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The Role of Responsible Carbon Management in Achieving Net-Zero Emissions Goals

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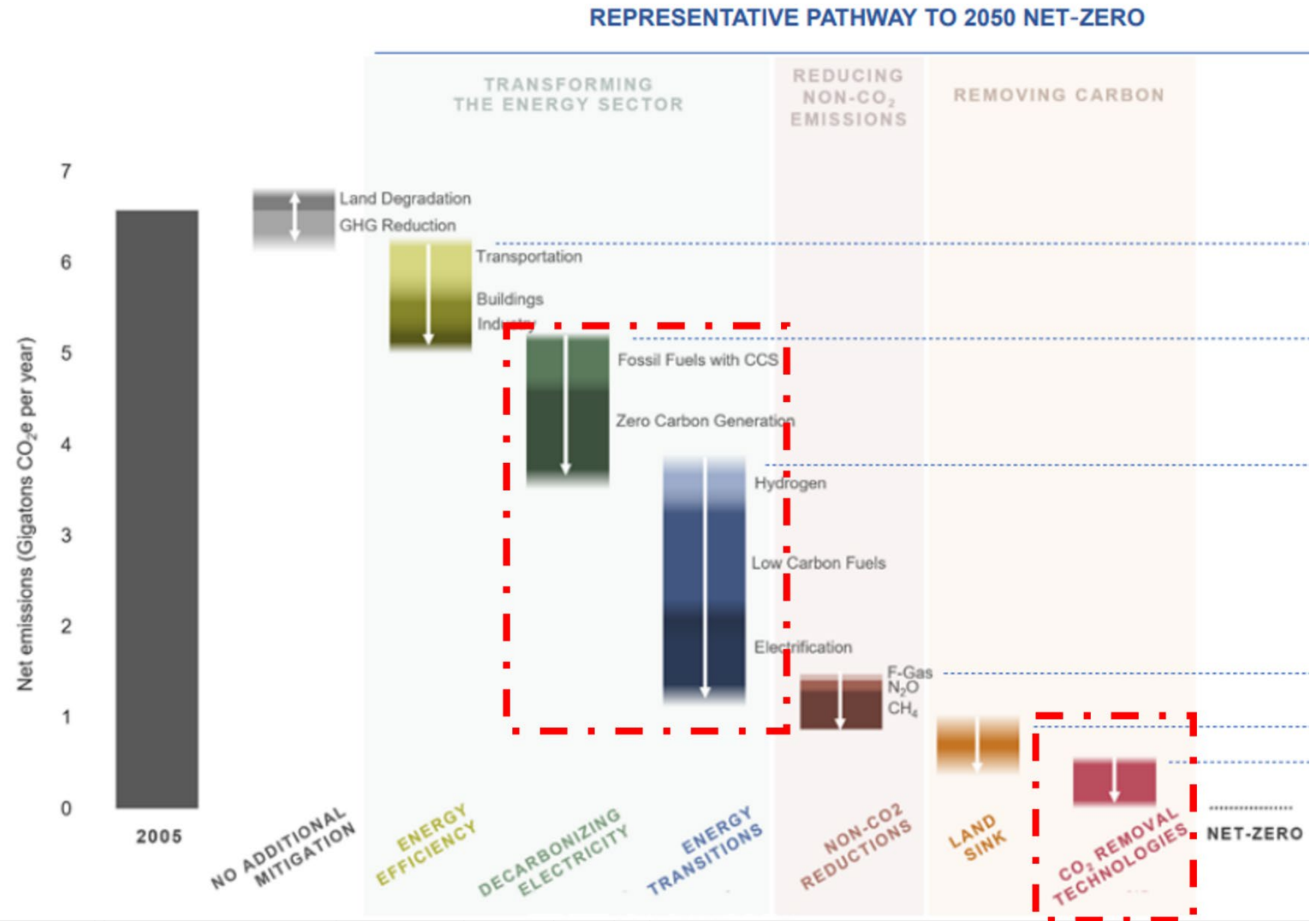


U.S. DEPARTMENT OF
ENERGY

Fossil Energy and
Carbon Management

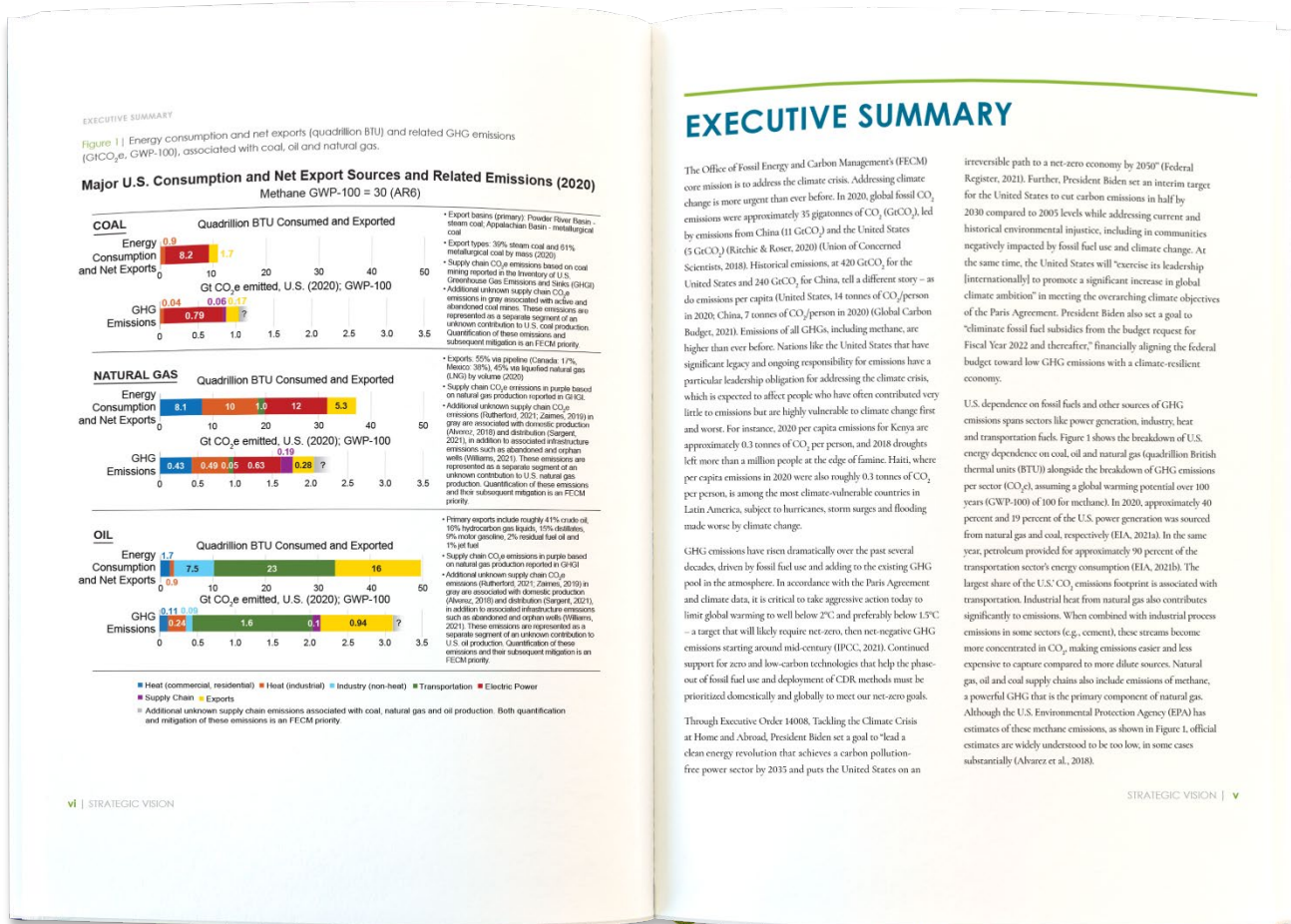
Role of Carbon Management in Achieving Net-Zero

- Point-source carbon capture necessary for infrastructure and industries with limited decarbonization options today, like cement
- Carbon dioxide removal critical for counterbalancing hard to decarbonize sectors, like agriculture, to reach net-zero
- Coupled legislation, e.g., BIL and IRA are critical for FOAK demonstration and ultimately, wide-scale deployment



<https://www.whitehouse.gov/wp-content/uploads/2021/10/US-Long-Term-Strategy.pdf>

Fossil Energy and Carbon Management Overview



- 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

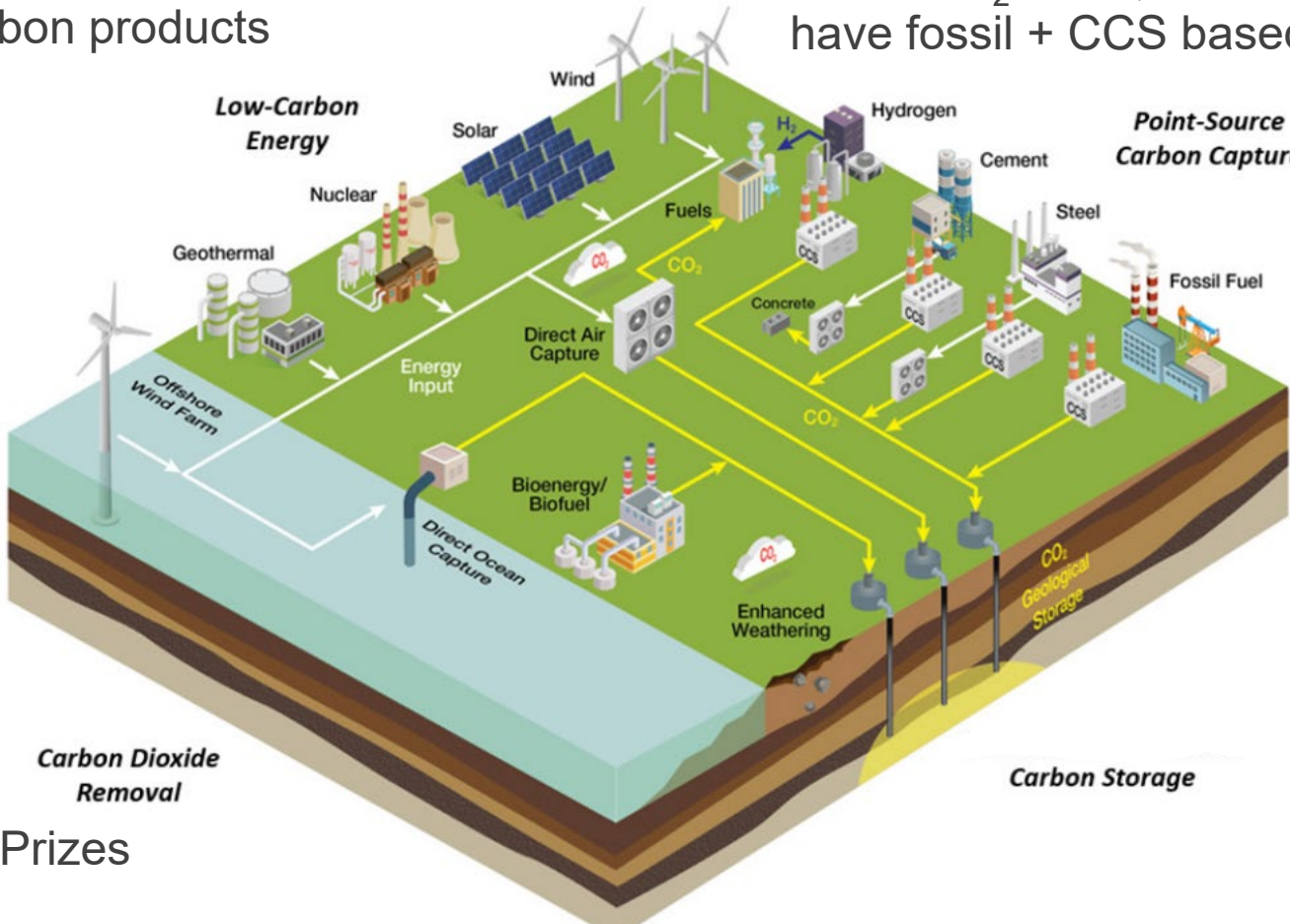
Source: [FECM 2022 Strategic Vision](#)

Bipartisan Infrastructure Law funding

\$300M for CO₂ conversion grants for low embodied carbon products

\$8B for H₂ Hubs, of which at least one will have fossil + CCS based H₂ production

\$2.5B for CO₂ transportation loan support via CIFIA program
\$100M for CO₂ transportation engineering studies



\$2.5B for commercial CCS demonstrations
\$1B for small CCS pilots

\$3.5B for Direct Air Capture Hubs
\$115M for Direct Air Capture Technology Prizes

\$2.5B for expanding DOE's CarbonSAFE storage characterization and buildout initiative

Carbon Capture and Removal with Equity and Justice

A New Requirement for DOE Carbon Management Projects

- Must advance equity and justice for communities

Project Applications Require New Plans for **Four Priorities**

- Community and stakeholder engagement
- Diversity, equity, inclusion, and accessibility
- Justice40 Initiative
- Quality jobs

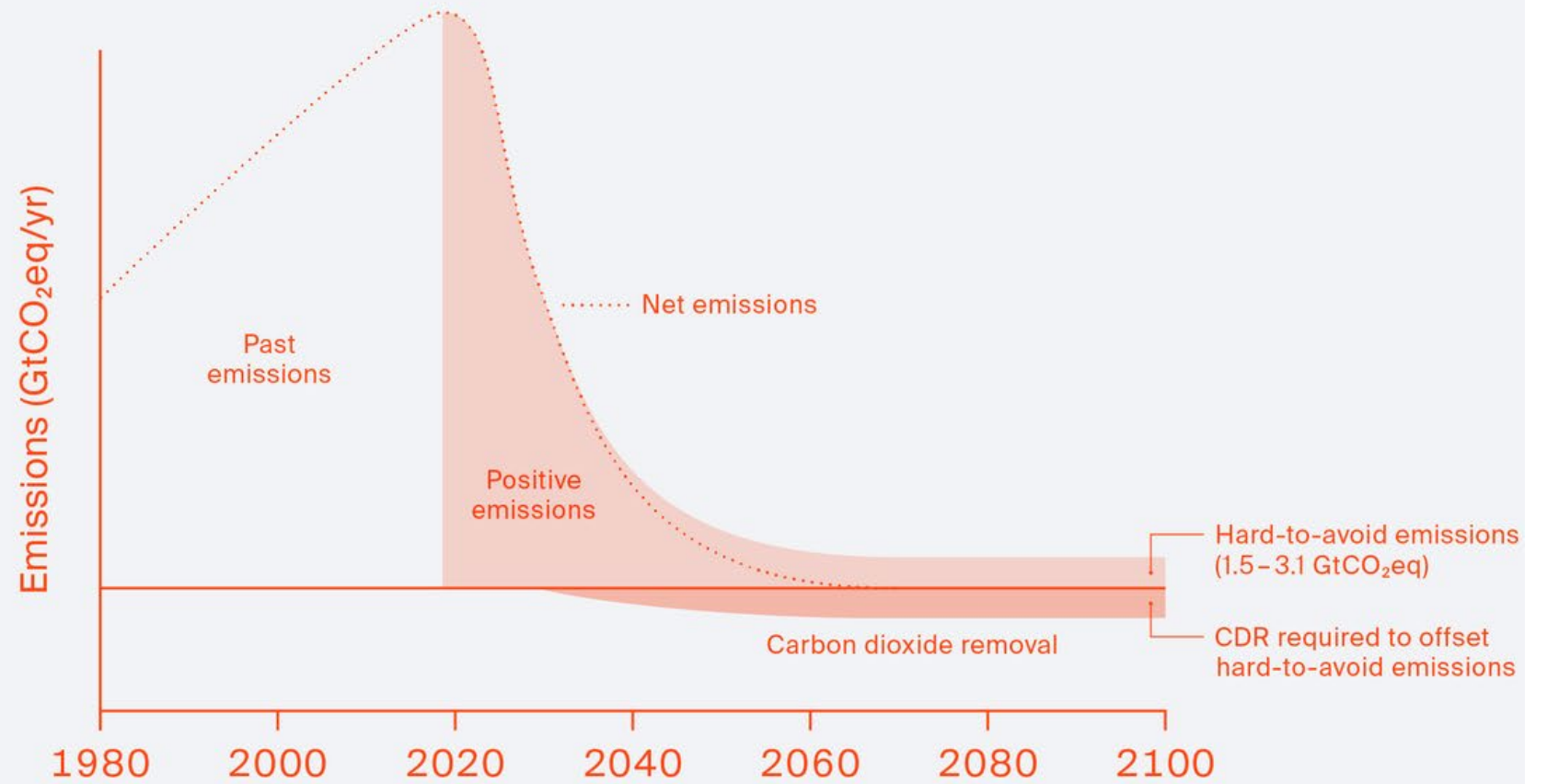
FECM's website (resources) provides guidance for applicants to develop these plans

<https://www.energy.gov/fecm/justice-engagement-planning-societal-considerations-impacts-fecm-projects>

Net-Zero and Role of Carbon Dioxide Removal

Figure 1.1 →

Schematic of hard-to-avoid emissions and the CDR needed to offset them. Adapted from a figure produced by Glen Peters (2020)



DOE has 20+ years of experience researching and testing CO₂ storage



Base Program

Phase I: Integrated CCS Pre-Feasibility
12-18-month initiative

- Formation of team
- Inventory available data
- Purchase seismic data
- Purchase and condition well data
- Model scenarios
- Risk Assessment
- Community Benefits

Bipartisan Infrastructure Law Program

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

- Data collection
- Geologic analysis
- Analysis of contractual and regulatory requirements
- Subsurface modeling
- Risk Assessment
- Evaluate monitoring requirements
- Community Benefits

Phase III: Site Characterization and Permitting
<3-year initiative

- Detailed site characterization
- Prepare/Submit UIC Class VI or BSEE Permits to Construct
- CO₂ Source(s) Feasibility Study
- CO₂ Pipeline FEED Study
- Storage Field Development and Commercialization Plan
- NEPA process/approvals
- Community Benefits

Phase IV: Construction
<2.5-year initiative

- Drill and complete injection and monitoring wells
- Complete risk and mitigation plans
- Obtain EPA UIC Class VI or BSEE Permit/Authorization to Inject
- Community Benefits

Phase III.5

- NEPA process/approvals
- CO₂ Pipeline FEED and supplemental analyses
- Community Benefits

2003

- DOE-led regional partnerships to validate CO₂ 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 CO₂ storage sites will be ready for integrated CCS system deployment in the 2025-2030 timeframe.

2023

- BIL builds on last 20+ years of CO₂ research.
- Enables commercial deployment of CO₂ storage.

Direct Air Capture Hubs

Topic Area 1: Feasibility *Concept Studies*

\$40,875,131 total selected
Maximum award of \$3,000,000
per project
14 awards
10 states
Up to 24 months to complete



Topic Area 2: Design *FEED Studies*

\$58,658,012 total selected
Maximum award of
\$12,500,000 per project
5 awards
5 states
Up to 24 months to complete

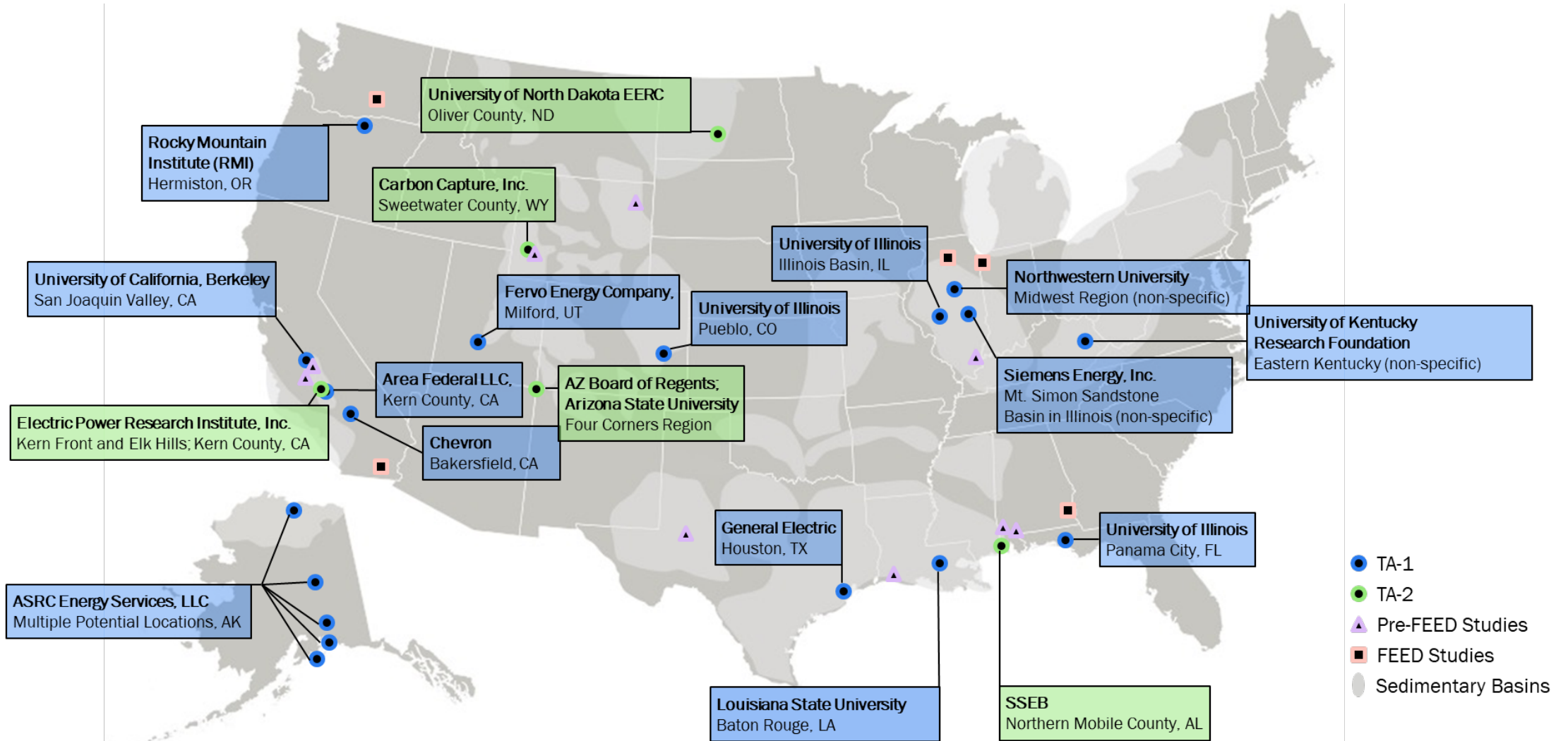


Topic Area 3: Build *Full Hub Design, Construction, and Operation*

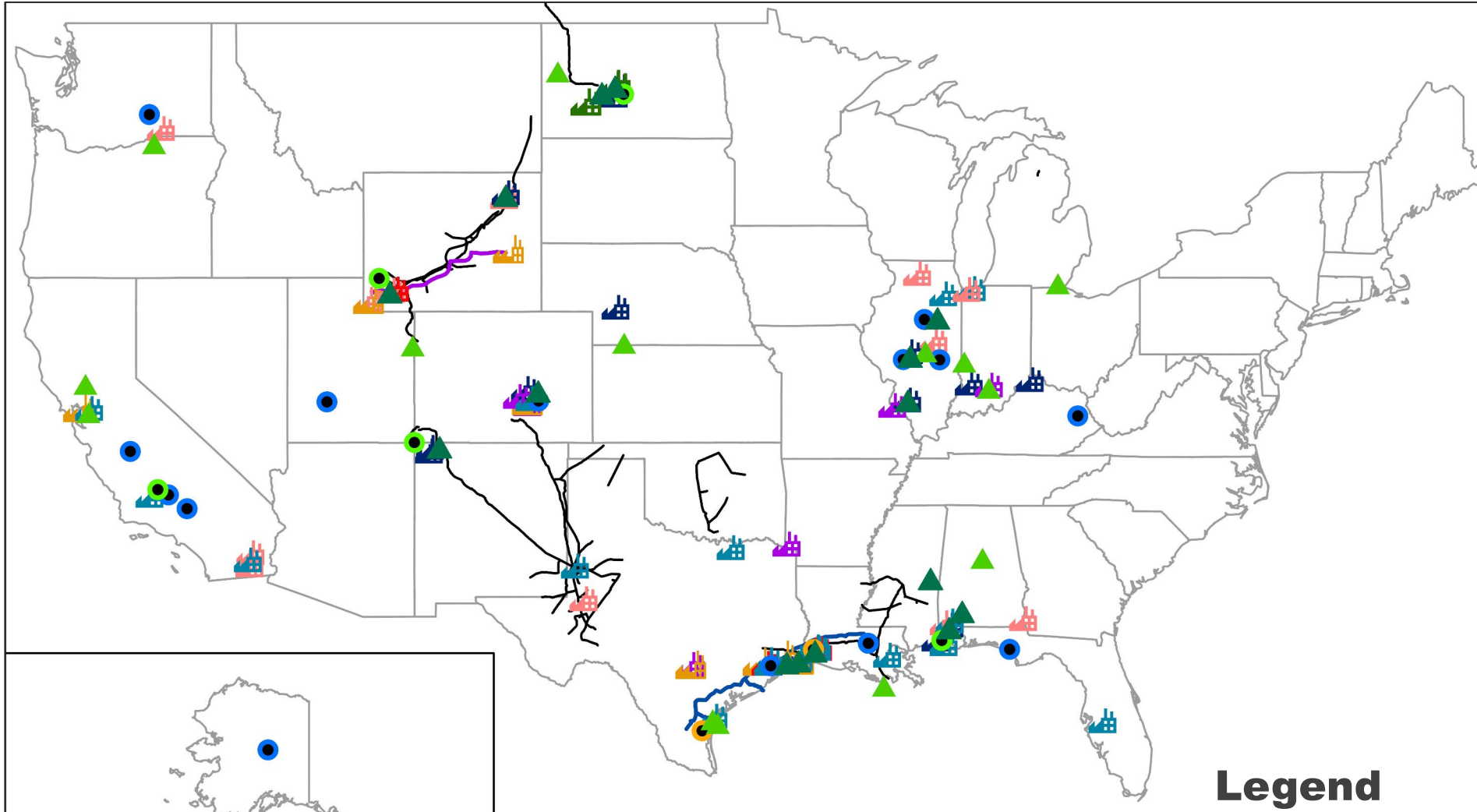
Up to \$1.2B
2 states
Up to 10 years to complete

- Meets industry at diversity of technology readiness levels → avoids tech lock in for early movers
- Supports a diversity of technologies and business models
- Launches community benefits conversations before detailed design
- Shows opportunity for DAC across geographies

Direct Air Capture Map TA 1 + 2 Selections

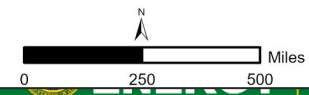


Carbon Management



Legend

- | | | | |
|-------------------|----------------|---------------------------|-------------------------------------|
| CarbonSAFE | DAC Hub | PreFEED/FEED Study | FEED Pipeline Selected |
| ▲ Phase II | ● TA1 | 🏭 Cement | — Carbon Solutions - WyoTCH |
| ▲ Phase III | ● TA2 | 🏭 Chemicals | — HEP - Gulf Coast Decarb System |
| | ● TA3 | 🏭 Power-Coal | — Existing CO ₂ Pipeline |
| | | 🏭 DAC | |
| | | 🏭 Ethanol | |
| | | 🏭 Power-Natural Gas | |
| | | 🏭 Hydrogen | |



Thank You

Learn More About Us

The Office of Fossil Energy and Carbon Management

<https://www.energy.gov/fecm>

Justice & Engagement

<https://www.energy.gov/fecm/justice-engagement-planning-societal-considerations-impacts-fecm-projects>

Our Strategic Vision

https://www.energy.gov/sites/default/files/2022-04/2022-Strategic-Vision-The-Role-of-Fossil-Energy-and-Carbon-Management-in-Achieving-Net-Zero-Greenhouse-Gas-Emissions_Updated-4.28.22.pdf