

June 2023

# Carbon Management Overview at DOE

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OFFICE OF FOSSIL ENERGY AND CARBON MANAGEMENT



U.S. DEPARTMENT OF  
**ENERGY**

Fossil Energy and  
Carbon Management



# Key Messages

Carbon management technology...



...works and is essential for meeting climate goals.



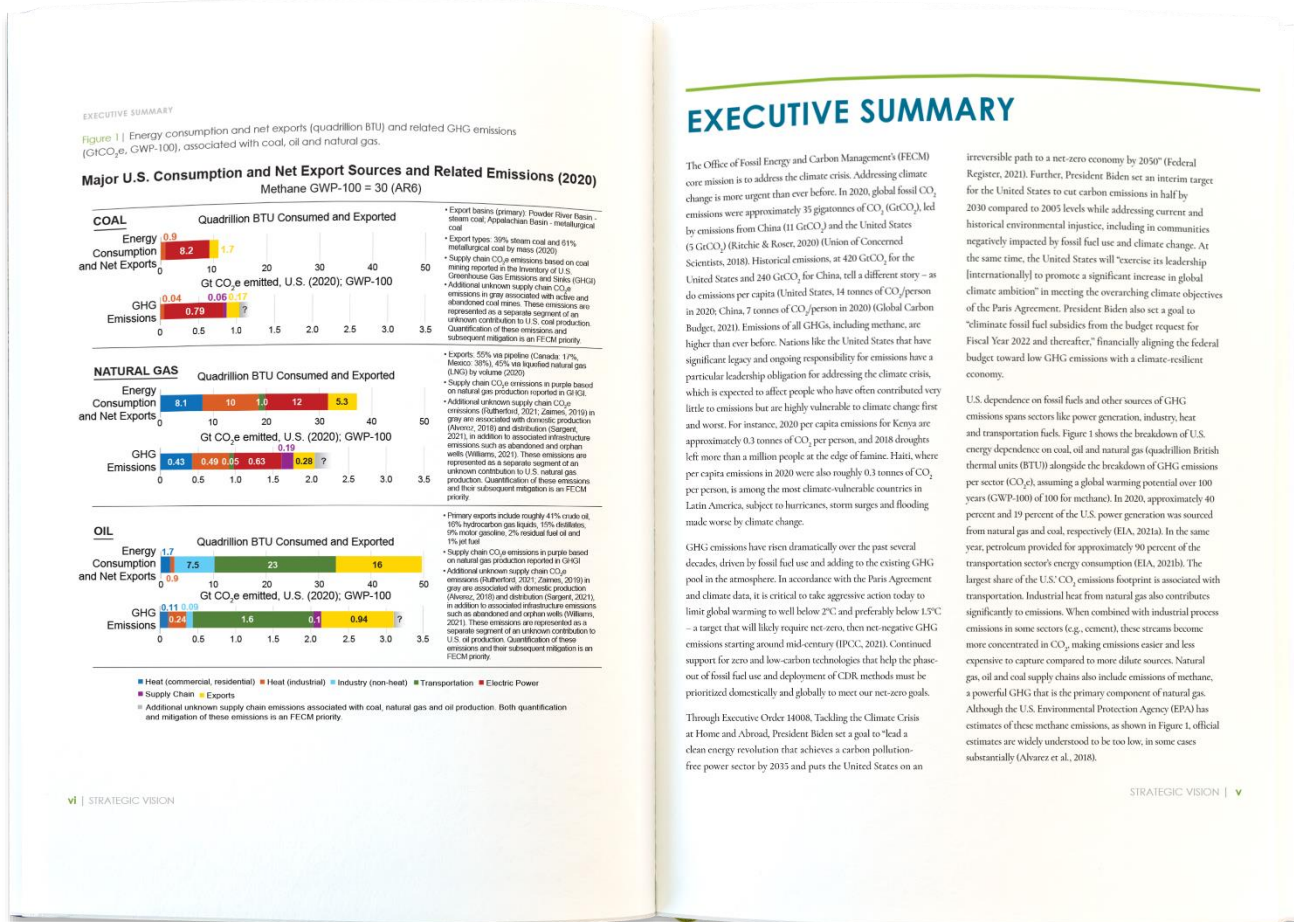
...is ready for commercial liftoff in the U.S. after recent policy advances.



...requires more policy, private investment, and international collaboration to unlock its full potential.



# Fossil Energy and Carbon Management Intro



- Two areas of focus:
  - Carbon management
  - Resource sustainability
- Office of Carbon Management:
  - ~\$450M annual budget
  - TRL 3-5 grant funding:
    - Engineering studies
    - Benchtop research
    - Small pilots and demos

Source: FECM 2022 Strategic Vision

# Carbon management technology...



...works and is essential for meeting climate goals.



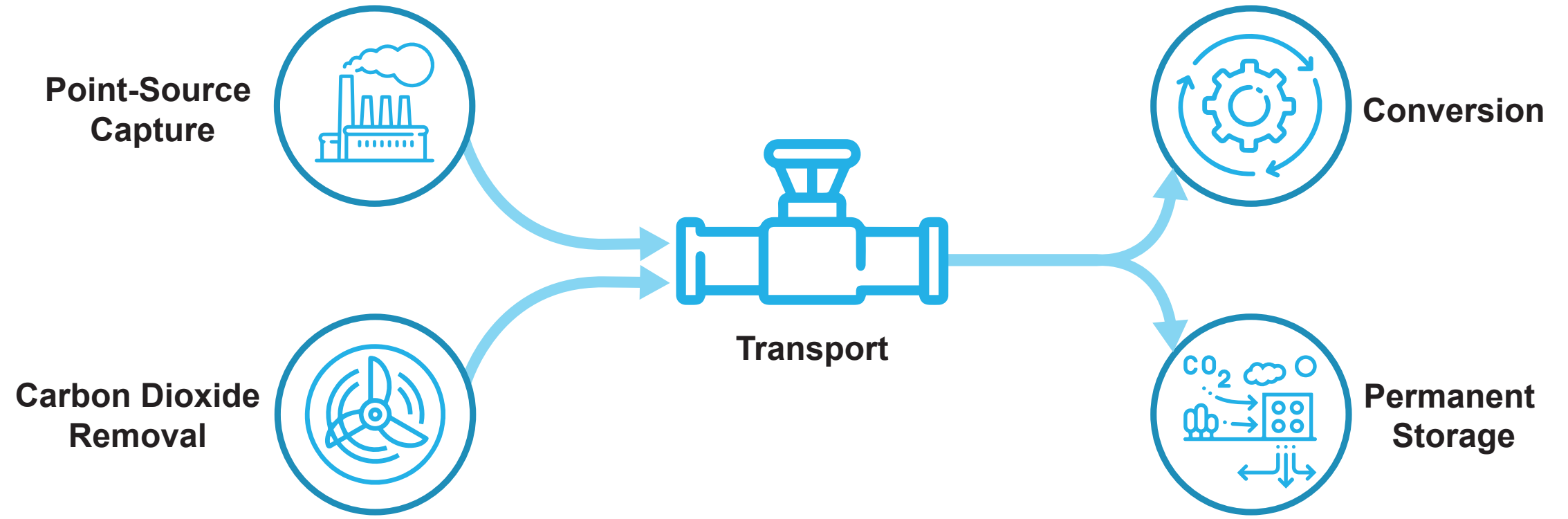
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# Carbon management is a system of technologies.







# Scaling carbon management is a Biden Administration climate priority.

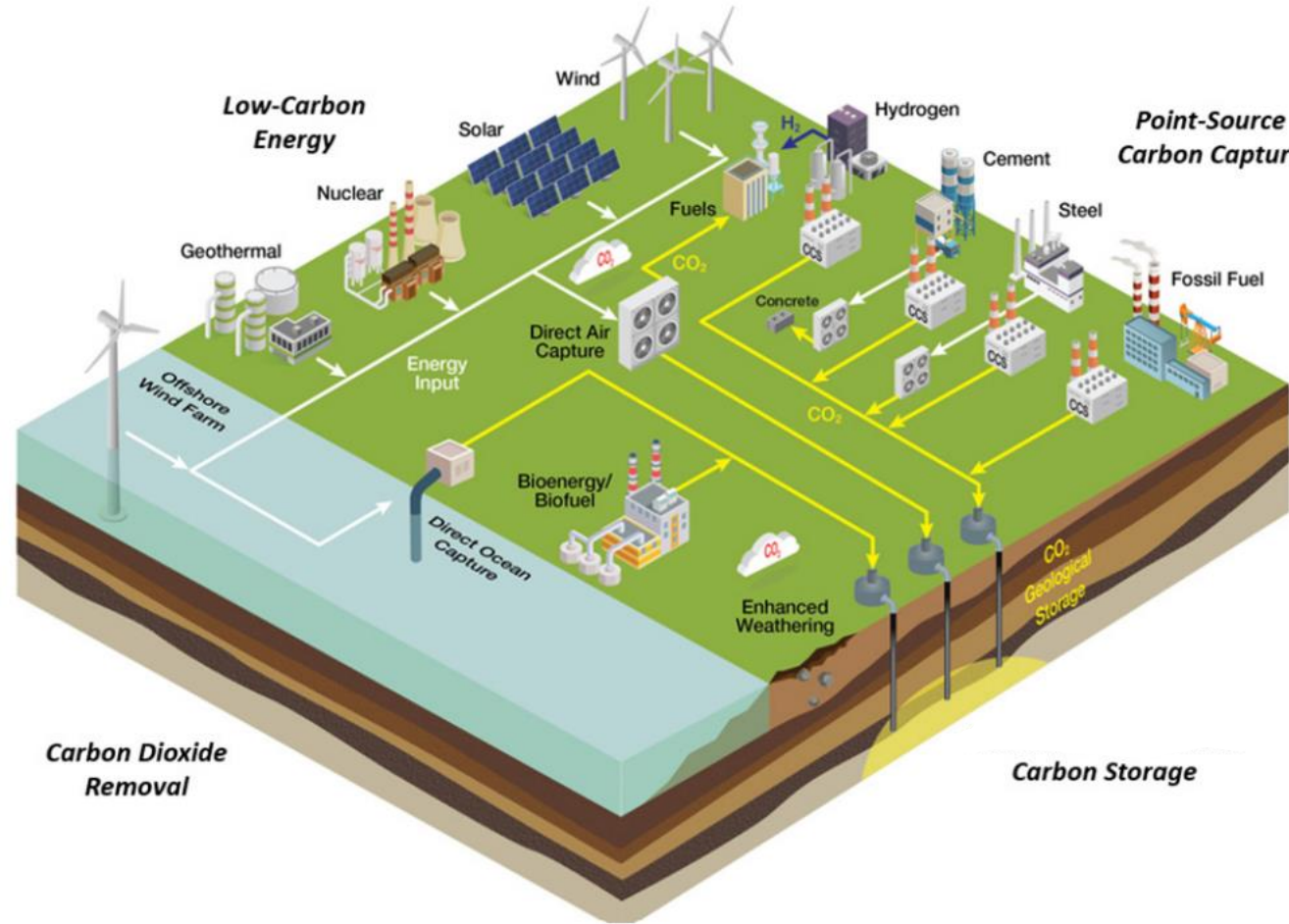
User Clip: POTUS on CMC  
POTUS on CMC



Clip Embed Add to Playlist Clipping Guide Share This Video

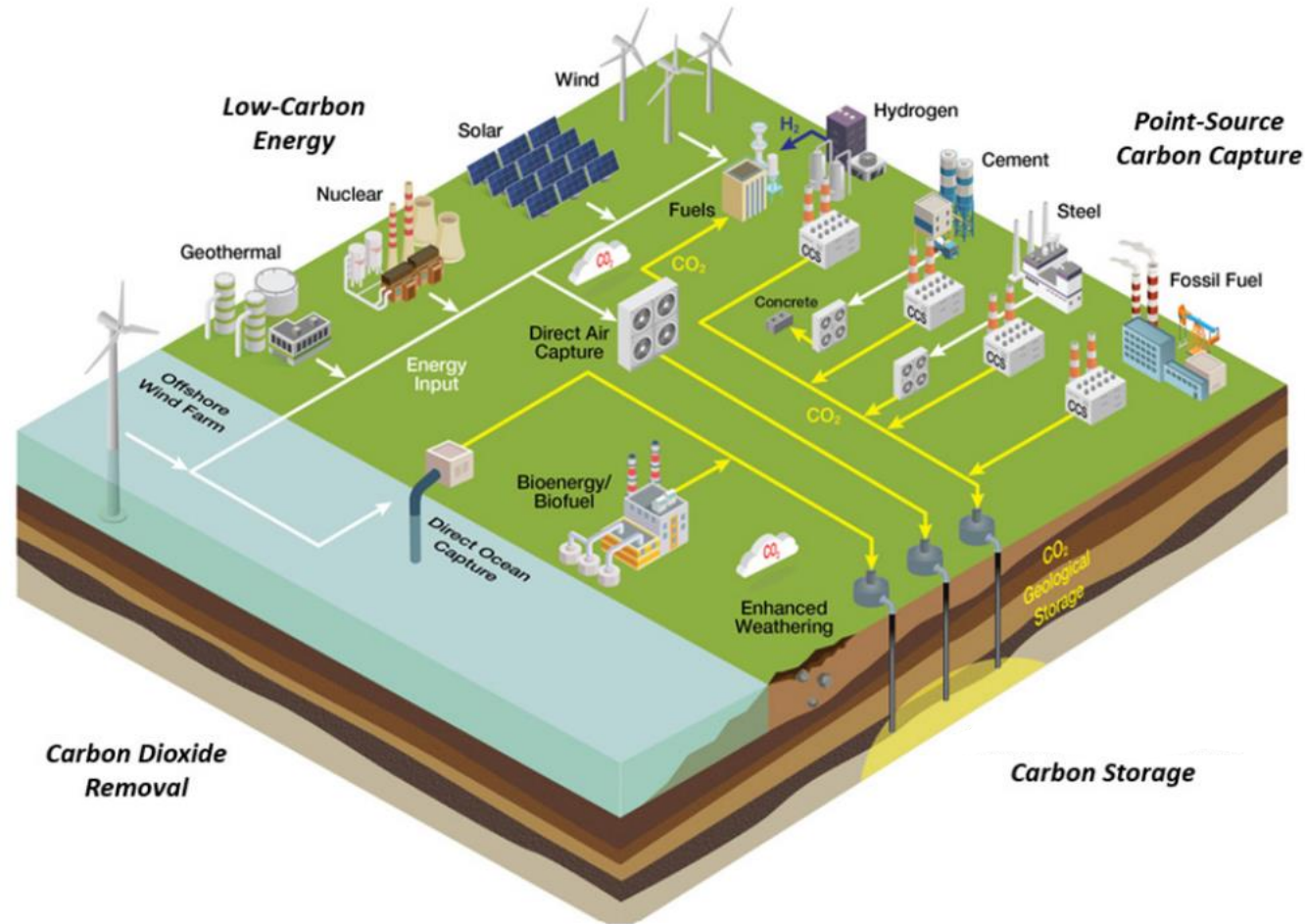


# Carbon management is a key component for meeting net-zero economy-wide climate goals.





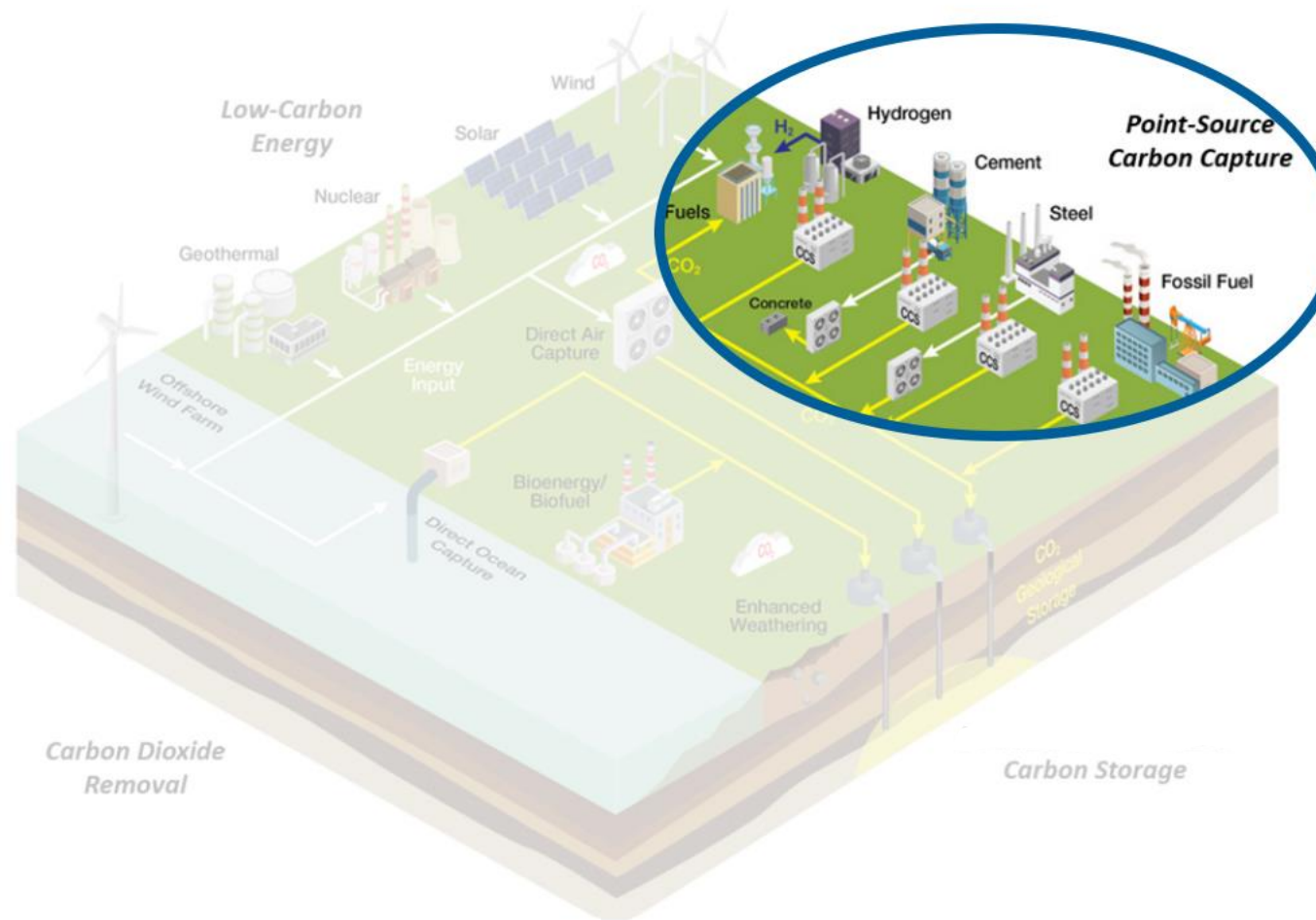
# ...a bridge for industrial decarbonization:





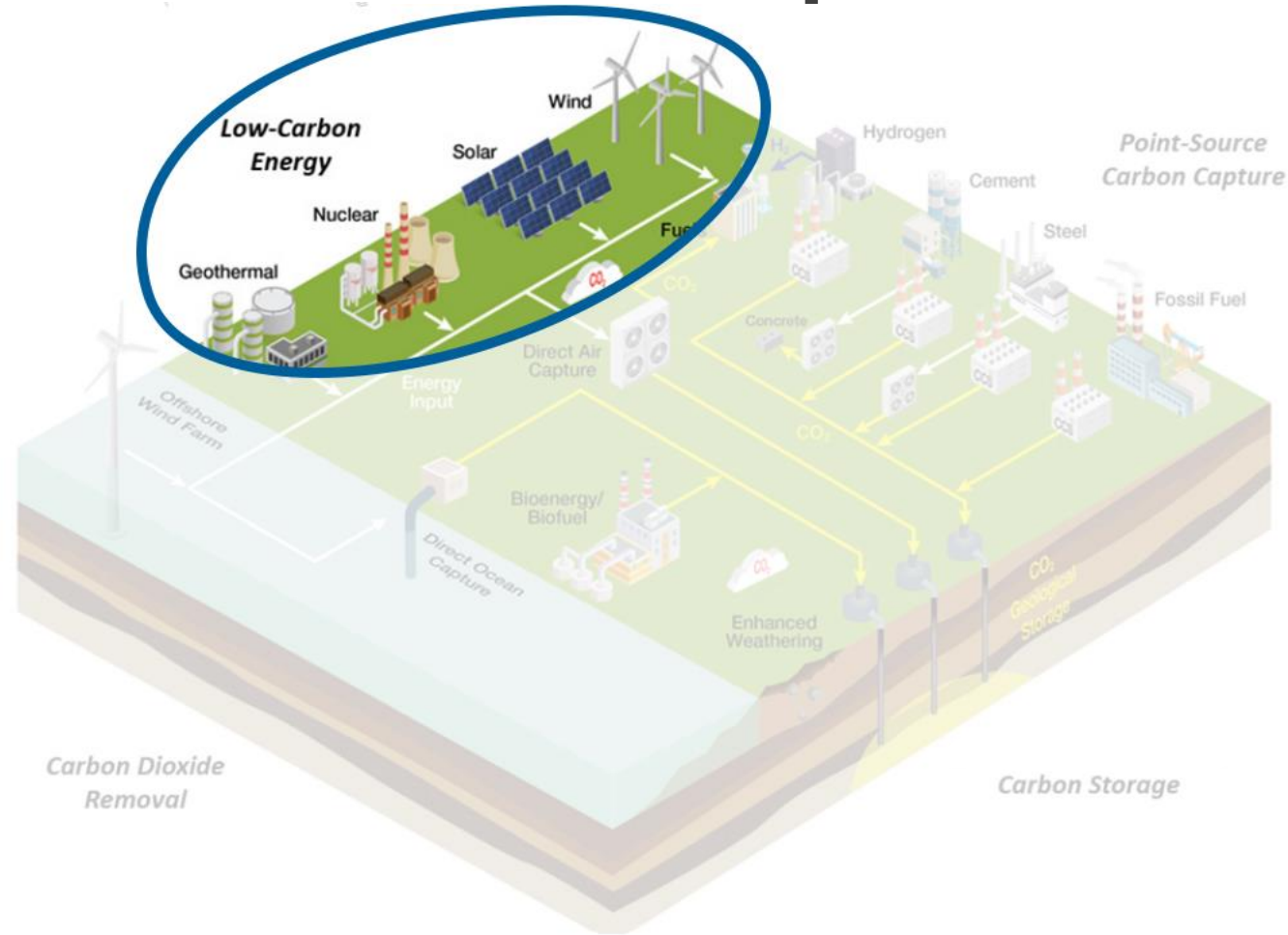


# ...a more reliable, low-cost power grid:



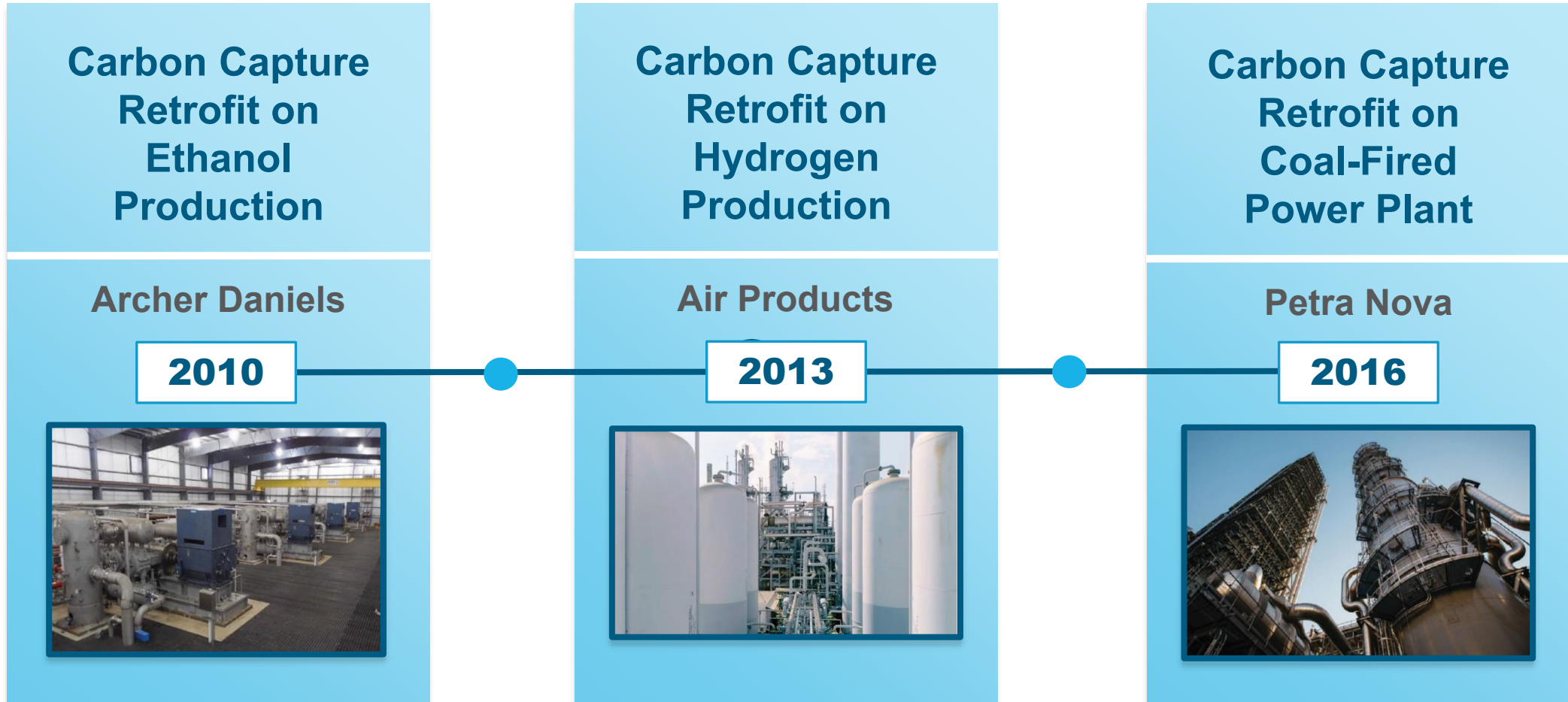


# ...negative emissions for offsets and legacy carbon emissions cleanup:





# DOE is confident carbon management is technically feasible.





# Industry has decades of experience with capture.

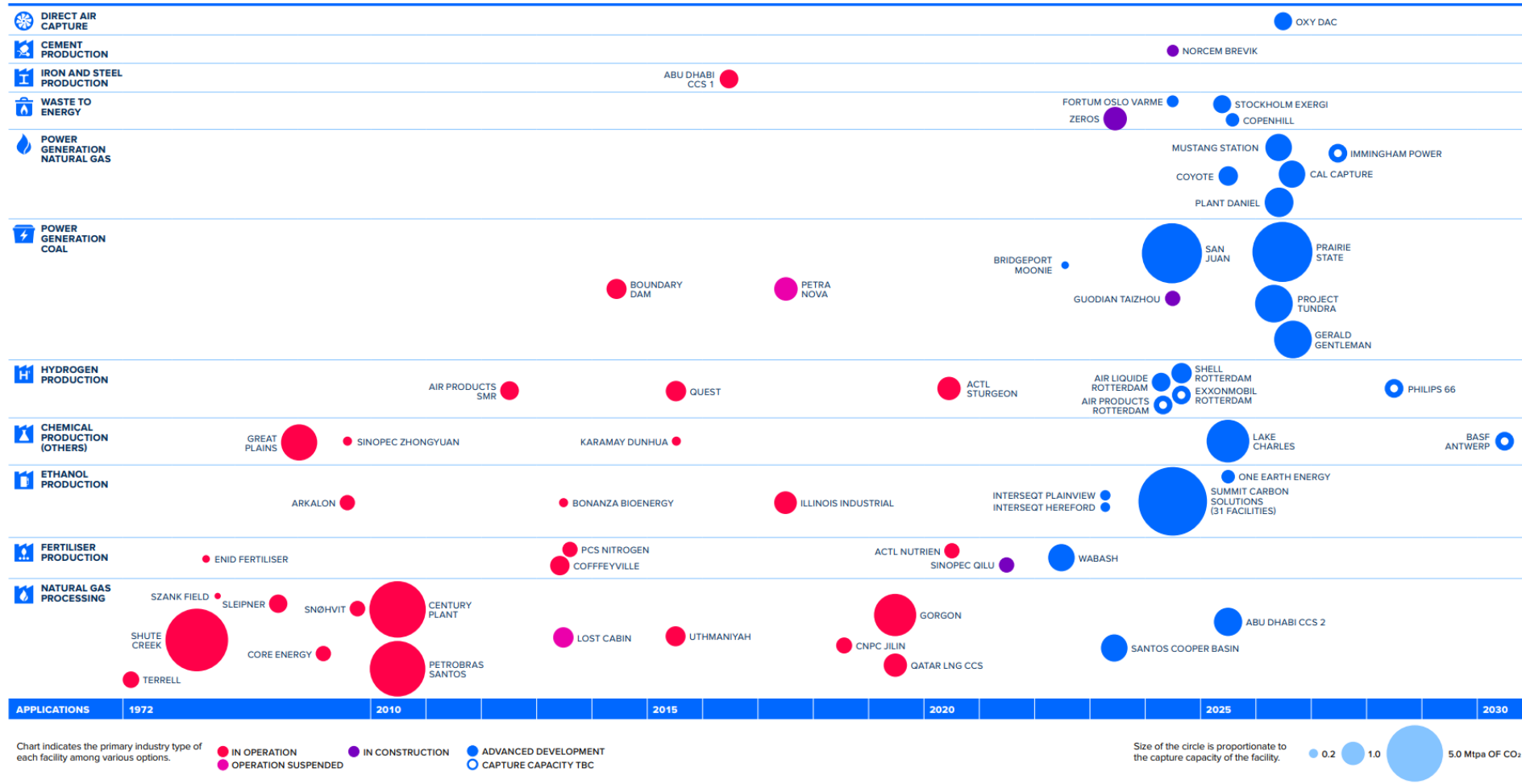


FIGURE 9 CCS PROJECTS BY SECTOR AND SCALE (BY CO<sub>2</sub> CAPTURE CAPACITY) OVER TIME

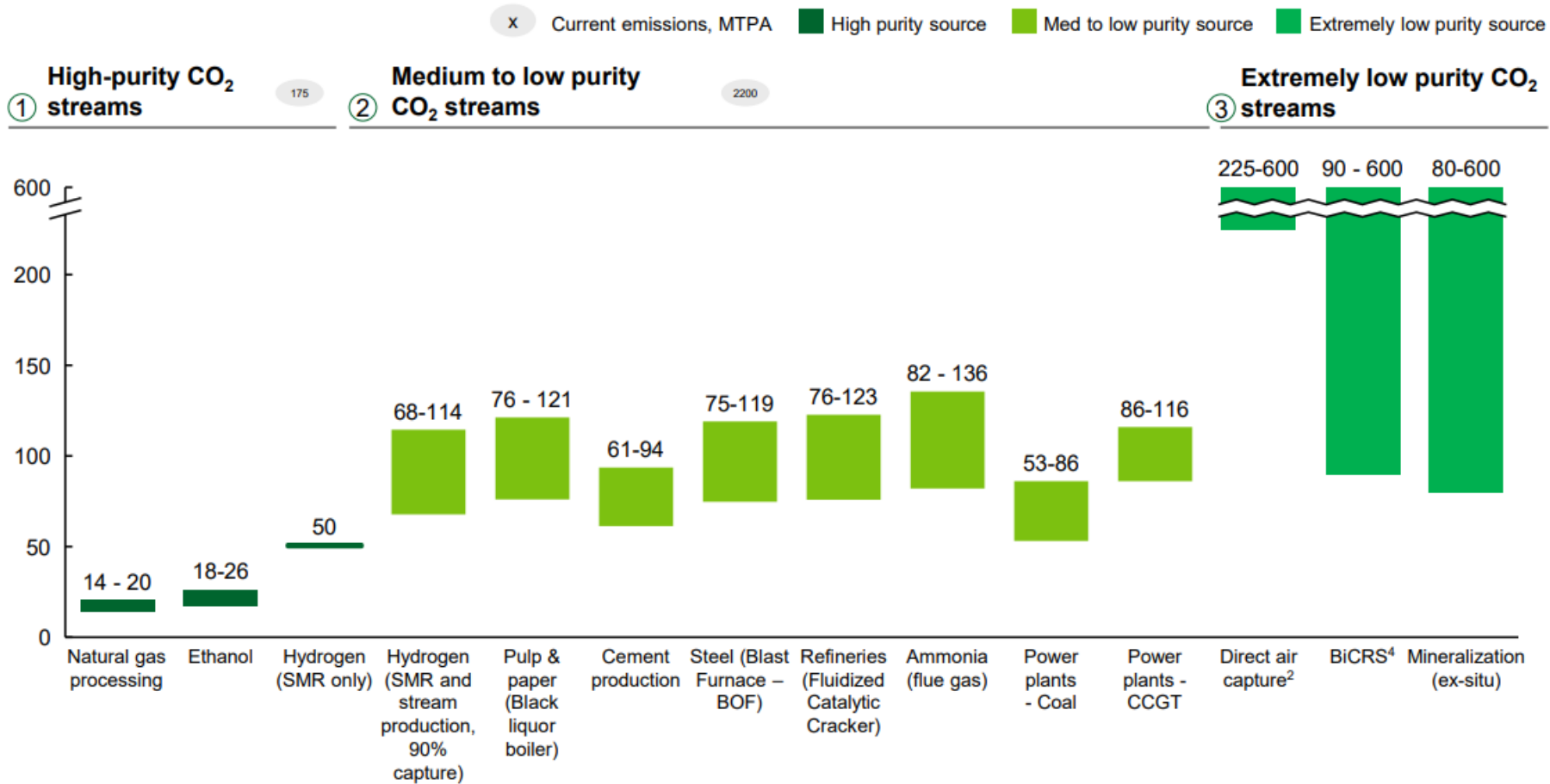
## Global Status of CCS 2022 - Global CCS Institute





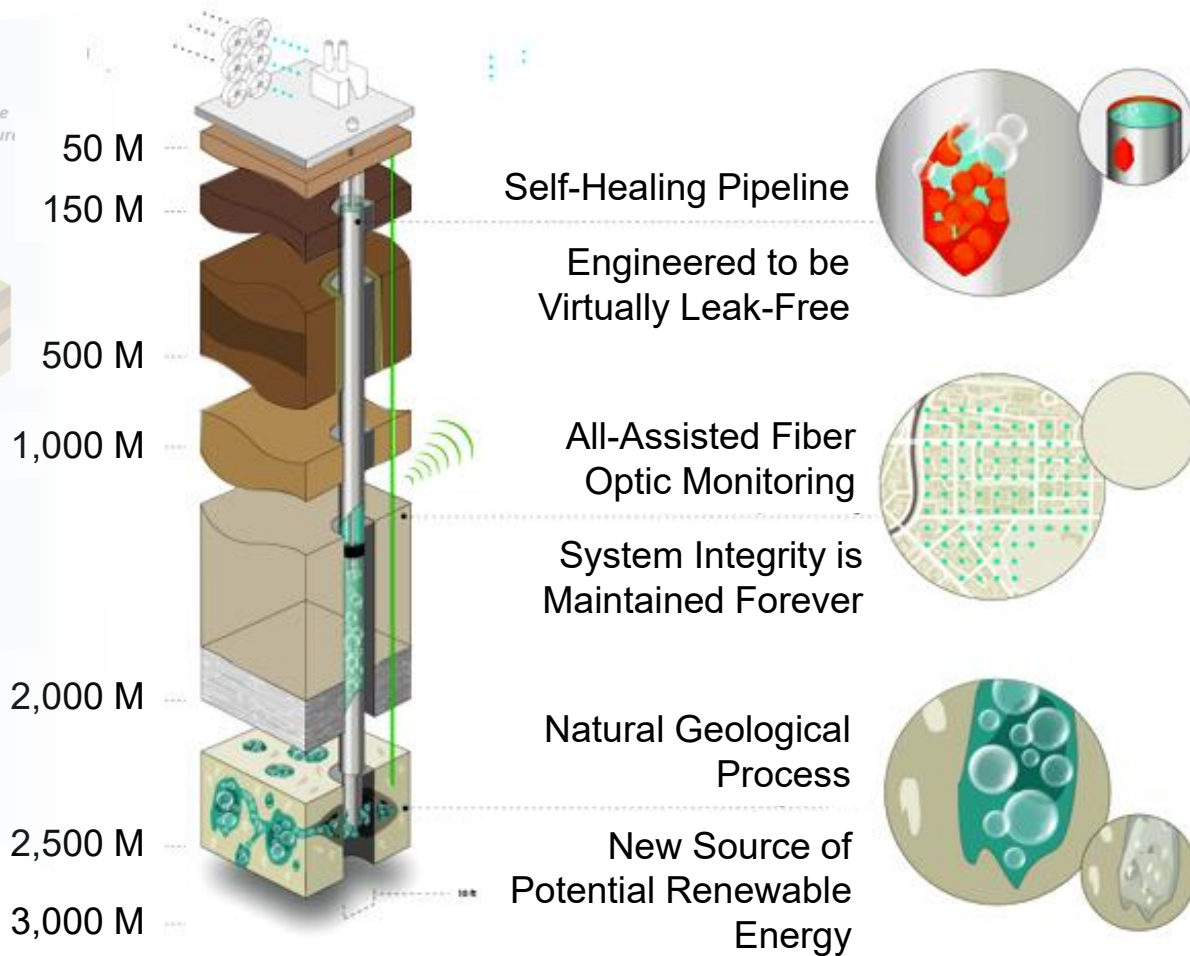
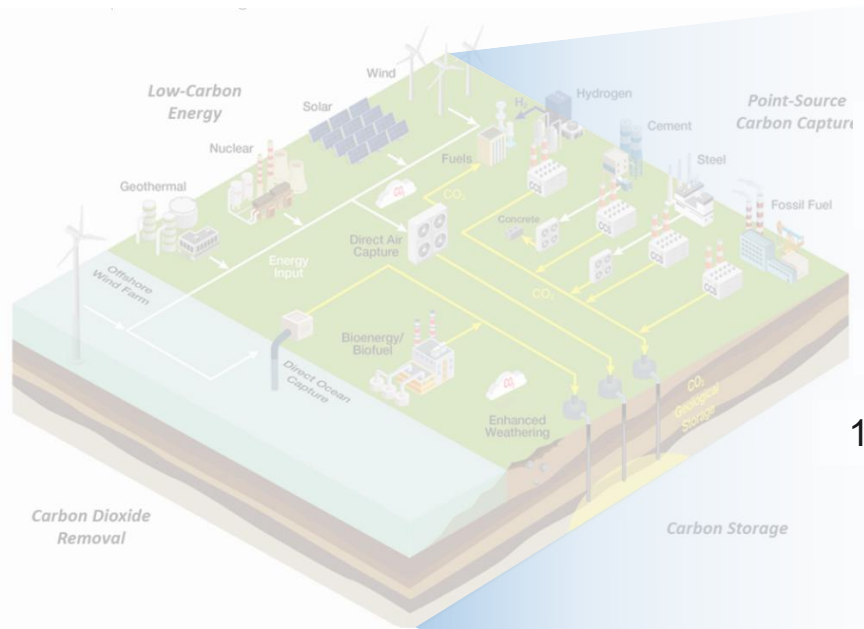
# Some capture applications are already low-cost.

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





# CO<sub>2</sub> storage in dedicated storage wells is proven at the Mt/year scale.



# Carbon management technology...



...works and is essential for meeting climate goals.



...is ready for commercial liftoff in the U.S. after recent policy advances.



...requires more policy, private investment, and international collaboration to unlock its full potential.

# ◆ The U.S. is poised for commercial liftoff.



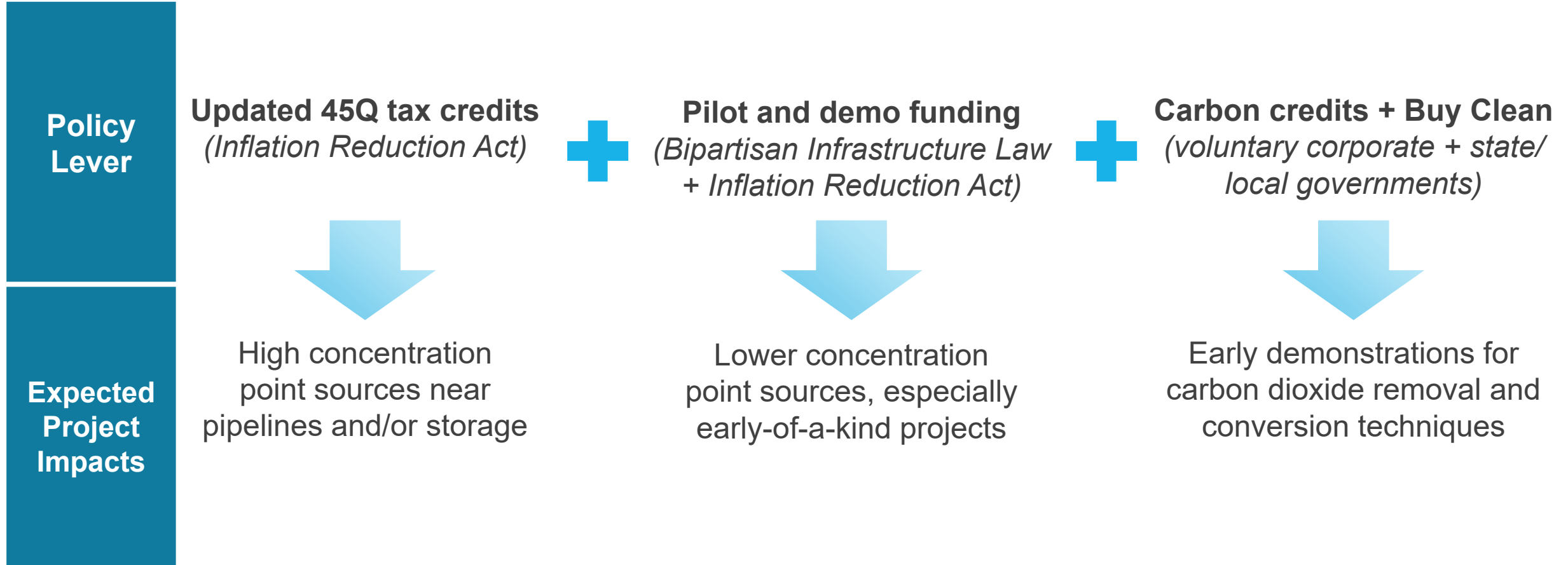
## Pathways to Commercial Liftoff: Carbon Management

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[Pathways to Commercial Liftoff: Carbon Management \(energy.gov\)](https://www.energy.gov/pathways-to-commercial-liftoff-carbon-management)



# ◆ U.S. policy enables full range of projects.





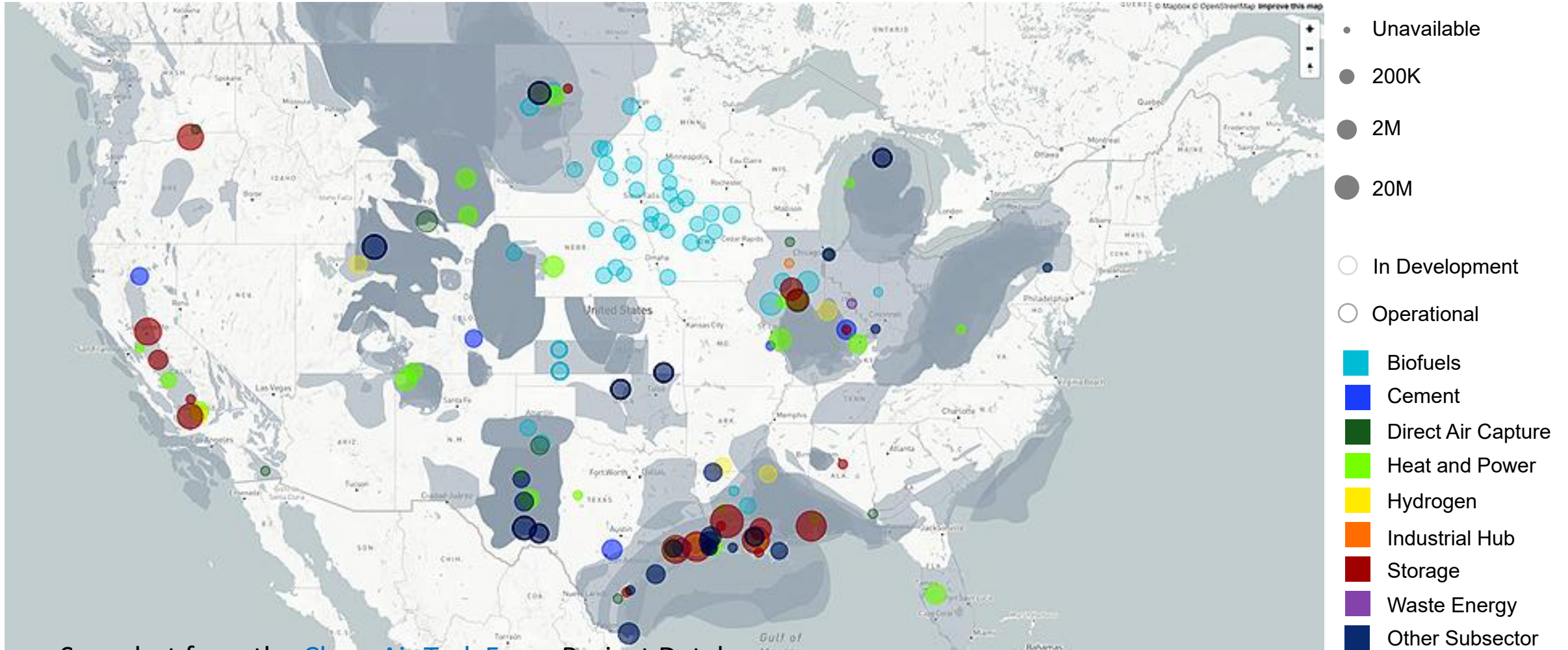
# 300M+ tons of CO<sub>2</sub> storage is economic by 2035.



Optimized CO<sub>2</sub> transport and storage network deployment modeling from the [Great Plains Institute](#) finds that, under 45Q, a shared, interconnected CO<sub>2</sub> transport and storage system could capture, transport and store 300 million metric tons of CO<sub>2</sub> per year by 2035 from industrial facilities and power plants.



# Numerous projects announced, but few online

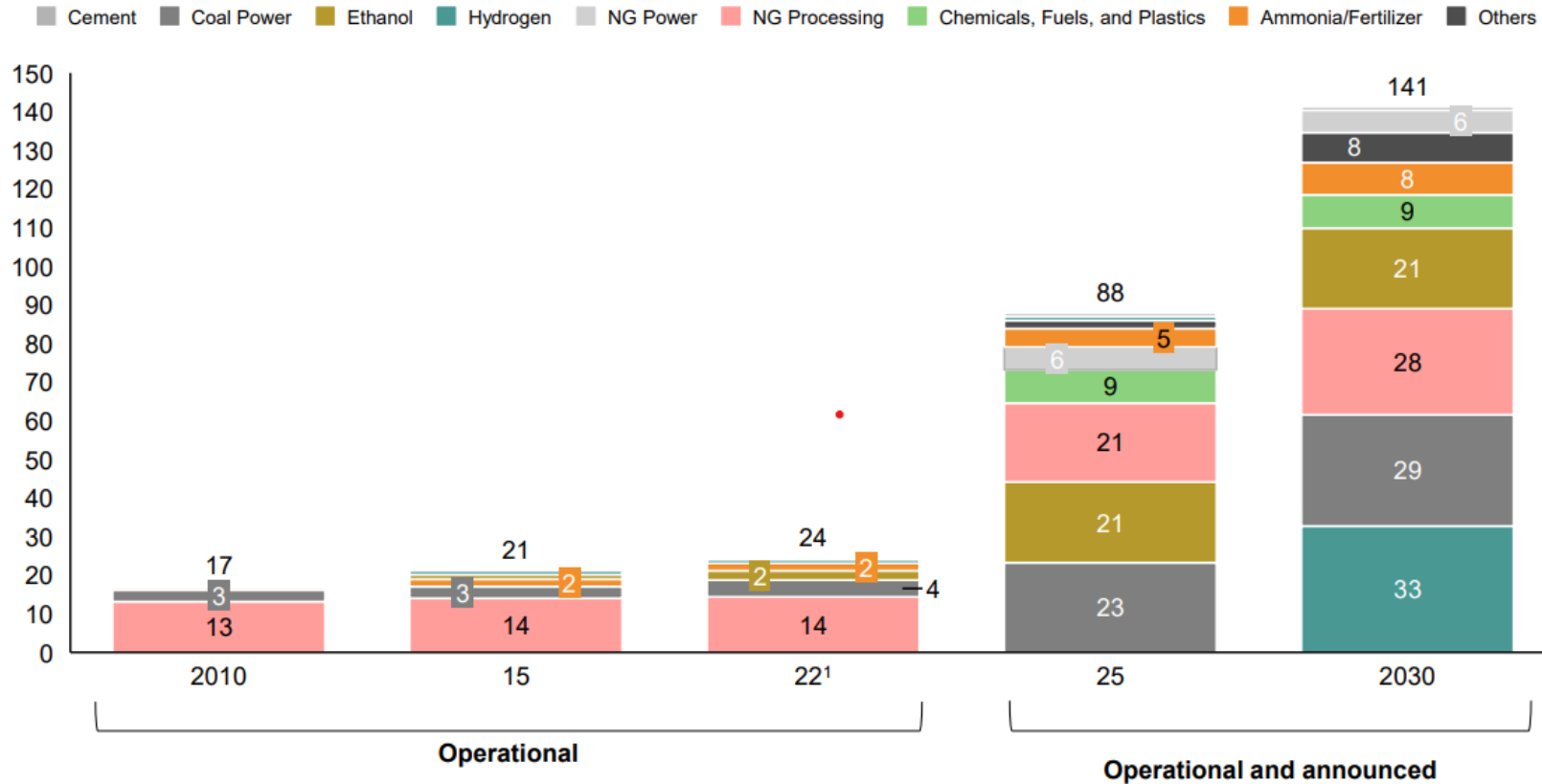


Snapshot from the [Clean Air Task Force Project Database](#)



# 100M+ t/y capacity by 2030 announced

U.S. point source CCUS capture capacity by year, MTPA

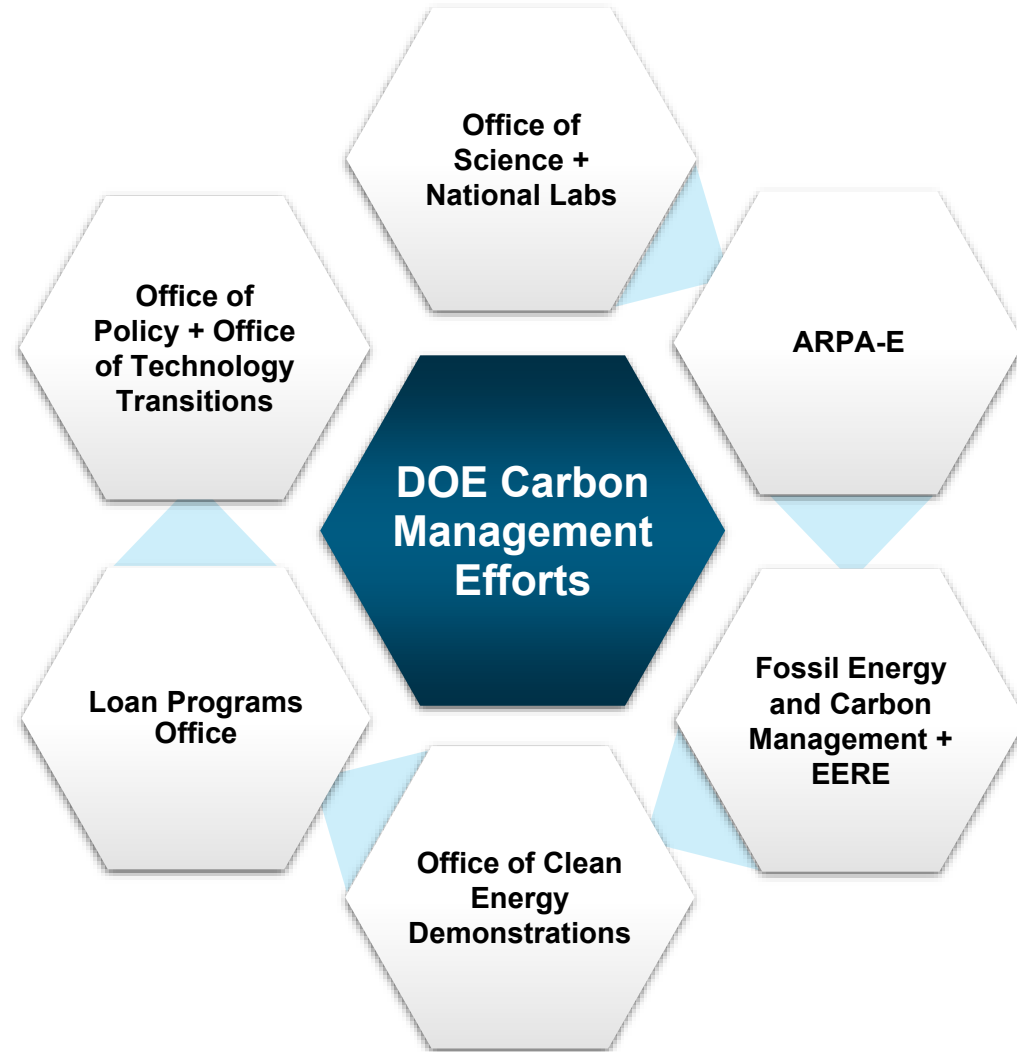


1 Includes those expected to have commissioning in 2022  
Source: Bloomberg New Energy Finance, "2022 CCUS Market Outlook"

Figure 5: The U.S. has over 20 MTPA of operational point source CCUS capacity, with an announced project pipeline of ~140 MTPA as of Dec 2022



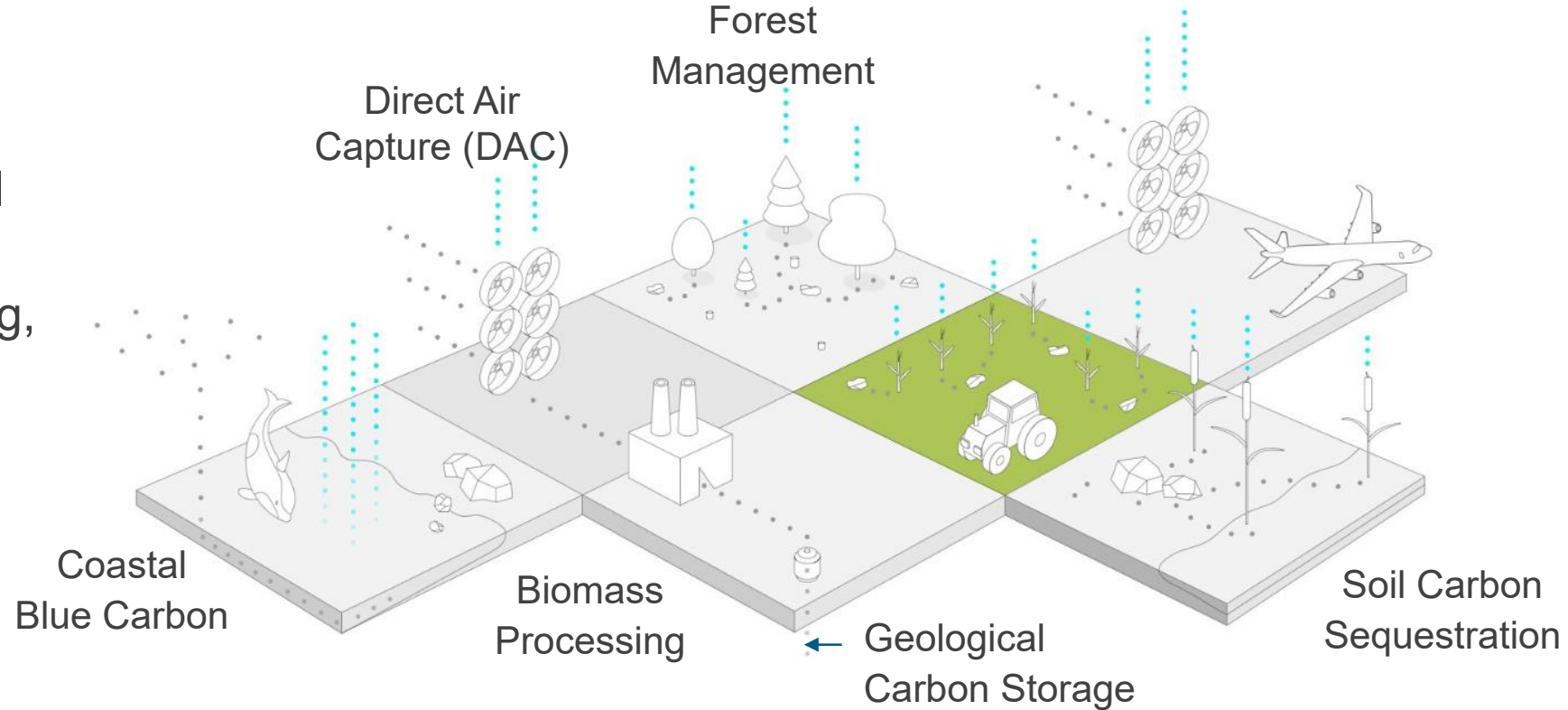
# ◆ DOE supporting liftoff across offices





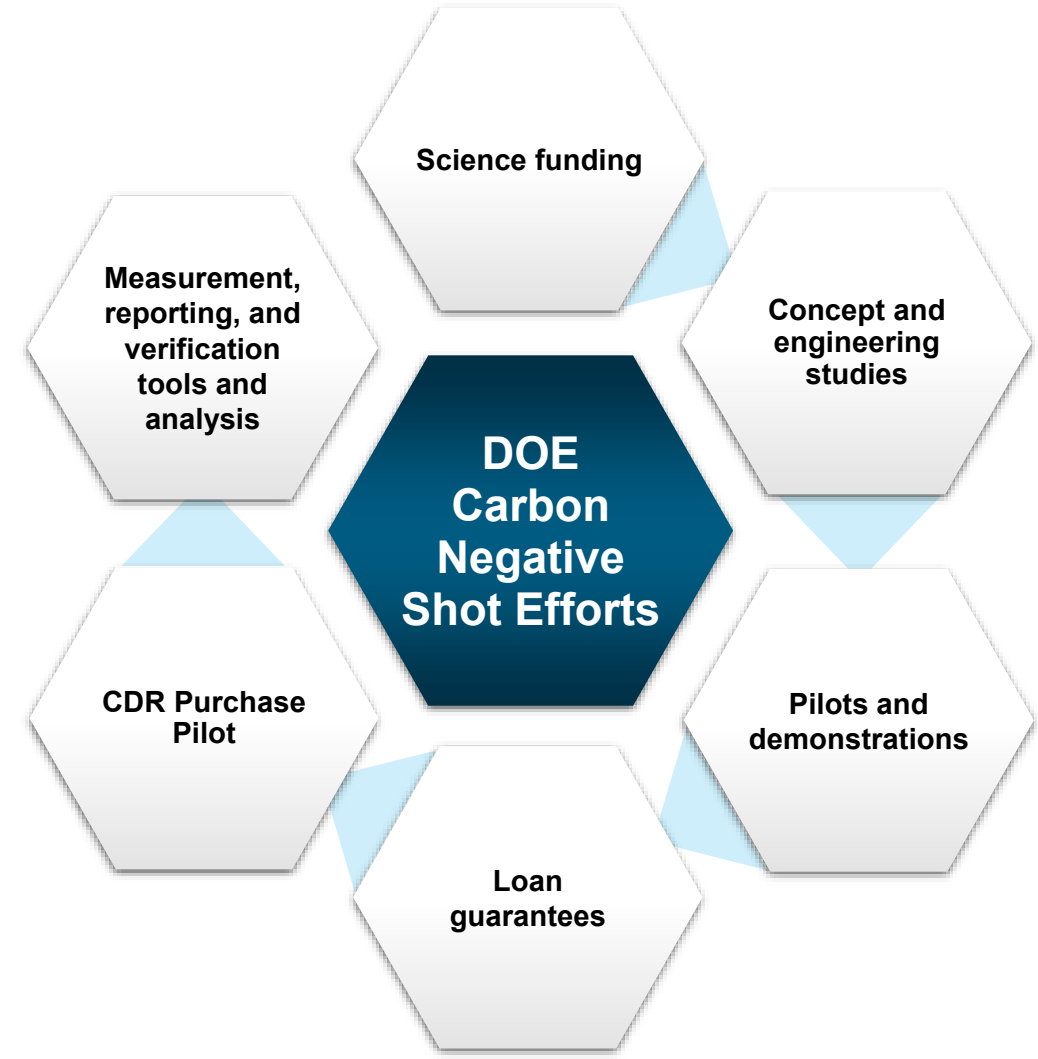
# Carbon Negative Shot sets innovation grand challenge

- \$100/ton CDR by 2032
- Pathway agnostic
- Gigaton-scale potential
- Inclusive of robust measurement, reporting, and verification



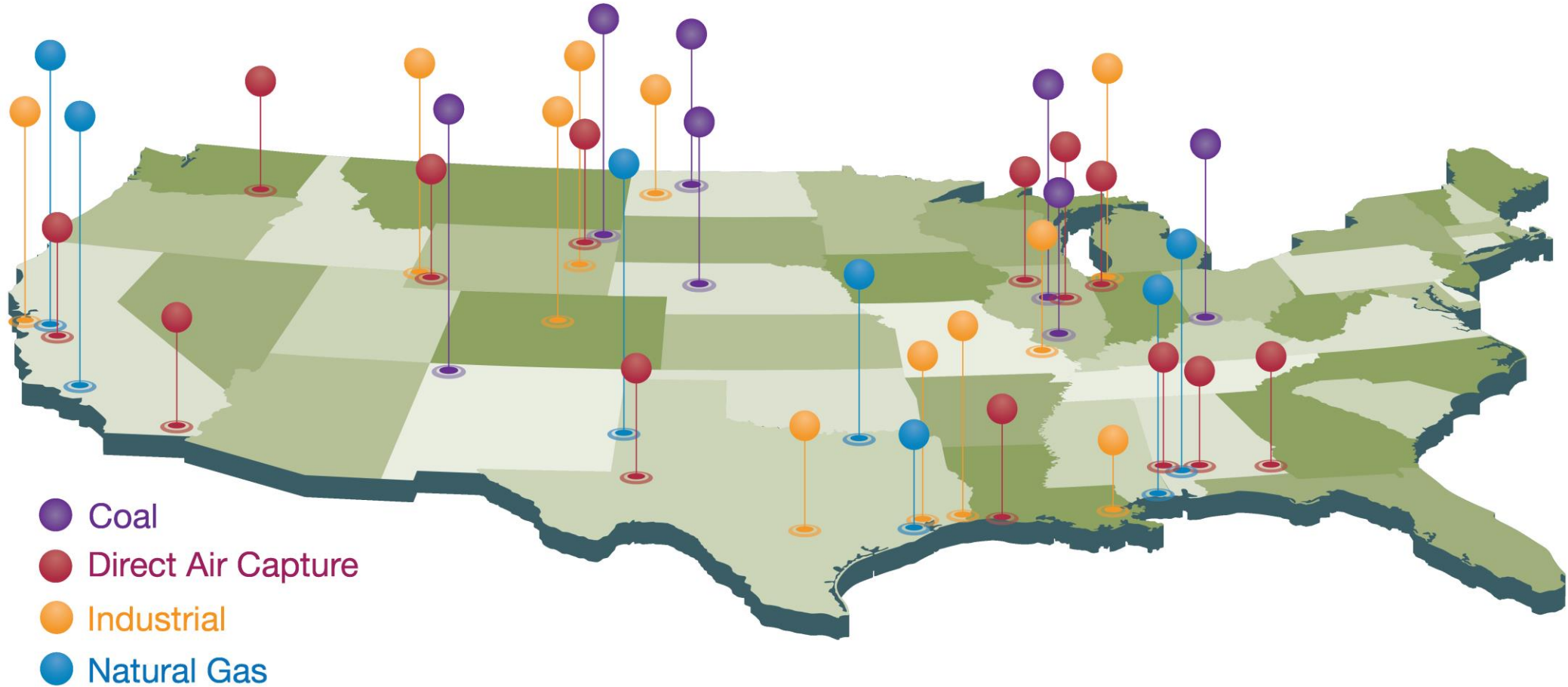


# Carbon Negative Shot activities across DOE





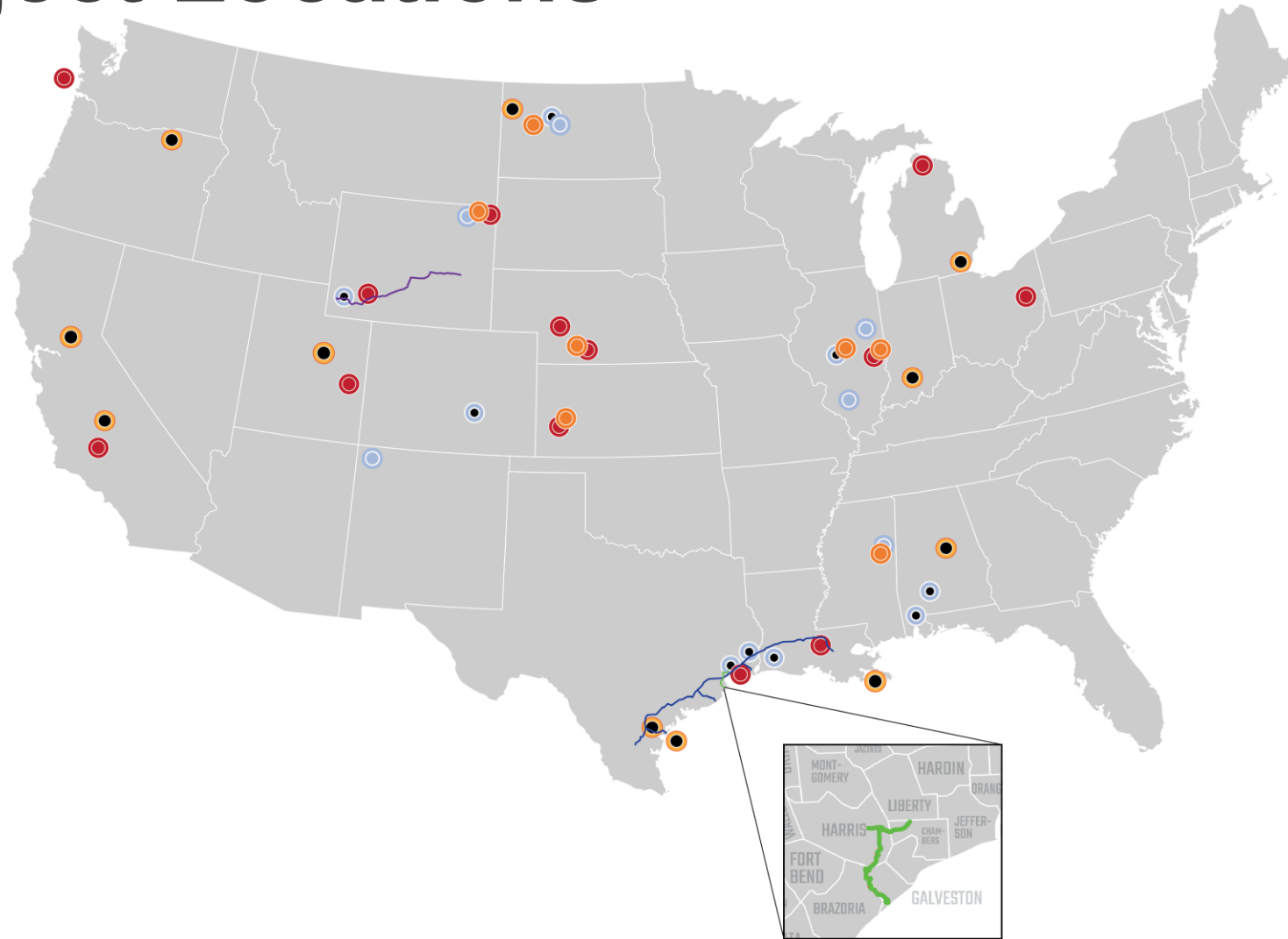
# FECM FEEDs and Pre-FEEDs... Overall Portfolio



# CarbonSAFE Project Locations

## Legend

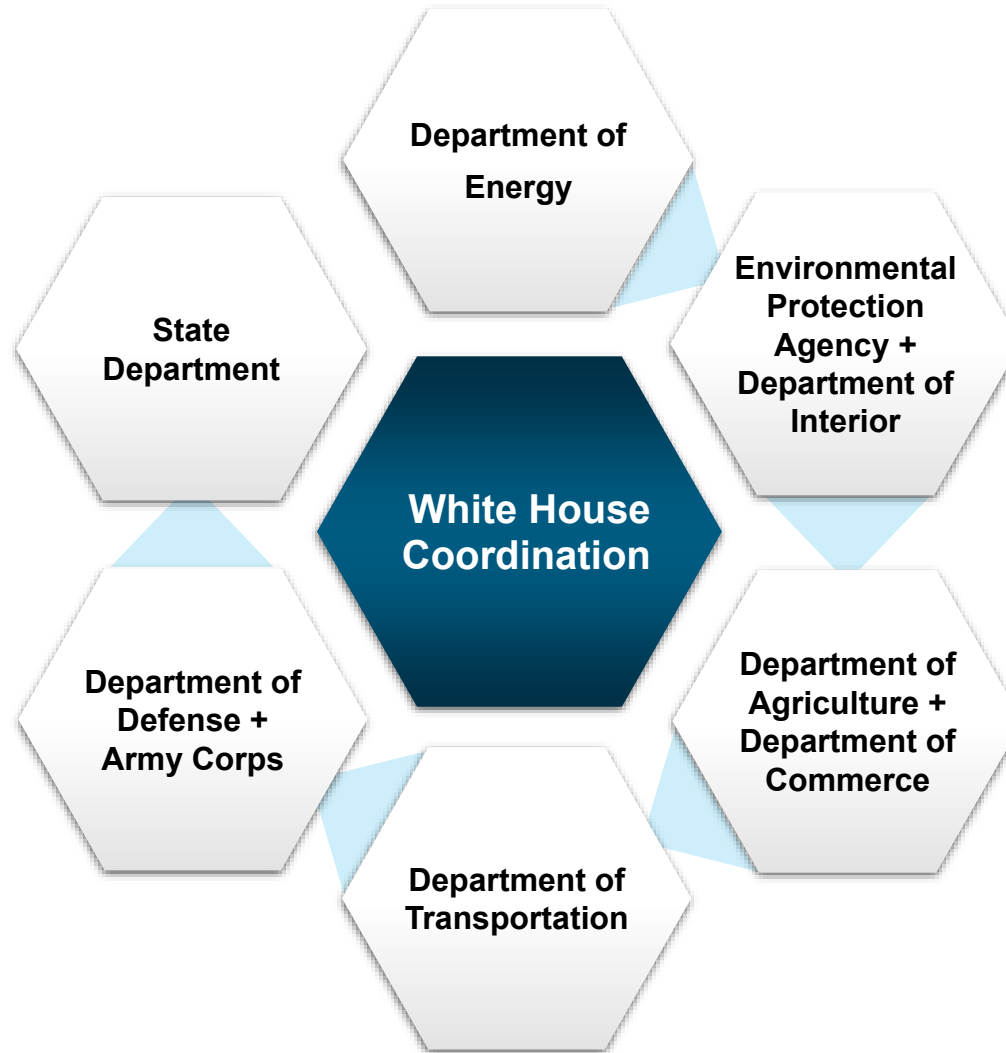
- FEED Pipeline Study - Selected FOA 2730**
- Carbon Solutions - WyoTECH*
- SSEB - Project Diamond*
- HEP - Gulf Coast Decarb System*
- Phase I**
- Phase II:**
- Phase II - Existing
- Phase II - Selected FOA 2610
- Phase III:**
- Phase III - Existing
- Phase III - Selected FOA 2711







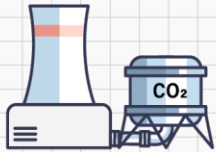
# All-of-Government Support for Carbon Management





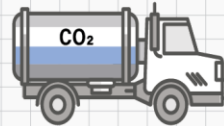
# Regulatory Context

## Regulations Applicable to Carbon Capture, Transport, and Storage Projects



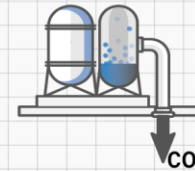
### Carbon Capture

- Clean Air Act
- Prevention of Significant Deterioration
- New Source Review



### Carbon Transport

- Hazardous Liquid Pipeline Act
- Rights of Way



### Carbon Storage

- Clean Water Act
- Federal Land Policy and Management Act
- Marine Protection Research Sanctuaries
- Mineral Leasing Act
- National Forest Management Act
- Outer Continental Shelf Lands Act
- Underground Injection Control Program

## Regulations that Apply Across Carbon Capture, Transport, and Storage

- Coastal Zone Management Act
- Comprehensive Environmental Response Compensation and Liability Act
- Endangered Species Act
- Emergency Planning and Community Right-to-Know Act
- Magnuson-Stevens Fishery Conservation and Management Act
- National Environmental Policy Act
- National Historic Preservation Act
- National Pollutant Discharge Elimination System
- Rivers and Harbors Act of 1899



# Social and environmental impacts essential for project success



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



Community and stakeholder engagement activities



Require monitoring and data collection including non-CO<sub>2</sub> emissions and water usage impacts



# What is included in successful Community Benefits Plans?

## Setting engagement goals

Set internal goals for stakeholder and community engagement, as well as discuss what goals stakeholders and communities have for the engagement process.

## Choosing methods of engagement and building a timeline

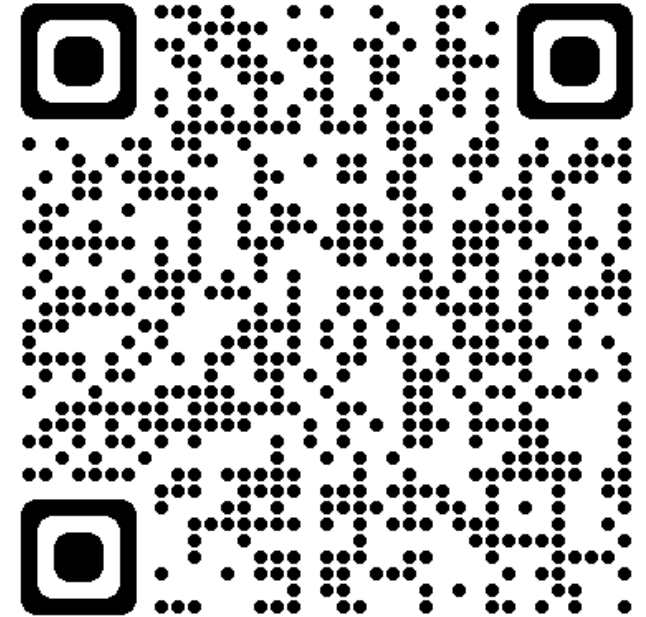
Identify when engagement is expected to occur in the project timeline and what type of engagement is planned.

## Defining resources required to implement plan

Define the scope, schedule, personnel, and budget to enact the plan, as well as key community partners.

## Crafting SMART milestones

Include Specific, Measurable, Achievable, Relevant, and Time-bound (SMART) milestones.



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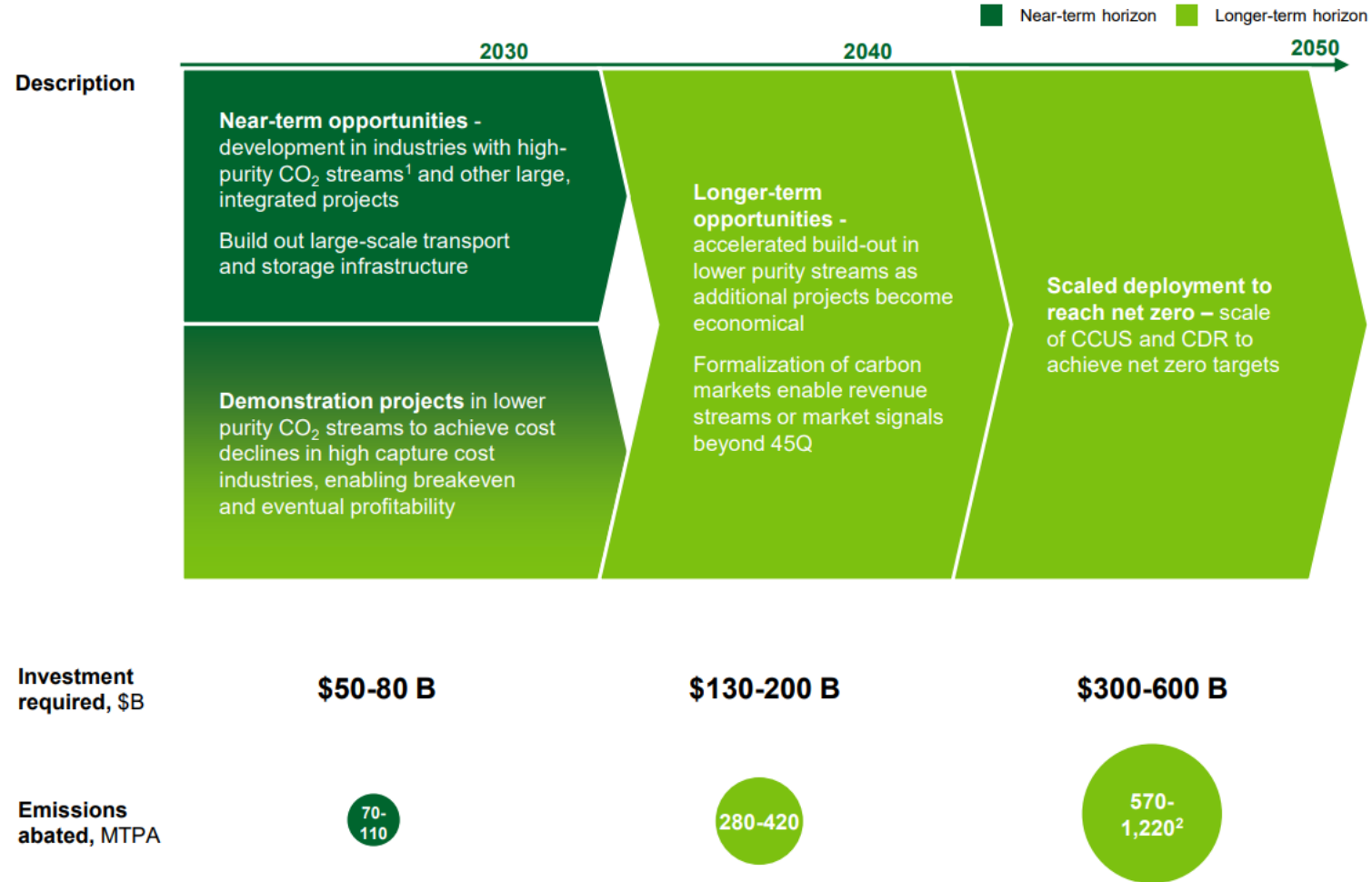


...requires more policy, private investment, and international collaboration to unlock its full potential





# \$100Bs in finance required





# Further policy required to unlock investment

## 2023 Policy Blueprint Recommendations

### Implementing the Supportive Policy Ecosystem



- Support swift and effective implementation of 45Q tax enhancements
- Ensure federal funding is timely, transparent, and in keeping with congressional intent
- Promulgate CO<sub>2</sub> storage regulations for federal lands

### Demand-Side Policies



- Develop a federal role in standardizing the marketplace
- Support purchasing of innovative carbon management products and services

### Jobs, Economic Development, and Affected Communities



- Leverage existing policy levers to expand support for jobs training
- Collect and disseminate information on air and environmental quality
- Provide technical assistance for community engagement

### Transport and Storage Infrastructure



- Support supplemental safety measures for CO<sub>2</sub> pipelines
- Provide clarity for CO<sub>2</sub> storage projects on federal lands
- Support implementation of Title 41 of the FAST Act
- Provide appropriate regulatory clarity for interstate construction

### Resources for Next Generation Technology Deployment



- Build upon momentum provided by federal demonstration programs
- Continue to scale federal funding for core carbon management activities
- Ensure the rapid scale-up of the carbon management industry

### Ensuring Investment Certainty



- Increase credit levels for carbon reuse for commercial products
- Index 45Q to inflation immediately to ensure carbon management's progress
- Provide clarity and certainty to the 45Q reuse pathway
- Catalyze the growth of a diverse carbon management industry
- Ensure the intended impact of the direct pay mechanism

[Source: Carbon Capture Coalition, 2023 US Federal Policy Blueprint](#)



# US International Engagement Priorities

## Bilateral:

- *R&D complementarities:* Canada, Norway, Japan, U.K., Australia, UAE, KSA, and more
- *Enabling activities:* Kenya, Nigeria, Mozambique, Brazil, India, Malaysia, and more

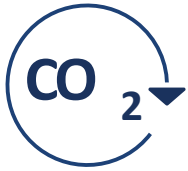
## Multilateral:

- *Information sharing and catalyzing actions:* Clean Energy Ministerial CCUS Initiative, Mission Innovation CDR mission, CDR Launchpad, G7, G20, IEA GHG Programme, and more
- *R&D collaborations:* Accelerating CCUS Technologies (ACT) and Clean Energy Transition Partnership (CETP)
- *Finance:* Development banks



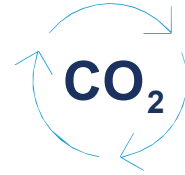


# Demonstrations and Large- Scale Pilots



## Carbon Capture

**Demonstration Projects:** Develop six carbon capture facilities to improve costs, emissions reductions, and environmental effects from coal and natural gas



## Carbon Capture Large-

**Scale Pilot Projects:** Establish and test innovative carbon capture pilot projects large enough to support new processes and technology improvements at scale

This summer, Office of Clean Energy Demonstrations will review applications for **large-scale carbon capture pilots and demos.**

- Demos selection notifications expected August 2023
- Pilots selection notifications expected September 2023
- Award negotiations expected fall 2023
- Learn more: [www.energy.gov/oced/carbon-management-0](http://www.energy.gov/oced/carbon-management-0)



# Regional Direct Air Capture Hubs Program

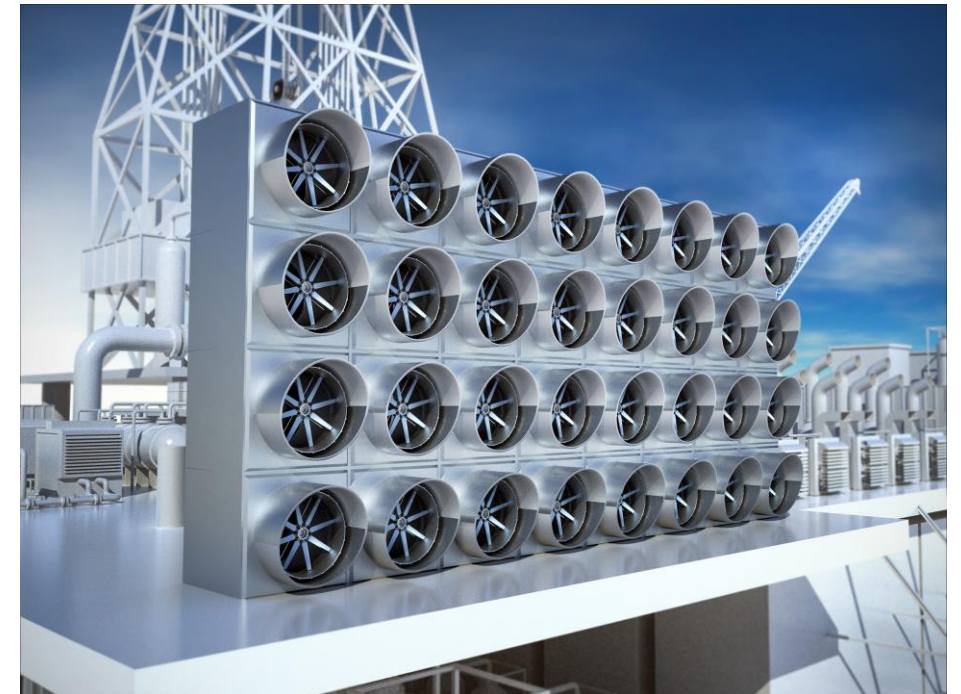
**\$1.2 billion in funding available to begin to conceptualize, design, plan, construct, and operate direct air capture hubs**

Part of larger \$3.5 billion effort to develop four domestic regional direct air capture hubs with potential to capture and permanently store or use 1 million+ metric tons of CO<sub>2</sub> annually

Email: [OCED@hq.doe.gov](mailto:OCED@hq.doe.gov)

Website: [energy.gov/oced/DACHubs](https://energy.gov/oced/DACHubs)

Funding Opportunity Announcement issued	December 13, 2022
Full applications submitted	March 13, 2023
Pre-selection interviews	Summer 2023
Expected date for DOE selection notifications	June 30, 2023
Expected timeframe for award negotiations	November 30, 2023

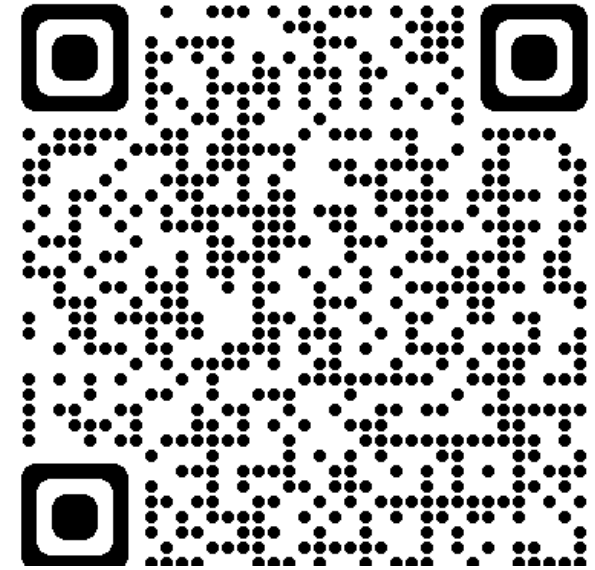




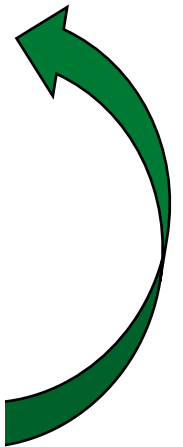


# Open Funding Opportunity Announcements

Announcement Title	Est. Total Federal Funding	Close Date
<a href="#">Direct Air Capture Pre-Commercial Technology Prize</a>	\$3.2M	9/26/23
<a href="#">Carbon Management</a>	\$45.5M	7/18/23
<a href="#">Carbon Storage Validation and Testing</a>	\$2.25B	7/6/23
<a href="#">Direct Air Capture Pre-Commercial EPIC Prize</a>	\$3.7M	6/22/23
<a href="#">Carbon Capture Large-Scale Pilot Projects</a>	\$820M	6/21/23



Sign up for FECM funding updates





U.S. DEPARTMENT OF  
**ENERGY**

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Carbon Management

A collage of four images on the left side of the slide. The top image shows an industrial oil or gas well. The middle image shows two scientists in a lab coat working with a beaker of blue liquid. The bottom-left image shows two people in field gear working with a core sample. The bottom-right image shows a large array of solar panels.

# Thank You!

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## Questions?

Contact Sarah Forbes, Deputy Director  
for Carbon Management Technologies: [Sarah.Forbes@hq.doe.gov](mailto:Sarah.Forbes@hq.doe.gov)

# FECM's Office of Carbon Management

*Focused on minimizing the environmental and climate impacts of fossil fuels and industrial processes, while working to achieve net-zero GHG across our economy*

## The Office of Carbon Management Technologies

Leads and invests in research, development, demonstration, and deployment across five divisions...



Hydrogen with Carbon Management



Carbon Transport and Storage



CO<sub>2</sub> Removal and Conversion



Integrated Carbon Management



Point-Source Carbon Capture

## The Office of Strategic Planning, Analysis, and Engagement

Leads in strategic activities and international, domestic, and intergovernmental coordination across two divisions...



Systems, Economic, and Environmental Analysis



Strategic Engagement