



U.S. DEPARTMENT OF  
**ENERGY**

Fossil Energy and  
Carbon Management

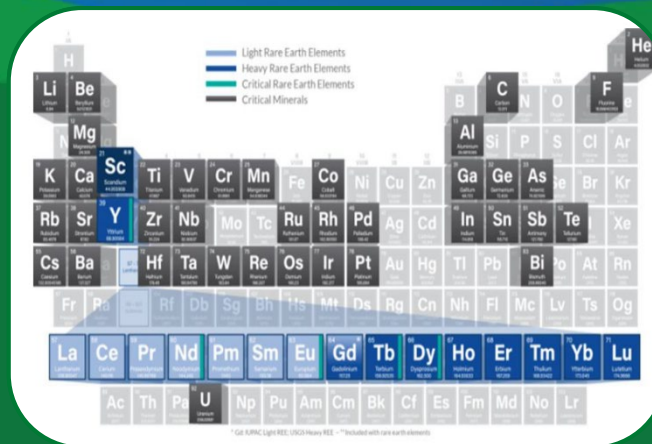
Groundwater Protection Council Annual

# Carbon Storage Facility Facility Enterprise (CarbonSAFE)

U.S. DOE Fossil Energy and Carbon Management

**John Litynski**

Office of Carbon Management, Carbon Transport and Storage



# Fossil Energy and Carbon Management (FECM)

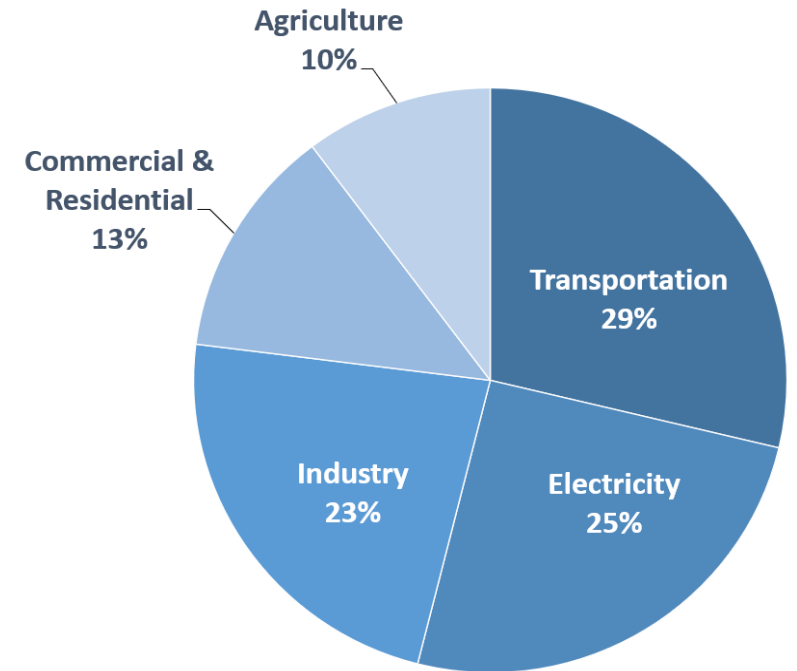
## Office of Fossil Energy and Carbon Management

DOE-FE is now DOE-FECM

New name for our office reflects our new vision

- President Biden's goals:
  - 50% emissions reduction by 2030
  - CO<sub>2</sub> emissions-free power sector by 2035
  - Net zero emissions economy by no later than 2050

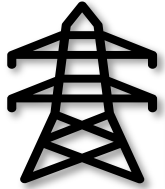
Total U.S. Greenhouse Gas Emissions  
by Economic Sector in 2019



U.S. Environmental Protection Agency (2021). Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2019

# Carbon Transport and Storage – FY23 \$122M

## RD&D: An Iterative Process towards Deployment

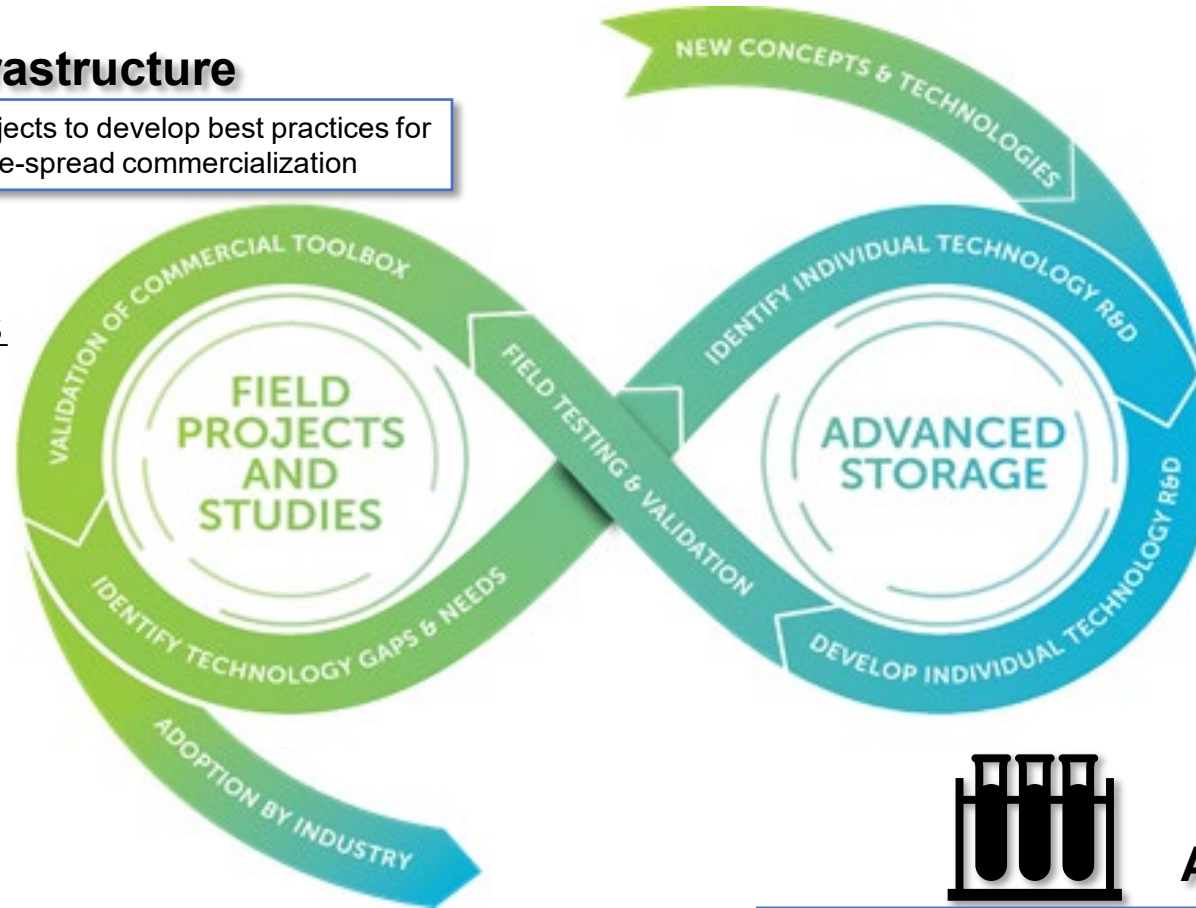


### Storage Infrastructure

Large-scale demonstration projects to develop best practices for industry and facilitate wide-spread commercialization

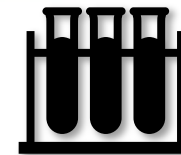
#### Storage Infrastructure Focus

- CarbonSAFE
- Regional Partnerships
- Offshore Storage
- Brine Extraction Strategy Test (BEST)
- Transition of O&G infrastructure



#### Advanced Storage Focus

- Well Integrity and mitigation
- Monitoring, verification, and accounting
- Storage complex efficiency and security
- SMART: Science-Informed Machine Learning for Accelerating Real Time Decisions
- NRAP: National Risk Assessment Partnership



### Advanced Storage

Harness early-stage storage concepts to technology demonstration

# DOE FECM CarbonSAFE Phases and Status

## • Phase III

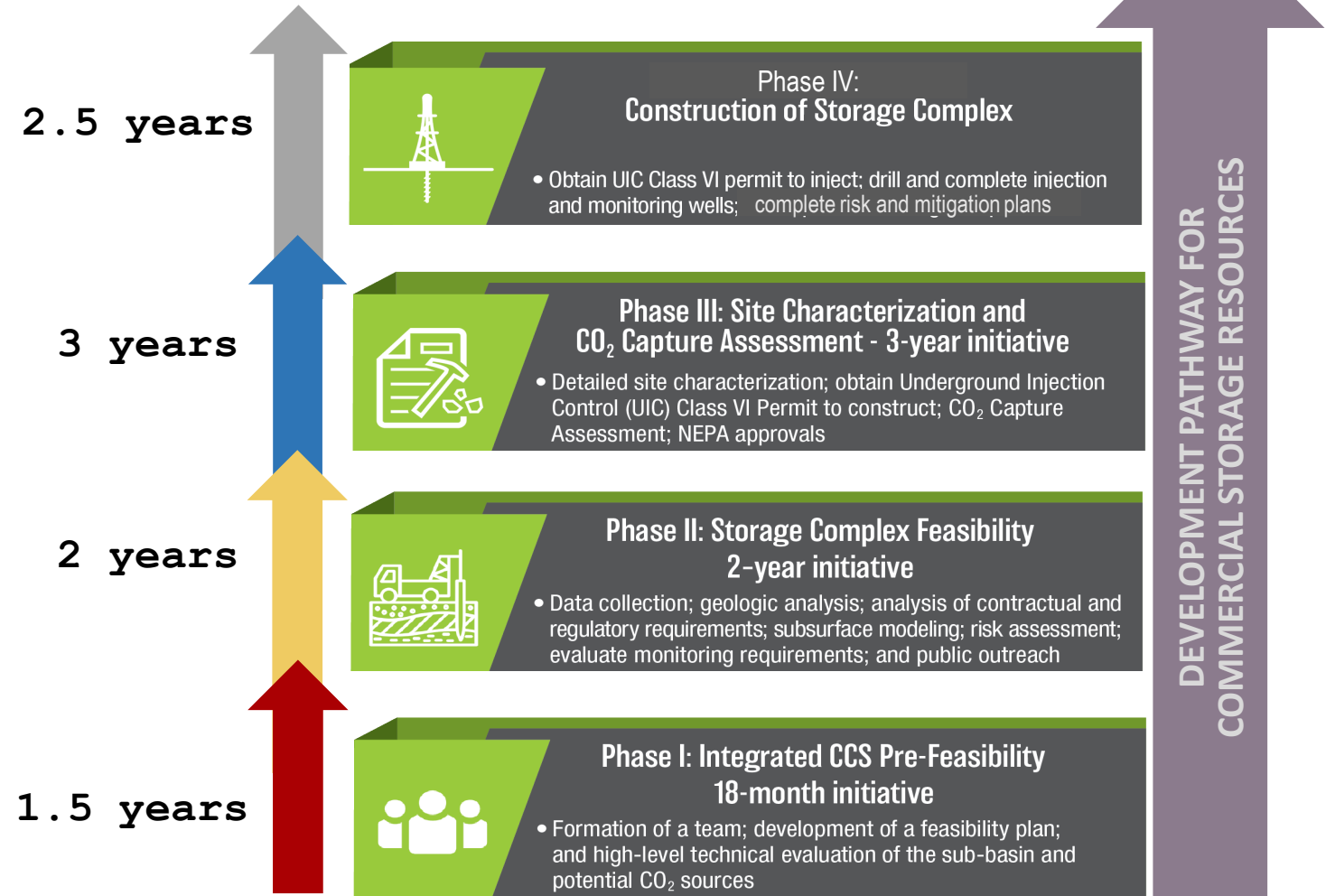
- 5 projects ongoing
- DOE Share ~\$17M per project
- Total DOE Funding ~\$86M
- Total Project Costs ~\$116M
- 10 publications to date

## • Phase II

- 4 projects completed, 2 ongoing
- DOE Share ~\$10M per project
- Total DOE Funding ~\$61M
- Total Project Costs ~\$87M
- 38 publications to date

## • Phase I

- 13 projects completed
- DOE Share ~\$1M per project
- Total DOE Funding ~\$15M
- Total Project Costs ~\$20M
- 78 publications to date



# DOE Carbon Storage Assurance Facility Enterprise (CarbonSAFE)

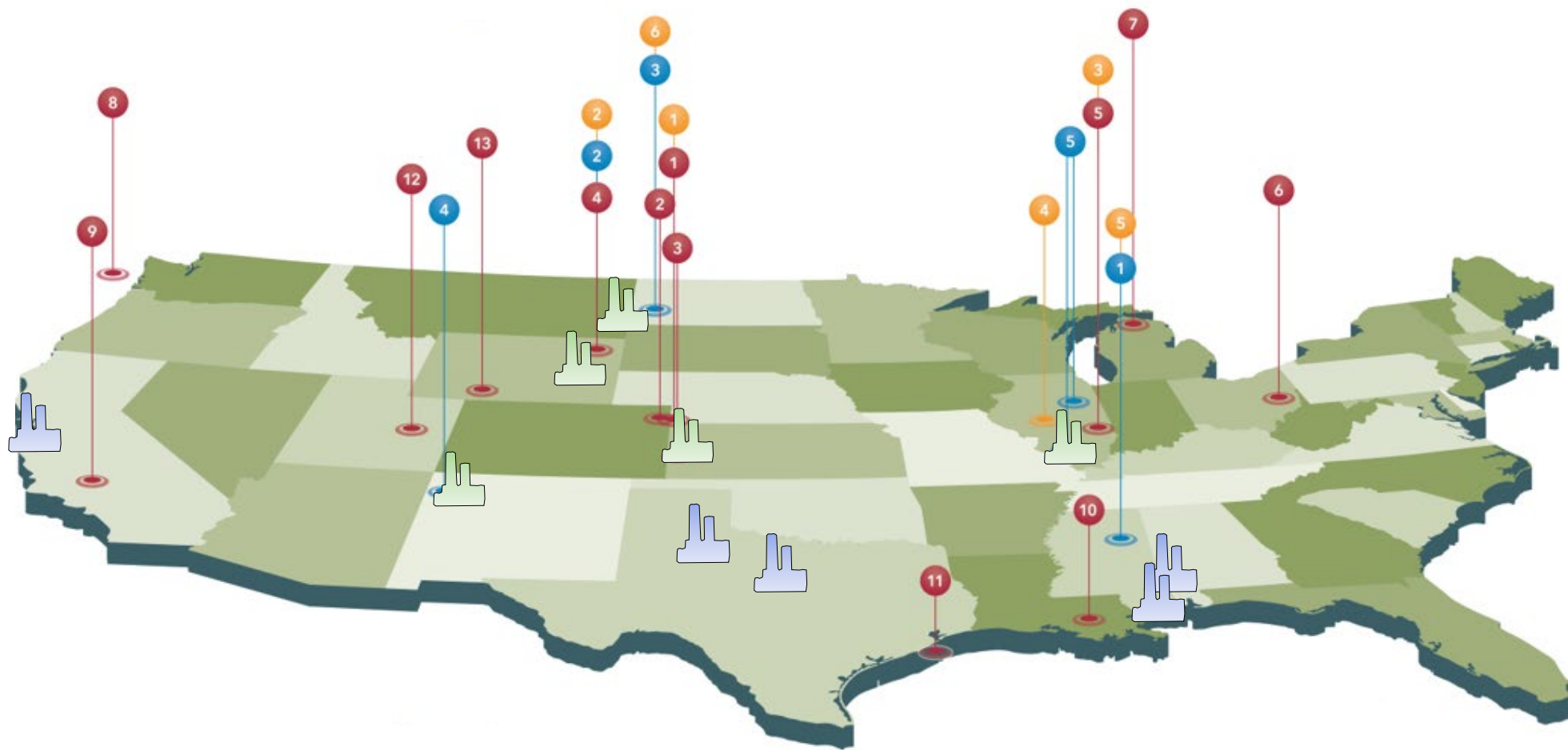
## CarbonSAFE & Capture Funded FEED Studies Locations

Phase I: Integrated CCS Pre-Feasibility: 18 month initiative

Phase II: Storage Complex Feasibility: 18-24 month initiative

Phase III: Site Characterization and CO<sub>2</sub> Capture Assessment: 3 year initiative

Phase IV: Construction of Storage Complex: 2.5 year initiative



FEED Studies  
Coal-based Power Plants

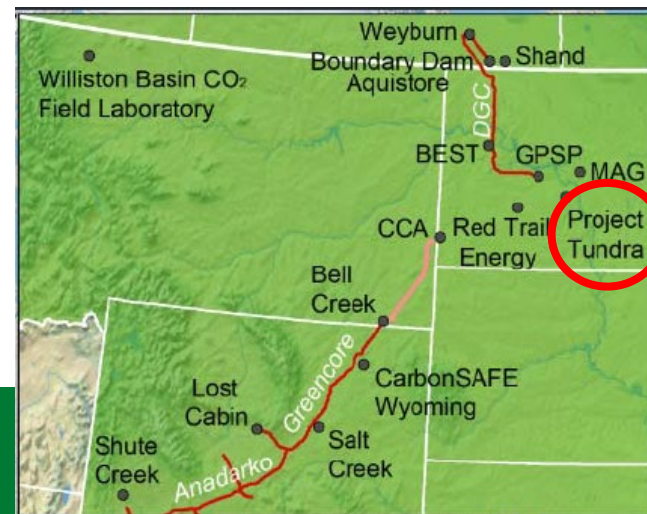
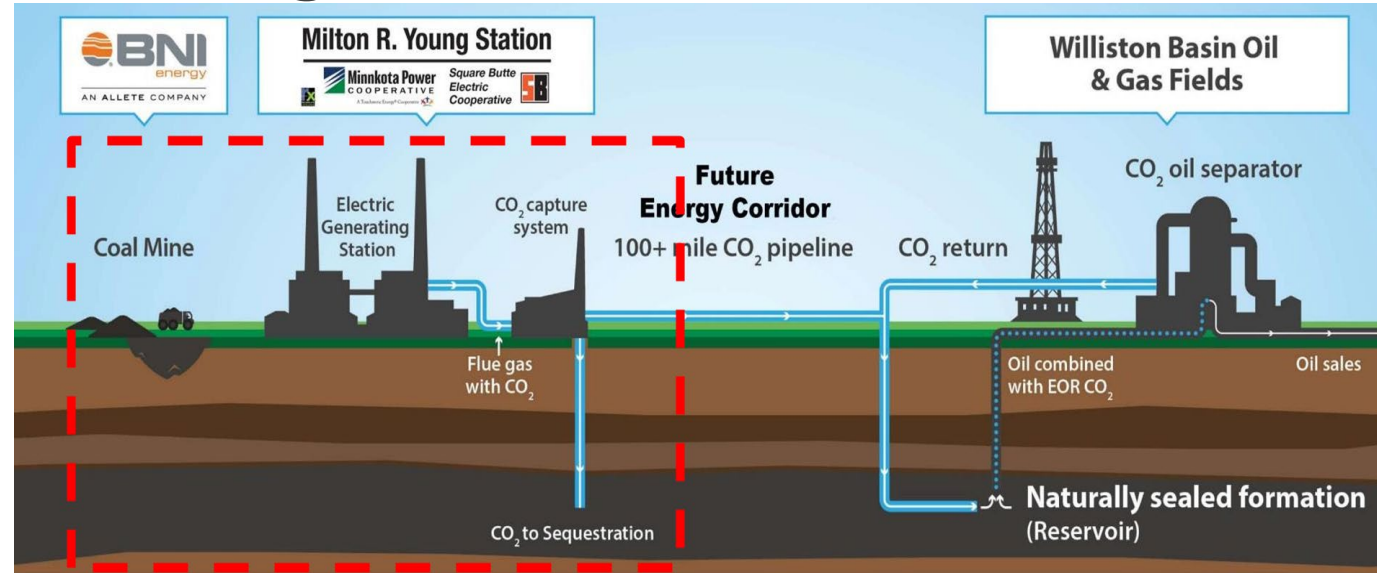


FEED Studies  
NG-based Power Plants

# North Dakota CarbonSAFE Phase II: Site Characterization and Permitting

## Recent Progress

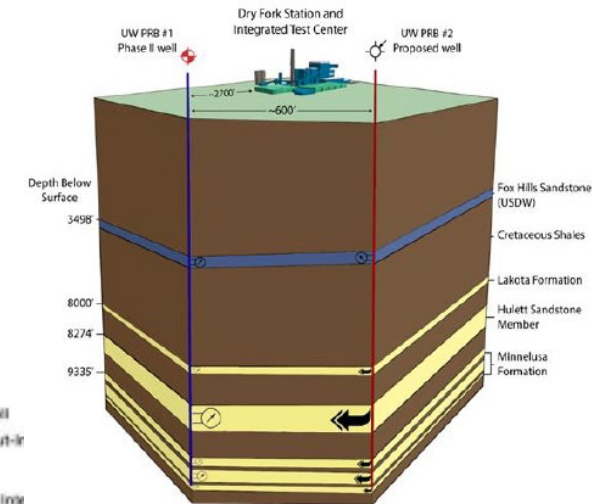
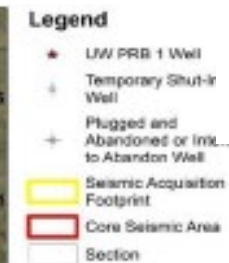
- Class VI permit issuance on 1/21/2022
- Received two CO<sub>2</sub> storage facility permit (permission to construct) approvals
  - Broom Creek Formation
  - Deadwood Formation
- Minnkota expects to begin CO<sub>2</sub> injection in 2025
- Submitted MRV plan to the U.S. EPA



# Wyoming CarbonSAFE: Accelerating CCUS Commercialization and Deployment at Dry Fork Power Station and the Wyoming Test Center

## Recent Progress

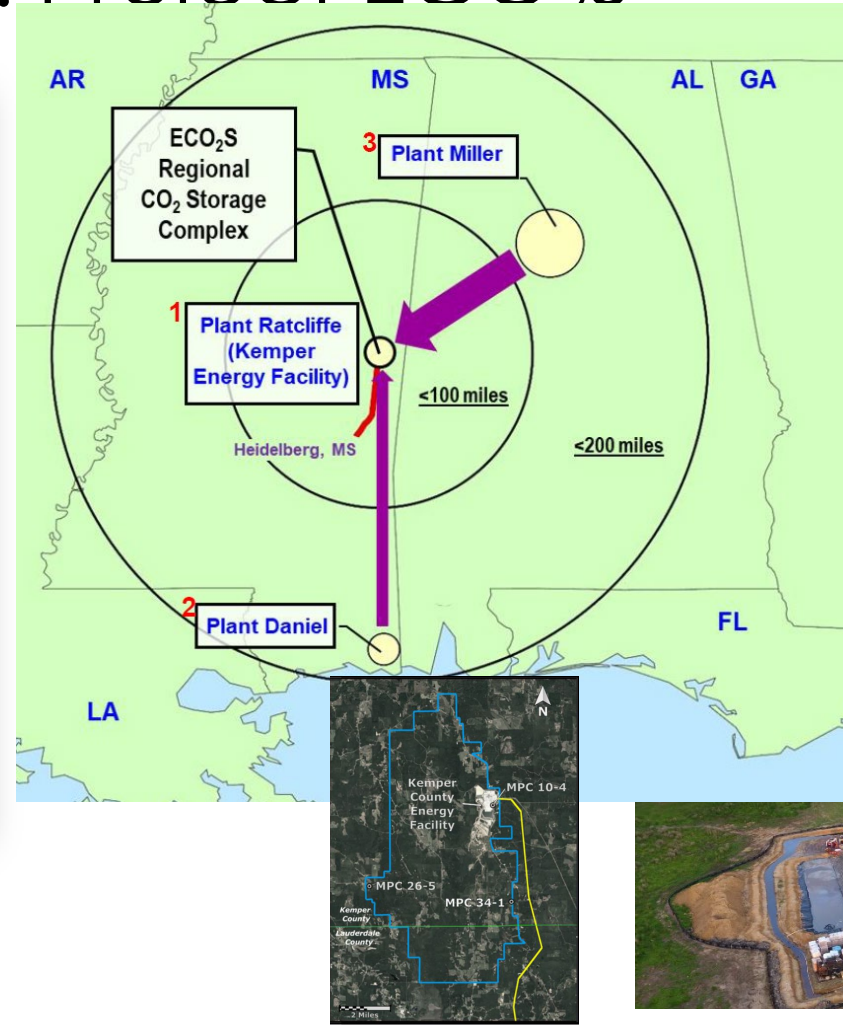
- Two potential injection wells for accessing different CO<sub>2</sub> injection zones in a stacked storage field
- Both wells are permitted as UIC Class I
  - UW-PRB #2 spud in Dec 2021; completed Jan 2022
  - UW-PRB #1 was reentered Jan. 2022; Feb. 2022
- EIV submitted and under review by NETL NEPA
- The team anticipates between 9 and 12 Class VI permit applications will be submitted - stacked storage at three or more sites with multiple injectors per site



*Schematic of the proposed Phase III subsurface field activities.*

# Establishing an Early CO<sub>2</sub> Storage Complex in Kemper County, Mississippi: Project ECO<sub>2</sub>S

- Field work to date.
  - Drill/core three characterization wells
  - Seismic acquisition (2D and 3D)
  - Core sampling and analysis
- Submission of NEPA EIV
- Analyzing data for UIC Class VI permit to construct application.
- FEED Study at Plant Daniel.

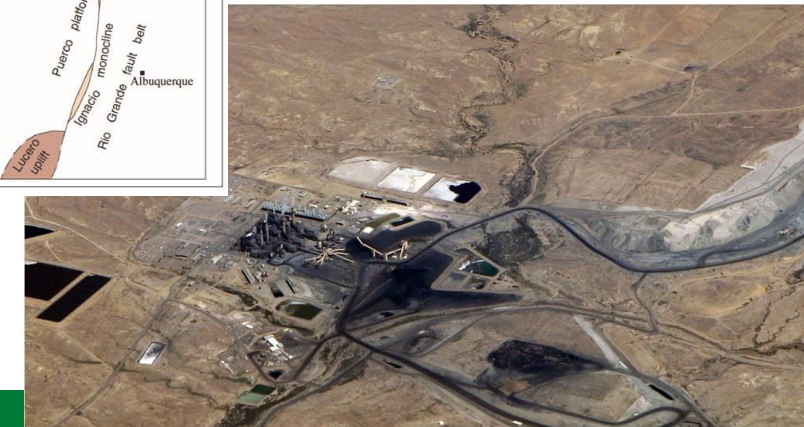
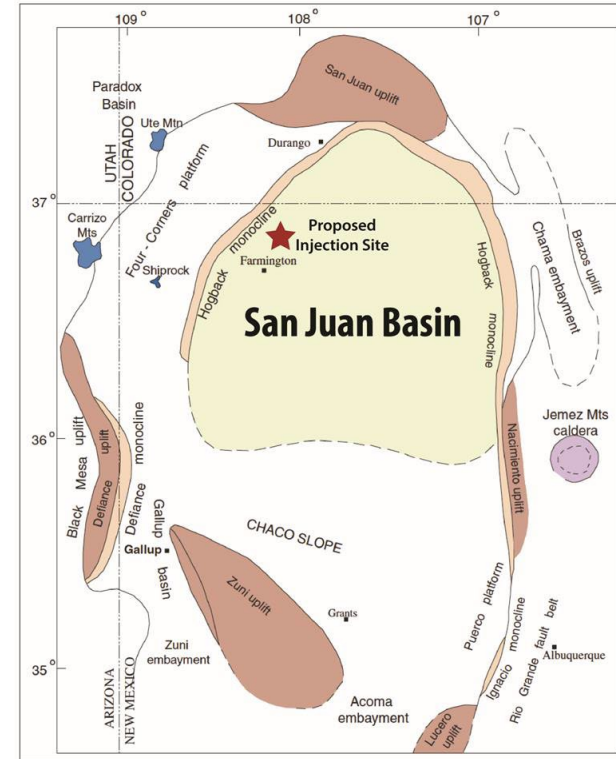




# San Juan Basin CarbonSAFE Phase III: Ensuring Safe Subsurface Storage of Carbon Dioxide in Saline Reservoirs

## Recent Progress

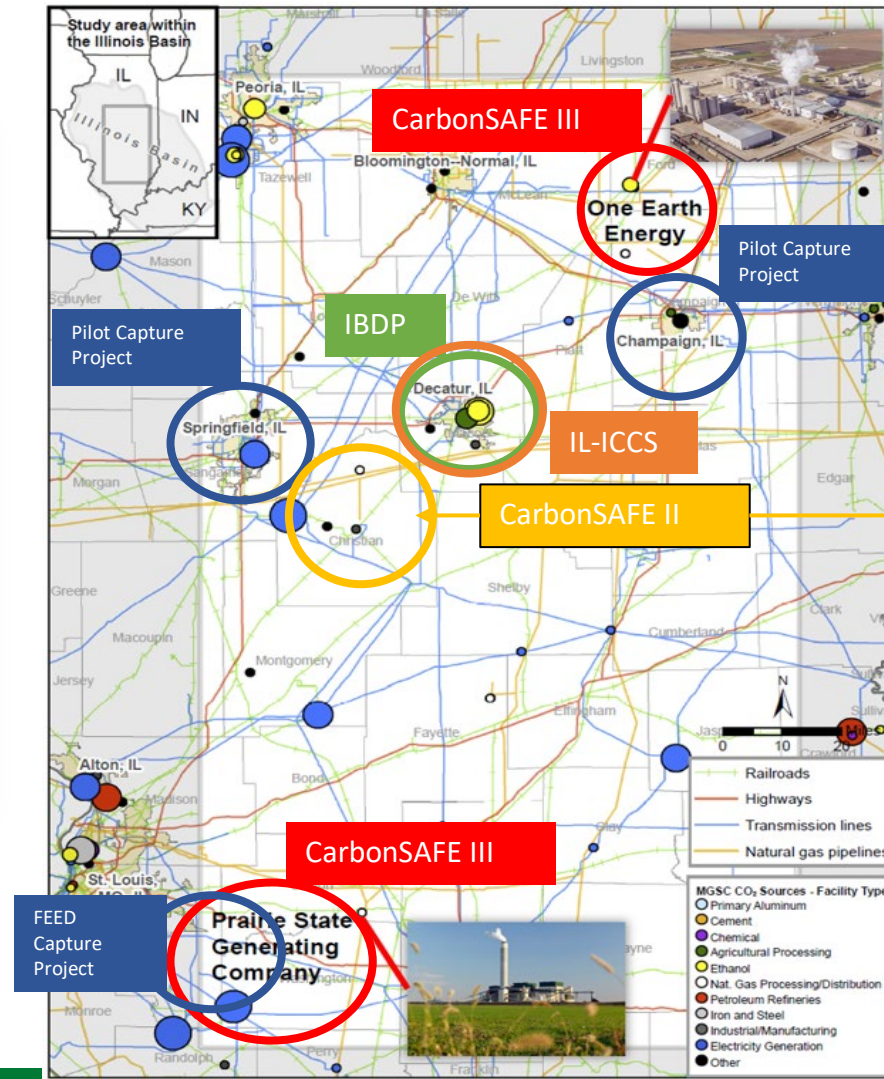
- The website for the project is up and running – [www.sanjuancarbonsafe.org](http://www.sanjuancarbonsafe.org)
- Received a permit to drill the stratigraphic well in February 2022.
- The EIV is undergoing minor revisions before a final submission is made to NEPA.
- Completed petrophysical and geomechanical analysis on key wells
- Developed preliminary models; conducted simulations



# Illinois Storage Corridor

## Recent Progress

- Interpretation of 2D seismic at both sites is in progress.
- Characterized the St. Peter Sandstone (reservoir) and the Maquoketa Shale (seal).
- Drilled stratigraphic test wells at both sites, obtained core samples, ran geophysical well logs.
- Class VI permit application writing in progress.



# Bipartisan Infrastructure Law (BIL) Overview

FECM – appropriated **\$6.5 billion** in new carbon management funding over 5 years through the Infrastructure Investment and Jobs Act (Bipartisan Infrastructure Law).

## Carbon Dioxide Removal - Direct Air Capture

Regional Direct Air Capture Hubs: \$3.5 billion  
DAC Technology Prize Competition: \$115 million

## Carbon Dioxide Utilization and Storage

Carbon Storage Validation and Testing: \$2.5 billion  
Carbon Utilization Program: \$310 million

## Front-End Engineering Design Studies

Carbon Capture Technology Program: \$100 million

## Critical Minerals and Materials

Rare Earth Element Demonstration: \$140 million  
Rare Earth Mineral Security: \$127 million

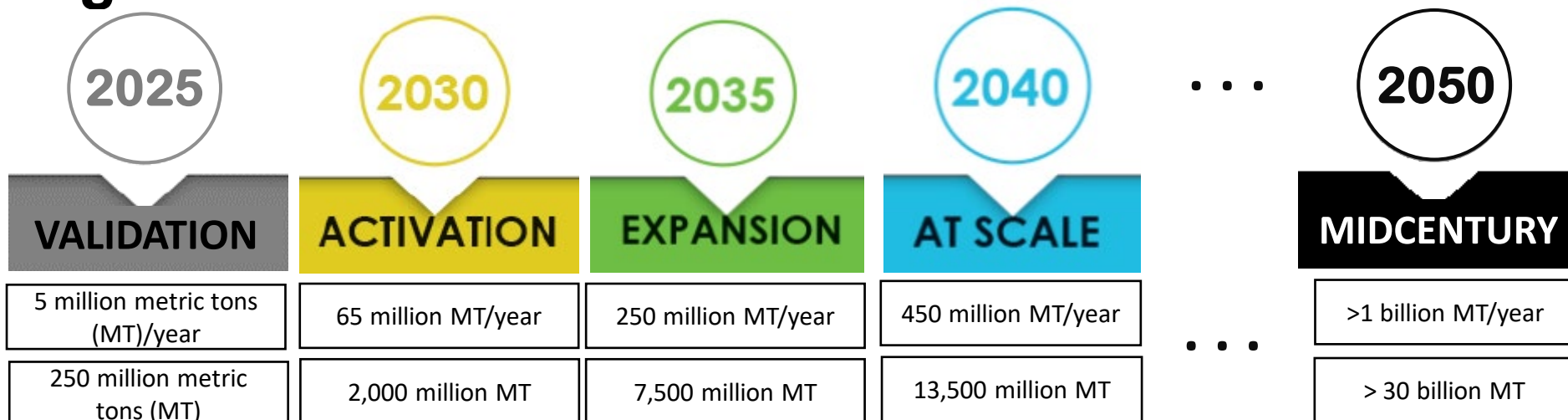
<https://netl.doe.gov/business/solicitations/bil>

# Rapid CCS industry growth needed for achieving U.S. decarbonization goals



## CarbonSAFE Targets

<b>Injectivity</b>
<b>Commercial Storage Potential</b>



**Biden Administration Executive Order 14008**  
Tackling the Climate Crisis at Home and Abroad

**50-52 percent reduction in economy-wide net greenhouse gas pollution** in 2030 from 2005 levels

**Net-zero emissions from the power sector** by 2035

**Net-zero emission economy** by 2050

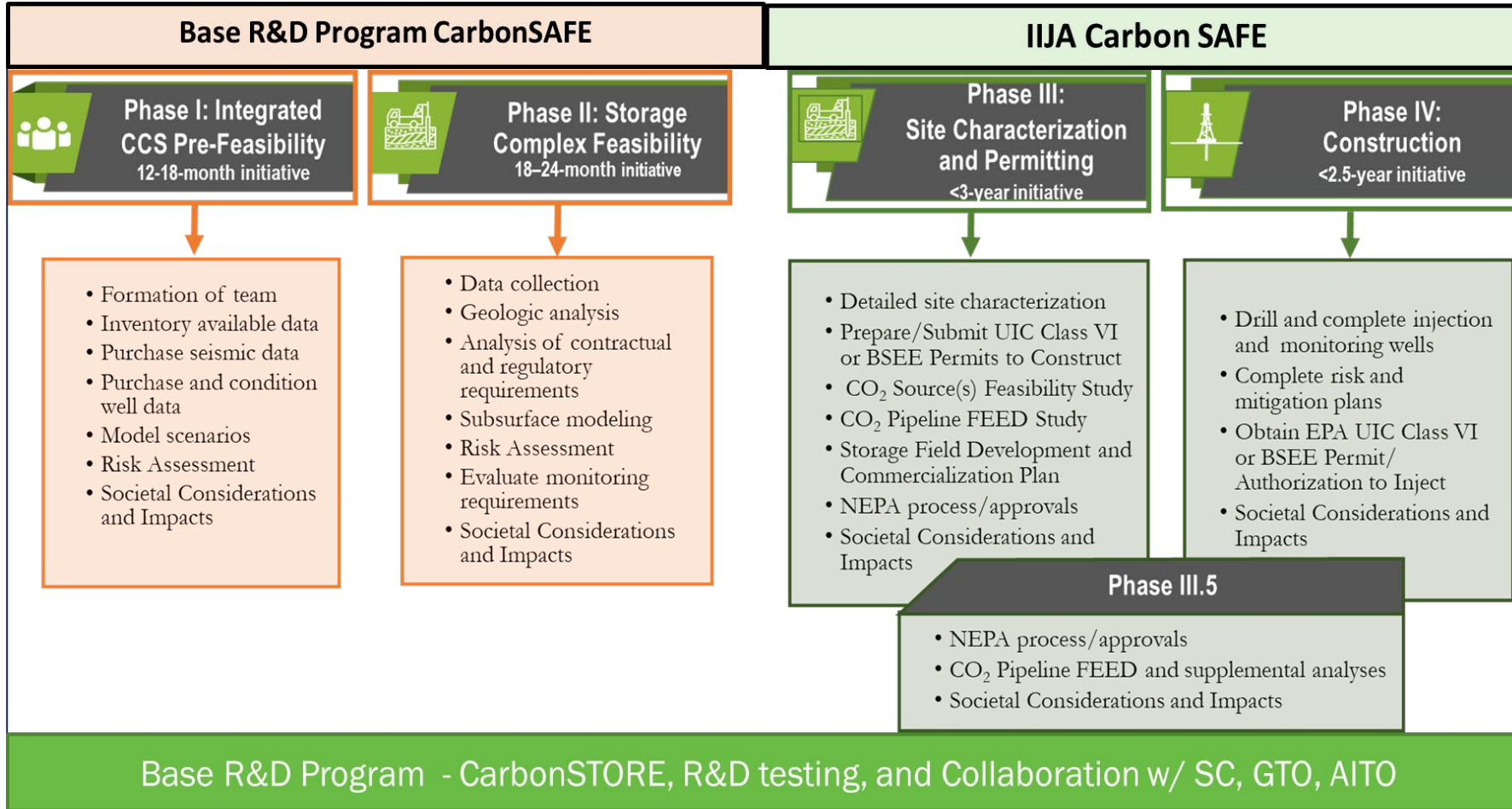
**External Metrics and Goals**

*The National Academies of* SCIENCES  
ENGINEERING  
MEDICINE  
**↑ CCUS 10X by 2030**

**ipcc**  
INTERGOVERNMENTAL PANEL ON climate change  
**Cumulatively sequester 350-1000 GT by 2050**



# Storage Validation and Testing—BIL 40305



\$2.5 billion over 5 years

**New or Expanded**  
large-scale  
commercialization  
carbon sequestration  
facilities

50 MMT Hubs and  
Large Scale Storage  
20-40 Facilities  
100 Class VI Wells

# Carbon Management Funding Opportunities

Announcement	Announcement Type	Status	Procurement ID
Storage Validation and Testing: Carbon Storage Assurance Facility Enterprise (CarbonSAFE): Phases III, III.5, and IV	BIL Section 40305 Notice of Intent (NOI)	Open April 29 – June 29, 2022	<a href="#">DE-FOA-0002729</a>
CarbonSAFE Phase II	FECM Funding Opportunity Announcement (FOA)	Open May 5 – July 5, 2022	<a href="#">DE-FOA-0002610</a>
Carbon Management	FECM Funding Opportunity Announcement (FOA)	Open May 2 – July 5, 2022	<a href="#">DE-FOA-0002614</a>
Regional Direct Air Capture (DAC) Hubs	BIL Section 40308 Notice of Intent (NOI)	Open May 13 – July 31, 2022	<a href="#">DE-FOA-0002746</a>



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# Questions?

