

Colorado (Pueblo) Regional DAC Hub

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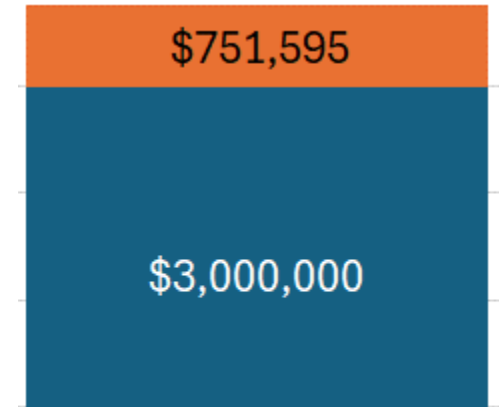


Project Overview

Total Funding: \$3,751,595

DOE: \$3,000,000

Cost Share: \$751,595



■ DOE ■ Cost Share

Work Period 1: 1 Jul 2024 – 31 Mar 2025

Work Period 2: 1 Apr 2025 – 30 Jun 2026

Project Participants:



Overall Project Objectives

The overall objective of this project is to complete a feasibility study for a Regional Direct Air Capture (DAC) Hub that encompasses the Pueblo region in the Colorado state, that is designed to assure a capacity to capture and store at least 1,000,000 metric tons (tonnes) of carbon dioxide (CO₂) from the atmosphere annually (MTA), with an initial capacity of at least 50,000 tonnes of CO₂ (KTA).

The study will be executed in two phases: Phase 0a (Pre-Feasibility) and Phase 0b (Feasibility).

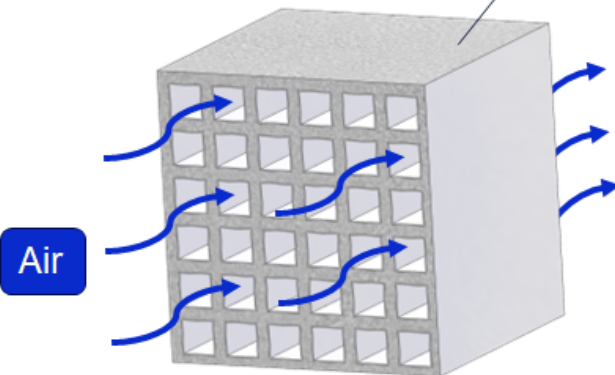
Project Location



Sustaera DAC Technology



Temperature, vacuum assisted, swing adsorption cyclic process

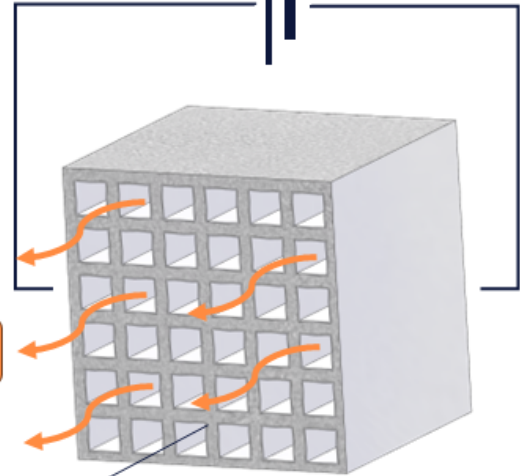


Air

Lightweight, mass-produced ceramic monolith converted to a resistive heater and coated with novel sorbent via standard process.

Operating Step 1, Adsorption:
Flow air through SMA channels to adsorb CO₂ without need for cooling after heated desorb

Inherently low-pressure drop, large geometric surface area, and low thermal mass coupled with fast, integrated resistive heating.



CO₂

Operating Step 2, Desorption:
Conduct renewable electricity through SMA to heat sorbent and desorb CO₂ and collect with vacuum

Sustaera DAC Technology

Low cost, high performance, stable amino acid salt solid sorbent on low pressure drop support with integrated heating

1. Minimize Capital Cost

- Low-cost materials and manufacturing
- High performance sorbent (high selectivity to CO₂, capture rate, capacity, stability) reduces capital intensity

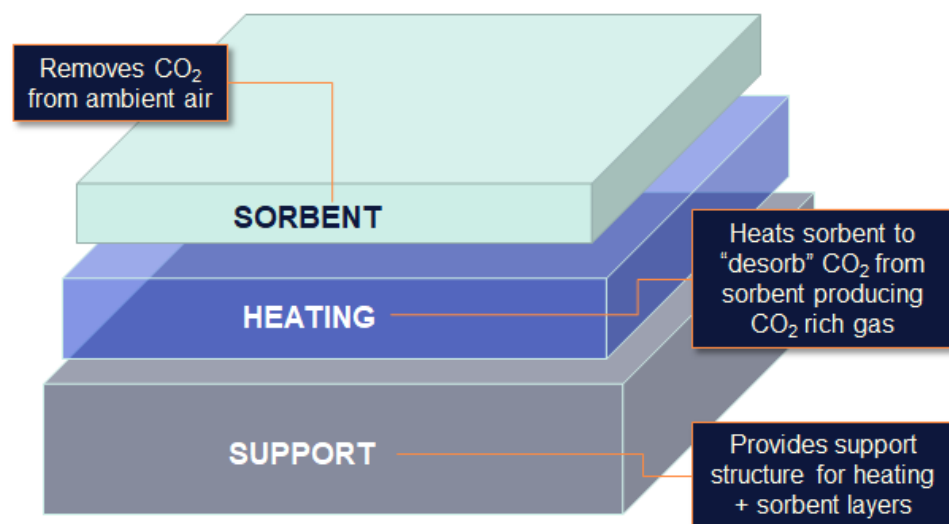
2. Minimize Energy

- Lower temperature required for regeneration (80°-120°C)
- Localized heating of active sorbent; “heating from within”

3. Maximize Net CO₂ Removal Efficiency

- Electric only design enables use of low carbon energy sources (e.g. wind, solar, geothermal)
- Fast cycle times due to adsorption/desorption kinetics and efficient heating yield lower embodied emissions from equipment manufacturing and construction

Three Layered System



Sustaera Proprietary Structured Material Assembly (SMA)

Sustaera DAC Technology

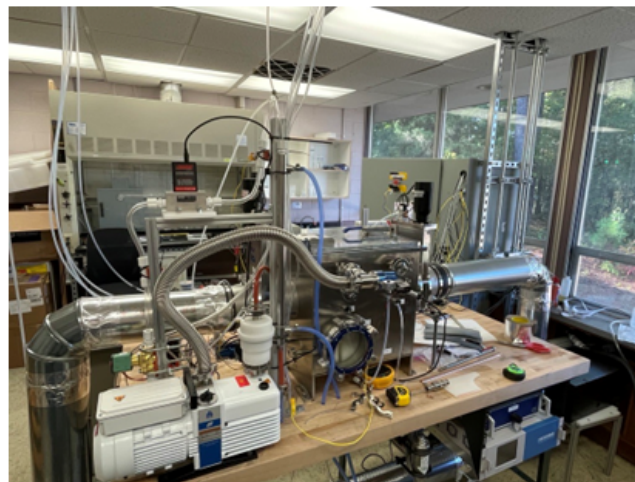
Seeded with DOE FECM NETL funding at Bench-scale to unlock private investment for verifying sorbent stability over 2,000 cycles in realistic DAC conditions and commercially producing and testing Generation 1 SMA with world-class partners



TRL 4

Fast Cycling Sorption Reactors –

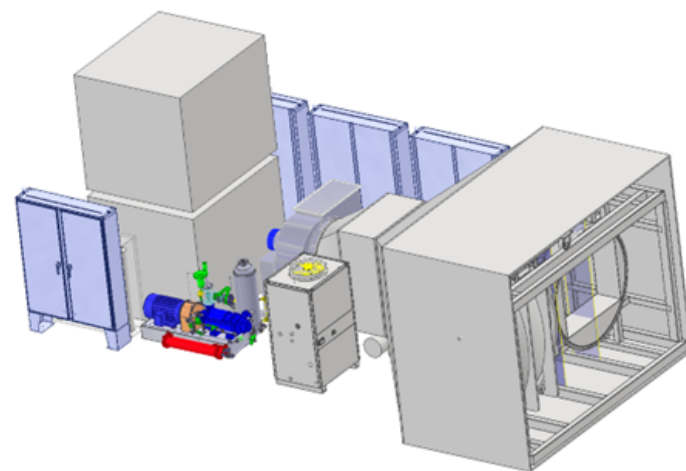
Fast cycling of sorbent & fully integrated cores for stability & capacity performance



TRL 5

Lab Pilot 1 TPY –

Capture ~1 tonne of CO₂/ year from ambient air utilizing commercially produced SMA.



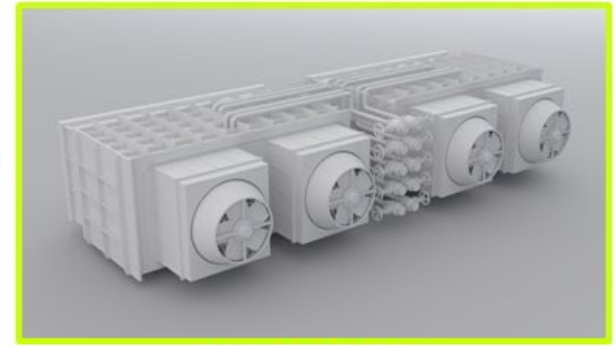
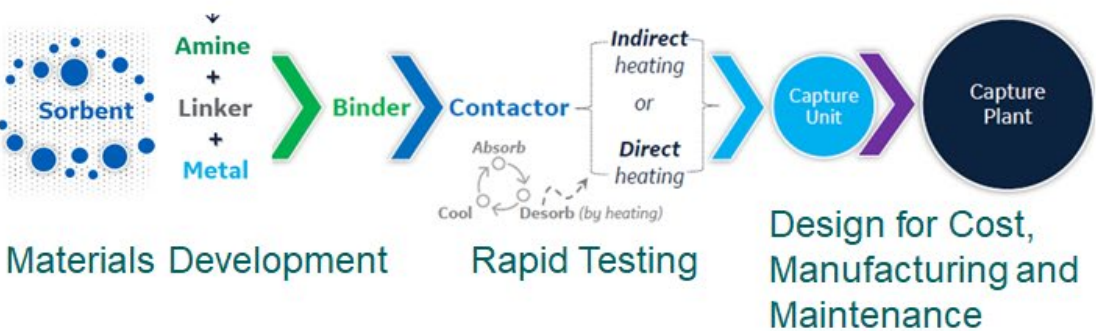
TRL 6

Outdoor Pilot 60 TPY –

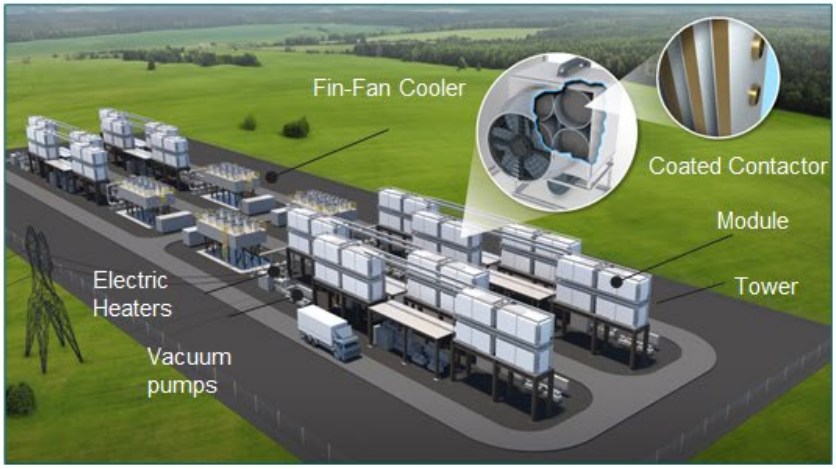
Capture 60 tonne of CO₂/ year from ambient air as final technology derisk step ahead of commercial facilities.

GE Vernova DAC Technology

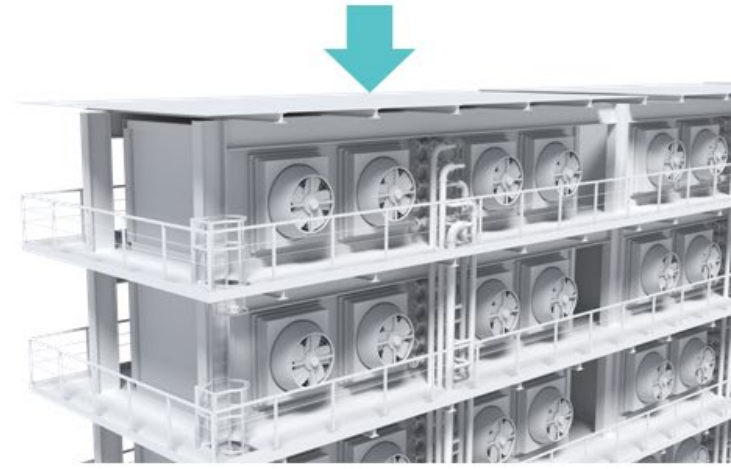
Carbon Capture & Atmospheric Water Extraction... "Powder to Plant"



Capture Unit



Capture Plant



Stacks of Units

Carbon America

Background:

Carbon America is a Colorado-based vertically integrated carbon capture and storage (CCS) developer, owner, and operator with a mission to quickly and safely capture and store as much carbon dioxide as possible. The company's team of world-class experts cover the entire CCS value chain, including capture processes; geology, geoscience, reservoir engineering; project development; commercial, finance, and tax equity structuring; regulatory and advocacy engagement; and acquisition of necessary land and sequestration site management for CO₂ storage.

Responsibilities:

Carbon America is currently partnering with the Colorado School of Mines on a CarbonSAFE project (separate award FE0032342) to characterize a potential sequestration site for this project.

They will also be integral to the consortium development discussions and hub feasibility study.

Technical Approach/Project Scope

Phase 0a (Pre-Feasibility)

Phase 0b (Feasibility)

Work Breakdown Structure	
Task #	Task
1	Project Management and Planning
1.1	Project Management Plan (PMP)
1.2	Business Plan
1.3	Financial Plan
1.4	Technology Maturation Plan (TMP)
1.5	Community Benefits Plan (CBP)
2	DAC Hub Pre-Feasibility
2.1	DAC Hub Description
2.2	DAC Technology Selection
2.3	DAC Hub Data Tables
2.4	Preliminary Life Cycle Analysis (LCA)
2.5	Safety, Security, and Regulatory Requirements
	Continuation Application / Decision Point 1

Work Breakdown Structure	
Task #	Task
3	Finalizing DAC Hub Concept
3.1	DAC Hub Concept
3.2	DAC Technology Descriptions
3.3	DAC Hub Data Tables
3.4	Integrated DAC System pre-FEED Study
3.5	DAC Hub Balance-of-Plant Conceptual Design
3.6	Updated Life Cycle Analysis (LCA)
3.7	Storage Field Development Plan Status
3.8	Environmental Health and Safety Risk Analysis
3.9	Safety, Security, and Regulatory Requirements
3.10	Integrated Project Schedule (IPS)

Technical Approach/Project Scope

Decision Points	Date	Success Criteria
End of BP1 - Go / No Go	14 February 2025	Complete pre-feasibility study.
	14 February 2025	Submission of completed Continuation Application.
At Project Completion	31 March 2026	Complete a preliminary front end engineering design (pre-FEED) study.
	31 March 2026	Complete a Technology Maturation Plan (TMP).
	31 March 2026	Complete a Life Cycle Analysis (LCA).
	31 March 2026	Complete an Environmental, Health, and Safety (EH&S) Risk Analysis.
	31 March 2026	Complete a Storage Field Development Plan.
	31 March 2026	Complete a Business Plan.
	31 March 2026	Complete a Financial Plan.
	31 March 2026	Complete the DAC Hub data tables.
	31 March 2026	Complete a Community Benefits Plan.

Progress and Current Status of Project

- a. Project Started: July 1st, 2024.
- b. Updated Project Management Plan submitted.
- c. Defining Hub structure, common facility philosophy, basis for development.
- d. Community Benefits Plan development proposal begun:
 - i. Pre-approval to attend FECM Carbon Management Workshop in Pueblo, CO, April 2, 2024 – learned community sentiments, understanding of DAC, and key stakeholder groups
 - ii. Started preliminary community/labor analysis and Justice40 benefits flow analysis

Summary of Community Benefits Planning Strategy

Justice40 Analysis



Benefit Maximization:

- Formulate strategies, methods, and milestones to optimize benefits and reduce negative impacts specific to the CO Pueblo region.

Impact Mitigation Plan:

- Develop a plan to address increases in air and water pollution, incorporating accountability, feedback, and transparency mechanisms with CO Pueblo's disadvantaged communities.

Engagement/Data Collection:

- Ensure access to and participation in collecting project data for affected communities.

Community Engagement



Needs Assessment:

- Assess community benefits, evaluate resources (including external partners), and establish a development timeline.

Communication Methods:

- Apply diverse communication techniques (e.g., focus groups, interactive workshops) to engage the community and establish clear engagement methods.

Engagement Strategy:

- Outline short and long-term goals and metrics for sustained community engagement in the CO Pueblo region.

Investing in American Workforce



Workforce Hiring Assessment:

- Assess future workforce needs, pinpoint potential hiring obstacles (e.g., skill shortages, competition), and identify opportunities for growth.

Creation and Retention of Jobs:

- Define project related quality jobs, develop comprehensive workforce development program, ensure workers' rights, and set clear goals, milestones, and resource plans.

Outreach and Engagement:

- Collaborate on strategies to attract underrepresented groups and promote local awareness of training and job opportunities through strategic partnerships and targeted outreach.

DEIA



DEIA Goals and Outcomes:

- Refine specific Diversity, Equity, Inclusion, and Accessibility (DEIA) objectives tailored to project.

DEIA Partnerships:

- Forge collaborations with Minority-Serving Institutions (MSIs) and local DEIA organizations.

Implementation Strategies:

- Develop actionable strategies to meet DEIA goals, including role definitions, resource requirements, accountability measures, and timelines.



Justice40 Communities in DAC Hub Region (indicated in blue)

Summary Slide

Project's key idea/takeaway:

- The Hub will leverage Carbon America's proposed study for CO₂ sequestration.
- The proposed Hub will also leverage NextEra Energy's existing partnerships.
- The Hub activities will support numerous businesses in developing technologies and partnerships, while benefitting economically depressed populations in the region.

Highlights of the Community Benefits Plan:

- The Community Benefits Plan (CBP) effort will attempt to quantify potential incremental economic development in the affected region and assess projected regional job creation levels with a focus on economically distressed/impacted communities.

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