management Framework	Waste Disposal Framework
<p>A resource management framework allows for the regulatory complexities that accompany CO₂ storage to be integrated into a unified regulatory framework and proposes a “public and private sector partnership.”</p> <ol style="list-style-type: none"> 1) Environmental protection 2) Ownership and management of pore space 3) Maximized storage capacity 4) Long-term liability 	<ul style="list-style-type: none"> • Sidesteps the public's role in both the creation of CO₂ and the mitigation of its release into the atmosphere. • Places the burden solely on industry to rid itself of “waste” from which the public must be “protected.” • Lacking citizen buy-in with respect to responsibility for the problem as well as the solution will have a negative impact on CO₂ storage as a viable methodology for reducing anthropogenic CO₂ emissions.

UIC Program Standards:

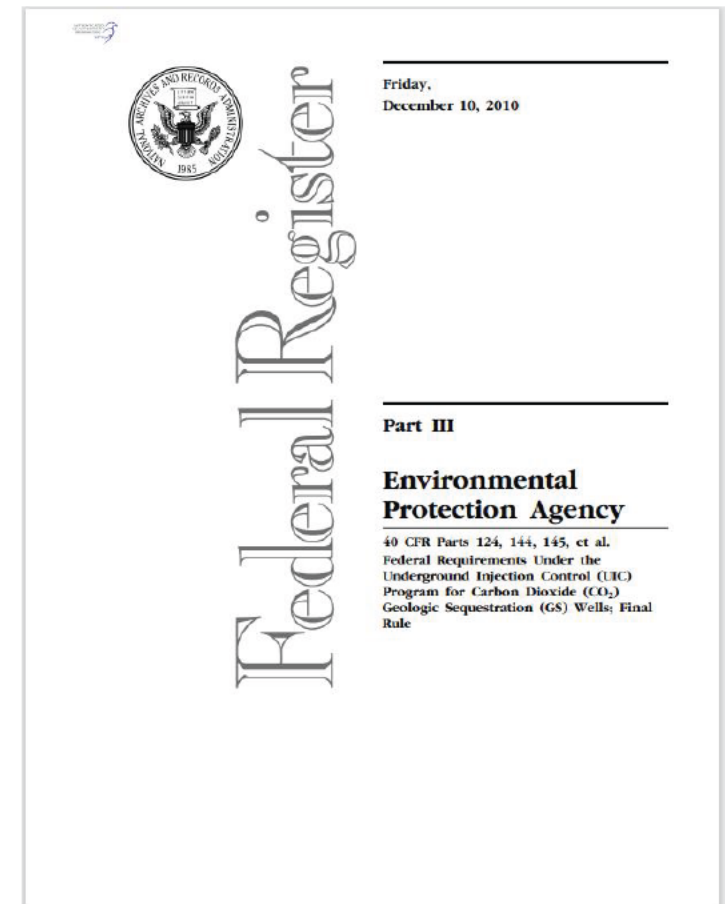
- ## Class VI Primacy in the United States



GEOLOGIC STORAGE PERMITS IN NORTH DAKOTA

EPA believes that States are in the best position to implement UIC–GS programs, and by allowing for independent Class VI primacy, EPA encourages States to take responsibility for implementation of Class VI regulations. The Agency’s UIC program believes that this may, in turn, help provide for a more comprehensive approach to managing GS projects by promoting the integration of GS activities under SDWA into a broader framework for States managing issues related to CCS that may lie outside the scope of the UIC program or other EPA programs. This would harness the unique efficiencies States can offer to promote adoption of GS technology that incorporates issues in the broader scope of CCS, while ensuring that USDWs are protected through the UIC regulatory framework. Allowing States to apply only for Class VI primacy will also shorten the primacy approval process. EPA’s willingness to accept independent primacy applications for Class VI wells applies only to Class VI well primacy and does not apply to any other well class under SDWA section 1422 (i.e., I, III, IV, and V).

<https://www.govinfo.gov/content/pkg/FR-2010-12-10/pdf/2010-29954.pdf>
(page 77242)



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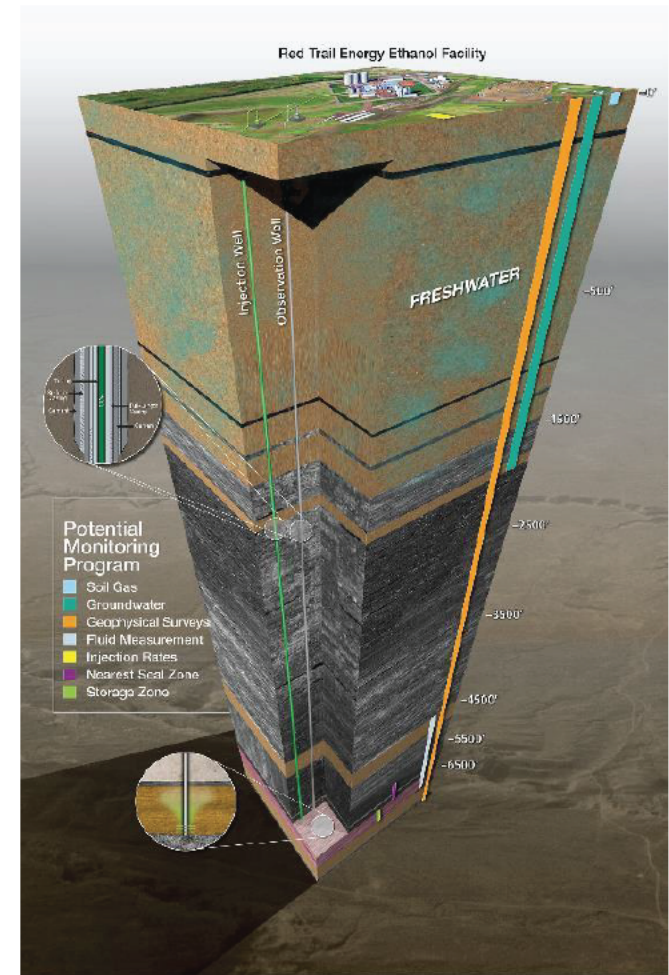
A close-up photograph showing a person's hands holding a large, rectangular, reddish-brown block of material, possibly a core sample or a piece of rock. The block has a rough, textured surface with some visible pores or small holes. The person is holding the block over a clear plastic container, which is partially visible at the bottom of the frame. The background is blurred, showing some indistinct shapes and colors.

**PERMITTING
GEOLOGIC
STORAGE OF
CARBON DIOXIDE**

STORAGE FACILITY PERMIT

North Dakota CO₂ Storage Facility Permit (Class VI) Checklist

- ☐ Pore Space Access
- ☐ Geologic Exhibits
- ☐ Geologic Model and Simulations
- ☐ Area of Review (AOR)
 - Supporting Plans
 - ☐ Testing and Monitoring Plan
 - ☐ Postinjection Site and Facility Closure Plan
 - ☐ Emergency and Remedial Response Plan
 - ☐ Worker Safety Plan
 - ☐ Well Casing and Cementing Program
 - ☐ Plugging Plan
 - ☐ Financial Assurance Demonstration Plan
- ☐ Injection Well and Storage Reservoir Information

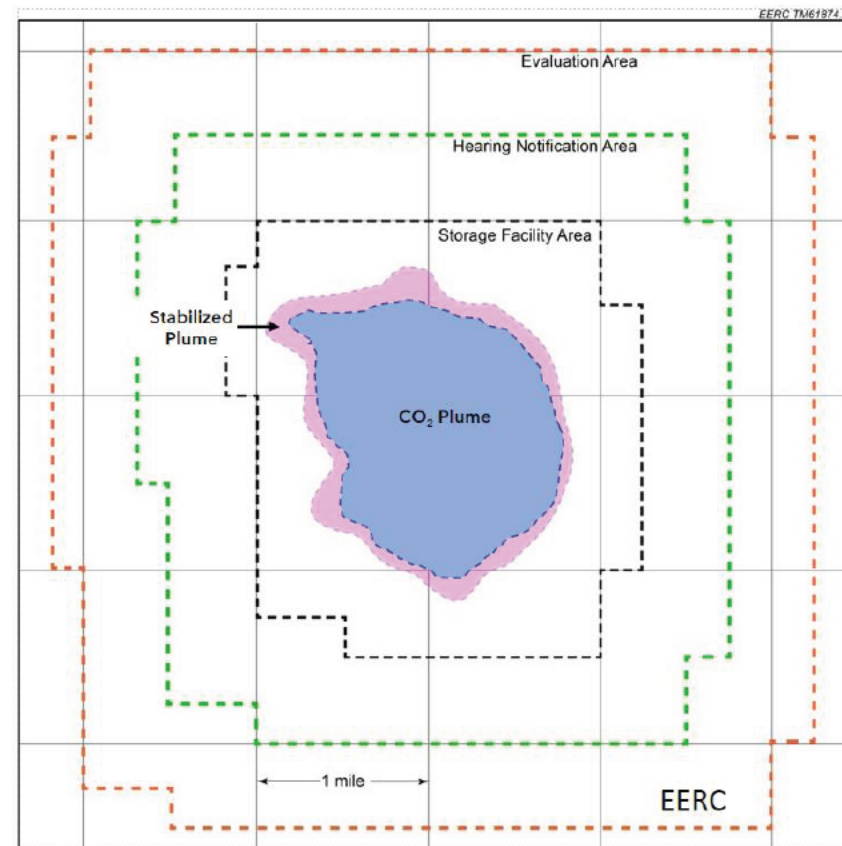


CCRG 16.07107.01

STORAGE FACILITY PROJECT BOUNDARIES

North Dakota UIC Class VI

- **CO₂ Plume** – Simulated boundary at end of injection.
- **Stabilized Plume** – Simulated boundary at postinjection stabilization.
- **Storage Facility Area** – Boundary + Buffer
[pore space lease and amalgamation area]
- **Hearing Notification Area** – ½ mile from the storage facility area boundary (mineral estate and surface estate).
- **Area of Review (AOR)** – Not shown; calculated with simulation.
- **Evaluation Area** – 1 mile from the storage facility area boundary (default minimum AOR).



GEOLOGIC STORAGE PERMITS IN NORTH DAKOTA

Red Trail Richardton Ethanol Broom Creek Storage Facility No. 1 –
Approved October 19, 2021



Minnkota Center MRYS Broom Creek Storage Facility No. 1
Minnkota Center MRYS Deadwood Storage Facility No. 1
Approved January 21, 2022

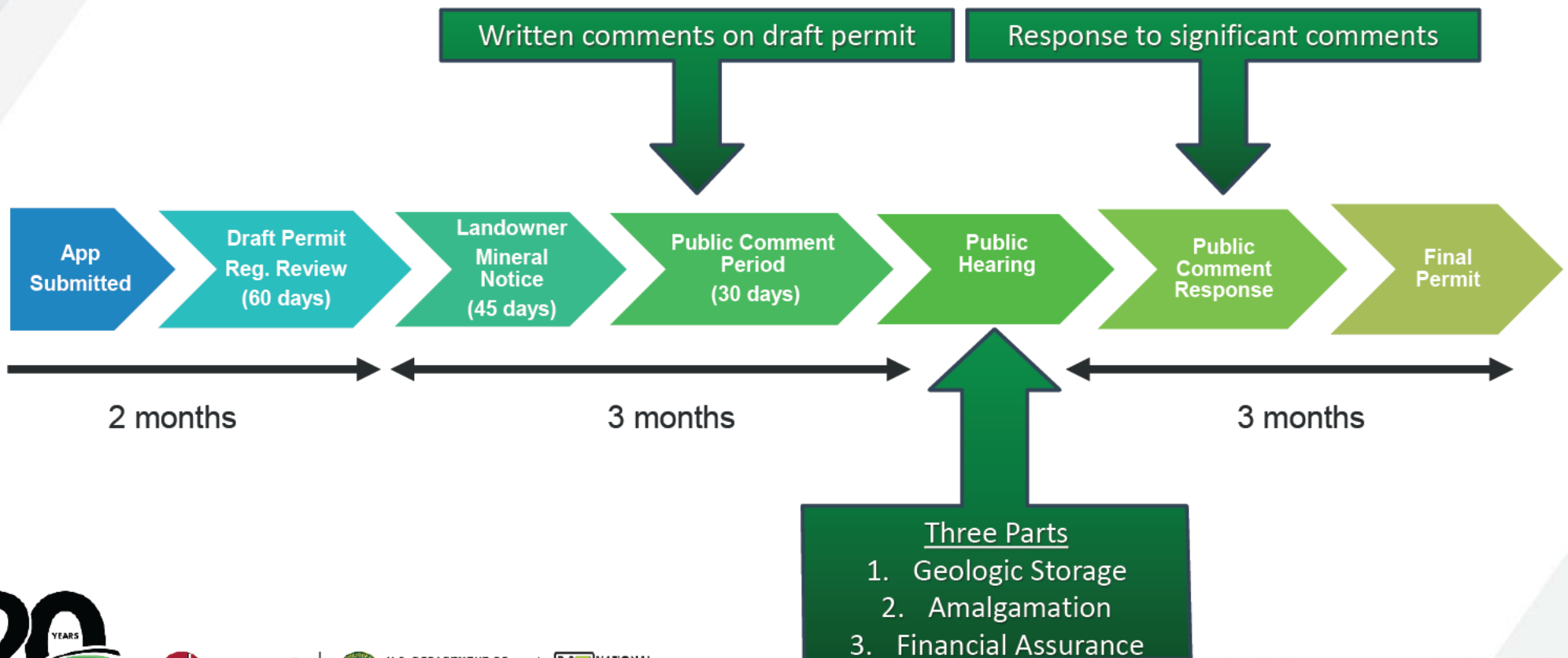


8-month Review and Approval Process

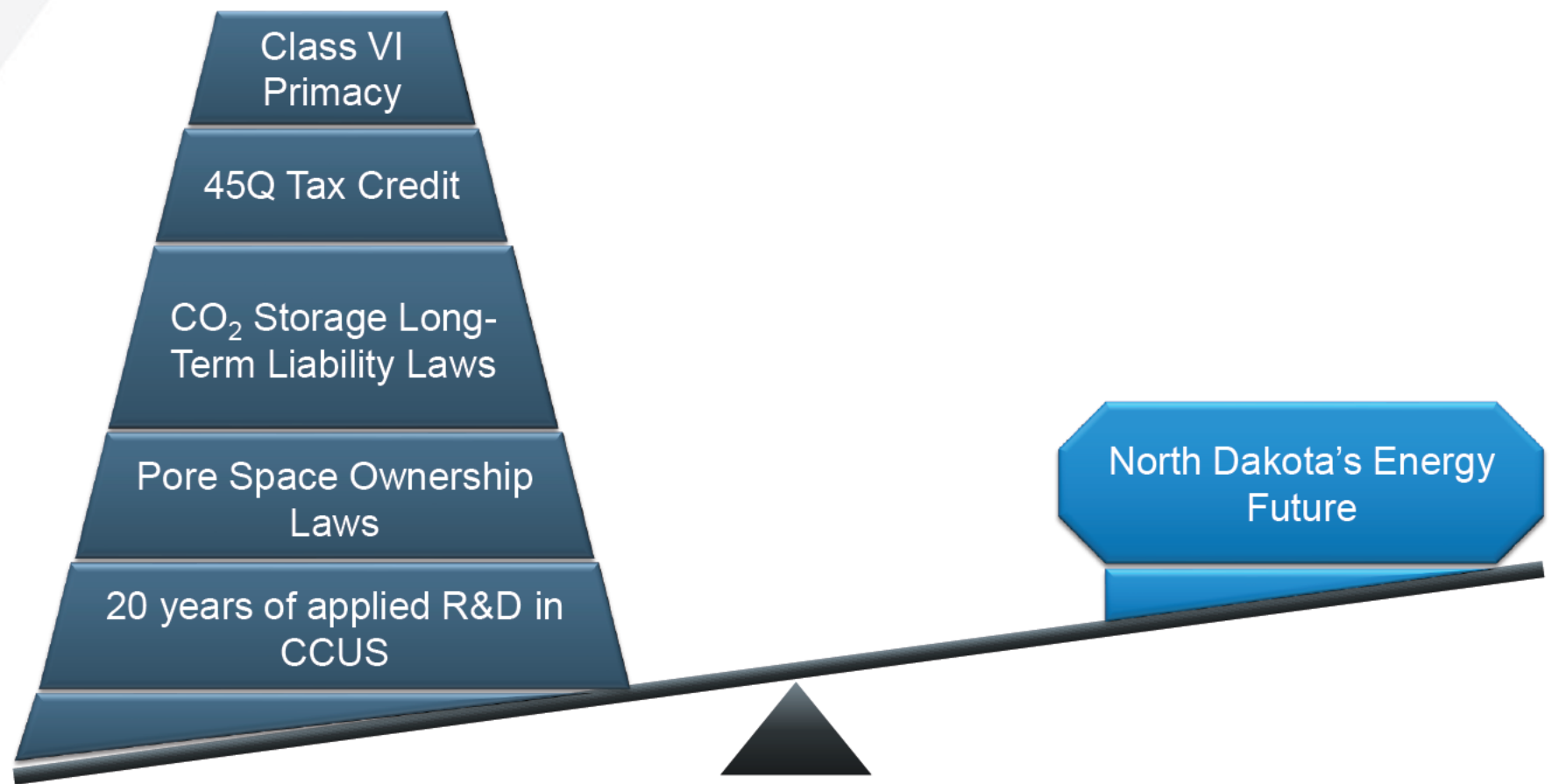


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STORAGE FACILITY PERMIT TIMELINE



NORTH DAKOTA'S LEVERAGE



INCENTIVES

45Q Tax Credits

- Projects beginning construction before January 1, 2033, can claim credits for 12 years after operations begin.
- Provides for direct payment for 45Q credits.
- Tax credit for CO₂ stored in a qualified EOR project: \$60/tonne.
 - Tax credit from direct air capture (DAC): \$130/tonne.
- Tax credit for CO₂ stored in a saline formation: \$85/tonne.
 - Tax credit from DAC: \$180/tonne.

West Coast LCFS Markets

- Credits trading up to \$80–\$220 per ton (June 2021–2022).
- Stacked with 45Q.

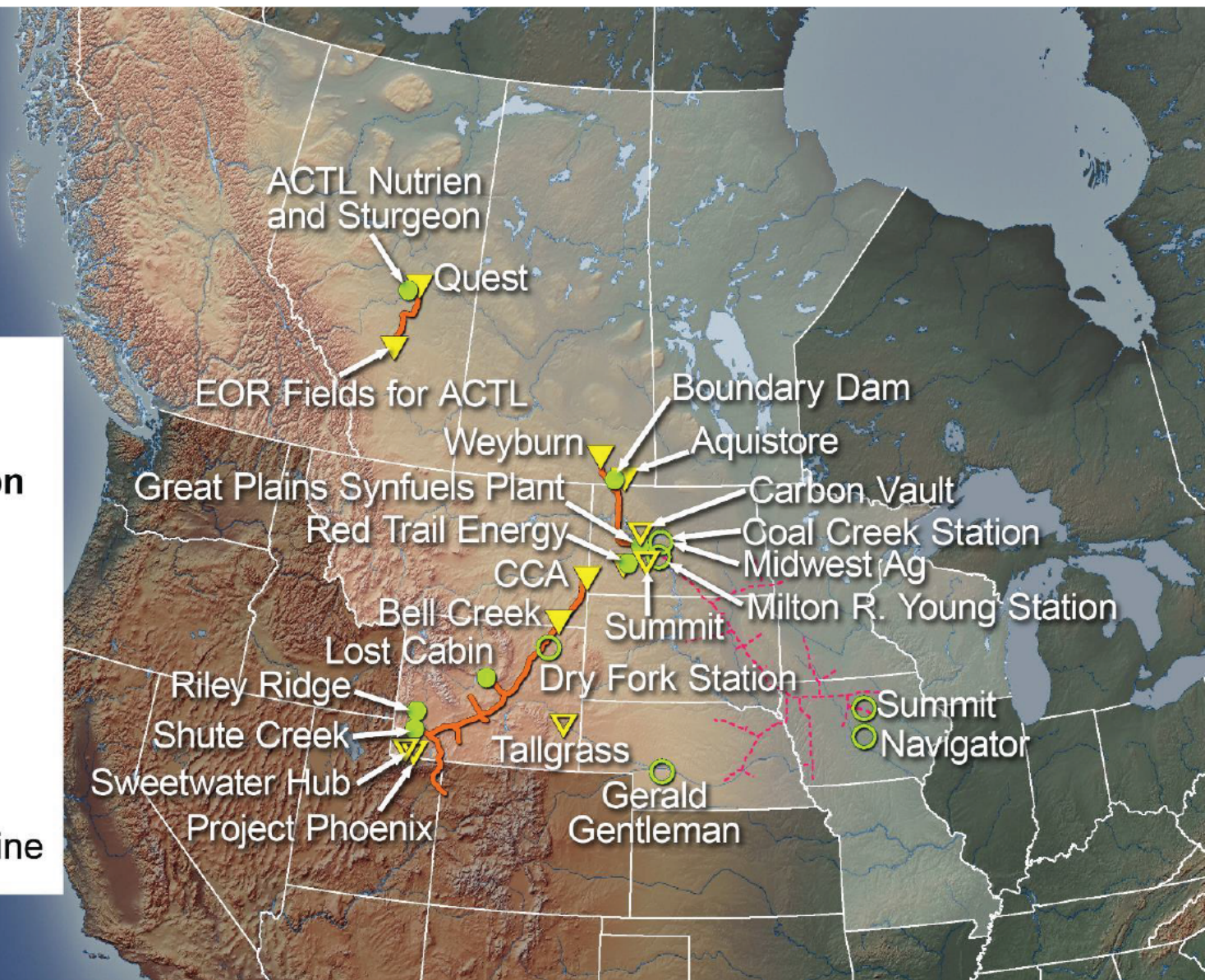
North Dakota Incentives

- No sales tax on capture-related infrastructure.
- No sales tax on CO₂ sold for EOR.
- No sales tax on construction of pipeline.
- Property tax-exempt for 10 years (equipment).
- Coal conversion tax: tax reduction with CO₂ capture (up to 50%).
- No sales tax on CO₂ EOR infrastructure.
- 0% extraction tax for 20 years for CO₂ EOR.

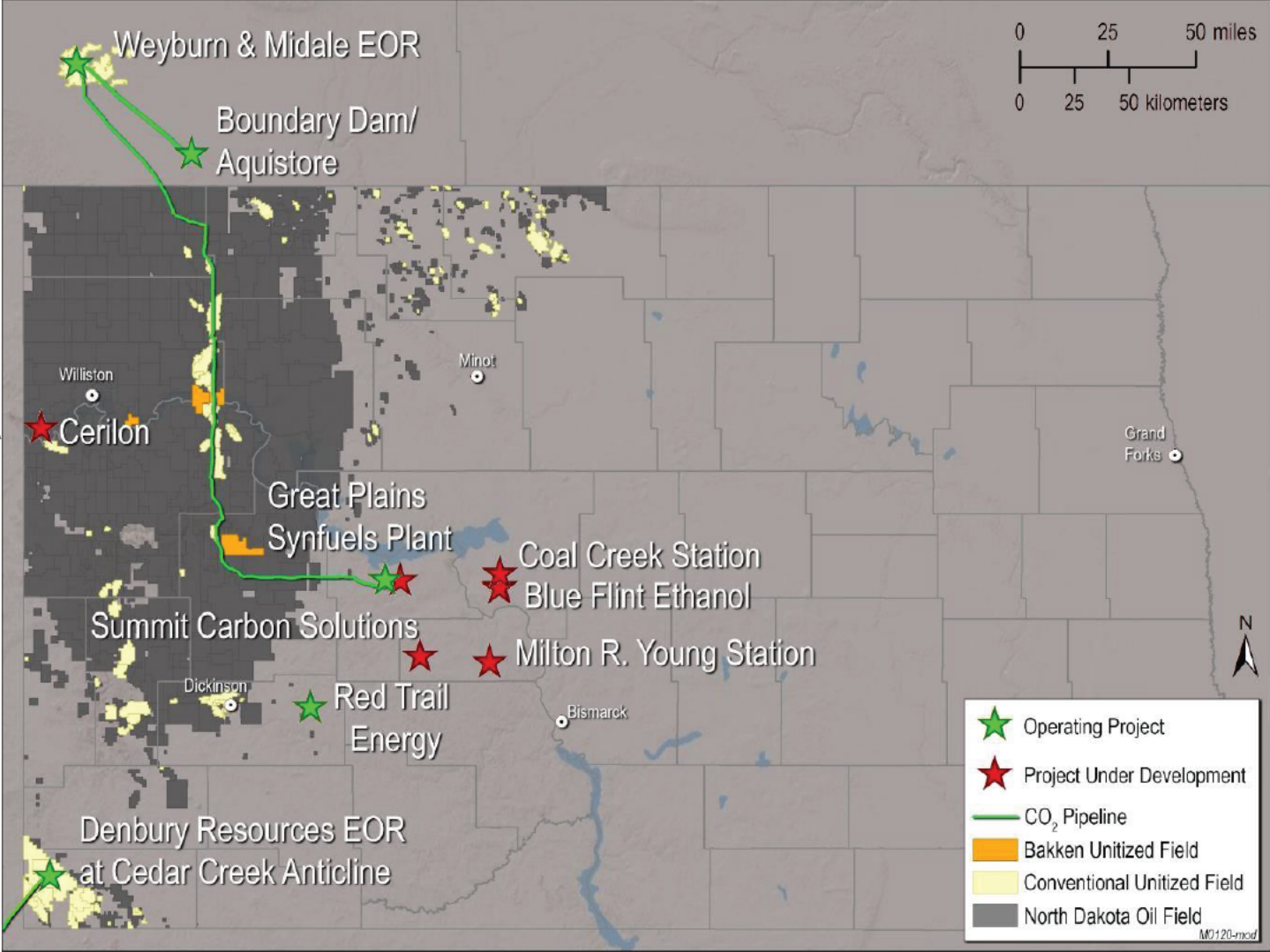


Active and Developing CCUS Projects in the PCOR Partnership Region

- Active Capture
- ▼ Active Injection
- Developing Capture
- ▼ Developing Injection
- CO₂ Pipeline
- - - Proposed CO₂ Pipeline



NORTH DAKOTA CCS/CCUS ACTIVITY



SUMMARY

- It starts with states taking the lead in regulating all aspects of carbon dioxide storage.
 - Overlays such as forced pooling, release of long-term regulatory responsibility, and title transfer incentivizes and enables storage projects.
- Oil and gas mineral resource policy is the most logical approach for CCS (i.e., resource management regulatory philosophy).
- Geologic CO₂ storage (i.e., dedicated storage) and CO₂ EOR (associated storage) can follow a very similar permitting process in primacy states.



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A wide-angle photograph of a campus scene. In the foreground, there are trees with yellow autumn leaves. In the background, there are several buildings, including a large brick building and a modern glass building. The sky is clear and blue.

THANK YOU

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ACKNOWLEDGMENT

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