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Carbon Management

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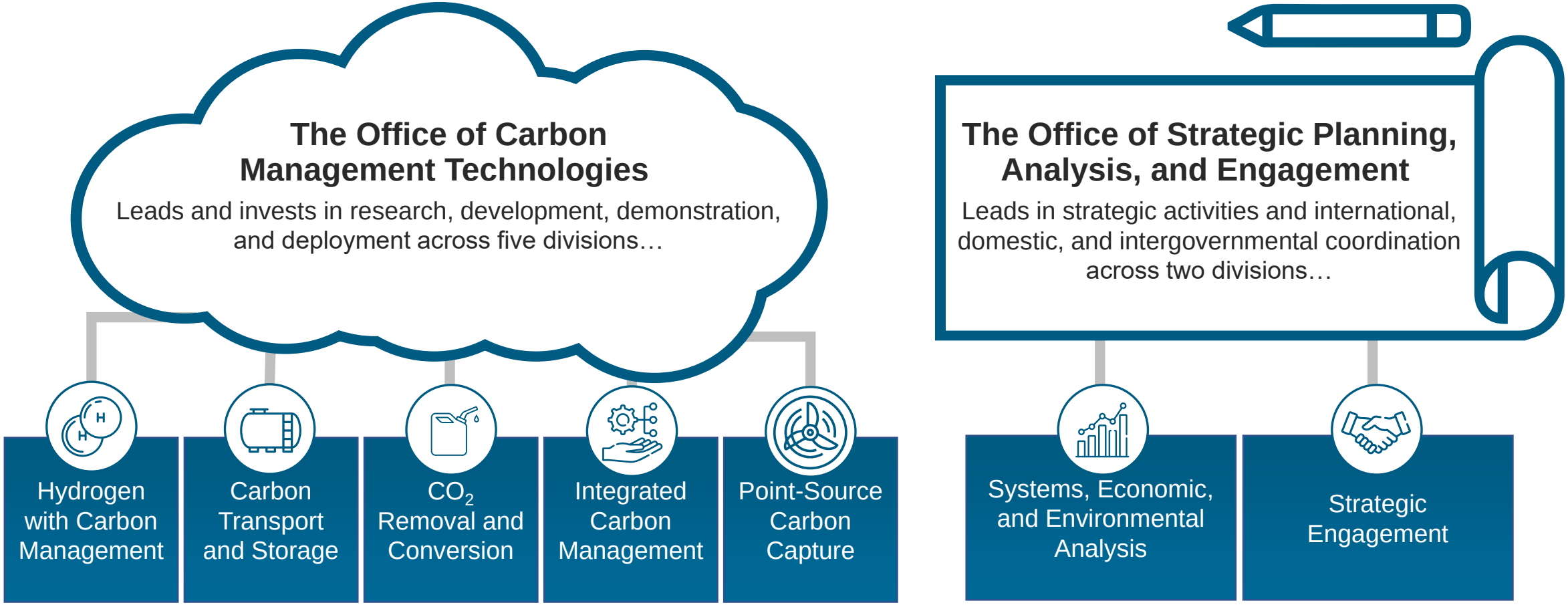
OFFICE OF FOSSIL ENERGY AND CARBON MANAGEMENT

U.S. DEPARTMENT OF ENERGY
Fossil Energy and Carbon Management

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



DOE is confident carbon management is technically feasible

Carbon Capture Retrofit on Ethanol Production

Archer Daniels

2010

Carbon Capture Retrofit on Hydrogen Production

Air Products

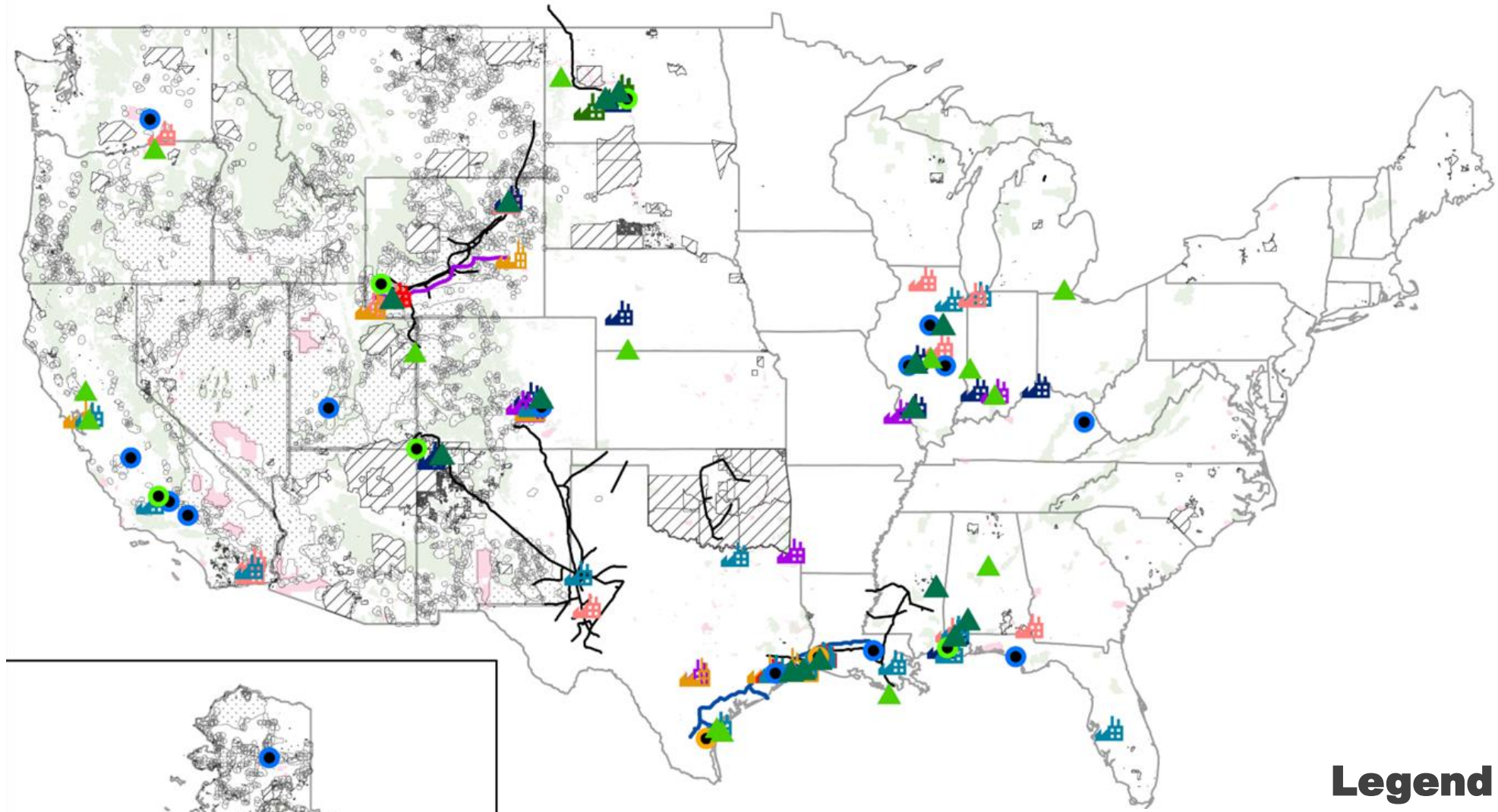
2013

Carbon Capture Retrofit on Coal-Fired Power Plant

Petra Nova

2016

Carbon Management –



Funding for Carbon Management Approaches

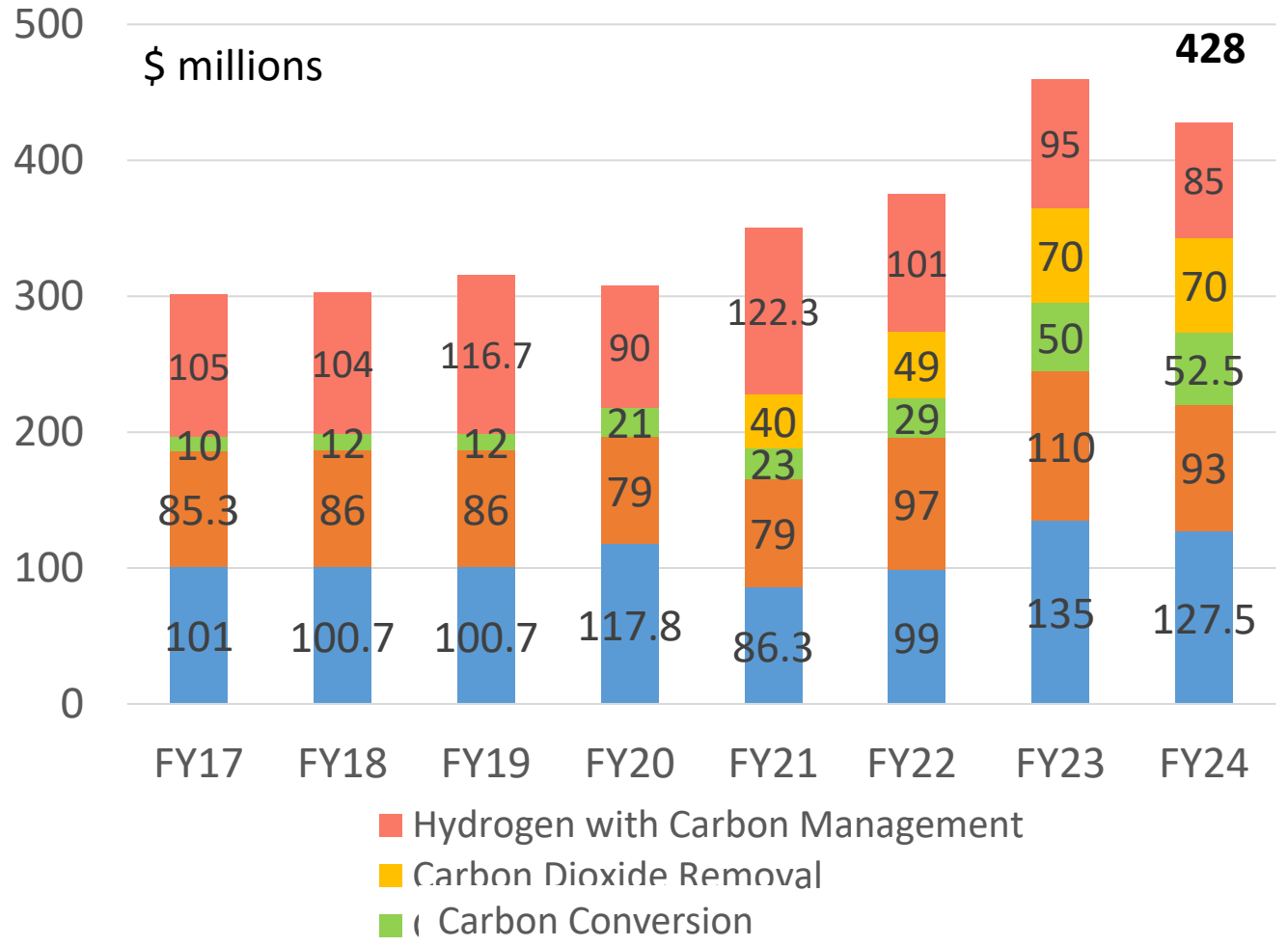
H_2 with Carbon Management
Conversion of carbon-based feedstocks to H2 coupled with carbon management

Carbon Dioxide Removal
Removal of atmospheric CO_2 and durable store

Carbon Conversion
Conversion of CO_2 to value-added products

Carbon Storage
Safe, cost- effective, and permanent geologic storage of CO_2

Carbon Capture
Capturing CO_2 from new and existing industrial and power plants



Point Source Carbon Capture

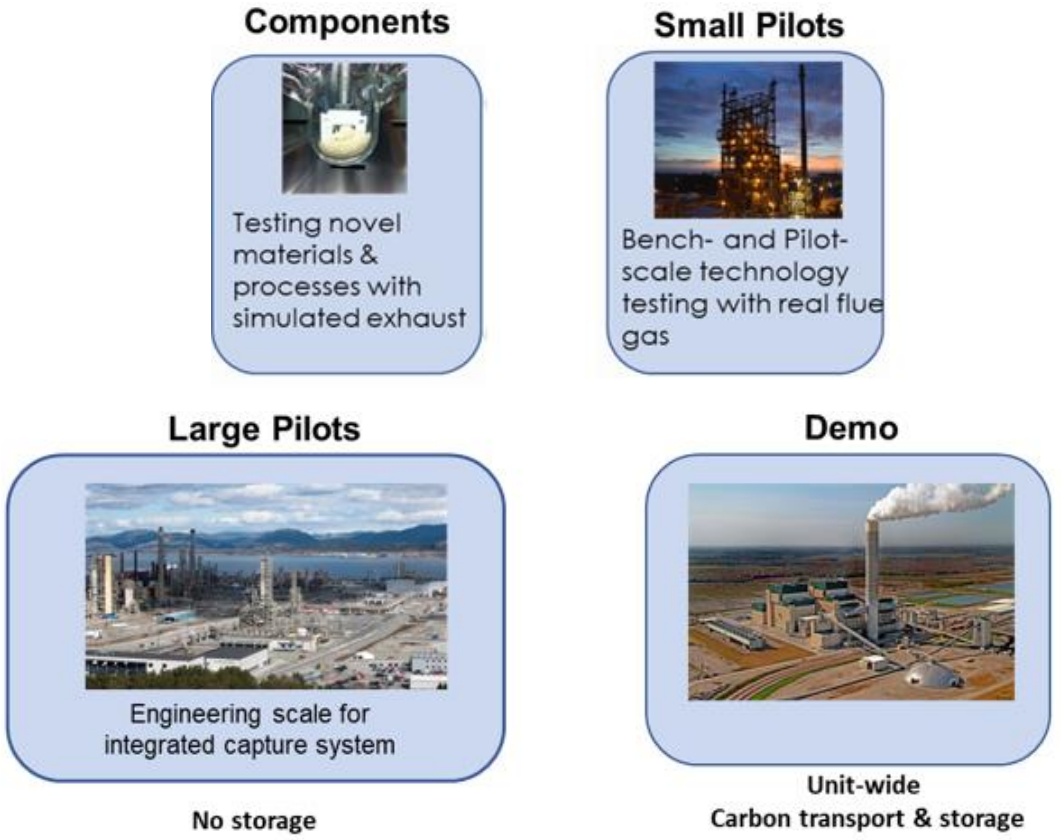
Advancing technologies for the capture of CO_2 from point sources, such as natural gas power and industrial facilities, with minimum cost and energy penalty.

Major program areas:

- Capture from power generation sources
- Capture from industrial sources
- Emissions control
- R&D solvents, sorbents, membranes, novel concepts

FY24 Congressional Budget:

$127.5M



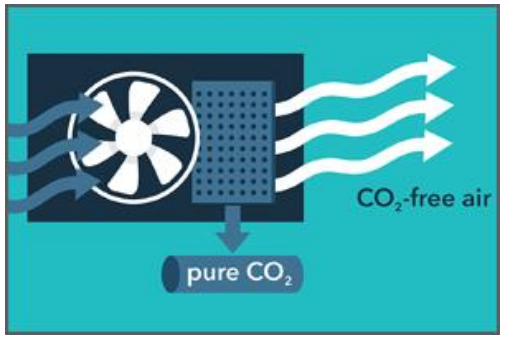
Carbon Dioxide Removal (CDR)

Advance diverse CDR approaches in service of facilitating gigaton-scale removal by 2050, emphasizing robust analysis of life cycle impacts of various CDR approaches and a deep commitment to environmental justice, including rigorously evaluating CDR, defining conditions for success and leveraging leadership and expertise.

Major program areas:

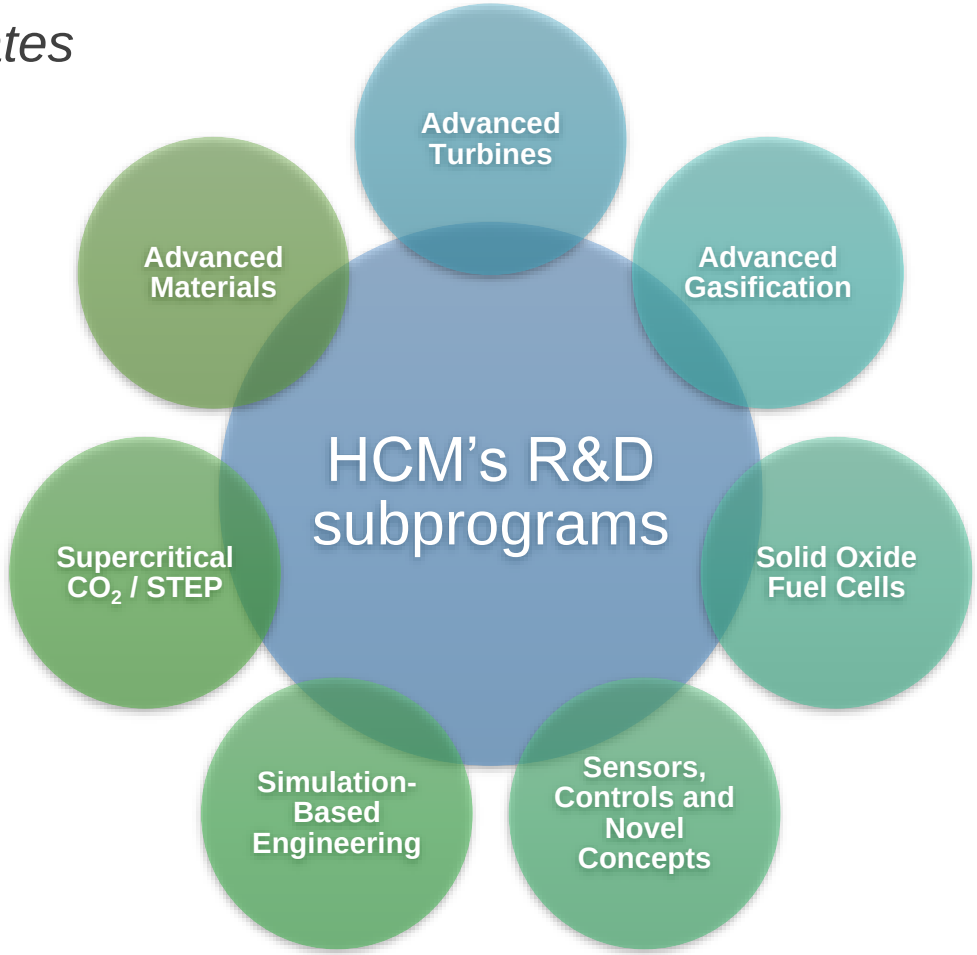
- Direct air capture
- Biomass Carbon Removal and Storage (BiCRS)
- Ocean CDR
- Enhanced Mineralization

FY24 Congressional Budget: **$70M**



Hydrogen with Carbon Management

Hydrogen with Carbon Management (HCM) division integrates carbon neutral or net-negative greenhouse gas (GHG) emissions technologies with carbon capture and storage (CCS) capabilities and improved fuel conversion efficiency.



Major program areas:

- Improving efficiency
- Increasing plant availability
- Achieving ultra-low emissions
- R&D overall system efficiency, reducing capital and operating cost, enabling affordable carbon capture

FY23 Congressional Budget: **$85M**

CO_2 Conversion

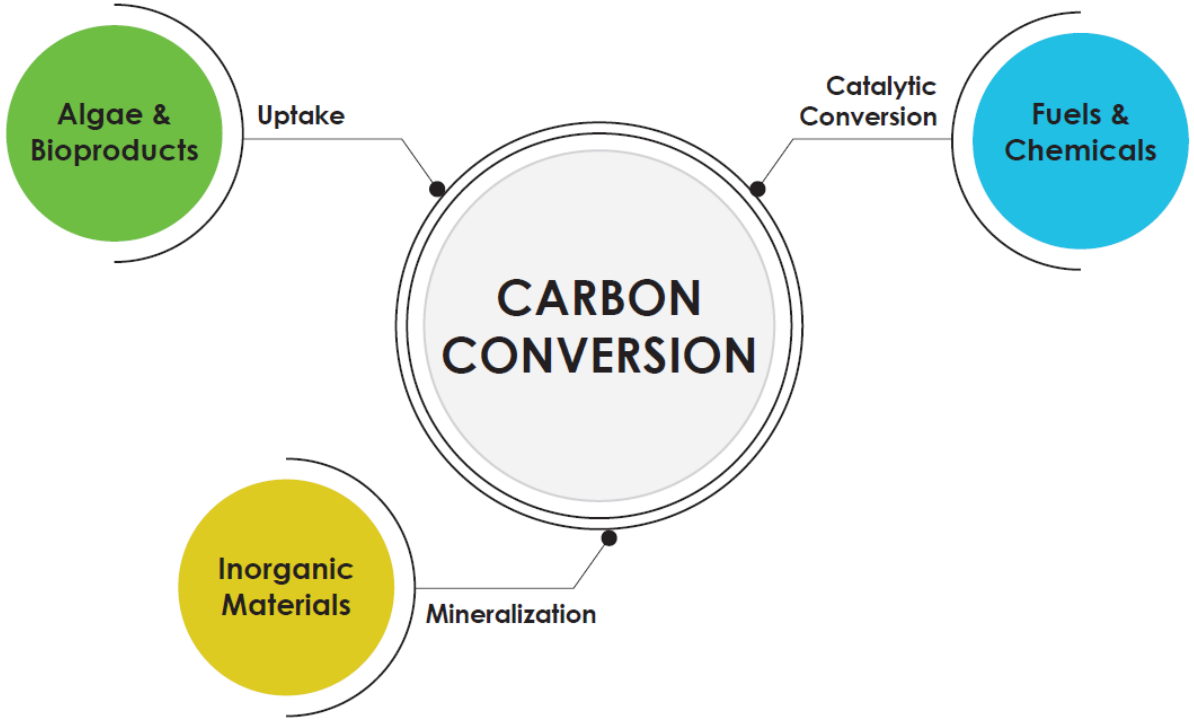
Research, develop and demonstrate a broad suite of technologies that convert CO_2 into environmentally responsible, equitable and economically valuable products and enable low-carbon supply chains to meet the goal of a decarbonized economy by 2050.

<u>Three major program areas</u>:

- Biological Uptake
- Catalytic Conversion
- Mineralization

<u>FY23 Congressional Budget</u>:

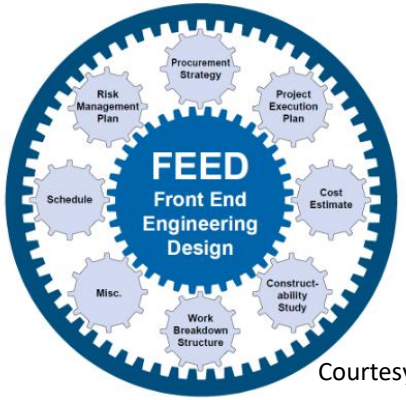
$52.5M



CO_2 Transport Program

Pre-Front-End Engineering Design Studies:

- Supports conceptual design & development of commercial-scale, intermodal CO_2 transport HUBs
- HUB designs may include multiple integrated transportation modes, including but not limited to pipeline, rail, maritime, truck and facilitate offtake of CO_2 streams at various conditions and compositions.



Courtesy: Valency

Front End Engineering Design Studies:

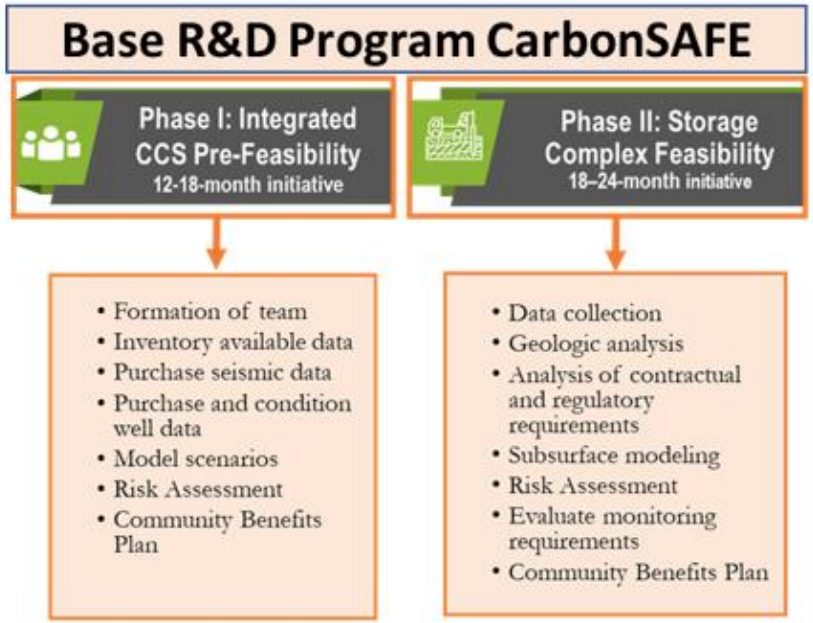
- BIL provides $100 million for carbon transport infrastructure FEED studies
- Accelerate the planning and development CO_2 transportation infrastructure by a variety of modes, such as through rail, trucks, ships, and pipelines

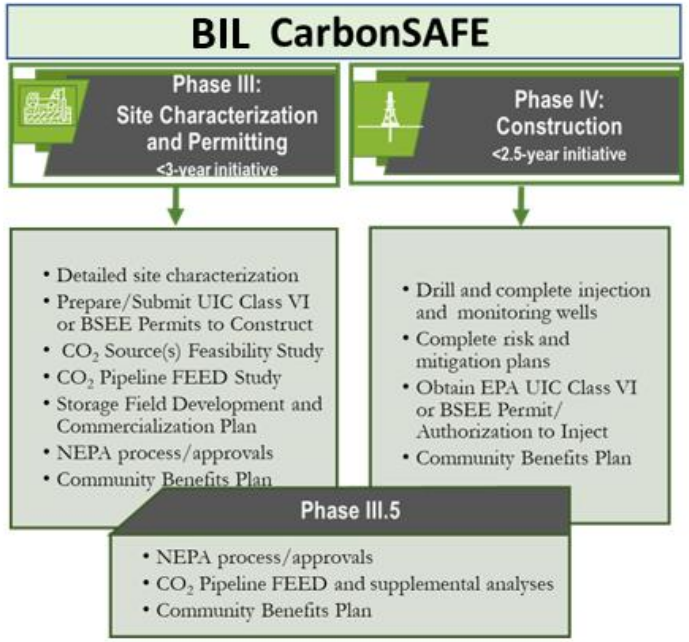
CO2 Infrastructure Finance and Innovation Act (CIFIA):

- DOE Loan Program Office financing large scale transport construction
- CIFIA supports CCUS and DAC technology deployment by financing projects that build shared CO_2 transport infrastructure
- BIL provides $2.1 billion for CO_2 transport infrastructure projects including:
  - Secured loans and loan guarantees (“CIFIA Loans”)
  - Grants for building excess capacity on new and existing CO_2 infrastructure
- Managed via a partnership between DOE’s Fossil Energy and Carbon Management Office, DOE's Loan Programs Office, and the National Energy and Technology Lab

LPO Loan Programs Office — BUILDING A BRIDGE TO BANKABILITY

Carbon Storage Program





2003

- DOE-led regional partnerships to validate CO_2 geologic storage.
- Completed injection test projects, with no negative impacts to human health or the environment.

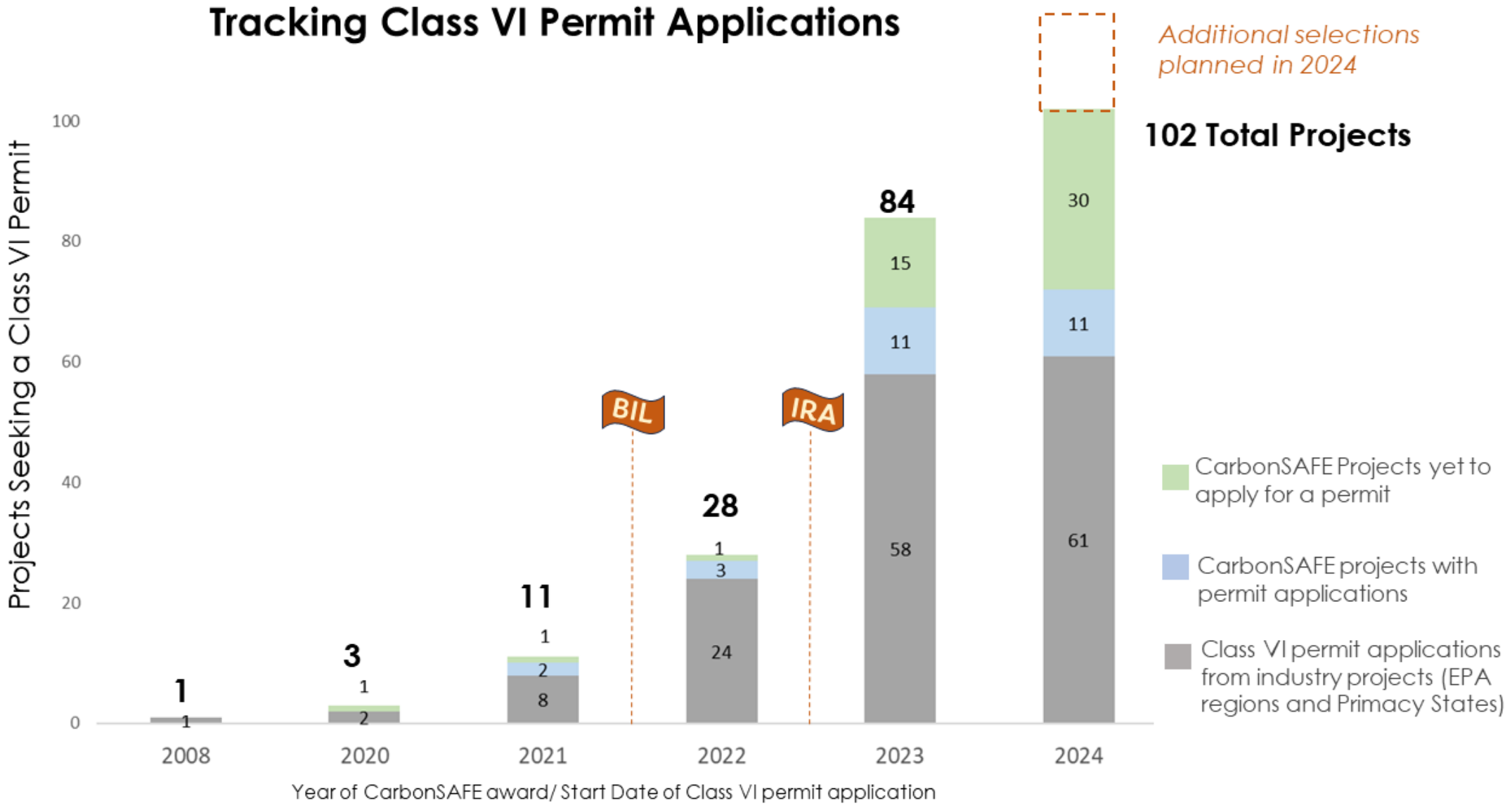
2016

- Successful tests led to the CarbonSAFE program.
- Focused on ensuring CO_2 storage sites will be ready for integrated CCS system deployment in the 2025-2030 timeframe.

2023

- BIL builds on last 20+ years of CO_2 research.
- Enables commercial deployment of CO_2 storage.

Carbon Storage Project Growth



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Thank You!

Questions?

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