Energy & Environmental Research Center (EERC)

Plains CO_2 Reduction (PCOR) Partnership – Major Projects and Class VI Primacy

CCUS in Kansas
Lawrence, Kansas
October 15, 2019

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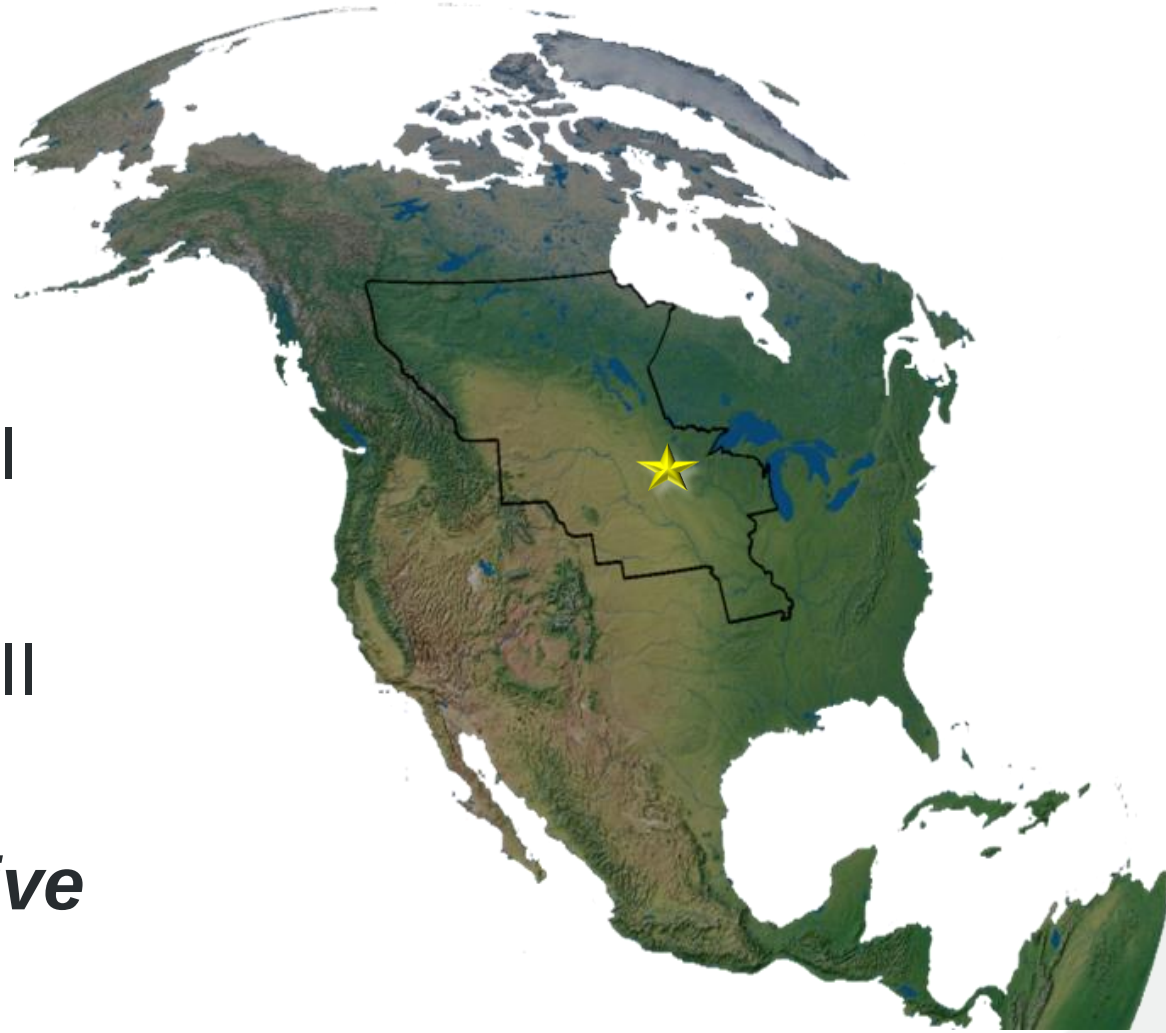
PCOR PARTNERSHIP TIME LINE

2003–2005: PCOR Partnership Phase I

2005–2008: PCOR Partnership Phase II

2007–2019: PCOR Partnership Phase III

2019–2024: PCOR Partnership Initiative



PCOR PARTNERSHIP PHASES I–III

Five key messages relate to:

1. Our engaged membership.
2. Outstanding regional CCUS potential.
3. CCUS works! We have demonstrated:
   a) Low risks of storage.
   b) Successful MVA.
4. Economic and environmental benefits.
5. Active public engagement and outreach.

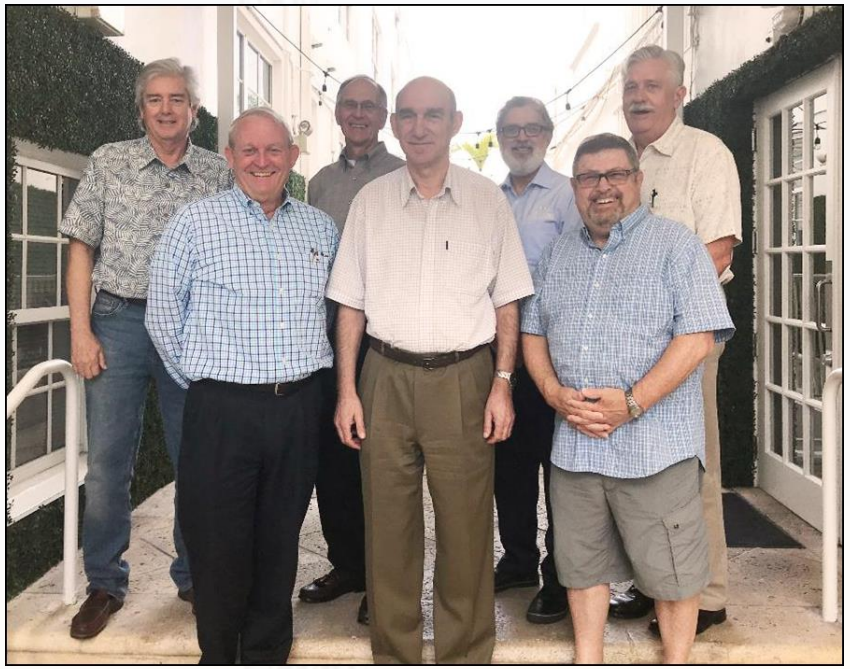


Image credit – EERC

ENGAGED PARTNERS

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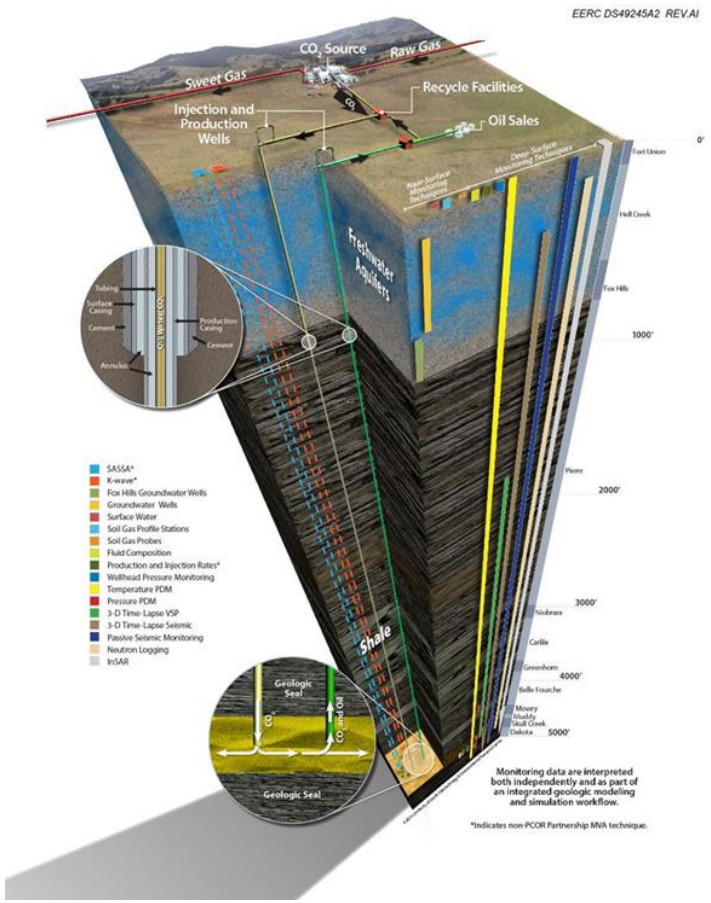
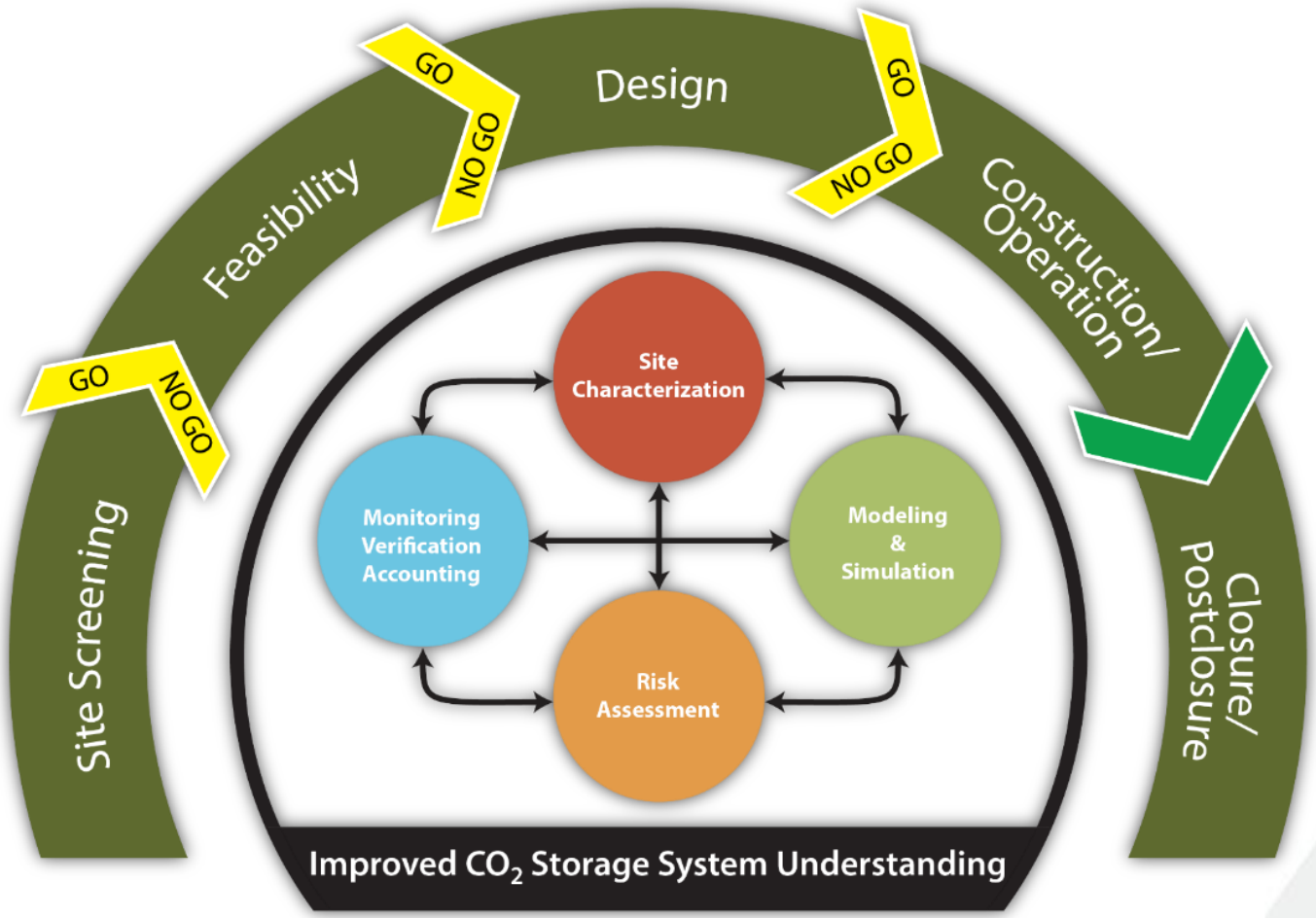
REGIONAL POTENTIAL FOR CCUS DEPLOYMENT

The PCOR Partnership region provides an ideal opportunity to deploy CCUS:

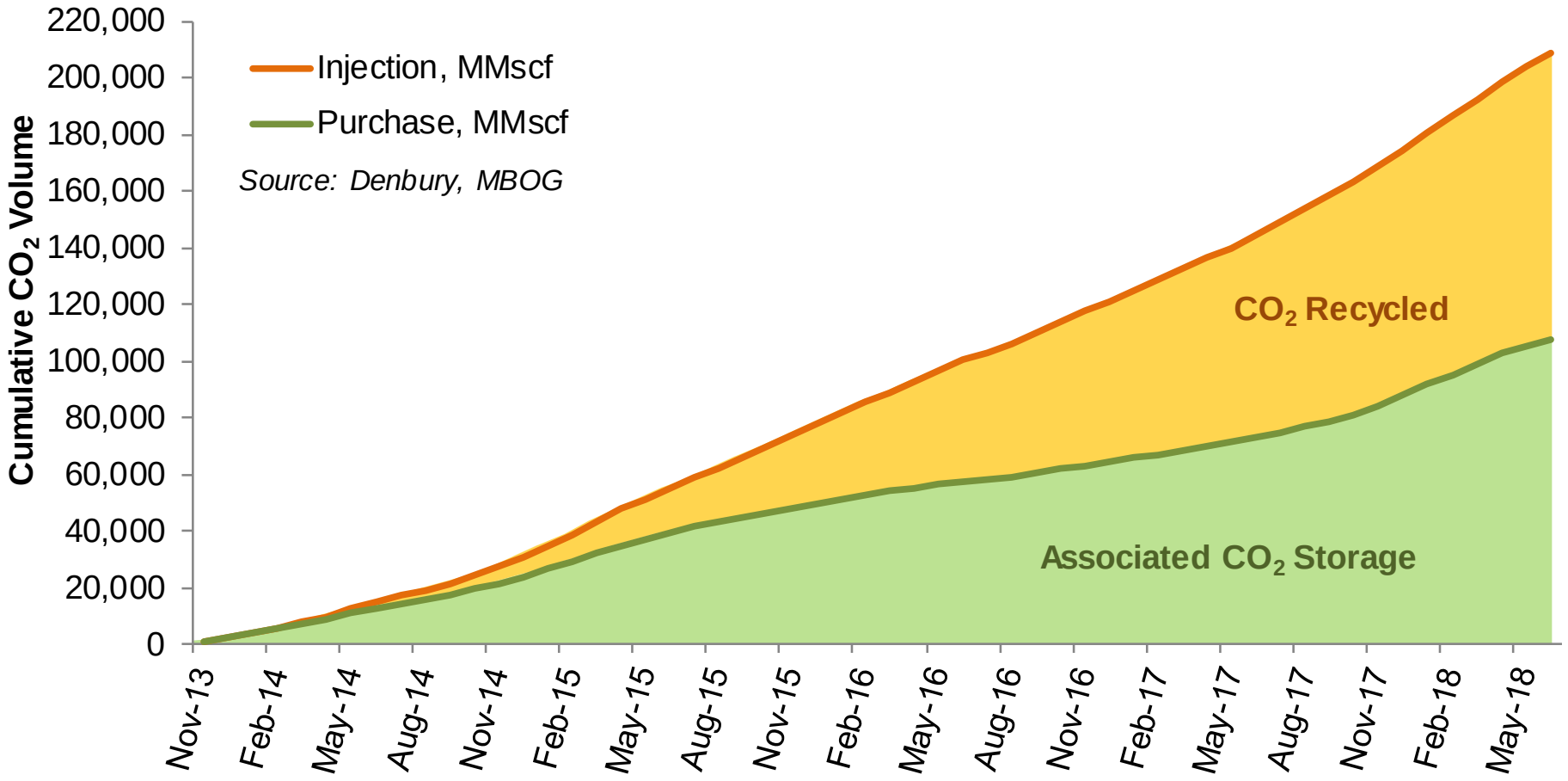
- **Suitable geology**
- **Fossil fuel resources**
- **An industrial and energy development base**

CCUS WORKS: ADAPTIVE MANAGEMENT APPROACH

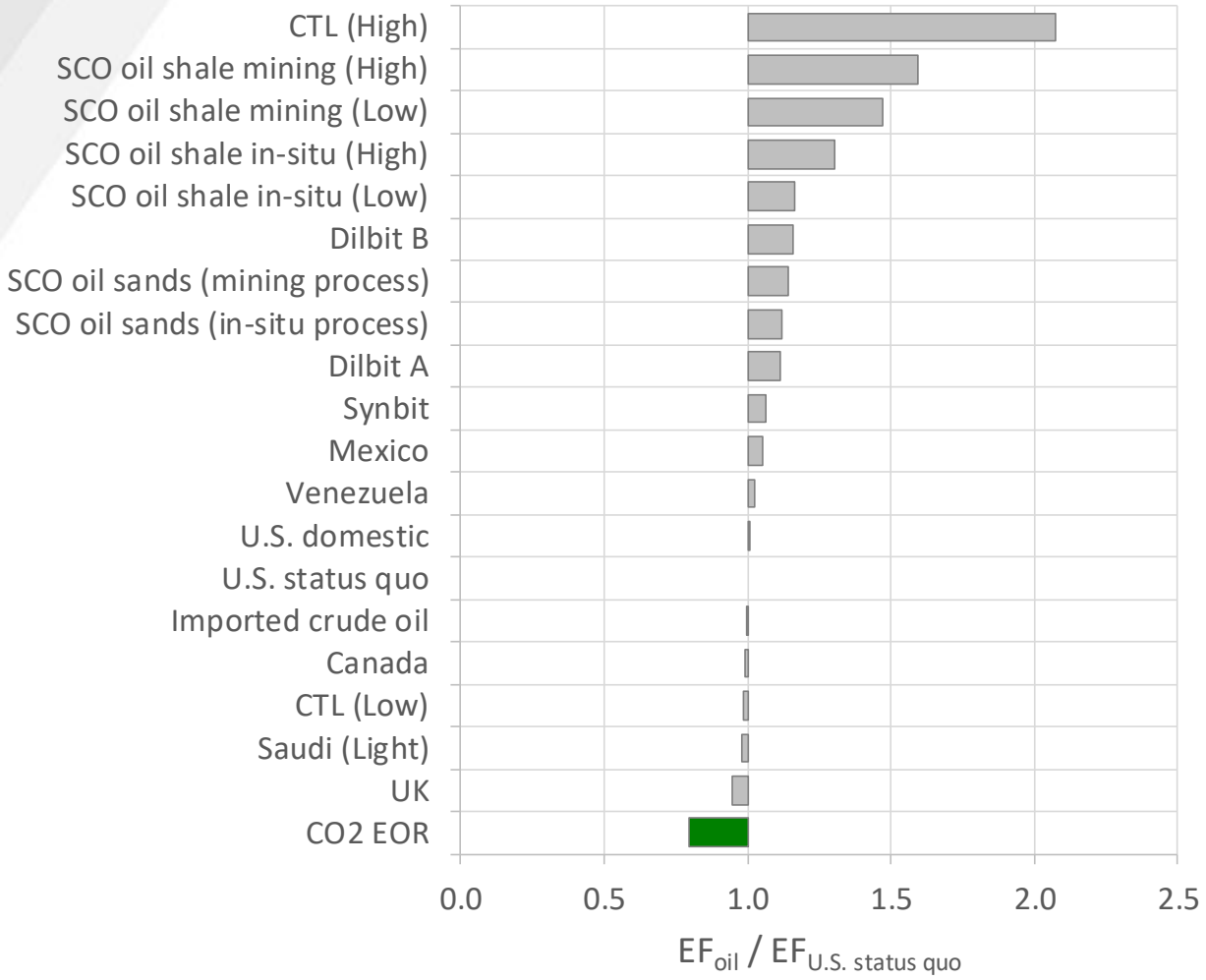




RELATIONSHIP OF EOR AND ASSOCIATED STORAGE



COMPARISON TO OTHER SOURCES OF CRUDE OIL



- Example of <u>associated</u> CO_2 storage.
- CO_2 captured from a lignite coal-fired power plant.
- Displace electricity from the MRO NERC region (Midwest Reliability Organization, North American Electric Reliability Corporation).
- **Oil via CO_2 EOR ~20% lower emission factor (EF).**
- Spreadsheet model available on PCOR Partnership website.

Adapted from:

Mangmeechai, A., 2009. *Life Cycle Greenhouse Gas Emissions, Consumptive Water Use and Levelized Costs of Unconventional Oil in North America*. Dissertation. Carnegie Mellon University, Pittsburgh, PA.

Azzolina, N.A.; Peck, W.D.; Hamling, J.A.; Gorecki, C.D.; Ayash, S.C.; Doll, T.E.; Nakles, D.V.; and Melzer, L.S. 2016. How green is my oil? A detailed look at greenhouse gas accounting for CO_2-enhanced oil recovery (CO_2-EOR) sites. *International Journal of Greenhouse Gas Control*, 51:369–379.

PCOR INITIATIVE AWARD, 2019–2024

Goal:

Identify and address regional storage and transport challenges facing commercial CCUS deployment

Vision:

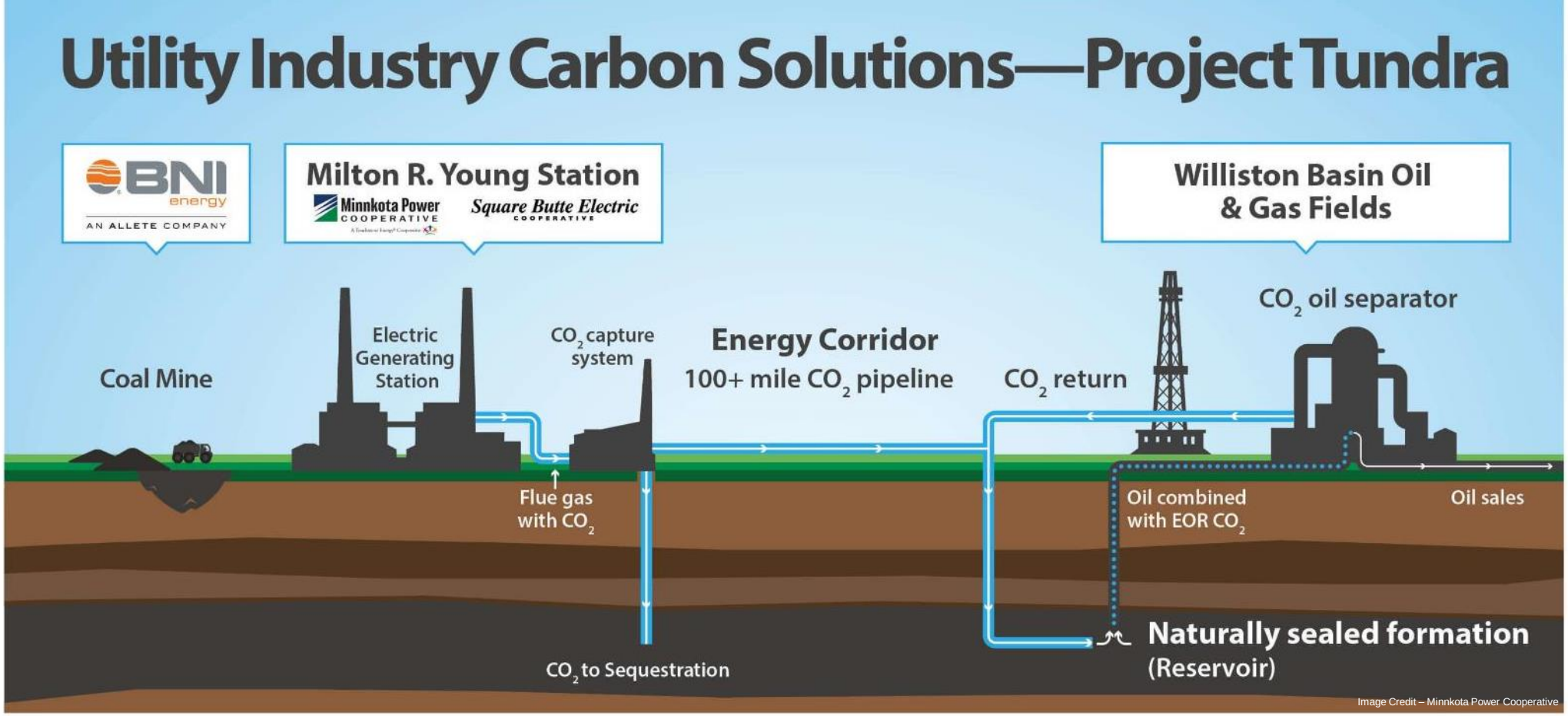
Provide the premier regional forum to promote CCUS infrastructure and accelerate CCUS deployment


Weyburn
Boundary Dam/ Aquistore
Williston Basin CO_2 Field Laboratory
DGC
BEST
GPSP
Red Trail Energy
Project Tundra
Bell Creek
Greencore
CarbonSAFE Wyoming
Lost Cabin
Salt Creek
Shute Creek
Anadarko
Fort Nelson
Zama
Quest
CCUS Project
Legacy CCUS Project
CO_2 Pipeline
Planned Pipeline
Planned Focus Area
Proposed PCOR Region

CCUS PORTFOLIO AT THE EERC

Project	Focus					
	Capture	Transport	CO_2 Storage		Techno-Economic	Regulatory
			Dedicated	Associated		
PCOR Partnership, *PCOR Initiative*						
CarbonSAFE North Dakota Phase II						
CarbonSAFE Wyoming Phase I/II						
CarbonSAFE Nebraska Phase I						
Red Trail Energy						
Williston Basin Field Lab						
ND Techno-Economic						
BEST						
SASSA						
IMS						
Bakken CO_2 Storage and EOR						
Advanced Characterization						
Tight Oil CO_2 Project						
Rich Gas for Conventional EOR						
EOR Controllable Completions						
Project Carbon						
Project Tundra FEED						
Aerosol Mitigation						

Utility Industry Carbon Solutions—Project Tundra



Project Roadmap:	Key Technology Improvements:	Project Feasibility	Initial Design, CO_2 for EOR and Sequestration:	Large Pilot Testing and FEED:	Commercial Application:
Timeline and Cost Estimate:	2015-2016 **$1 million**	2016-2017 **$1 million**	2018-2019 **$30 million**	2020-2021 **$100 million**	2022-2024 **$1.3 billion**

NORTH DAKOTA CARBONSAFE

- Address technical and nontechnical challenges specific to commercial-scale deployment of a CO_2 storage project in central North Dakota.
- Long-term goal: develop a certified (permitted) geologic storage opportunity should a business case for CO_2 storage emerge.

BRINE EXTRACTION AND STORAGE TEST (BEST)

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THANK YOU

Critical Challenges. Practical Solutions.