

May 2024

# Carbon Management Overview

## Fossil Energy and Carbon Management

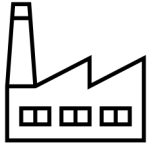
DRAFT – FOR DISCUSSION ONLY



U.S. DEPARTMENT OF  
**ENERGY**

Fossil Energy and  
Carbon Management

# What is carbon management?



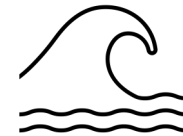
CO<sub>2</sub> capture, transport, use, and storage from existing emissions sources



Carbon removal using technologies like direct air capture and CO<sub>2</sub> mineralization



Carbon removal using natural and working ecosystems like forests, wetland, agriculture



Carbon removal using marine ecosystems, both in open ocean and in coastal ecosystems

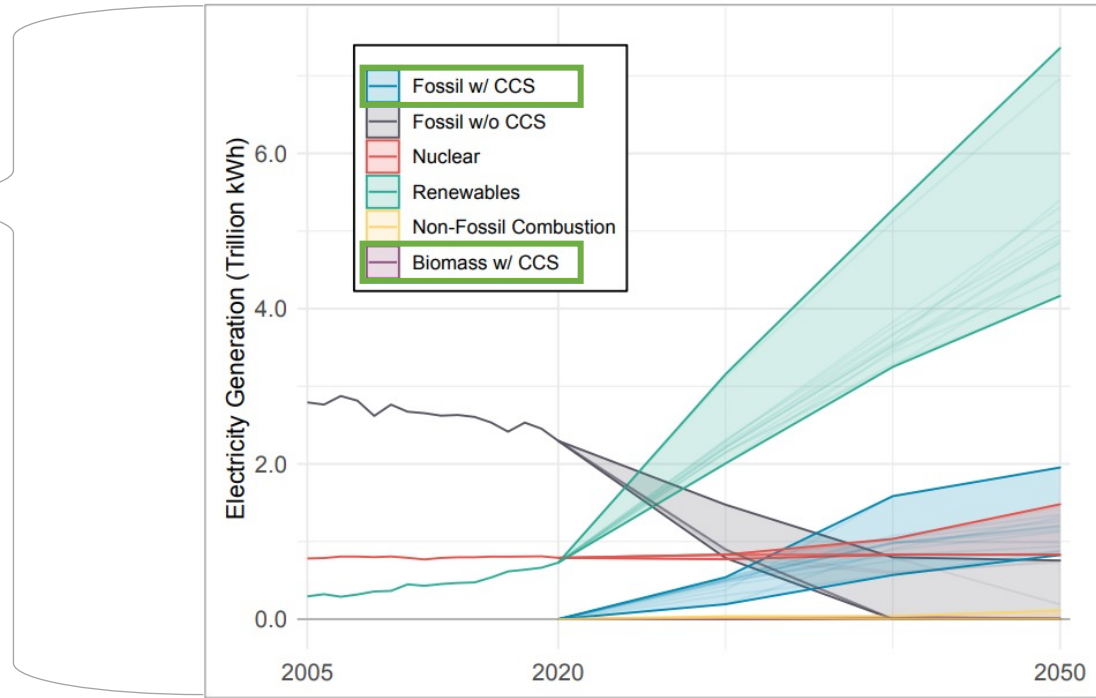
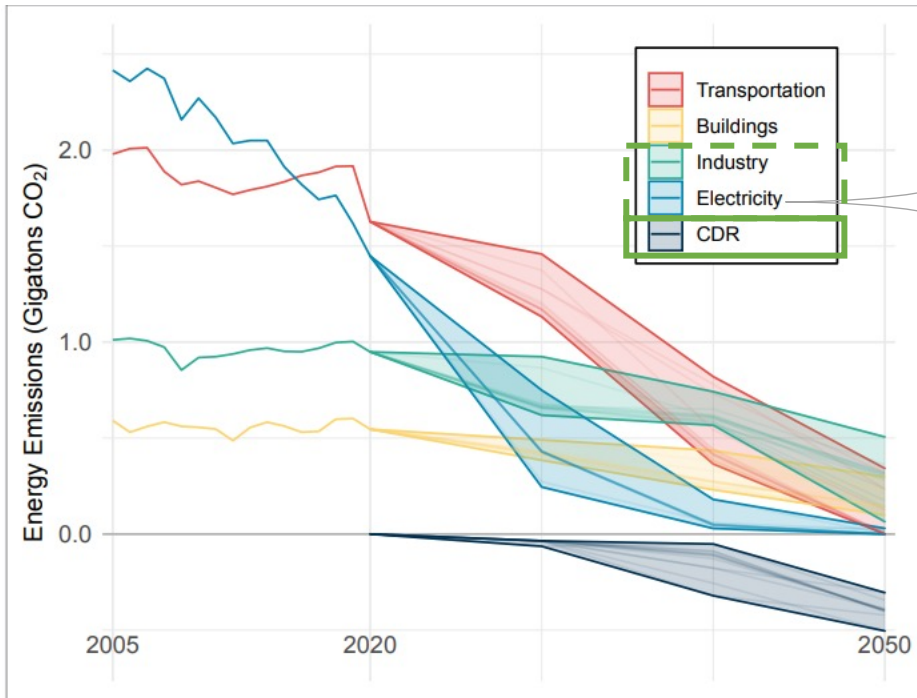


# 100Mt+/year-scale carbon removal is essential for achieving the US mid-century Climate Strategy

Carbon management

**Total CO2 Emissions:** Carbon dioxide removal (CDR) expected to be required to meet goal of Net Zero by 2050

**Electricity Generation:** Fossil w/ CCS and Biomass w/ CCS expected to be important electricity sources in 2050, alongside renewables and nuclear



Source: The Long-Term Strategy of the United States, Pathways to Net Zero, November 2021



# President Biden directs agencies to implement carbon management “responsibly”



DOE includes community, workforce, and environmental criteria in funding opportunities (up to 20% on major demos)



DOE supports community and stakeholder engagement activities

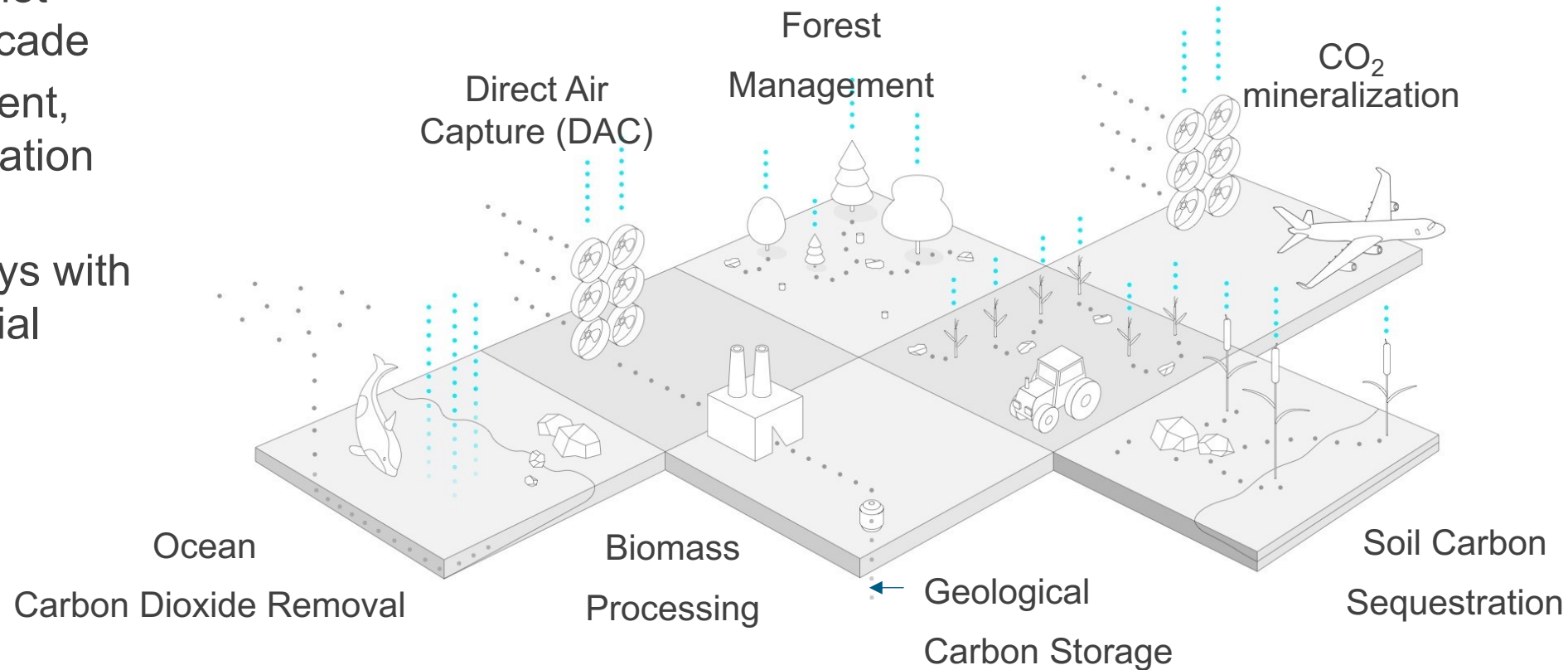


DOE requires monitoring and data collection to inform life cycle analysis, including non-CO<sub>2</sub> emissions and water usage impacts



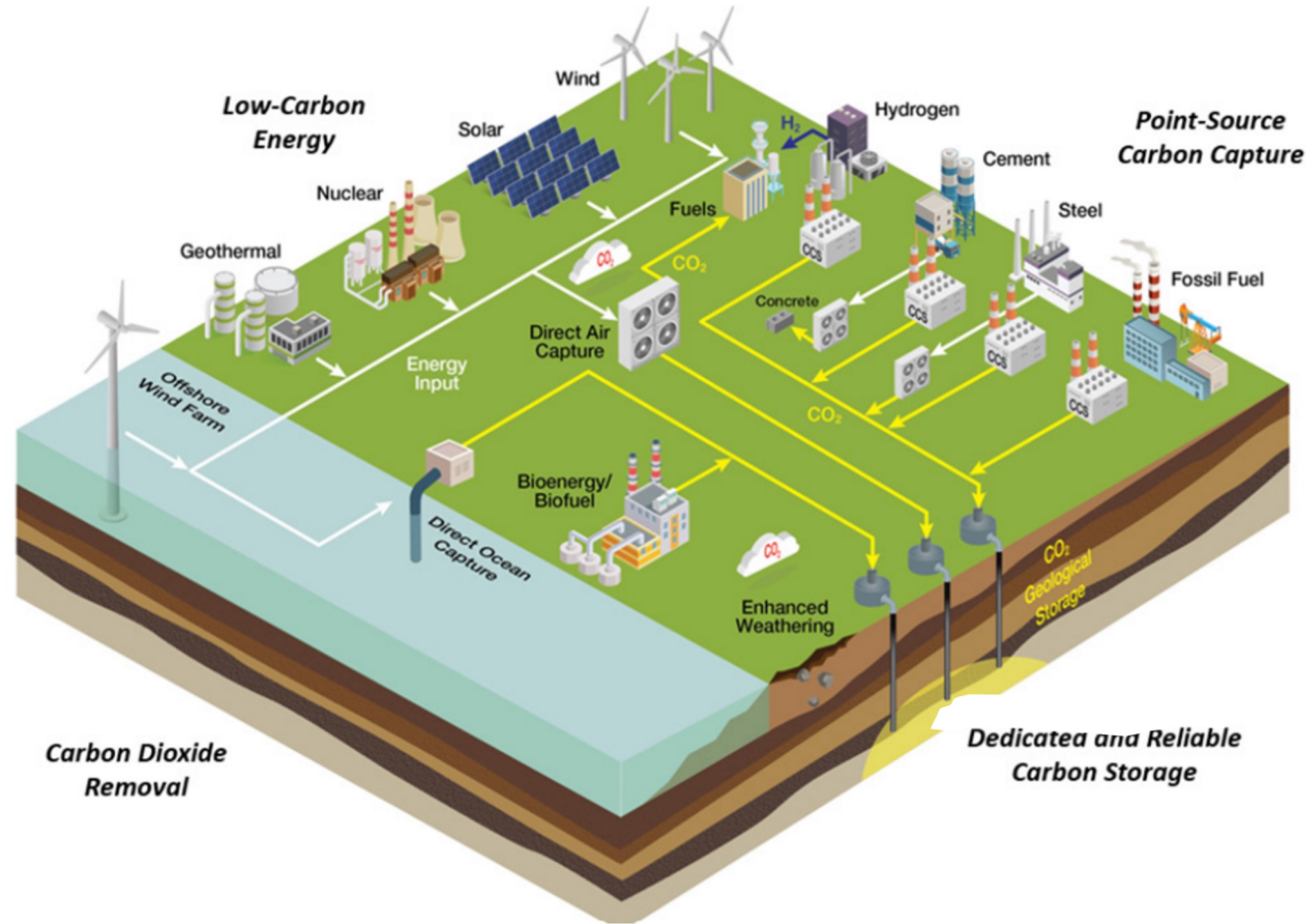
# Carbon Negative Shot sets CDR innovation grand challenge across DOE

- Goal of \$100/tonne net removed within a decade
- Including measurement, reporting, and verification (MRV) costs
- Across CDR pathways with gigaton-scale potential





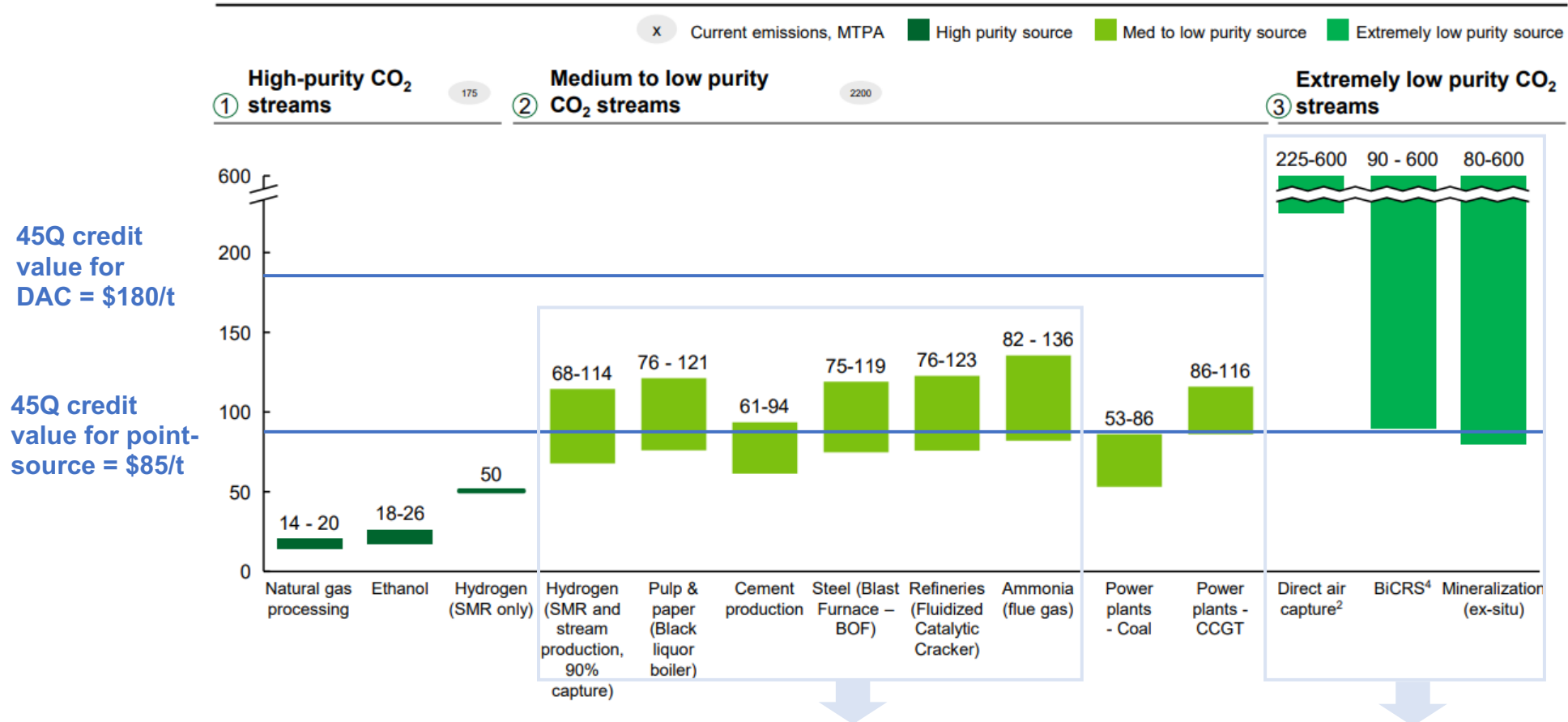
# Carbon management is a system of CO<sub>2</sub> capture, transport, conversion, and storage technologies





# DOE analysis shows that only high-concentration, low-cost CO<sub>2</sub> capture likely to emerge with 45Q alone

Carbon capture costs<sup>1</sup> excluding storage and transport costs, \$/tonne CO<sub>2</sub>



**Many critical use-cases with fewest alternatives for decarbonization will not develop based on 45Q alone**



## Guiding principles for the Carbon Negative Shot

- Implementing CDR policy as a ***complement*** to direct emissions reductions
- Supporting ***solution diversity***
- Ensuring high-quality, transparent, and workable ***measurement, reporting, and verification (MRV)***
- Providing ***community*** benefits and protecting the ***environment***
- Informing innovation with robust ***analysis***
- ***Partnering*** with other governments and the private sector



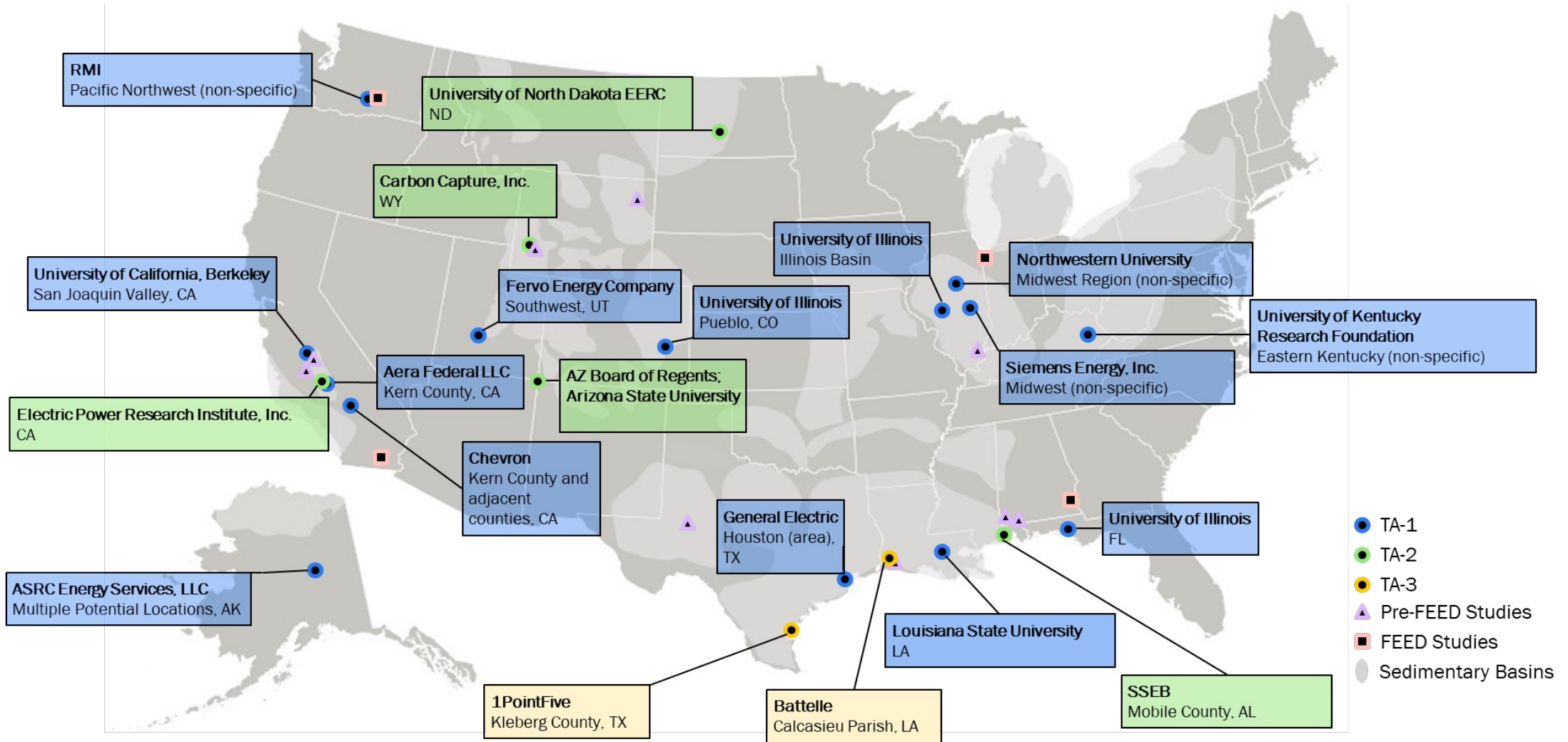


# Strategic pillars organizing DOE efforts

1. Support ***applied innovation*** across a portfolio of technologies
2. Fund ***infrastructure*** supporting CDR innovation and deployment
3. Create robust, transparent, and workable ***MRV*** frameworks
4. Demonstrate models for ***community and workforce benefits***
5. Support the development and implementation of ***regulations and incentives***
6. Collaborate with the ***private sector***
7. Leverage ***US climate diplomacy***

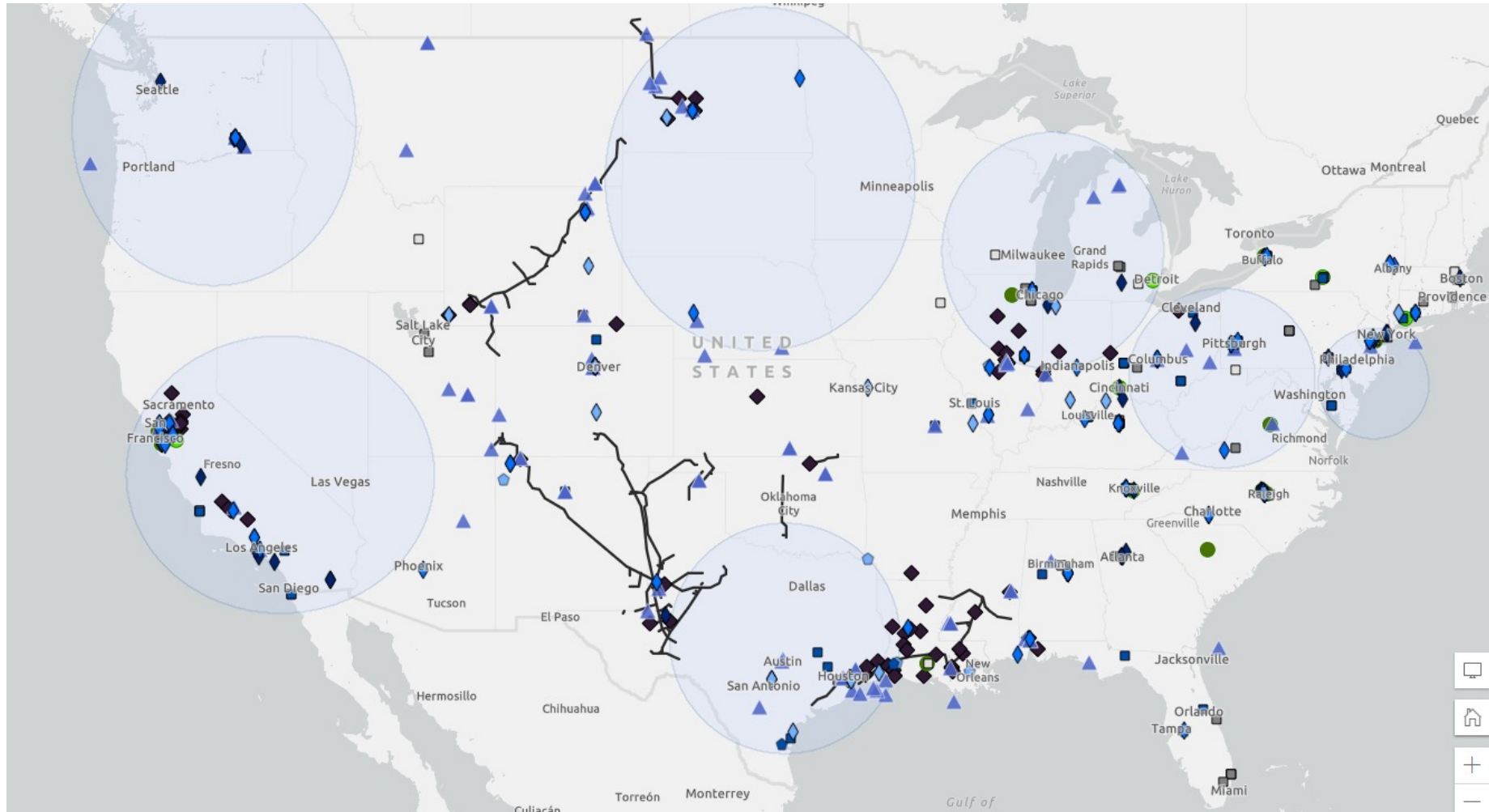


# Direct Air Capture Hub Selections (Topic Areas 1-3)





# Map of DOE Carbon Management Funding Awards



[Link: DOE Carbon Management RD&D](#)



# MRV Technology Commercialization Fund (\$15M)

## Lead Lab

## Key activities

Lawrence Livermore National Laboratory

Develop an umbrella carbon dioxide removal MRV framework in collaboration with National Renewable Energy Laboratory, Lawrence Berkeley National Laboratory, and a leading group of five industry partners headed up by CarbonPlan. Lawrence Livermore National Laboratory will also play a coordination role for the cohort of carbon dioxide removal MRV projects.

Pacific Northwest National Laboratory

Develop an adaptive MRV framework for mineralization-based carbon dioxide removal pathways in collaboration with Lawrence Livermore National Laboratory and 22 industry partners. The team will work closely with communities, especially often disadvantaged mining towns and coastal communities that would be prime candidates for mineralization-based carbon dioxide removal, to understand how MRV can be used to address their needs and concerns.

National Renewable Energy Laboratory

Develop and validate best practices for cement and concrete carbon dioxide removal pathways in collaboration with Lawrence Livermore National Laboratory, Oak Ridge National Laboratory, and nine industry partners. The cement and concrete industries present a nearly unparalleled opportunity for direct air capture coupled with permanent sequestration and provides a value-added end use for captured carbon dioxide.

National Renewable Energy Laboratory

Address critical MRV challenges for biomass carbon removal and storage pathways in collaboration with Lawrence Livermore National Laboratory and eight industry partners. The project seeks to address a scientific knowledge gap regarding the durability of various bio-derived products and a lack of best practices and protocols needed.



# Community Benefits Plans



**About Community Benefits Plans**

Clean Energy Infrastructure

Clean Energy Infrastructure » About Community Benefits Plans

Community Benefits Plans Webinar Series: CBP 101 Webinar

**ENERGY**

Watch later Share

**Community Benefits Plans 101: Informational Video**

- ❖ Kate Gordon - Senior Advisor to Secretary of Energy
- ❖ Betty Jones - Director of Office of Energy Jobs
- ❖ Wahleah Johns - Director of Office of Indian Energy
- ❖ Chris Gunn - Senior Advisor on Environmental and Energy Justice for Office of Economic Impact and Diversity
- ❖ Dr. Catherine Clark - Energy Justice Liaison for Office of Clean Energy Demonstrations
- ❖ Jill Capotosto - Energy Justice Liaison for Office of Clean Energy Demonstrations

Watch on YouTube

This webinar is the first of a series on U.S. Department of Energy requirements for Community Benefits Plans (CBP).

U.S. Department of Energy

## About Community Benefit Plans



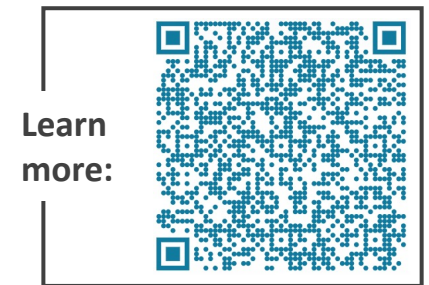


## CDR Purchase Pilot Prize

- Provide demand “pull” for CDR field that lacks a natural customer
- Demonstrate ability of government to purchase high-quality CDR
  - Convince legislators that future CDR purchase efforts are valuable
  - Take learnings from the initial pilot as foundation for larger-scale effort with future funding
- Crowd in additional voluntary corporate purchases
  - Show that CDR purchases are essential and possible today
  - Provide template for how to purchase high-quality CDR that is readily replicable by voluntary efforts
  - Validate a basket of suppliers that corporates can easily purchase from

# Planned: Voluntary CDR Purchase Pilot

- Goal is increased **investment and market transparency** in the voluntary CDR market
- Challenges other organizations to join DOE in **purchasing small and growing amounts of CDR** with robust durability and MRV
- Participants submit purchases of durable CDR credits for **recognition on DOE's leaderboard and to compete for the most**
  - Qualifying purchases can be of any size, any durable CDR approach, and any jurisdiction
  - Different categories will allow organizations of all sizes and industries to compete
- Participating can **enhance organizations' climate ambitions**:
  - **Securing supply of CDR** today, ahead of net-zero target deadlines
  - Maximizing impact on **innovation and transparency** in the CDR market
  - **Earning recognition as a CDR champion** on DOE's leaderboard and at events
  - **Gaining access to DOE resources and suppliers** to guide purchasing decisions
- DOE is currently accepting entries and the leaderboard will **launch in summer 2024**



Join the challenge, add yourself to our mailing list, or provide input at [voluntaryCDRchallenge@hq.doe.gov](mailto:voluntaryCDRchallenge@hq.doe.gov)



# Mission Innovation CDR

- Accelerate RD&D of technological CDR approaches, including: direct air capture, enhanced mineralization, and biomass with carbon removal and storage
- Emphasize long-term, secure CO<sub>2</sub> storage and conversion into long-lived products

## **Coalition:**

- Co-leads – Canada, Saudi Arabia, United States
- Members – Australia, European Commission, Japan, Norway, India, United Kingdom
- Observers – Germany, Iceland, Bahrain



## **Workstreams:**

- CDR Launchpad (Info sharing on 1kta projects and MRV collaboration)
- Mapping of Demonstration and Deployment Projects
- Direct Air Capture R&D
- BiCRS
- Enhanced Mineralization
- Life Cycle Analysis Case Studies
- Student Prize Competition on MRV

