May 2024

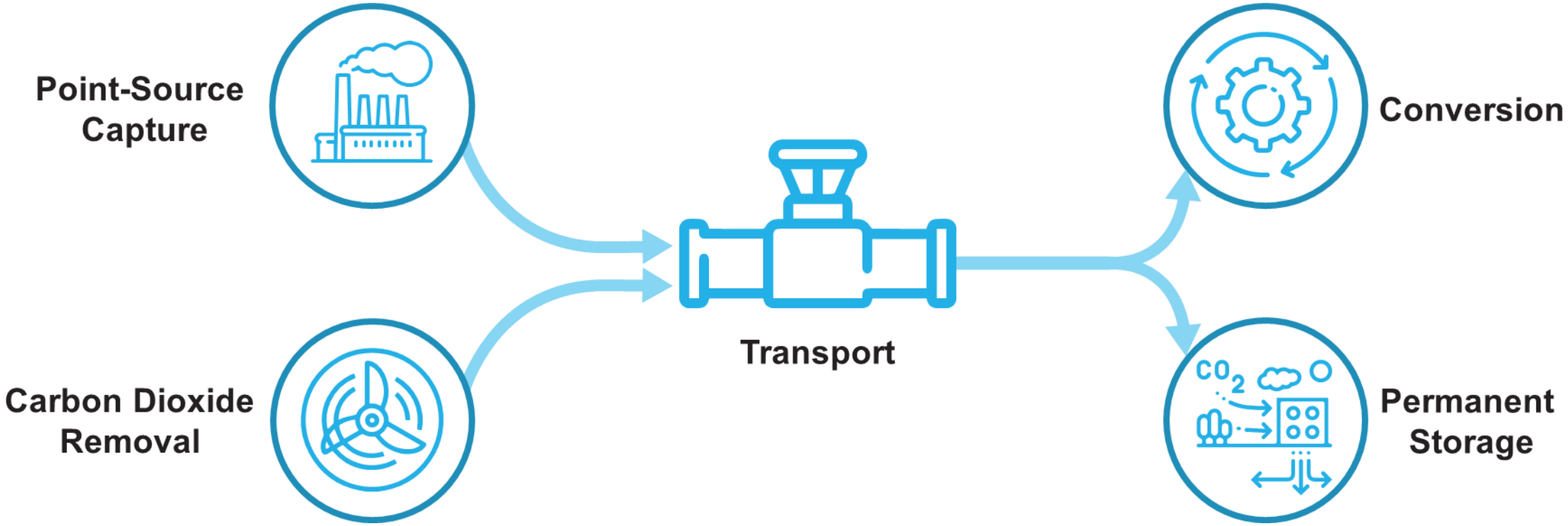
# Point Source Carbon Capture

**Dan Hancu**, Division Director, Point Source Carbon Capture

U.S. DEPARTMENT OF ENERGY

Fossil Energy and Carbon Management

# “Carbon management” refers to:

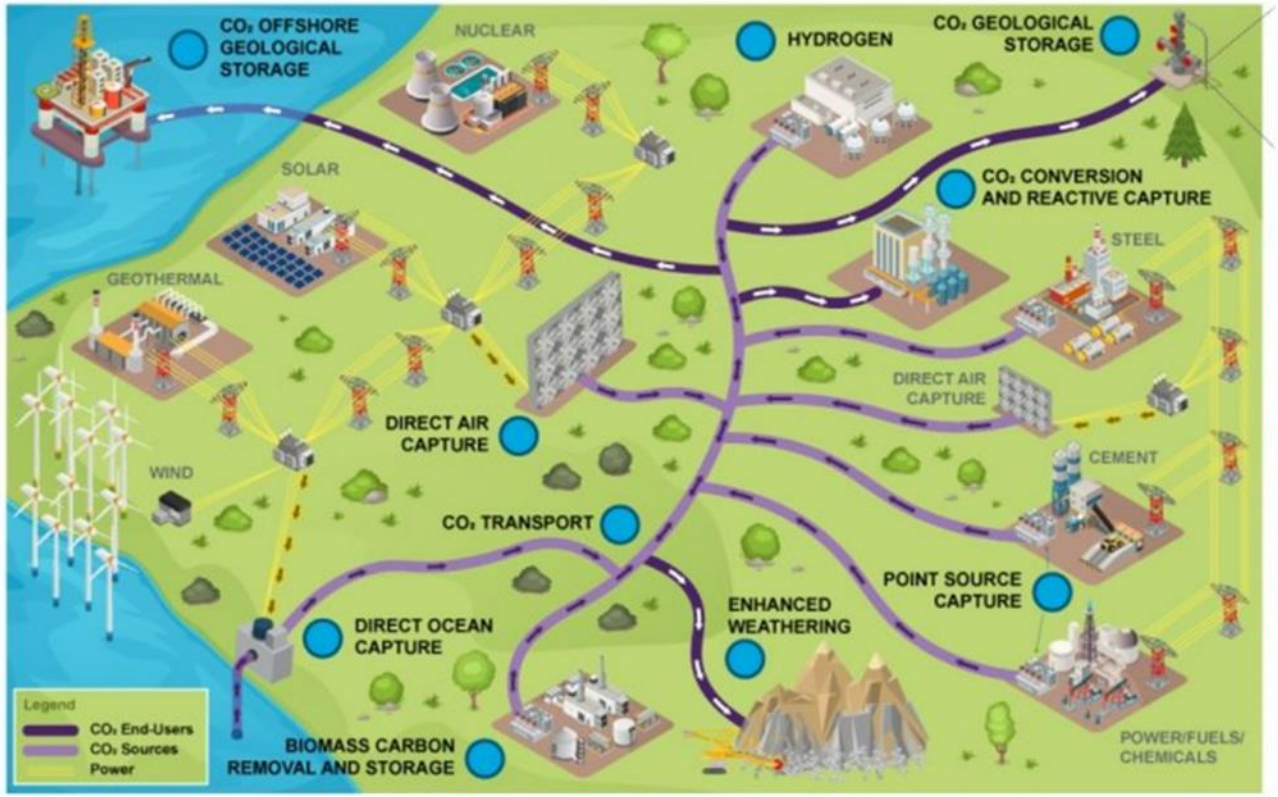


# Carbon management: BIL & IRA funding

## Carbon Transport and Storage

- $CO_2$ transportation loan support
- $CO_2$ transportation engineering studies

- Expanding storage capacity: CarbonSAFE




## Carbon Capture & Industrial Decarb

- Commercial CCS Demos
- Carbon Capture Pilots

- $H_2$ Hubs
- Industrial Decarbonization

## Carbon Dioxide Removal

- DAC Hubs

## Carbon Dioxide Conversion

- Utilization Procurement Grants & $CO_2$ Conversion

**BIL**: Bipartisan Infrastructure Law; **IRA**: Inflation Reduction Act

# Carbon Capture Program…Evolution

## 1st and 2nd Generation Technologies

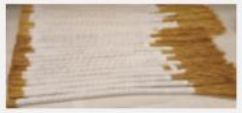
2025: $40/tonne $CO_2$

**2008 -**

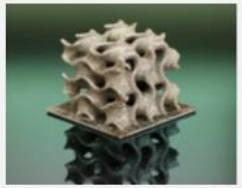
- ✓ Lower CAPEX/OPEX
- ✓ Reduced regeneration energy
- ✓ Increased working capacity

## Transformational Technologies

2030: $30/tonne $CO_2$



Hollow Fibers



3D Print

Biphasic Solvent

**2015 -**

- ✓ Water Lean Solvents
- ✓ Adv. Membranes
- ✓ Hybrid Systems
- ✓ Process Intensification

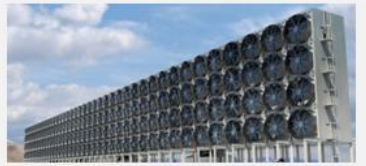
## Scale-up

TCM

**2018 -**

- ✓ Engineering Scale testing
- ✓ FEED studies

## Industrial, NG,CDR & CCS Demos



Carbon Engineering, DAC

Ethanol Plant

**2020 -**

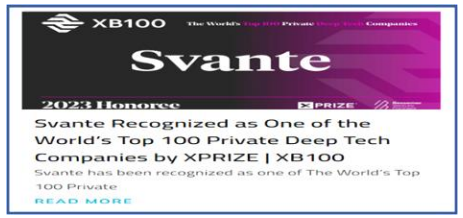
- ✓ CDR: DAC & BiCRS
- ✓ Industrial, NG
- ✓ CCS Demos



**Reduce cost and risk to enable wider, strategic commercial deployment**

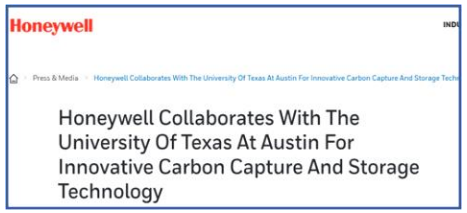
# Commercial, licensing deals

chevron invests in carbon capture and removal technology company, ION clean energy

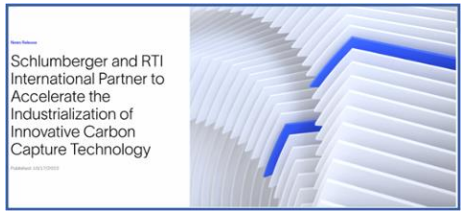





SLB Announces Agreement to Acquire Majority Ownership in Aker Carbon Capture








chevron invests in carbon capture and removal technology company, svante

HOUSTON/VANCOUVER, Dec. 15, 2022 – Chevron New Energies (CNE), a division of Chevron U.S.A. Inc., and Svante announced that Chevron is the lead investor in Svante's Series E fundraising round, which raised $318 million that




Technip Energies and Shell Catalysts & Technologies Strengthen Strategic Alliance on CANSOLV Technology to Address Growing Carbon Capture and Storage Demand


Linde Signs Agreement with ExxonMobil for Carbon Dioxide Off-Take

Baker Hughes

Baker Hughes Partners with NET Power Zero-Emissions Power Plants

Exxon Mobil buys Denbury, pipeline company with carbon capture expertise, for $5 billion

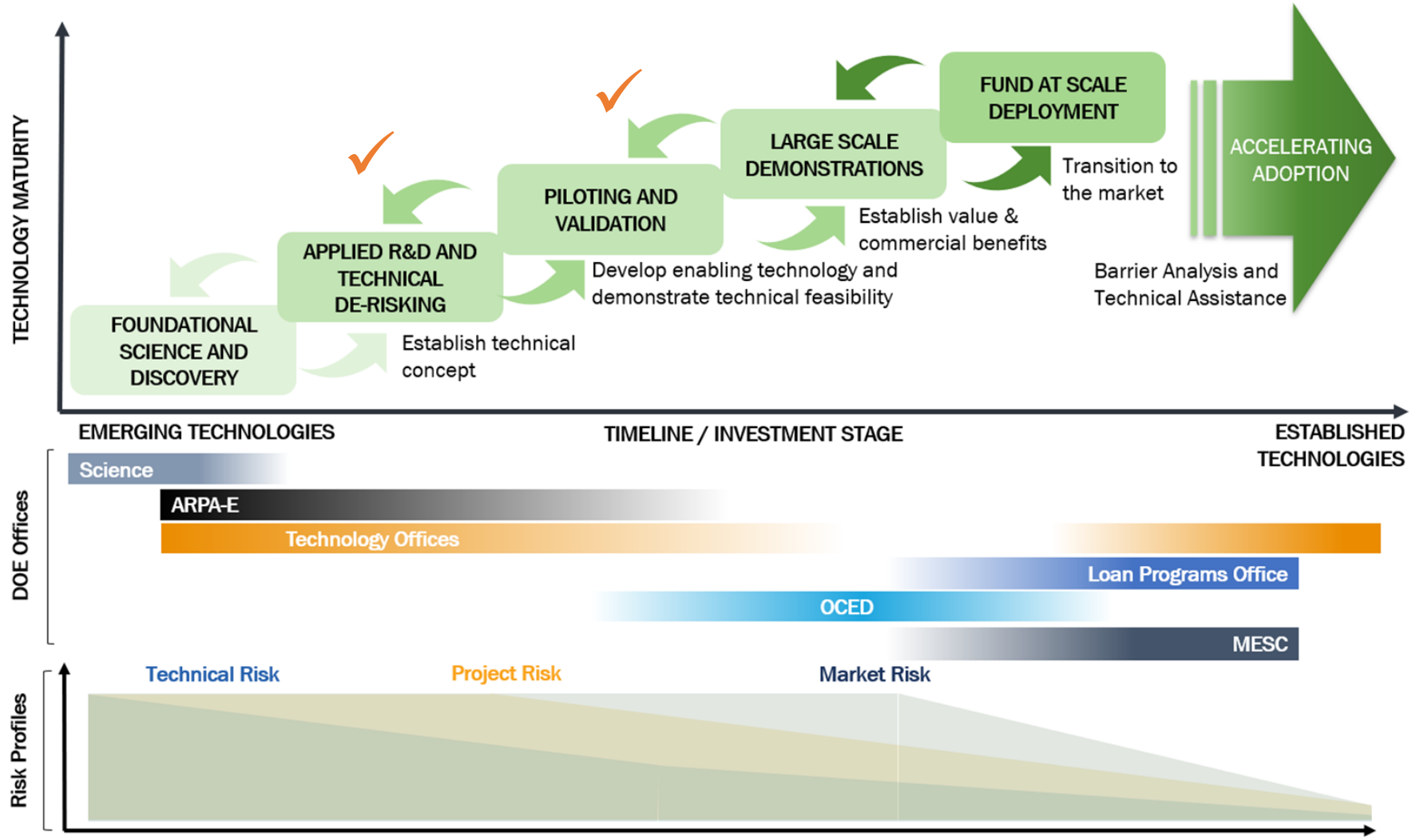
LG&E and KU, EPRI, University of Kentucky, begin industry-leading research

CHART
Cooler By Design.

Chart Industries Acquires Sustainable Energy Solutions, Inc.

GE and Svante Announce Collaboration to Develop Carbon Capture Technology for Power Generation

# DOE Landscape




✓ FECM PSC

# DOE Point Source Carbon Capture Portfolio

| | Components | Small Pilots | Large Pilots | Demo |
|---|---|---|---|---|
| |  Testing novel materials & processes with simulated exhaust |  Bench- and Pilot-scale technology testing with real flue gas |  Engineering scale for integrated capture system |  Unit-wide Carbon transport & storage |
| | | | No storage | |
| ARPA-E | ✓ FLECCS | ✓ FLECCS | | |
| FECM | ✓ ✓ | ✓ ✓ | ✓ MTR, UIC, TCM | |
| IEDO | ✓ | ✓ | | |
| OCED | | | | ✓ ✓ 25 MW 75 KTA **BIL Funded** ✓ ✓ unit 300+ KTA |

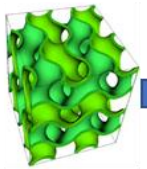
✓ Industrial
✓ Power

**ARPA-E:** Advanced Research Program Agency – Energy
**OCED**: Office of Clean Energy Demonstration

**FECM**: Fossil Energy and Carbon Management;
**IEDO**: Industrial Efficiency & Decarbonization Office

# FECM Point Source Carbon Capture

**Lab & Bench**



TRL 2-4

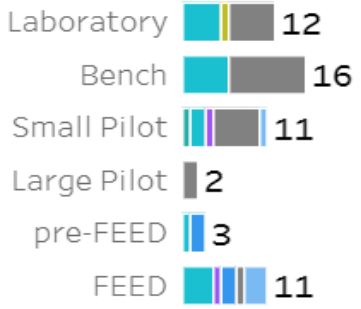
**Small Pilots**

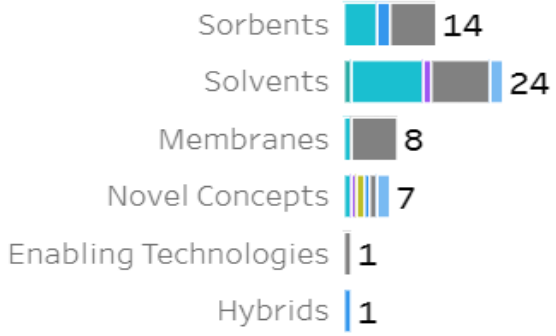
TRL 4-5

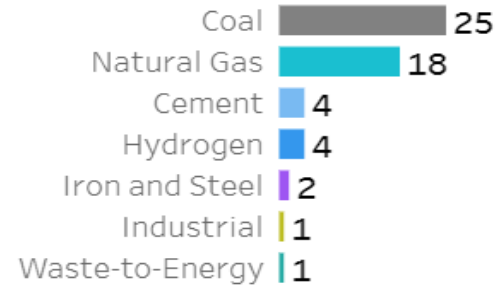
**Large Pilots**

TRL 5-7

**FEED Studies**




[Point Source Carbon Capture Project Map | netl.doe.gov]



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# NGCC/Coal FEEDs

**Bechtel**
Commercial MEA
Sherman Generating Station (Texas)

**EPRI** Electric Power Research Institute
Fluor's Econamine FG Plus℠ (EFG+)
Elk Hills Power Plant (California)

**Southern Company**
Linde-BASF aqueous amine-based solvent
Plant Daniel Unit 4 (Mississippi)

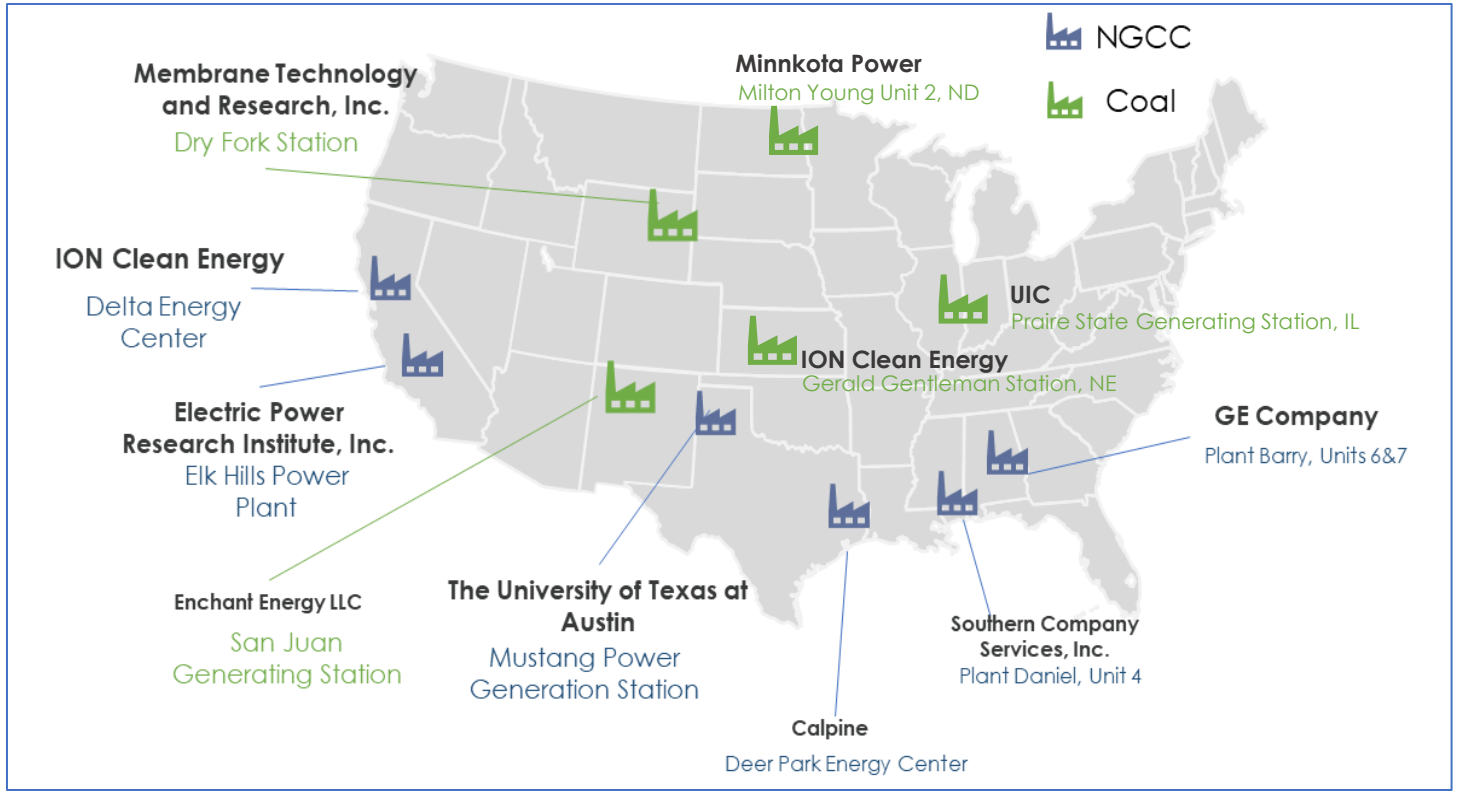
**The University of Texas at Austin**
Piperazine Advanced Stripper (PZAS™) Process
Mustang Power Generating Station (Texas)

**Calpine**
Shell's CANSOLV technology
Calpine's Deer Park Energy Center (Texas)

**ION Clean Energy**
ION's water-lean (ICE-21) solvent
Calpine's Delta Energy Center (California)

**GE Gas Power**
Linde-BASF aqueous amine-based solvent
Southern Company's Plant Barry (Alabama)

**NGCC FEEDs**



# 10 MW Pilot: UIC/Linde-BASF

City, Water, Light and Power's (CWLP) Dallman Power Plant

https://www.netl.doe.gov/project-information?p=FE0031581

# Small Pilots (< 1 MW)

## *Project Enterprise (ION)*

*1 MW*

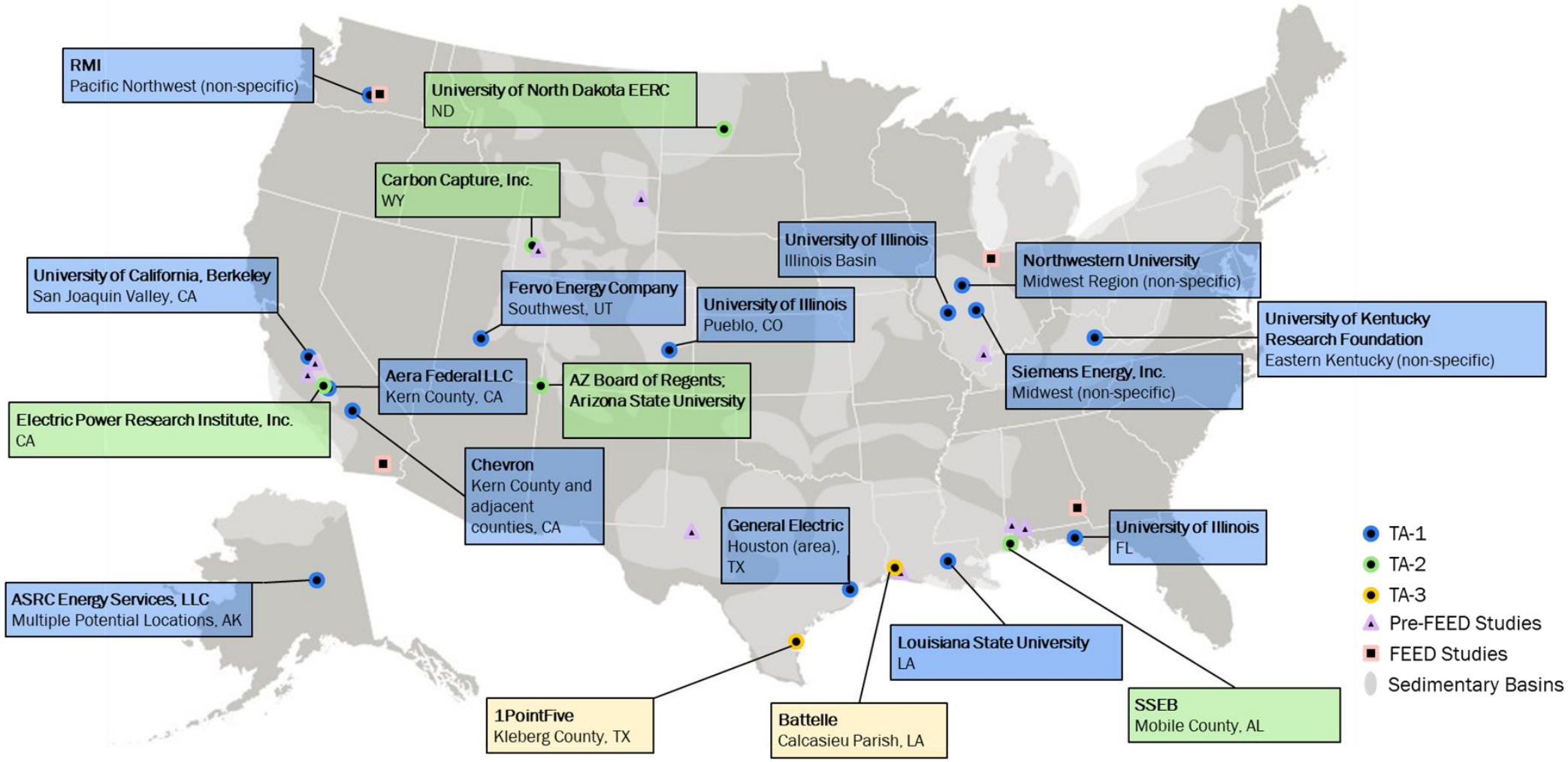
- 10 tpd $CO_2$ pilot on a 1 MWe slipstream flue gas
- NGCC power plant, Calpine's Los Medanos Energy Center, CA
- MEA, ICE-21 and ICE 31 solvents testing

## *Chevron Natural Gas Carbon Capture Technology Testing Project*

*25 tpd $CO_2$*

- Chevron's Kern River oil field San Joaquin Valley, CA USA
- Skid-mounted modular design of second-of-a-kind (SOAK) Svante capture plant
- Operation of the 14% $CO_2$ Flue Gas: testing in progress

# BIL: Proposed Regional DAC Hub Locations



**FINANCIAL ASSISTANCE**
**FUNDING OPPORTUNITY ANNOUNCEMENT**

**Department of Energy (DOE)**
**Office of Fossil Energy and Carbon Management (FECM)**

**CARBON MANAGEMENT**
**Funding Opportunity Announcement (FOA) Number: DE-FOA-0002614**

**AOI-1. Carbon Conversion Technology**
The objective of AOI-1 is to support R&D investigating the conversion of carbon dioxide ($CO_2$) into environmentally responsible and economically feasible products.

**AOI-2. Carbon Dioxide Removal Technology**
The objective of AOI-2 is to solicit applications that develop carbon dioxide removal (CDR) technologies (e.g., direct air capture with durable storage,
biomass carbon removal and storage, enhanced mineralization, ocean-based CDR, terrestrial sequestration) to support progress towards achieving the U.S. Department of Energy's Carbon Negative Shot target

**AOI-3. Point Source Carbon Capture**
The objective of AOI-3 is to solicit applications that are specifically focused on developing lower cost, highly-efficient, technologies for point source capture from fossil fuel power plants and industrial point sources.

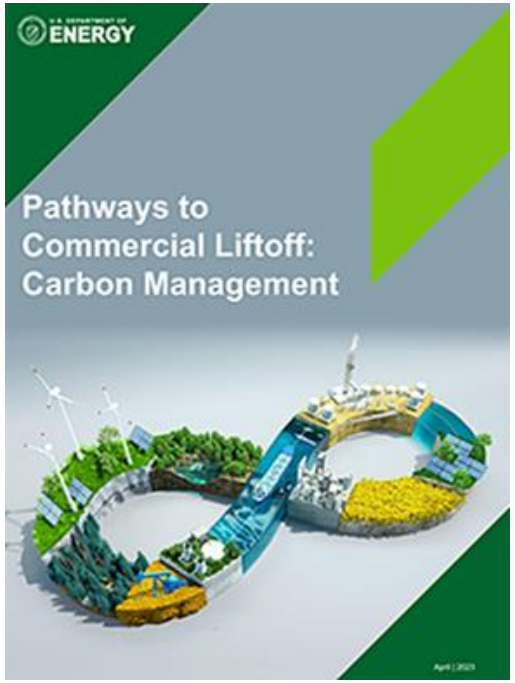
**AOI-4. Carbon Storage Technology**
AOI-4 aims to support resource assessments to securely store large amounts of CO2.

# Carbon capture program: *Outreach*


*Carbon Capture Newsletter*


*Carbon Capture Program R&D Compendium*


*Carbon Matchmaker*

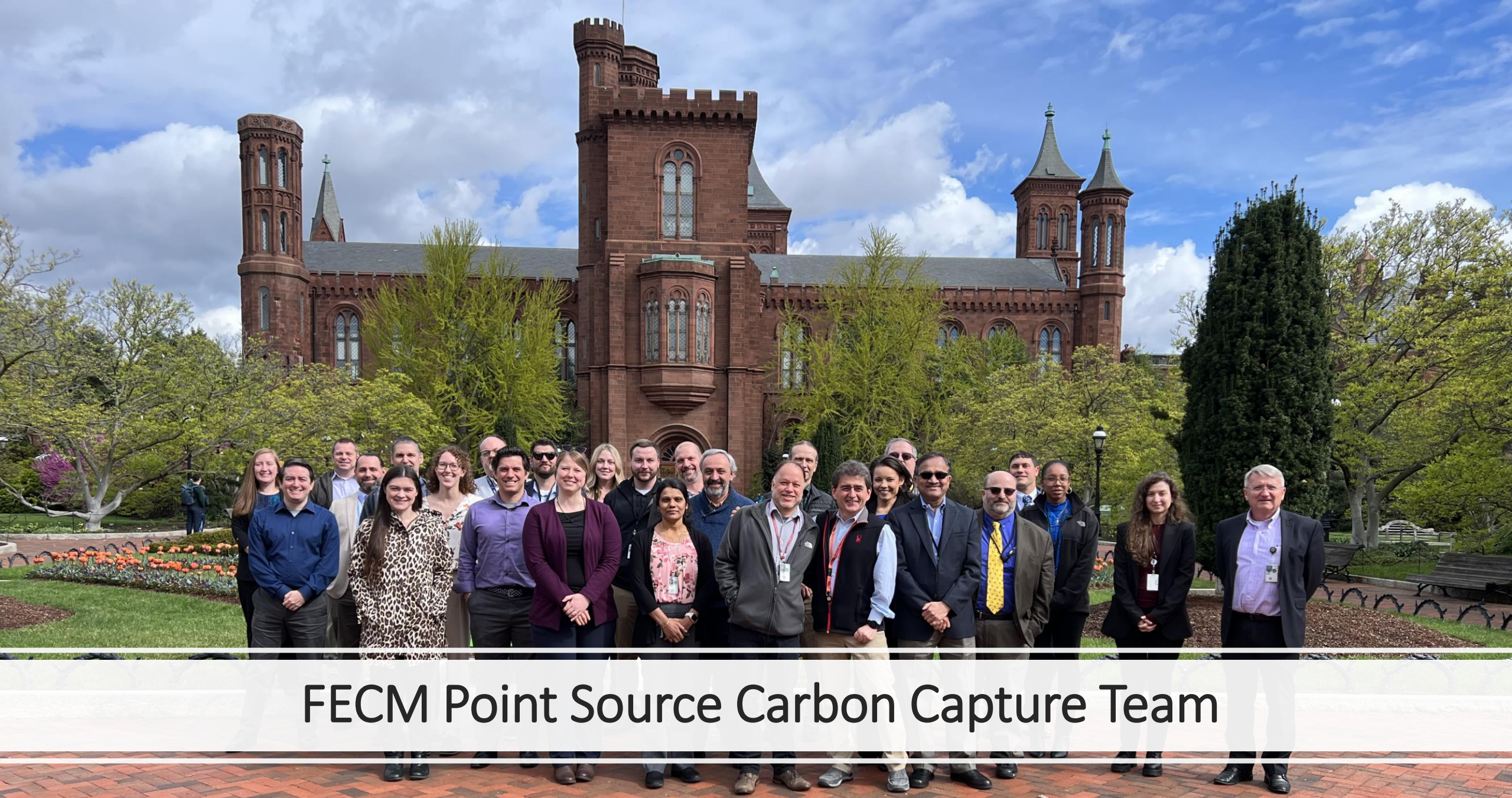



*Commercial Liftoff Report*

[Pathways to Commercial Liftoff: Carbon Management (energy.gov)]

https://www.netl.doe.gov/carbon-management/carbon-capture

https://www.energy.gov/fecm/carbon-matchmaker



# FECM Point Source Carbon Capture Team

May 2024

# Carbon Transport and Storage Initiatives


## Amanda Raddatz

DIRECTOR FOR CARBON TRANSPORT AND STORAGE
OFFICE OF FOSSIL ENERGY AND CARBON MANAGEMENT


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

# Key Messages

Carbon management technology…

1

…works and is essential for meeting climate goals.

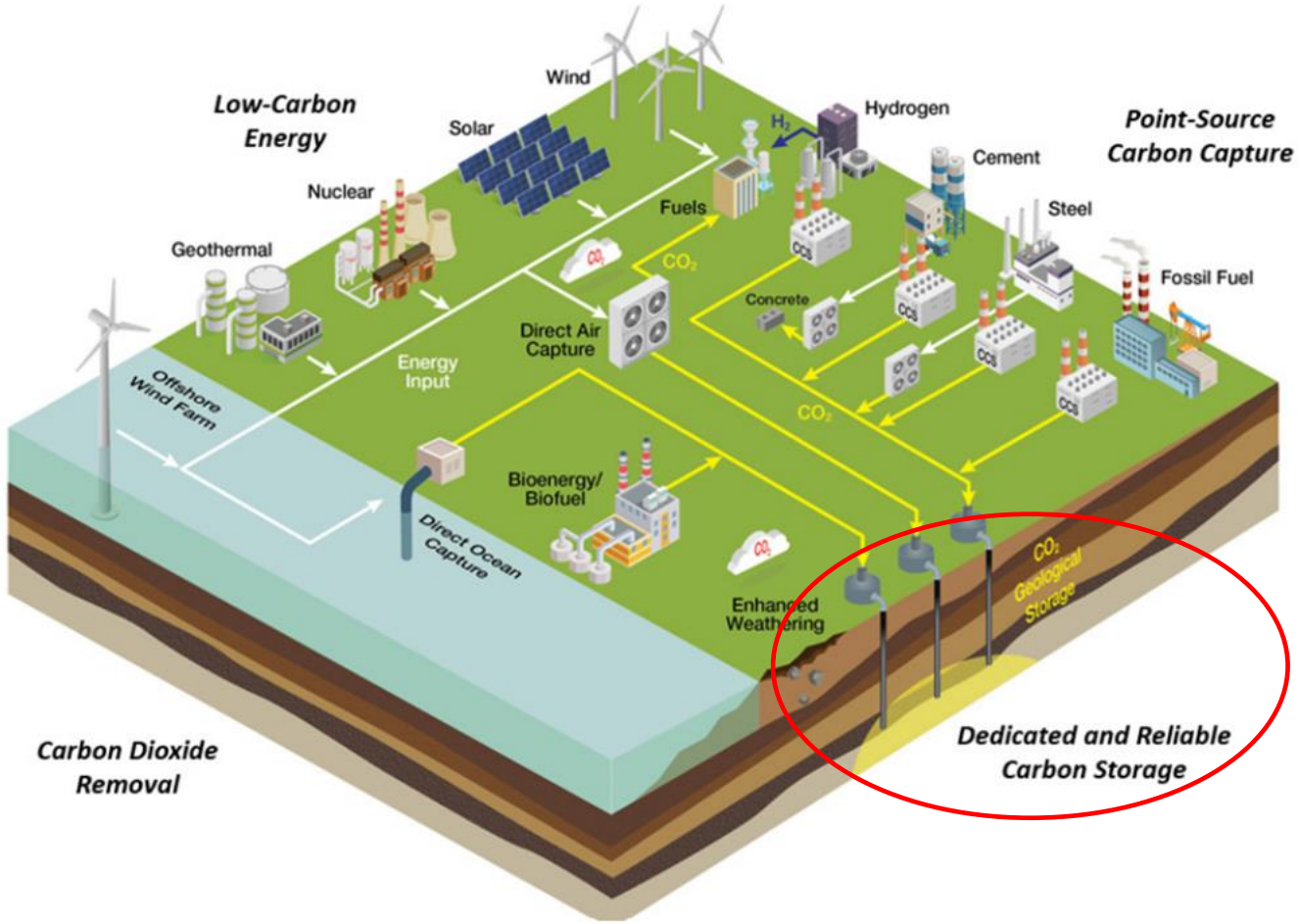
2

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

3

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

# T&S as part of the Carbon Management ecosystem



# Rapid CCUS & CDR Industry Growth Needed for Achieving U.S. Decarbonization Goals

| | 2025 | 2030 | 2035 |
|---|---|---|---|
| | VALIDATION | ACTIVATION | EXPANSION |
| **Injectivity** | 5 million metric tons (MT)/year | 65 million MT/year | 100 million MT/year |
| **Commercial Storage Potential** | 250 million metric tons (MT) | 2,000 million MT | 3,000 million MT |

carbon SAFE

**Biden Administration Executive Order 14008**
Tackling the Climate Crisis at Home and Abroad

**50-52% reduction in economy-wide net greenhouse gas pollution in 2030 from 2005 levels**

**Net-zero emissions from the power sector by 2035**

**Net-zero emission economy**
by 2050

**External Metrics and Goals**

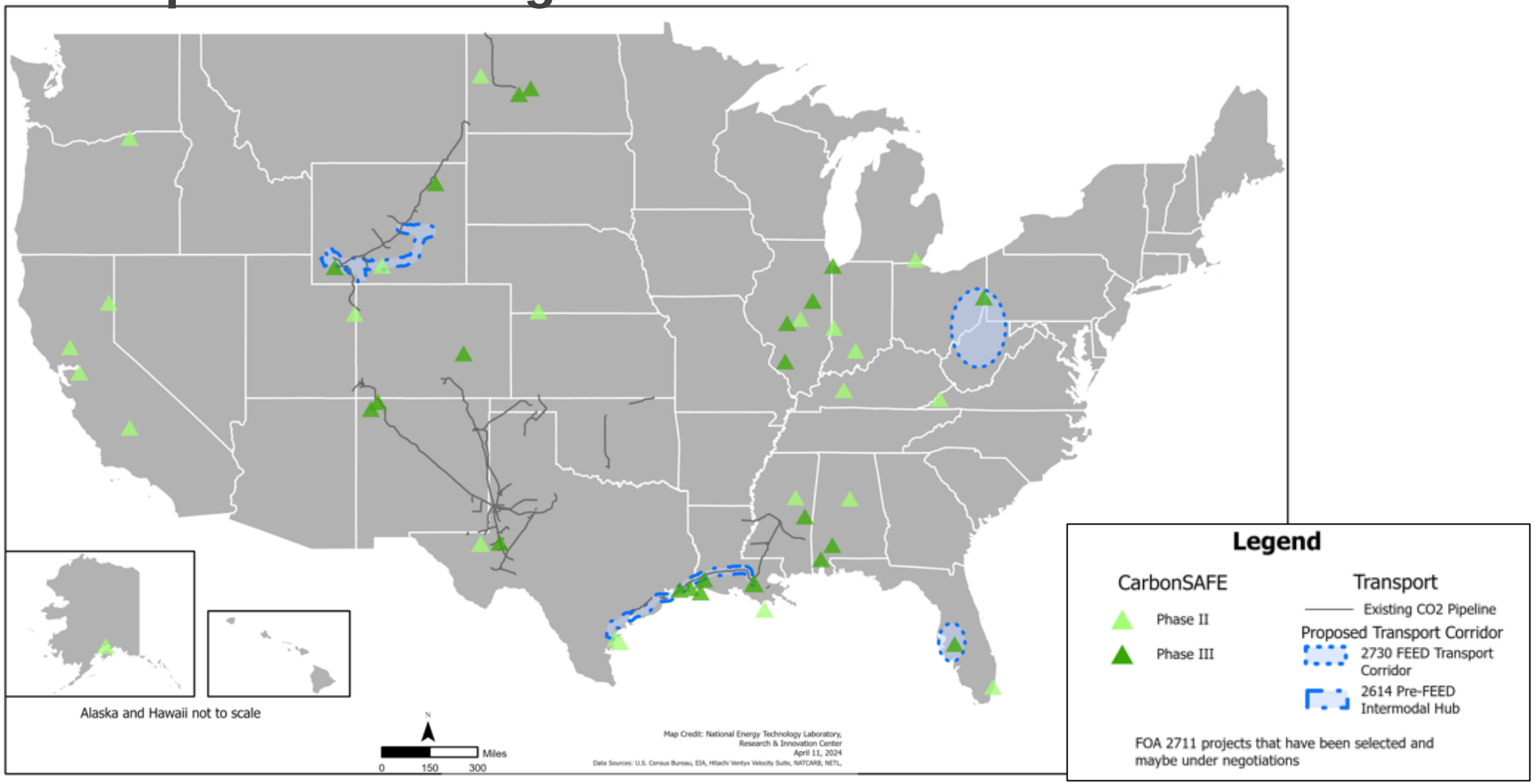
The National Academies of SCIENCES ENGINEERING MEDICINE

**↑CCUS 10X by 2030**

IPCC
INTERGOVERNMENTAL PANEL ON climate change

**Cumulatively sequester 350-1000 GT by 2050**

# DOE's CT&S Programs continue to de-risk and accelerate US carbon transport and storage infrastructure



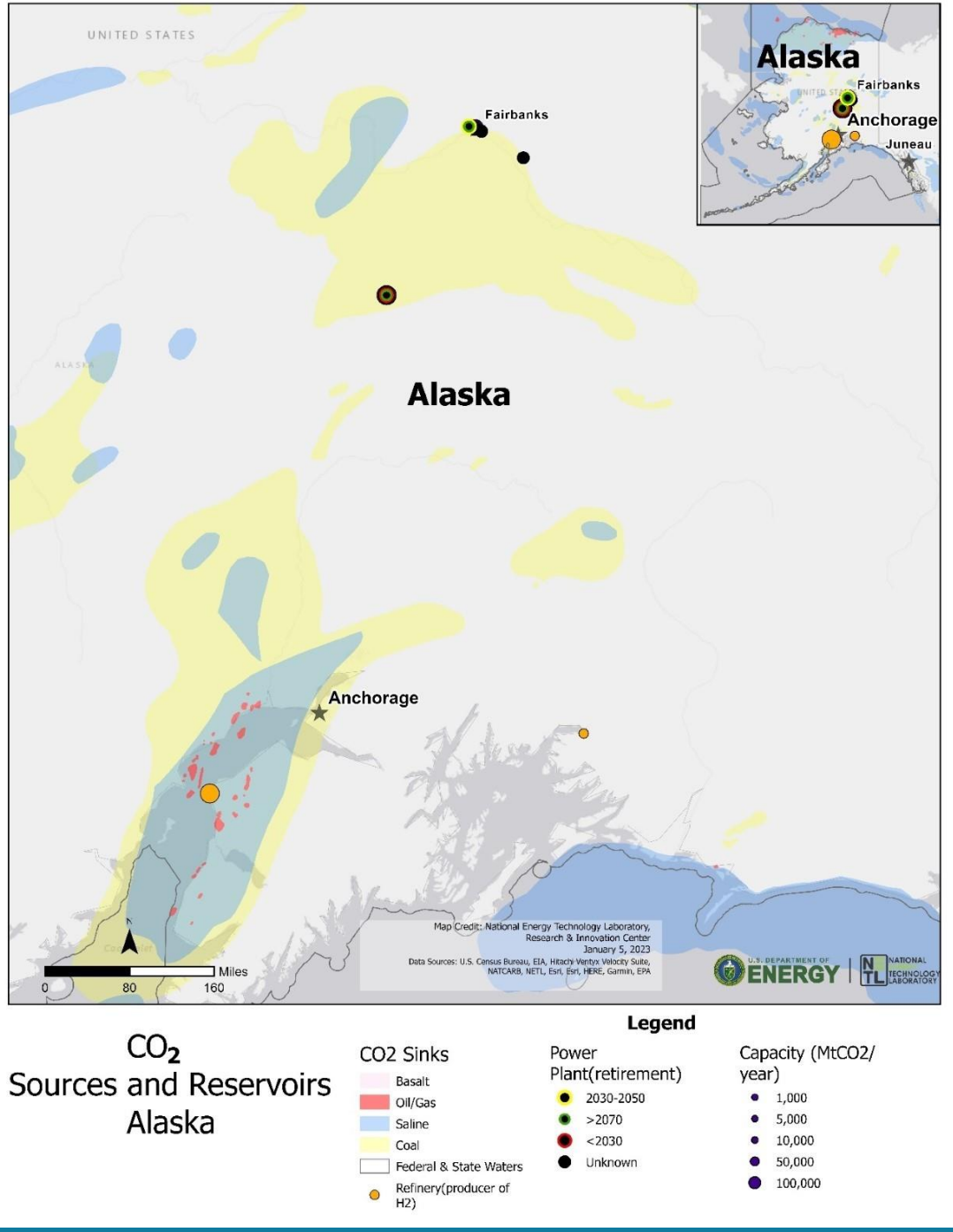
# Alaska Infrastructure

## Cook Inlet Region

| Alaska | | |
|---|---|---|
| $CO_2$ Source | Facilities | $CO_2$ emissions (MtCO2eq/yr) |
| Refining | 2 | 110,675 |
| Power Plant | 23 | 1,160,470 |

| Field | CO2 Storage Estimates | | |
|---|---|---|---|
| Cook Inlet (Gt) | $P_{10}$ | $P_{50}$ | $P_{90}$ |
| Hemlock Formation | 0.91 | 4.33 | 16.61 |

"Potential for carbon sequestration in the Hemlock Formation of the Cook Inlet basin, Alaska", Scott Pantaleone and Shuvajit Bhattacharya



# What is carbon SAFE?

## Carbon Storage Assurance Facility Enterprise (CarbonSAFE)

The CarbonSAFE Initiative builds off the work done by the Regional Carbon Sequestration Partnerships to fund and develop projects focused on ensuring carbon storage complexes will be ready for integrated Carbon Capture, Utilization, and Storage (CCUS) system deployment in the 2025-2030 timeframe.

*CarbonSAFE Illinois Macon County*

## PROGRAM OBJECTIVES

- Address the R&D knowledge gaps and develop the technologies needed to nationally deploy commercial scale (50+ million metric ton) $CO_2$ storage.
- Understand the development of a CCUS storage complex from the feasibility study through the point of injection.
- Improve understanding of commercial-scale project screening, site selection, geologic characterization, modeling, and monitoring.
- Address both the technical and non-technical challenges associated characterization, permitting, and monitoring of a geologic storage complex.

# Carbon Storage Program


## Base R&D Program CarbonSAFE

**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 Plan

**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 Plan

## BIL CarbonSAFE

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

- Detailed site characterization
- Prepare/Submit UIC Class VI or BSEE Permits to Construct
- $CO_2$ Source(s) Feasibility Study
- $CO_2$ Pipeline FEED Study
- Storage Field Development and Commercialization Plan
- NEPA process/approvals
- Community Benefits Plan

**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 Plan

**Phase III.5**

- NEPA process/approvals
- $CO_2$ Pipeline FEED and supplemental analyses
- Community Benefits Plan

### 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.

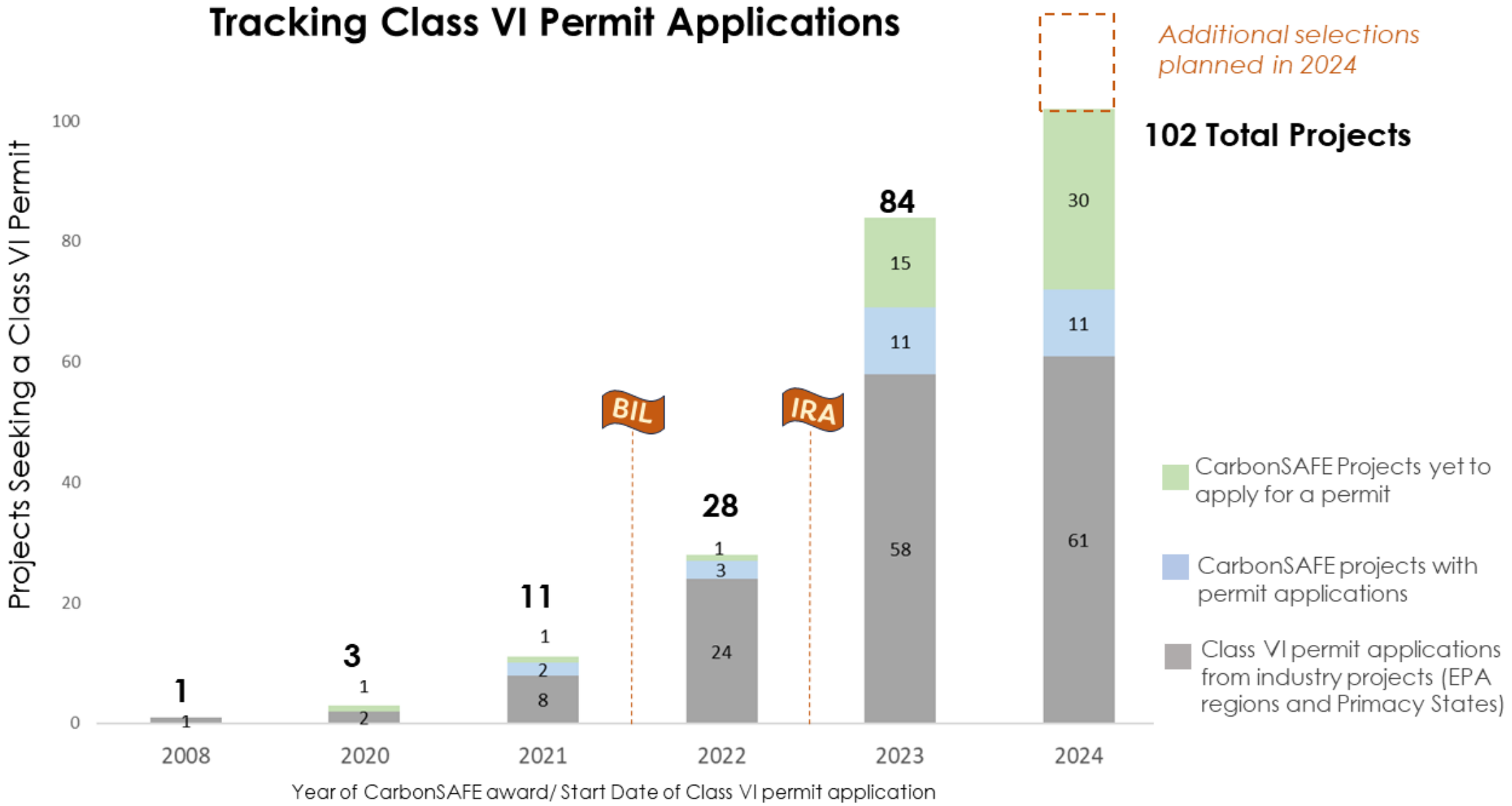
### 2016

- 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.

# Storage Project Growth



# New Initiatives that Support CarbonSAFE


- Data collection & tools to support **CarbonSAFE** site selection.
- Develop basin-scale resource management frameworks.
- Risk-based decision making (permit restriction, leasing, etc).

- $2.5 BIL funding, 20-40 commercial storage projects, >100 wells.
- Site specific geologic data collection as inputs to CarbonBASE tools.
- Host CarbonSTORE projects in different settings.

- Provides field laboratories to test & compare carbon storage technologies, useful for next generation **CarbonSAFE** projects.

# Carbon Basin Assessment and Storage Evaluation


## *Objectives:*

- Embark on a national geologic data collection/drilling campaign in basins where geologic data availability is low
- Develop user-friendly site screening and selection tools that enable rapid and accurate decision-making on-site screening and selection
- Develop management tools to assess dynamic storage performance and risks at the basin scale
- Design and deploy basin-wide storage resource monitoring systems

- Multiyear initiative – 5+ years
- Data made public through EDX data warehouse
- Will help de-risk future CarbonSAFE projects
- Interfaces with NRAP

## *Benefits:*

- Reduces costs to project developers (lessened need to drill exploration wells to identify suitable storage sites)
- Identifies areas to avoid (poor reservoir quality or potential hazards e.g., critically stressed faults)
- Supports transparency by providing the public, regulators, and other stakeholder access to the same data
- Refines estimates of the nations “practical” carbon storage resources.

# CarbonSTORE

(Carbon Basin Storage Technology and Operations REsearch Facility)

***Field laboratories to test & compare carbon storage technologies***

**Leverage CarbonSAFE and other sites of interest to …**

- Compare performance of advanced vs. existing technologies
- Gain R&D data associated with operating injection facilities to improve performance, and reduce uncertainty
- Conduct experiments at different times to assess performance and potential long-term impacts



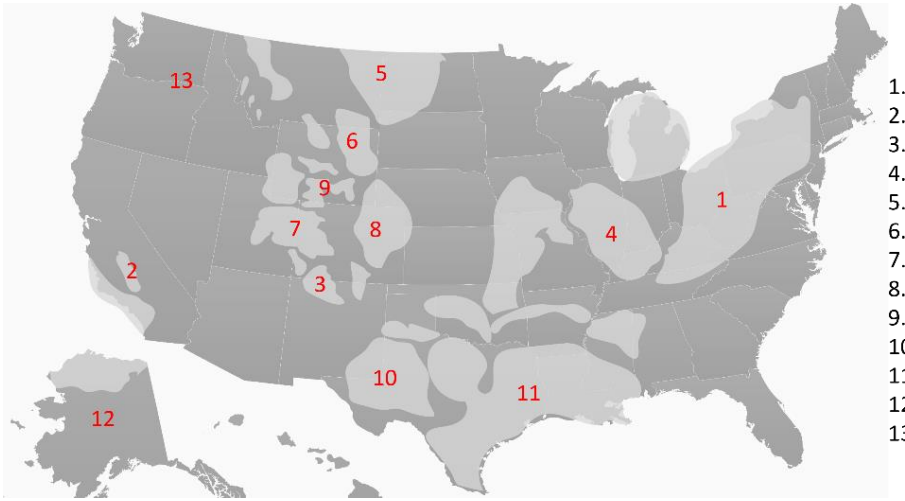
# Continuation of Regional Technical Assistance on Carbon Storage

## FOA 3014: Regional Initiative for Technical Assistance Partnerships (RITAP) to Advance Deployment of Basin-Scale Carbon Transport and Storage and Community Engagement

***Objective:***

Provide basin-specific technical assistance to project developers, regulators, community groups, labor organizations where multiple proposed carbon storage facilities will be located.

Major basins within the U.S.




1. Appalachian-North
2. Central Valley (CA)
3. San Juan River-Raton-Black Mesa
4. Illinois
5. Williston
6. Powder River
7. Uinta
8. Denver
9. Green River-Wind River
10. Permian
11. Gulf Coast (Onshore/Offshore)
12. Alaska
13. Columbia River Basalts

***Key Activities:***

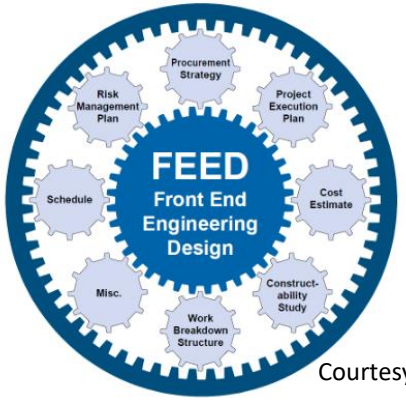
- Expand and strengthen technical assistance on CCS/CDR to stakeholders and affected communities
- Help train the next generation of technical professionals in geologic storage of $CO_2$
- Continue carbon storage resource assessments
- Identify value-added crosscutting opportunities (e.g., integration with geothermal energy and critical mineral recovery)

The projects funded under DE-FOA-0003014 will build on the knowledge and experience gained from the Regional Carbon Sequestration Partnerships (2003-2020) and subsequent Regional Initiative Technical Assistance projects.

# $CO_2$ 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




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

## CO2 Infrastructure Finance and Innovation Act (CIFIA)

- Secured loans and loan guarantees (“CIFIA Loans”)
- Grants for building excess capacity on new and existing CO2 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

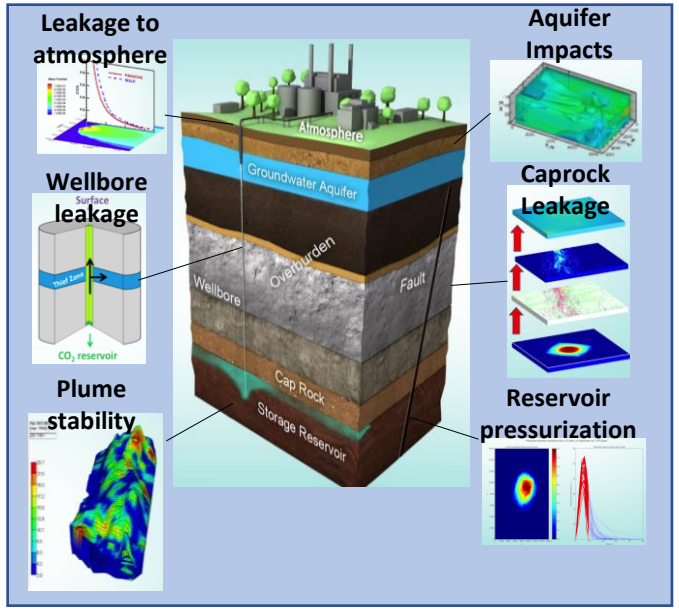
# Storage Facilities Decision Support Tools

## Technologies to improve performance and reduce the cost

NRAP National Risk Assessment Partnership

[National Risk Assessment Partnership]

### Site specific risk-based decision support tools for Stakeholders




SMART

[SMART Initiative]

### Real-time Visualization, Forecasting, and Virtual Learning for Decision Makers

**Primary Focus Areas of SMART**

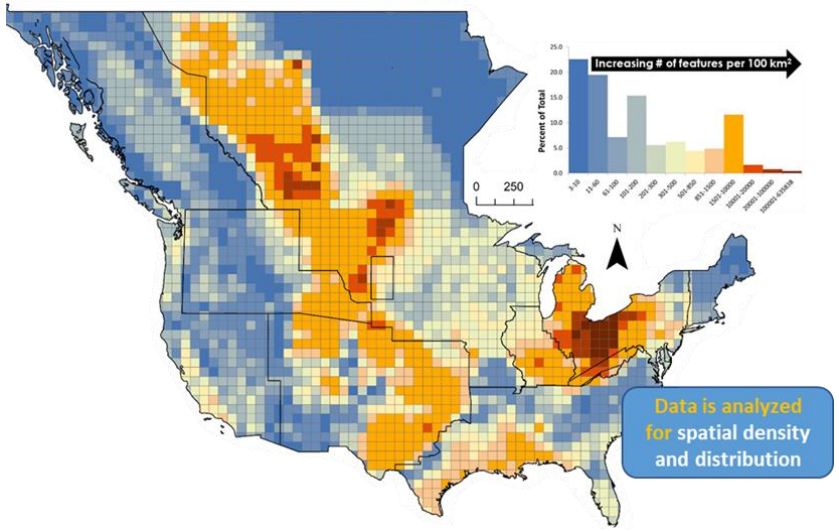
| | |
|---|---|
| REAL-TIME VISUALIZATION | Enable dramatic improvements in the visualization of key subsurface features and flows by exploiting machine learning to improve speed and enhance detail. |
| REAL-TIME FORECASTING | Transform reservoir management: perform rapid analysis of real-time data to inform operational decisions. |
| VIRTUAL LEARNING | Develop a computer-based experiential learning environment to improve field development and monitoring strategies. |

Science-informed Machine Learning for Accelerating Real-Time Decisions in Carbon Storage Applications

EDX 4CCS Energy Data eXchange

[Welcome - EDX (doe.gov)]

### Providing stakeholders/community access to CCS data resources

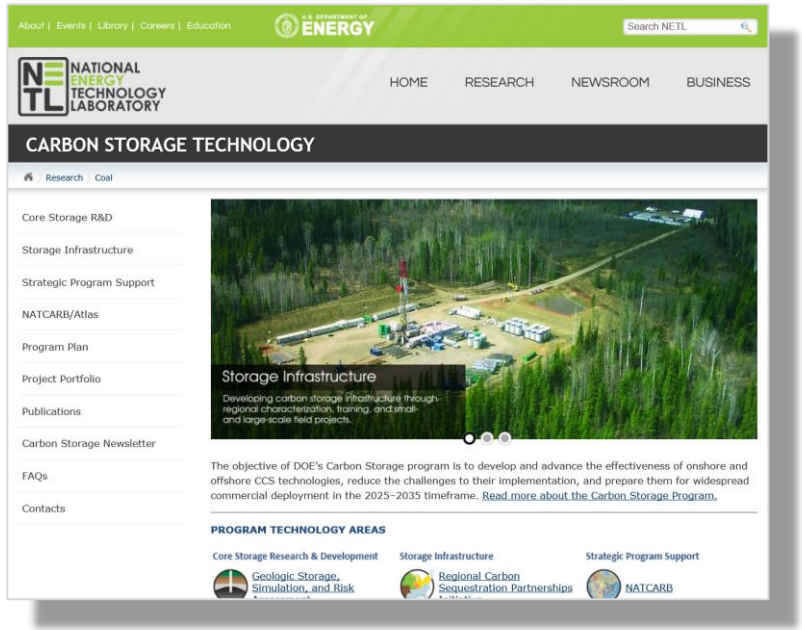



**DisCO$_2$ver**

# For More Information

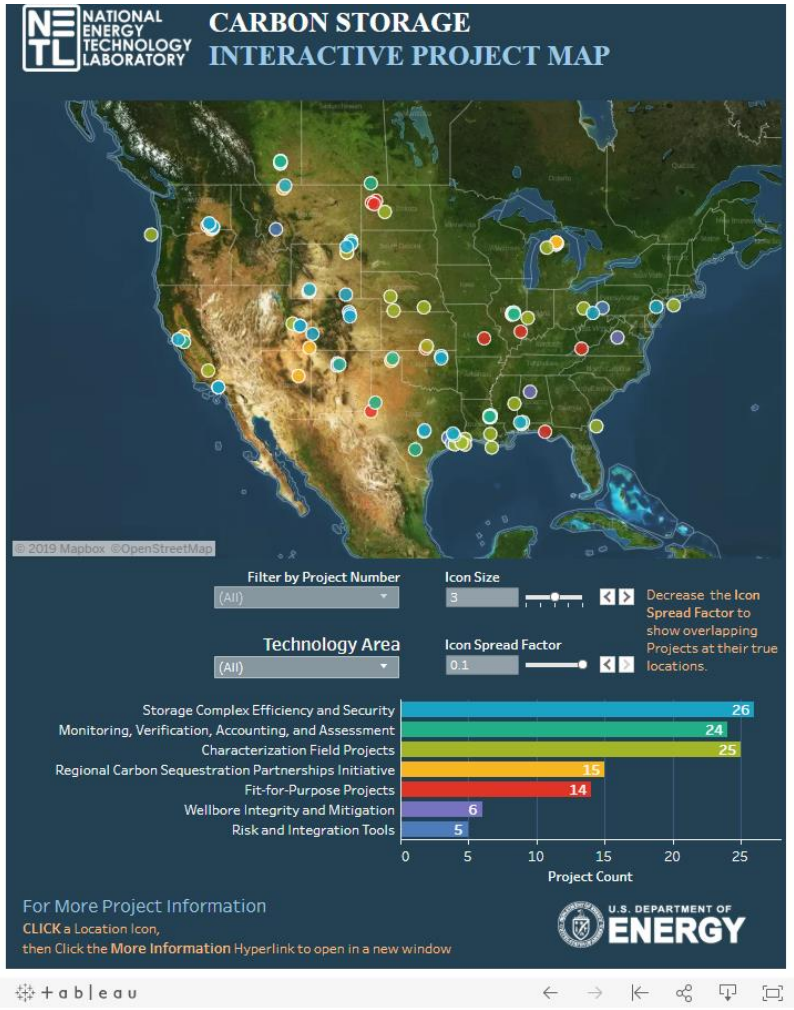
## NETL Carbon Storage

https://netl.doe.gov/coal/carbon-storage



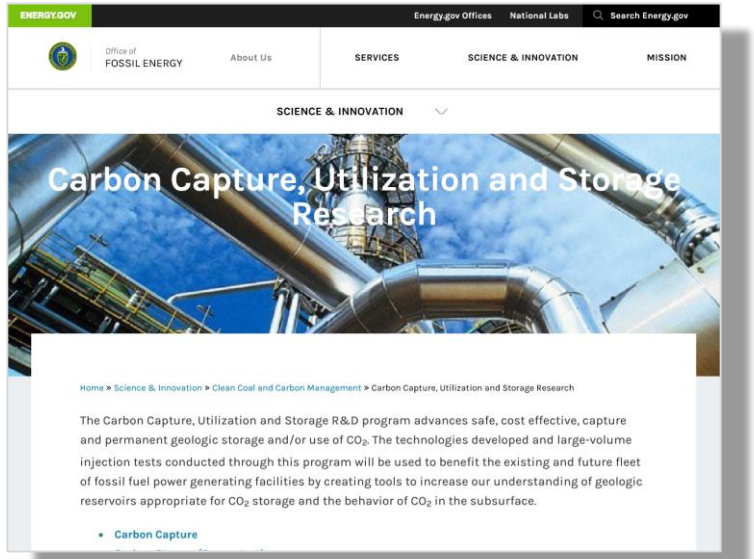

@NationalEnergyTechnologyLaboratory

@NETL_News




## Office of Fossil Energy and Carbon Management

www.energy.gov/fecm/office-fossil-energy-and-carbon-management

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OCED
Office of Clean Energy Demonstrations

THE OFFICE OF
# CLEAN ENERGY DEMONSTRATIONS


# Alaska Regional Decarbonization Workshop

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Office of Clean Energy Demonstrations
U.S. Department of Energy

May 8, 2024

# Disclaimer

**As DOE is actively engaged in Financial Assistance and Other Transaction Authority planning, we are subject to constraints during this period to ensure fairness of the process:**

- **DOE can only communicate public and non-privileged information during this meeting or event.**
- **DOE cannot discuss the details of active or planned financial assistance matters [e.g., Requests for Information (RFI), Notices of Intent (NOI), Requests for Proposals, Funding Opportunity Announcements (FOA)] or entertain requests for a specific outcome or benefit related to a Financial Assistance or OT activity.**

# Background

- The International Energy Agency says we need global public investments of at least $90 billion this decade for large-scale clean energy demonstration projects to achieve net zero emissions by 2050
- Two recent historical climate laws enacted—the Bipartisan Infrastructure Law and Inflation Reduction Act—appropriated $25+ billion to the Office of Clean Energy Demonstrations (OCED) to deliver large-scale clean energy demonstration projects
- OCED will accelerate clean energy technologies and fill a critical innovation gap on the path to achieving our nation's climate goals while mitigating risks that allow private sector investors and developers to act

# OCED Mission

Deliver clean energy technology **demonstration projects at scale** in partnership with the **private sector** to **accelerate deployment**, **market adoption**, and the **equitable transition** to a decarbonized energy system.”

# OCED Mandate

## SCALE EQUITABLE, CLEAN ENERGY

Help enable 100% clean electricity by 2035 & net -zero emissions by 2050 through an equitable energy transition

## UNLOCK NEW INVESTMENT

Unlock and scale trillion-dollar clean energy follow on investment from the private sector and other sources of capital

## DE-RISK TECHNOLOGY

Maintain risk-based, balanced, and defensible portfolio of investments

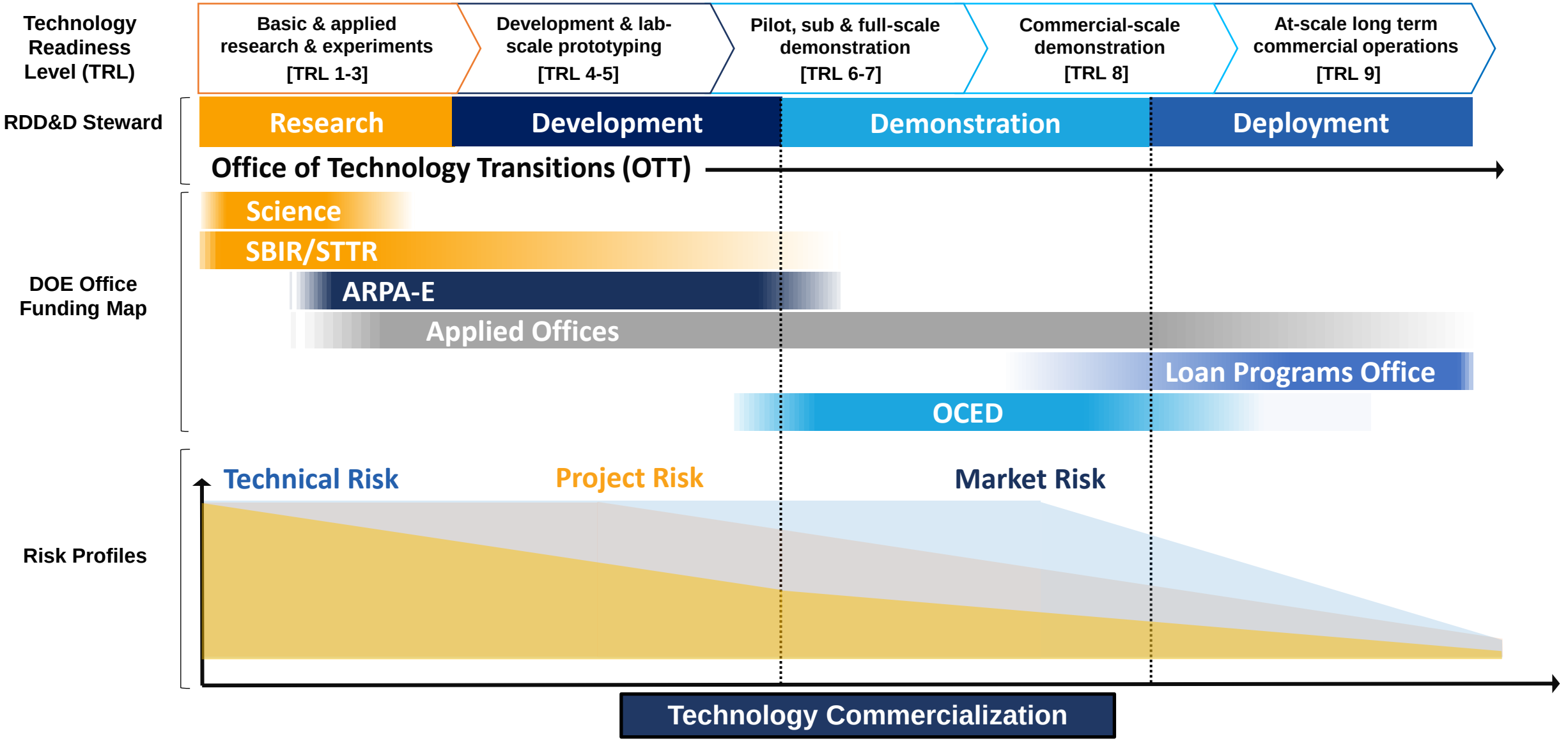
## PROVIDE PROJECT OVERSIGHT

Serve as primary DOE office to deliver full scale clean energy demonstration projects and project management oversight excellence

## ENGAGE & COLLABORATE

Leverage private sector and broader energy ecosystem to inform OCED and DOE technology commercialization efforts

# Role Across Research, Development, Demonstration & Deployment (RDD&D) Continuum



# Prioritizing Community Benefits in OCED Projects

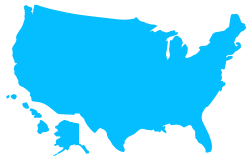
OCED **requires** applicants to include a Community Benefits Plan to help ensure broadly shared prosperity in the clean energy transition.

By **prioritizing community benefits**, we can ensure the next chapter in America's energy story is marked by greater justice, equity, security, and resilience.

**Community & Labor Engagement**

**Diversity, Equity, Inclusion, & Accessibility**

**Investing in the American Workforce**



**Justice40 Initiative**

# OCED Scope

**Advanced Reactor Demonstrations ($2.5 billion)**

**Carbon Management ($7 billion)**

**Clean Energy Demonstrations on Mine Land ($500 million)**

**Distributed Energy Systems Demonstrations ($50 million)**

**Energy Improvements in Rural or Remote Areas ($1 billion)**

**Industrial Demonstrations ($6.3 billion)**

**Long-Duration Energy Storage Demonstrations ($505 million)**

**Regional Clean Hydrogen Hubs ($8 billion)**

**Liftoff Enabling Programs ($133 million)**

# Advanced Reactor Demonstrations

## Support domestic nuclear industry in design, licensing, construction, and operation of two advanced nuclear reactors

***Current Status***

- November 2022: Awarded $2.5B in funding through the Bipartisan Infrastructure Law

**TerraPower Natrium Reactor**

- 2022: Completed independent project review
- November 2021: Selected Kemmerer, WY as preferred site

**X-energy Xe-100**

- Partnering with Dow Chemical Company
- May 2023: Selected Seadrift, TX as preferred site
- 2022: Completed independent project review

# Carbon Management

***Three programs, $7B***

**Carbon Capture Demonstration Projects:** Develop six at scale carbon capture facilities from gas, coal and industrials

- 2 FOAs issued: FEEDS and Demos
- 6 FEEDS under award of 8 selected
- 3 Demos selected, 2 Nat Gas 1 Coal

**Carbon Capture Large-Scale Pilot Projects:** Establish and test innovative carbon capture pilot projects to support new processes and technology at scale

- 4 projects selected

**Regional Direct Air Capture Hubs:** Develop four regional direct air capture hubs to capture and sequester, utilize, or sequester and utilize at least 1,000,000 metric tons of $CO_2$ annually

- 2 DAC Hubs selected (Topic 3)
- 1 under award

- Additional carbon management projects in Industrial Demonstration Program and Hydrogen Hubs
- ~$2B in funding for more demonstration FOAs

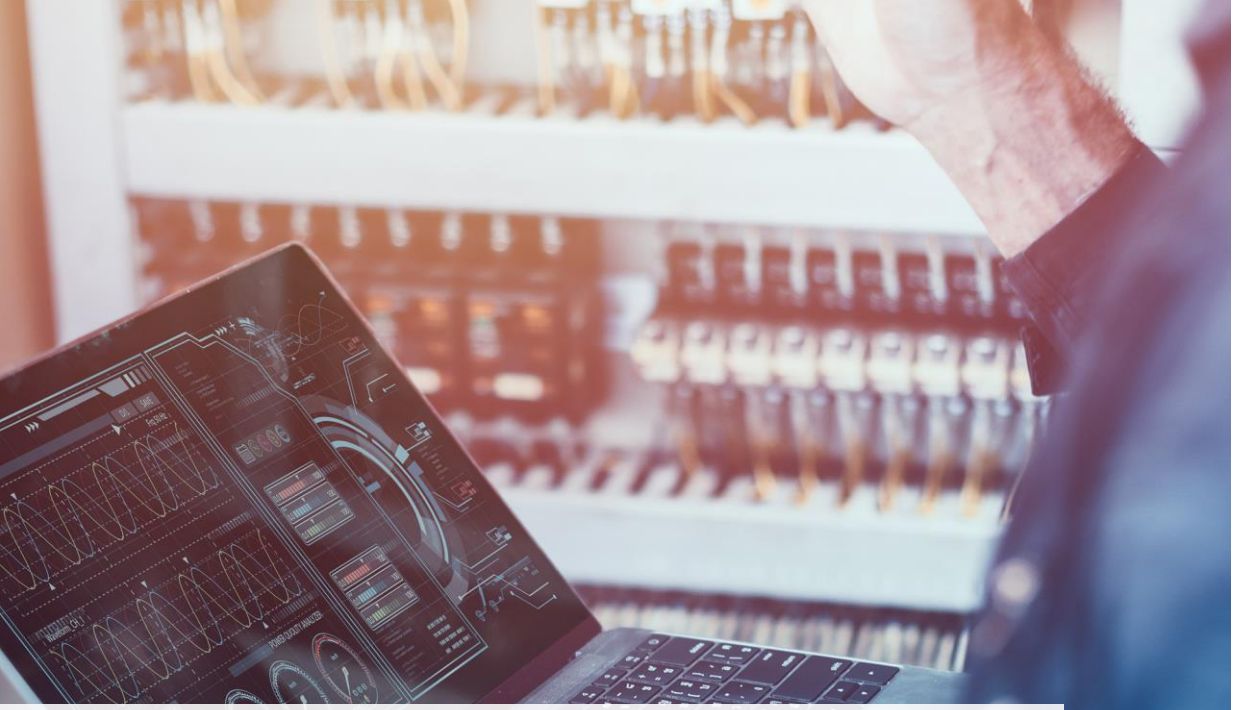
# Clean Energy Demonstrations on Mine Land

## Carry out up to five clean energy projects on current and former mine land to show technical and economic feasibility

- Eligible technologies: solar (at least two projects); micro-grids; geothermal; direct air capture; fossil generation with CCUS; energy storage; advanced nuclear
- Focus on local economic development and environmental justice

***Current Status***

- March 2024: Selected five projects for award negotiations
- August 2023: Received full applications
- April 2023: Issued $450M funding announcement
- September/October 2022: Hosted regional workshops
- August 2022: Closed RFI



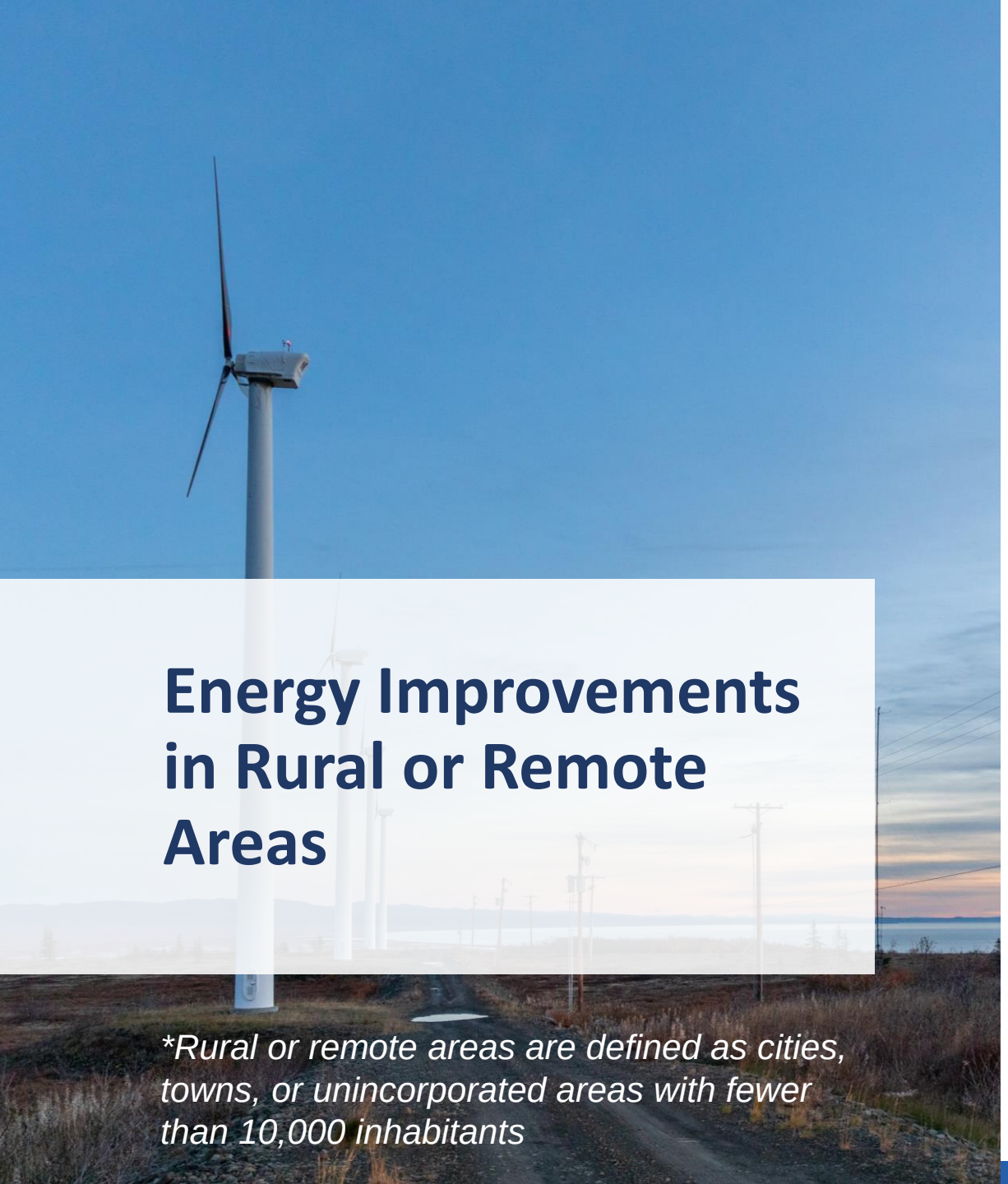
# Distributed Energy Systems

## Develop reliable, resilient and cost-effective energy systems to better support our rapidly changing electric grid and the growth of electric vehicles, energy storage, and the electrification of buildings and industry

- Projects will demonstrate aggregated approaches that integrate utility planning, sensors, communications and control infrastructure, and solutions to long-term operations.

***Current Status***

- April 2024: Deadline for full applications
- December 2023: Deadline for concept papers
- September 2023: Issued $50M funding announcement
- July 2023: Issued NOI & RFI for anticipated $50M funding announcement



# Energy Improvements in Rural or Remote Areas

**Rural or remote areas are defined as cities, towns, or unincorporated areas with fewer than 10,000 inhabitants*

## Improve resilience, safety, reliability, and availability of energy in rural or remote areas and increase environmental protection from adverse impacts of energy use

### *Current Status*

- **Grant**
  - April 2024: Selected 19 projects for award negotiations
  - October 2023: Received full applications
  - May 2023: Announced $50M in grant funding
- **Energizing Rural Communities Prize**
  - July 2023: Selected 67 winners
  - March 2023: Announced $15M prize
- **Funding Opportunity Announcement**
  - February 2024: Selected 17 projects for award negotiations
  - August 2023: Received full applications
  - March 2023: Issued $300M funding announcement
  - December 2022: Closed RFI

# Industrial Demonstrations

## Demonstrate transformational technologies to decarbonize energy-intensive industries

- Drive a U.S. competitive edge in low- and net-zero carbon manufacturing
- Help build a market for green products through high-impact, replicable solutions

***Current Status***

- April 2024: Selected 33 projects for award negotiations
- August 2023: Received full applications
- March 2023: Issued $6B funding announcement


# Long-Duration Energy Storage Demonstrations

***Three programs***

**LDES Demonstrations:** Develop energy storage technology to supply energy at peak periods of demand on electric grid and improve energy efficiency, reduce peak loads of homes and businesses, provide ancillary services for grid stability, and increase the feasibility of microgrids.

**DOE/DOD LDES Joint Program:** Collaboration between DOE and Department of Defense (DOD) for long-duration demonstrations on government facilities.

**Energy Storage Pilot Grant Program:** Program that aims to bring a range of benefits provided by storage to targeted recipients including states, tribes, and utilities.


# Long-Duration Energy Storage Demonstrations

***Current Status***

## LDES Demonstrations

- September 2023: Selected nine projects for award negotiations
- November 2022: Issued $349M funding announcement
- June 2022: Closed RFI

## LDES Lab Call

- September 2023: Selected six projects for award negotiations
- March 2023: Received scoping study

*Under Development: Energy Storage Pilot Grant Program and Joint DOD Program.*

# Regional Clean Hydrogen Hubs

## Build 6-10 regional clean H2Hubs across the country to create networks of clean hydrogen producers, consumers, and local connective infrastructure to accelerate use of clean hydrogen.

- Feedstock diversity
- End use diversity
- Geographic diversity
- Employment and training

***Current Status***

- October 2023: Selected seven projects for award negotiations
- July 2023: Announced $1B NOI and RFI for demand-side hydrogen initiative
- September 2022: Issued $7B funding announcement

# Liftoff Enabling Programs

**Manufacture of Advanced Key Energy Infrastructure Technologies (MAKE IT) Prize:** To boost domestic manufacturing and ensure a robust, secure supply chain of critical clean energy technology components.

**Voucher Program:** To provide free assistance to companies for commercialization and pre-demonstration services, and to local governments for siting and permitting needs.

**Collaborative Alignment for Clean Technology Industries (CACTI):** For DOE National Laboratories to establish two industry working groups to increase communication across entities working within clean energy technology industries.

# Liftoff Enabling Programs

**GREET User Interface:** To develop an industry-friendly and easy-to-use interface to access this standard life-cycle analysis modeling tool (GREET) and facilitate viability of new industrial projects.

**$CO_2$ Removal Measurement, Reporting, and Verification Removal (MRV) Lab Call:** To establish industry-accepted framework for measurement, reporting, and validation of carbon removal through mineralization, cement/concrete, biomass, and direct air capture pathways.

**Solutions for Lasting, Viable Energy Infrastructure Technologies (SOLVE IT):** To support innovative local clean energy solutions through organizations with a demonstrated history of community-based initiatives to help communities find solutions to their energy challenges.

# OCED in Alaska


**15**

Number of projects OCED is invested in across 32 sites (11 to be determined).

**$213**

Millions of dollars directed to OCED projects in Alaska.

**8**

Different technology areas invested in (solar, battery storage, wind, thermal storage, microgrid, heat pumps, hydropower, transmission).

# Stay Connected

- **OCED Website & Newsletter Sign-up**
  energy.gov/oced
- **OCED Exchange (RFIs, NOIs, and FOAs)**
  oced-exchange.energy.gov
- **American-Made Challenges**
  americanmadechallenges.org
- **Self-nominate to be a FOA reviewer**
  oced-exchange.energy.gov/Registration
- **Apply to the Clean Energy Corps**
  energy.gov/CleanEnergyCorps
- **Get in touch via email**
  OCED@hq.doe.gov
- **Follow us on LinkedIn**
  linkedin.com/company/doe-oced/

# Thank you!


OCED

Office of Clean Energy Demonstrations

For more information, please visit: energy.gov/OCED

# Backup Slides

☆ Initial Application

◇ Go/No-Go Decisions

| | Application | Phase 1: Detailed Plan | Phase 2: Project Development | Phase 3: Install, Integrate, Construct | Phase 4: Ramp-Up & Operate |
|---|---|---|---|---|---|
| | **Pre-DOE funding** Up to 50% | **TBD DOE funding** Up to 50% **12-18 months** | **TBD DOE funding** Up to 50% **2-3 years** | **TBD DOE funding** Up to 50% **2-4 years** | **TBD DOE funding** Up to 50% **2-4 years** |
| **Engineering, Procurement, Construction, Operations** | • Engineering concept (~5%)<br>• Tech. readiness descriptions<br>• Project L1 Integrated Project Schedule (IPS), Phase 1 L2 IPS<br>• Class 4/5 Total Project Cost (TPC) estimate | • Engineering & design (~30%)<br>• Tech readiness analysis, including uncertainties, risk<br>• Project L2 IPS, Phase 2 L3 IPS<br>• Class 3 TPC estimate | • Engineering & design (~90%)<br>• Tech updates<br>• Project L3 IPS, Phase 3 L4 IPS<br>• Class 1 TPC estimate<br>• Standard project management (PM) tool in use<br>• Operations plan | • Tech risk updates, tracking<br>• Progress execution reports<br>• Interim Go/No-Go reviews | • Regular operations status reporting<br>• Tech risk updates, tracking<br>• Final TPC accounting |
| **Business Development & Management** | • Business strategy<br>• Team description<br>• Workforce plan (SKAs)<br>• Finance plan<br>• Market potential analysis | • Project Management Plan (PMP)<br>• Risk Management Plan (RMP)<br>• Financial model<br>• Updated workforce plans<br>• Market & off-take commitments<br>• Site selection | • Teaming, offtake, & feedstock agreements<br>• Sites access secured<br>• Integrated RMP updated<br>• Confirmed project financing<br>• Labor agreements | • Regular progress/status reporting for all agreements<br>• Regular financial status reports<br>• Other reporting per T/Cs<br>• Updated RMP covering Phases 3 & 4 | • Financial models updated with offtake & production data<br>• Revised growth plans & projections<br>• Updated RMP covering ramp & steady state operations |
| **Permitting & Safety** | • Safety history/culture description<br>• Permitting timeline overview<br>• Environmental approval overview (State & Federal) | • Site Safety Plans (SSP)<br>• Physical, Information, Cyber Security Plans (including PCII)<br>• Environmental data package<br>• Initial NEPA documentation | • Execution-ready SSP<br>• Final physical, information & cybersecurity plans<br>• Permits for construction<br>• Environmental reviews / assessments | • Status reporting on required permits & environmental<br>• Safety & security incident reporting & audits<br>• Permits for operations | • Ongoing permit, safety, & security reporting |
| **Community Benefits** | • Community Benefits Plan (CBP), including community & labor engagement; quality jobs and workforce development; DEIA; J40 Initiative | • Implement Community Benefits Commitments (CBC)-Phase 1 Scope<br>• Update Community Benefits Commitments for Phases 2 – 4 based on Phase 1 activities | • Implement CBC-Phase 2 scope<br>• Update CBC for Phase 3-4 based on Phase 2 activities | • Implement CBC-Phase 3 Scope<br>• Update CBC for Phase 4 based on Phase 3 activities | • Implement CBC-Phase 4 scope<br>• Update CBC based on activities & findings from ramp-up to commercial scale operation |
| **Technical Data** | • LCA Analysis (i.e., GREET) | • Performance model | • Mature LCA, V&V plans | • Periodic TEA & LCA updates | • Validated performance model<br>• LCA & TEA incorporating |

# Phased Approach to Project Management


Initial Application

Go/No-Go Decisions

| | | | | |
|---|---|---|---|---|
| **Pre-DOE funding** Up to 50% | **TBD DOE funding** Up to 50%<br>**12-18 months** | **TBD DOE funding** Up to 50%<br>**2-3 years** | **TBD DOE funding** Up to 50%<br>**2-4 years** | **TBD DOE funding** Up to 50%<br>**2-4 years** |

# Build America, Buy America (BABA)

- The BIL's BABA provisions provide a new Made in America requirement for financial assistance awards, whether funded through the BIL or appropriations:
  - "None of the funds made available for a Federal financial assistance program for infrastructure may be obligated for a project unless all of the iron, steel, manufactured products, and construction materials used in the project are produced in the United States"

- DOE may waive the application of a Buy America preference on a project if:
  - It is in the public interest
  - Items are not available in sufficient quantities or satisfactory quality
  - Costs are unreasonable (>25%)
  - An urgent need in an unforeseen and exigent circumstance (waiver of public notice and the OMB review process)

# OCED Credo

| | |
|---|---|
| **T** Transparency | Ensure fairness, clarity, and candor throughout the lifecycle of the demonstration projects |
| **R** Replicability | Enable private sector replicability, feasibility, and deployment through technical, financial, commercial, and human capital |
| **U** Urgency | Accelerate timeline to unleash private sector clean energy investment to meet U.S. net-zero goals |
| **S** Shared Success | Ensure OCED and its private sector partners are fully aligned to achieve win-win equitable outcome |
| **T** Timeliness | Commit to crisp decision-making to severely limit project delays |