

Federal Investments in Carbon Management

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THE WORLD NEEDS MORE COWBOYS.

CCS Infrastructure Considerations

- CCUS Infrastructure Requirements
- WY Class II EOR success and opportunity
- Federal Funding Drivers and Opportunities
- Complimentary WY Funding Opportunities
- Community Benefits – Impacts on Funding Decisions/Requirements

CCS infrastructure Requirements

...between 390,000 and 1.8 million good-paying jobs

Storing 1 to 2 billion tons of CO₂ per year by 2050



CCS Capture Requirements

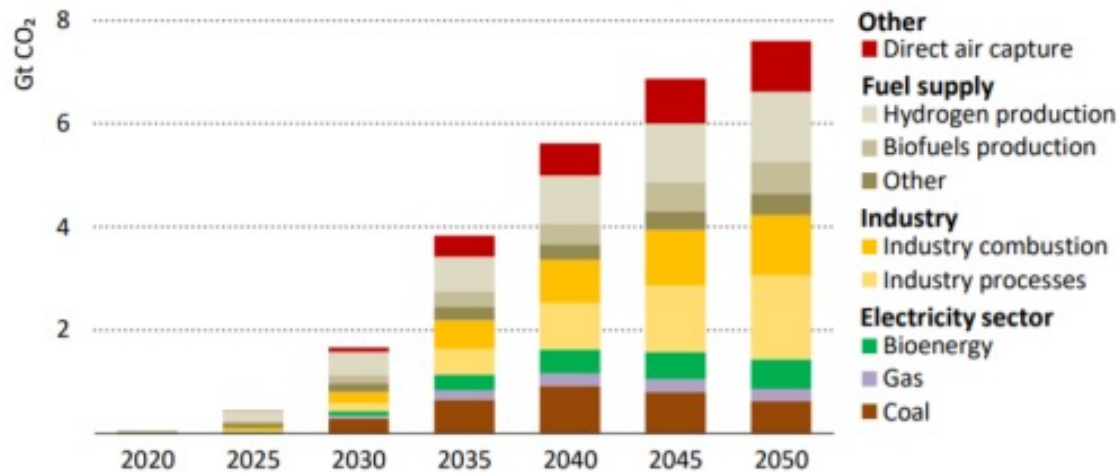


Figure 6: IEA NZE global CO₂ capture by source, 2020–2050

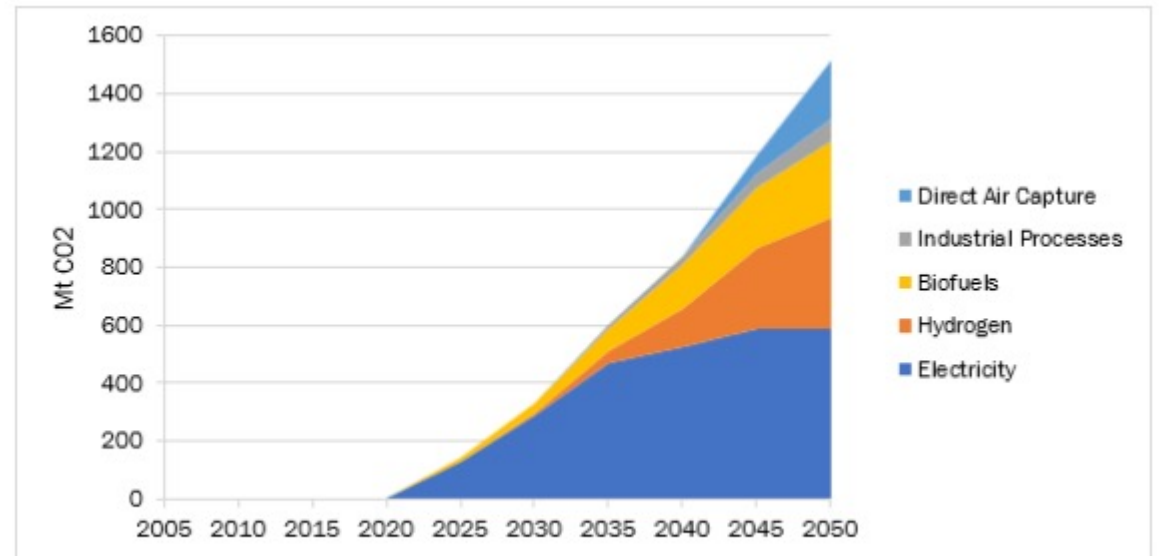


Figure 7: U.S. CCS separated by CO₂ source as predicted by one of the scenarios in the Long-Term Strategy.

1000s carbon capture systems

Feb 2022 - U.S. Department of Energy Response to Executive Order 14017, "America's Supply Chains - Carbon Capture, Transport, & Storage Supply Chain Deep Dive Assessment"

July 7, 2023 – EPA Releases - Greenhouse Gas Standards and Guidelines for Fossil Fuel-Fired Power Plants

Demand for CCS Capture Systems



Table 19: Carbon capture economy: Number of projects and employees (5-year intervals)

Category		2030	2035	2040	2045	2050	Grand Total
Projects	Total Estimated CO ₂ Capture Projects	35	556	465	431	271	1758
	Estimated Industrial Facility Projects (GPI extrapolation)	25	394	330	306	192	1247
	Estimated Power Plant Projects (GPI extrapolation)	10	162	135	125	79	511
Employees	# of Operations Employees (GPI extrapolation)	3,105	49,330	41,256	38,240	24,044	155,975
	# of Project/Infrastructure Employees (GPI extrapolation)	4,704	74,726	62,495	57,926	36,422	236,273
	# of Operations Employees (Global CCS extrapolation)	700	11,120	9,300	8,620	5,420	35,160
	# of Project/Infrastructure Employees (Global CCS extrapolation)	35,000	556,000	465,000	431,000	271,000	1,758,000

- 50X growth in capture projects
- MEA – 40X annual production growth
- OEM and EPC requirements
- Steel, concrete, pump, compressors
- Human capital

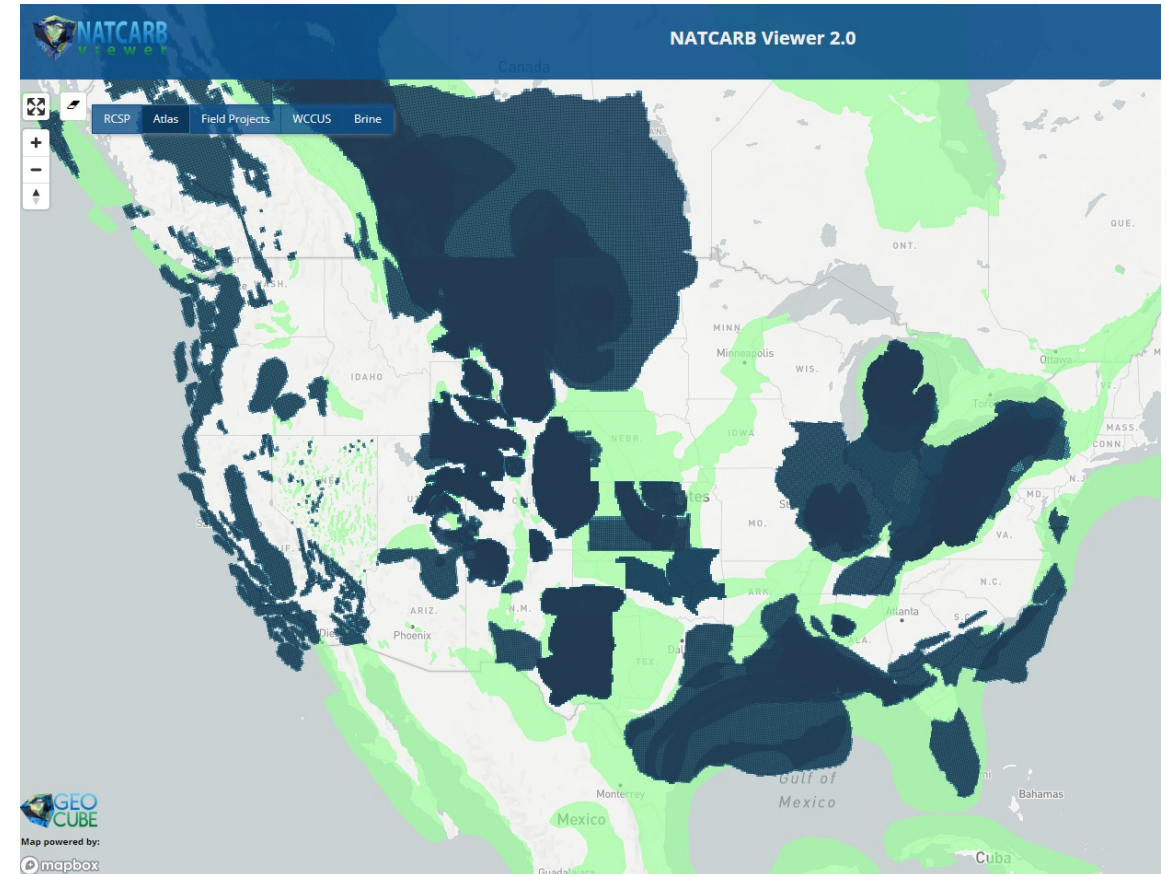
Pipeline and Storage Resources



Figure 20: Princeton University NZA pipeline network for 1.6 Gtpa by 2050 (for reference)

70,500 to 96,700 miles of CO2 pipelines
required by 2050 to meet NZA goals
~22.73 to 30.16 millions tons of steel required

Princeton Netzero America



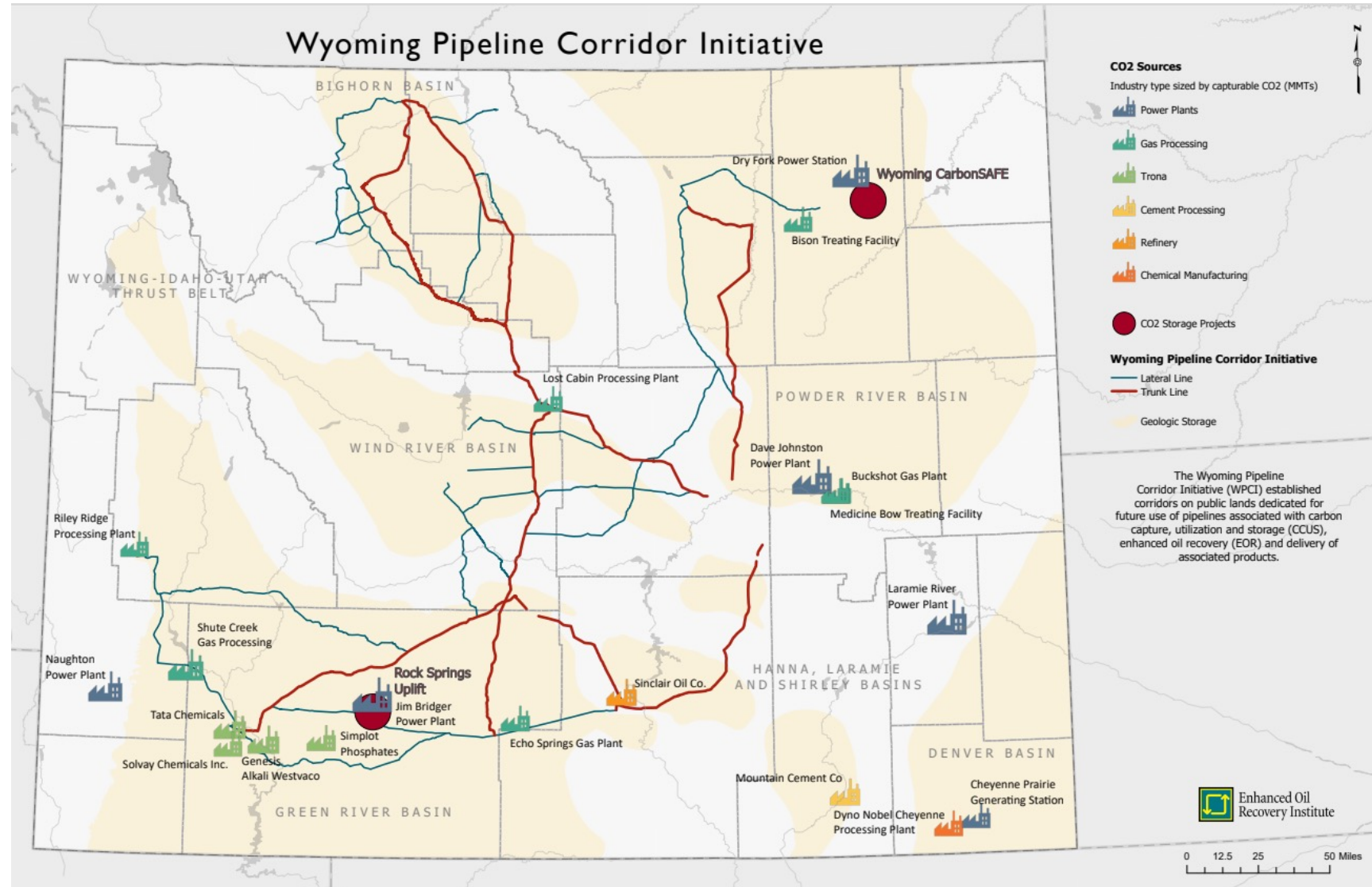
By 2050 - 30+ GT of Commercial Storage Capacity
1000+ of Class VI injection wells

Wyoming CO2 Pipeline and Corridors

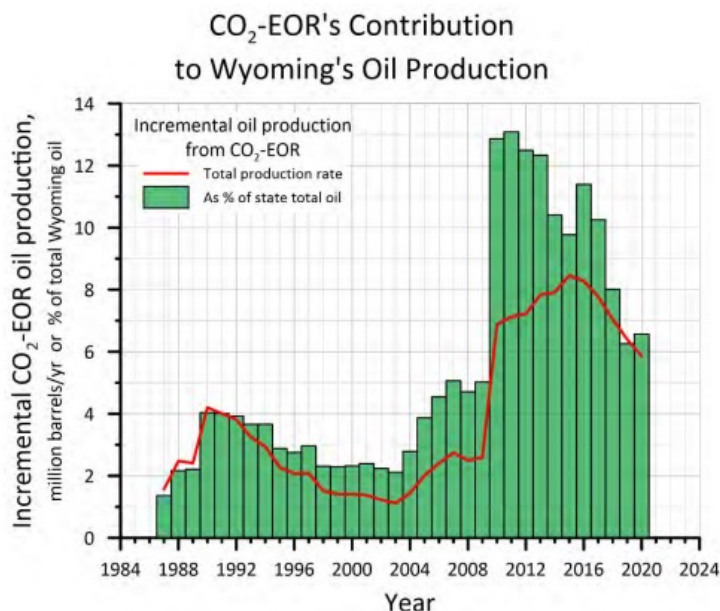
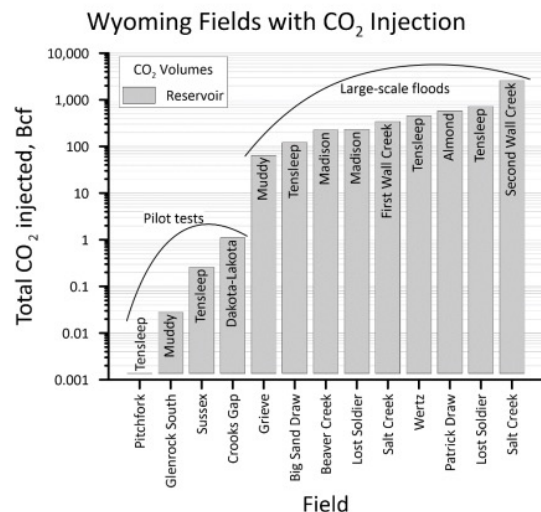
“...designates almost **2,000 miles of corridors across private, state, and BLM-managed lands** in Wyoming for potential pipeline development associated with **carbon capture, utilization and storage**, as well as pipelines and facilities associated with **enhanced oil recovery**. The BLM’s decision only applies to **1,111 miles located on public lands** managed by the agency.”

Enhanced Oil Recovery institute

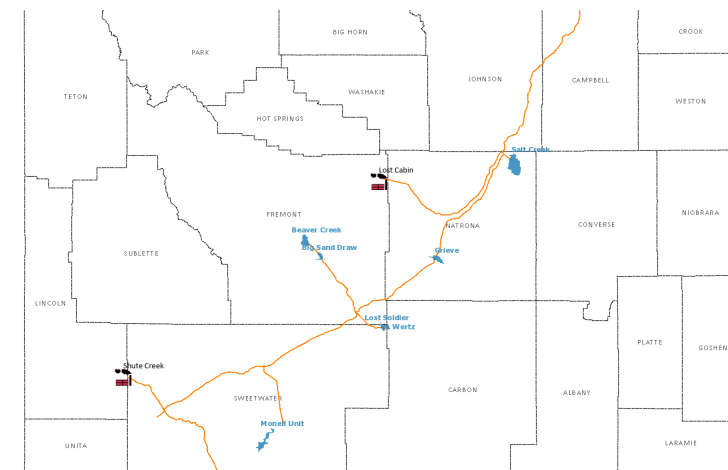
Co-lead \$3M WyoTCH FEED Study in central Wyoming



Building CCS Infrastructure on Class II Success



Wyoming CO₂ Pipelines and EOR Sites



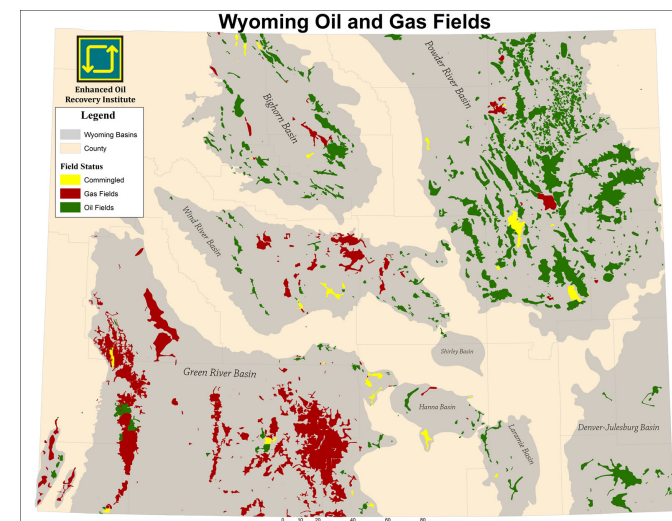
Class II for Geologic Storage

Feb 2022

“ExxonMobil to expand carbon capture & storage at LaBarge, Wyoming, facility”

Sep 2022

“BLM Approves First Application for CO₂ Underground Storage on Public Lands in WY”



Federal Funding Drivers and Opportunities

Bi-partisan Infrastructure Law - \$12.1 billion in Carbon Management funding (CO₂)

- OCED - Large Scale Carbon Capture Pilots¹ - \$937 million
- OCED - Commercial CCS Demonstration Project¹ - \$2.5 billion
- OCED - Direct Air Capture Hubs¹ - \$3.5 billion
- FECM - Carbon Storage Validation and Testing² - \$2.5 billion
- FECM - CO₂ Transport Front End Engineering and Design (FEED) studies² - \$100 million
- FECM/LPO - CIFIA (loans and expansion grants)³ – \$2.2 billion

Other BIL funded OCED Programs

- Hydrogen Hubs¹ - \$8 billion (at least one blue hydrogen, one nuclear, one renewable energy hub)
- Industrial Demonstrations (Deep Decarbonization) - \$6.3 billion
- Clean Energy Demonstration Program on Current and Former Mine Land - \$500 million

OCED Large Pilots and CCS Demonstration

Large Carbon Capture Pilots

BIL Section 41004a - \$937 million

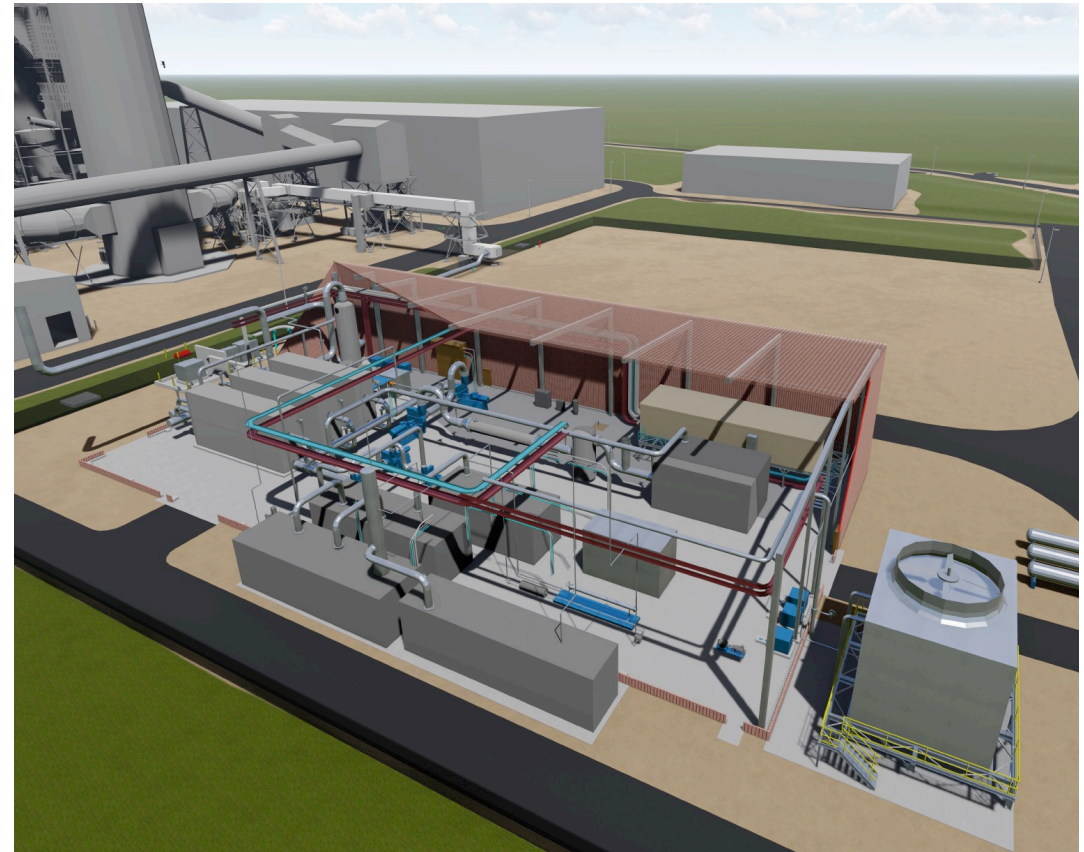
- Transformational capture systems
- Coal, natural gas, or industrial
- Full applications submitted Jun 21 and being evaluated

CCS Integrated Demonstrations

41004b – \$2.5 billion

- Two projects for natural gas electric generation facility
- Two projects for coal electric generation facility; and
- Two projects for industrial facility not purposed for electric generation.

Two FOA Closings – FEED and fully integrated Demos



OCED Direct Air Capture [DAC] Hubs

BIL Section – 40308

\$3.5 billion of 5 Fiscal Years

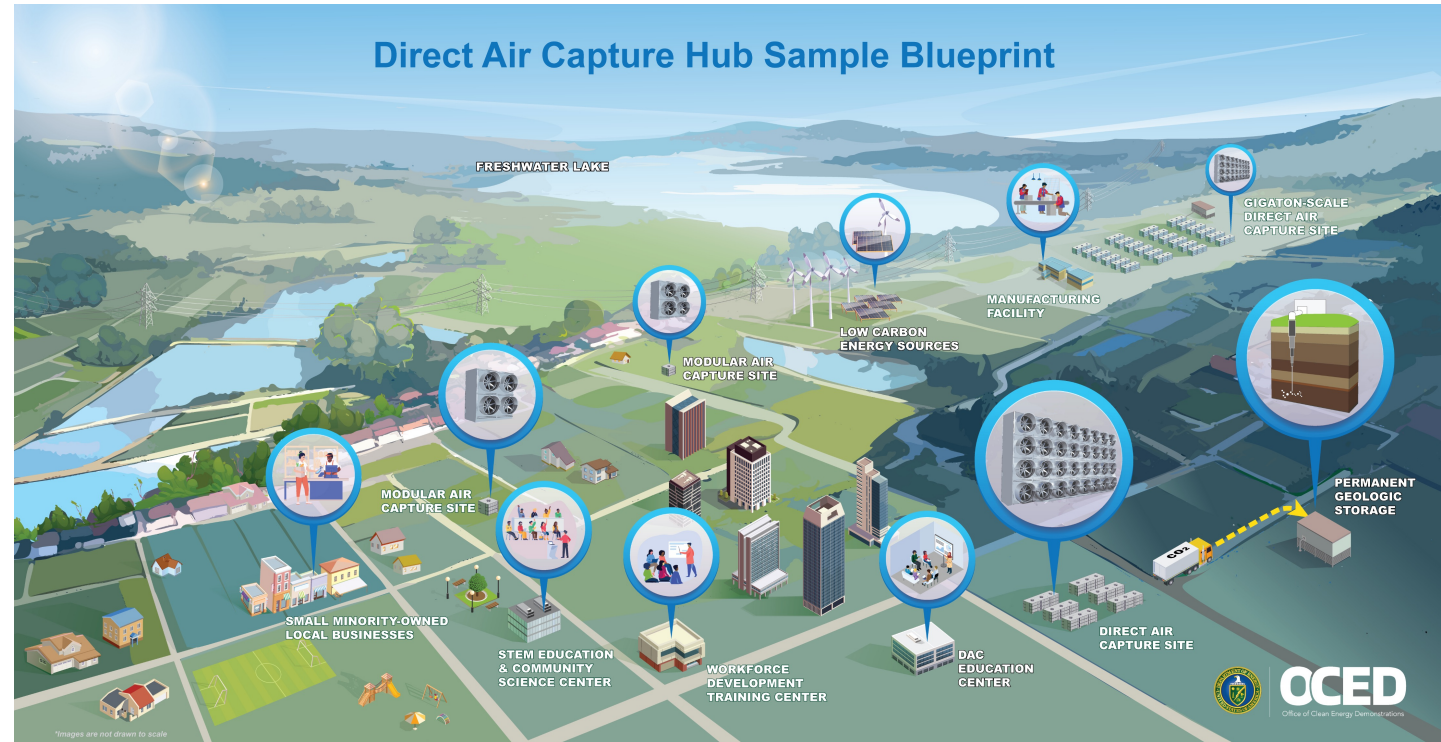
4 Regional DAC Hubs

August 2023 Announcement

21 Projects Selected for negotiations

- 2 full scale DAC Hubs (TX, LA)
- 5 Design Studies
- 14 Feasibility Studies

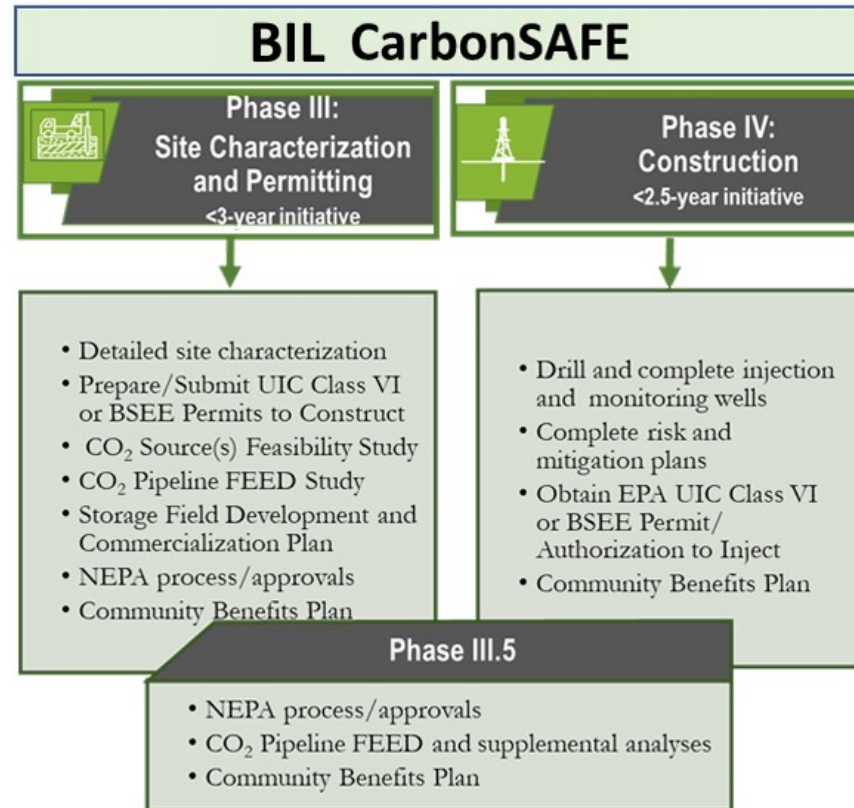
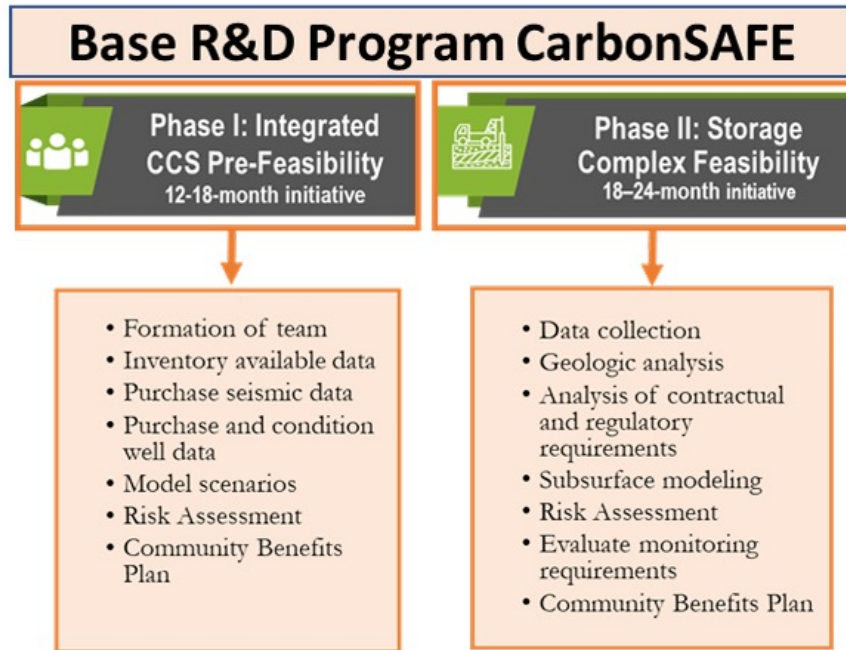
Building an ecosystem for DAC



The Wyoming Regional Direct Air Capture Hub – Carbon Capture Inc. (Design Study)

40305 – Carbon Storage Validation and Testing – \$2.5B

Enhanced CarbonSAFE Program



BIL 40305—Storage Validation and Testing

\$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

~80-100 Class VI Wells

Current Status:

Round 1 - Selected 9 projects \$242 million

University of Wyoming Selected - \$47.6M

Round 2 - applications under evaluation

Round 3 - Expected release Q2 FY2024

Source: US DOE Office of Fossil Energy and Carbon Management

Carbon Transport Funding

BIL Section 40303 – Carbon Transport FEED Studies

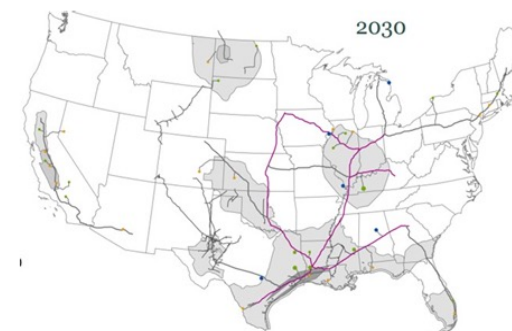
- \$100 million for Front Engineering and Design Studies of CO₂ transport systems
- All form of transport (rail, truck, ship, pipeline)
- Class III FEED studies requested by DOE
- Light version of CBP's

Current Status

- First round focused on pipeline (3 projects selected)
- Second round open for applications

BIL Section 40304 - CO₂ Infrastructure Finance and Innovation Act (CIFIA)

- Loan subsidies guidance available
- Future growth grants - \$500M FOA



2030: ~11,000+ miles of CO₂ pipelines

Modeling from Princeton's Net-Zero America Study (2020)

Other Federal Funding Opportunities

Inflation Reduction Act

- IRS Tax Credit enhancements – 45Q (CCUS) and 45V (Low GHG hydrogen)
- \$9.7 billion for rural development grants and loans for clean energy – USDA Rural Cooperatives
- Enhancements to DOE Loan Program Office - \$250B
- Low carbon building products - GSA and DOT with EPA certification - \$4B

DOE Annual Appropriations

- FECM ~\$450M annual carbon management budget
- Carbon Management requirements throughout Science, ARPA-E, and EERE office requests
- Crosscutting working groups throughout department
- Inter agency and department Carbon Management working groups (100+ federal employees)

EPACT 2020 Authorization - Fund one or more carbon capture test centers (\$25M for 5 years)

Wyoming Complimentary Opportunities

Governor's Energy Matching Funds \$150M – 50% BIL/IIJA cost share

- carbon capture utilization and storage
- carbon dioxide transportation
- industrial carbon capture
- coal refinery
- hydrogen production, transportation, storage, hydrogen hub development
- Biomass and biochar
- Hydropower
- lithium, processing and separation, battery storage or wind and solar energy

Bonds - \$3 billion

- transmission lines
- pipelines
- export facilities

2023 State Energy Program Grants

- Energy audits and retrofits

Community Benefits Plans – Impacts of Funding

Four Major Elements (20% of merit review)

- Community and Labor Engagement
- Investing in America's Workforce
- Advancing Diversity, Equity, Inclusion, and Accessibility (DEIA)
- Implementing Justice 40 Initiative

Specialized teams to review CBPs and work with recipients on plans and implementation

Implemented by Executive Orders

(No authorization or appropriations)

- 11246, 14005, 14008 Sec223, 14025, 14036, 14052, 14075 Sec 16

Elements to Note/Encouraged

- Apprenticeship programs
- Minority Institution consideration
- Community Benefits Agreements
- Community Workforce Agreements
- Good Neighbor Agreements
- Project Labor Agreements
- Collective-Bargaining Agreements

Questions?

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