AERA DAC HUB KERN

DE-FE0032383

2024 FECM/NETL Carbon Management Research

Project Review Meeting, August 5 – 9, 2024

Aera Federal LLC

A subsidiary of California Resources Corporation

Hatuaon (**Dudi**) Ritonga

Project Overview | Feasibility, Pre-Feed, Balance of Plant & CBP Planning

Establish the technical and business feasibility of a DAC Hub concept in California's Kern County.

- Evaluate the technical and engineering integration required for the DAC Hub ecosystem, including CO_2 capture, transport, and permanent sequestration, as well as supporting infrastructure and resource requirements
- Demonstrate feasibility of permanently storing at least 1MM MT of CO_2 per year at a minimum of 12 years
- Develop Community Benefits Plan (CBP), which will consider U.S. Department of Energy (DOE) goals of community engagement; diversity, equity, inclusion, and accessibility (DEIA); American workforce investment; and Justice40

Confirming advantages and answering uncertainties.

- Business Plan (business case; commercial; market analysis)
- Financial Plan
- Technology Maturation Plan
- Risk Management Plan
- CBP

Who We Are | Aera Federal has assembled a strong technical and community coalition to deliver success

Aera Federal LLC[1] is a subsidiary of California Resources Corporation (NYSE: CRC) since July 1, 2024. An independent energy and carbon management company committed to energy transition, CRC produces local, responsibly sourced energy while accelerating the decarbonization of industrial and energy industries.

Being the Prime Recipient / Principal Investigator, Aera Federal will have the ultimate accountability of the success of the execution of this Award. Collaborating while leading the sub recipients and engineering subcontractor, the team will produce the highest possible quality TA-1 product on time and on budget.

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mosaic

Capture technology partners (TRL 5-7) will test and advance two distinct sorbent technologies

Carbon Capture

BATTELLE

Engineering, project management, and grant execution expertise will help deliver technical excellence while meeting strict grant requirements

Kiewit

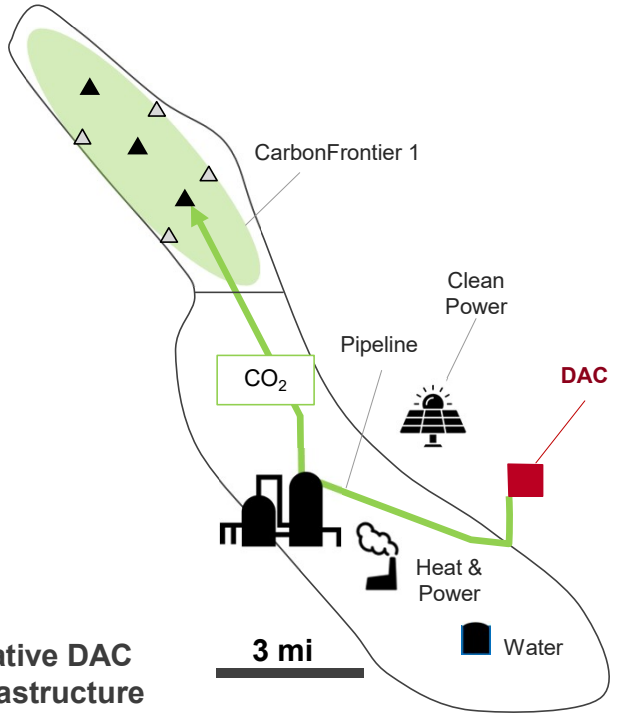
CSUB

CSUB's leadership leverages the University's longstanding community ties to deliver on DEIA and Justice40 grant requirements

1) Formerly an Aera Energy, LLC subsidiary

Project Discussions | DAC provides optionality to achieve net zero target while providing potential entry into an areas of high growth potential

- **Net zero solution for enterprise and partner industries**
- Subsidized pathway to derisk DAC technologies
- Position for future $0.5B TA-3 Award
- Synergy with CRC's other carbon management initiatives
- New businesses with growth potential:
  - Carbon credits
  - Belridge-based services to DAC tenant(s)



Belridge Oilfield w/ Illustrative DAC Location and Enabling Infrastructure

Project Funding and Performance Dates | 39% Cost Share in a 24-mo Award contract period

DAC Hub Kern Project

DOE-approved Project Cost ($MM)

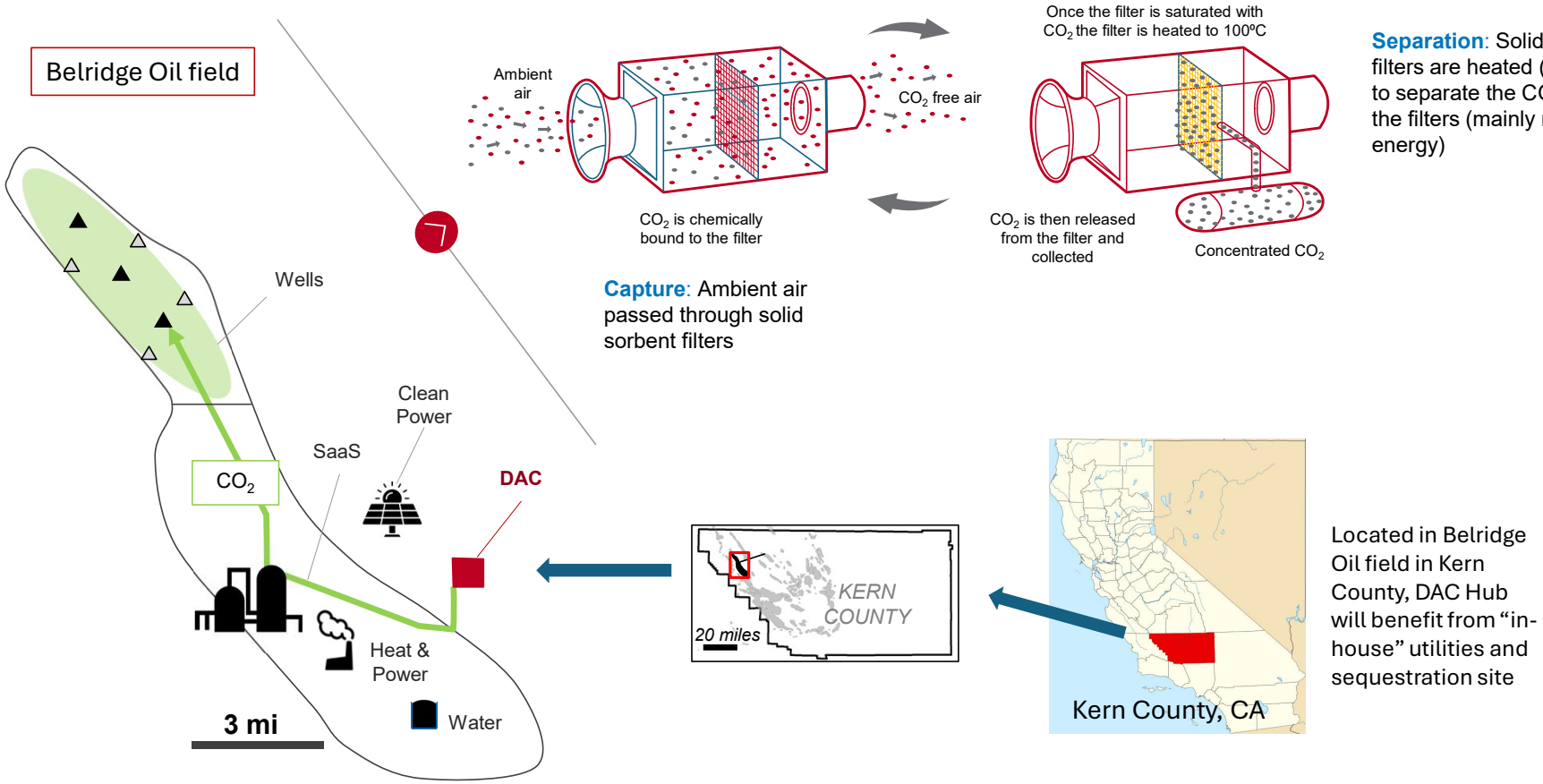
Budget Period	Federal	Cost Share	Total Cost	Cost Share %
1	$1	$0.7	$1.7	43%
2	$1.8	$1	$2.9	37%
3	$0	$0	$0	0%
Total	**$2.8**	**$1.8**	**$4.6**	**39%**

Rounding occurs. No Actual Expenses incurred until project is kicked off

Performance Date

- Phase 0a: 05/01/24 – 01/31/25 (Feasibility)
- Phase 0b: 02/01/25 – 04/30/26 (Pre-FEED)

DAC Hub Kern Fundamentals | Direct Air Capture + Sequestration

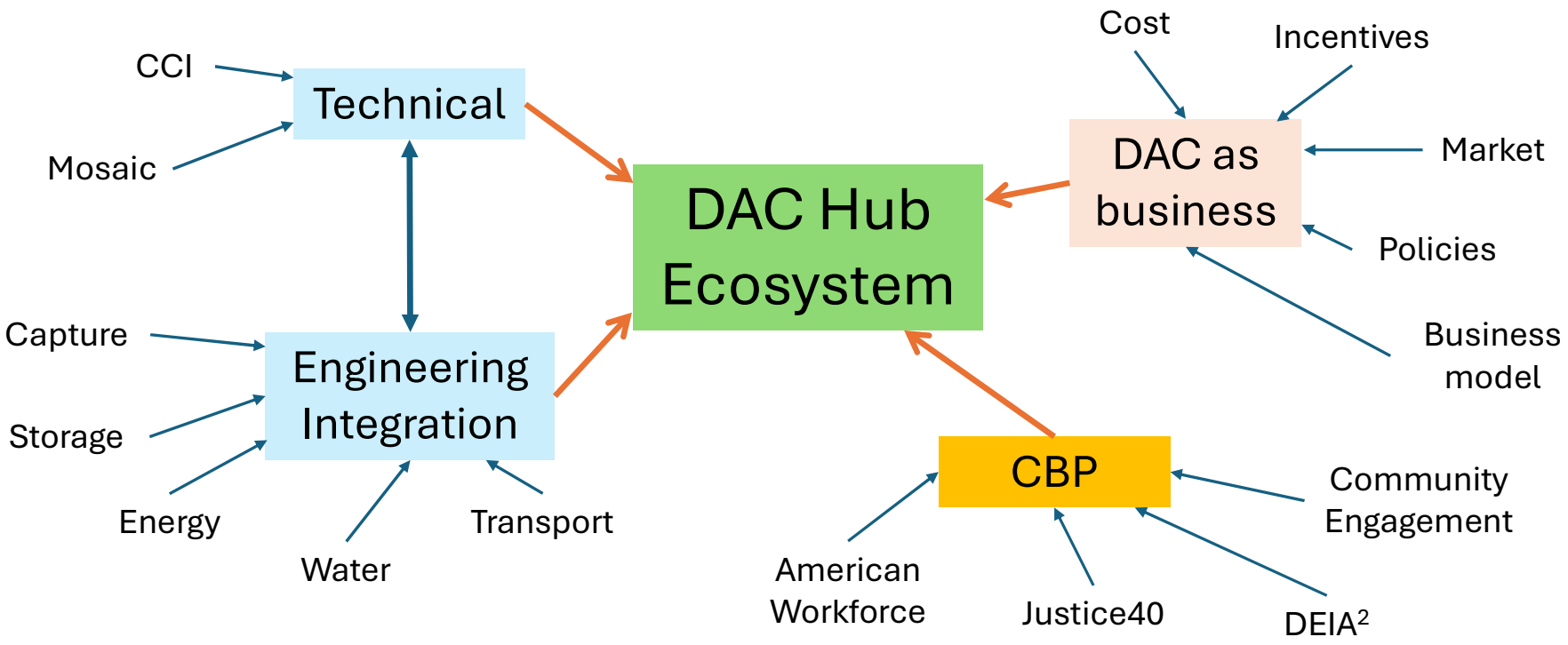


Capture: Ambient air passed through solid sorbent filters

Separation: Solid sorbent filters are heated (~80-100C) to separate the CO_2 from the filters (mainly renewable energy)

Located in Belridge Oil field in Kern County, DAC Hub will benefit from "in-house" utilities and sequestration site

SOPO[1] | Hybrid scientific, business, and social approach to advance DAC Hub Ecosystem



1) SOPO – Statement of Project Objectives
2) Diversity Equity Inclusion Accessibility

SOPO[1] | Complete combination of technical, business, and community benefit plans

This project aims to establish the technical and business feasibility of the Aera DAC Hub – Kern along with the CBP[2] planning.

Project Management Plan
Technology Maturation Plan
Business and Financial Plan
Integrated Project Schedule
Storage Field Development Plan

EH&S Risk Analysis
Risk Management Plan
Safety Culture
Permitting Workflow

CBP Proposal

DAC Hub concept Development – 1MTA
Energy Technology Assessment (50KTA / 1MTA)
Anchor DAC Technology Selection (50KTA)
DAC Hub BOP Design – 1MTA
Life Cycle Analysis (LCA) – 50KTA

Phase 0a: 05/01/24 – 01/31/25 (Feasibility)

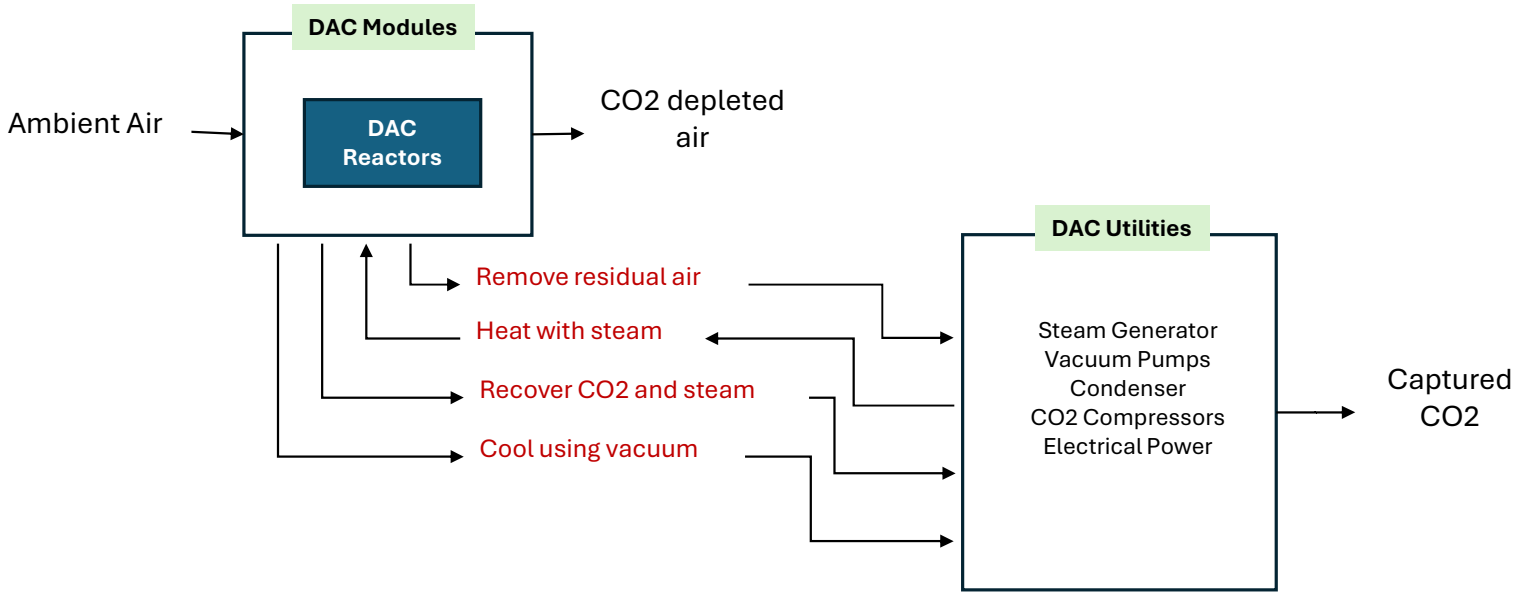
CONTINUOUS DECISION 1

Energy Supply Design
(50KTA pre-FEED / 1MTA Conceptual)
Integrated DAC pre-FEED – 50KTA
DAC Hub BOP Conceptual Design – 1MTA
Storage Field Development Plan
DAC Hub Data Tables
Preliminary LCA – 50KTA / 1MTA

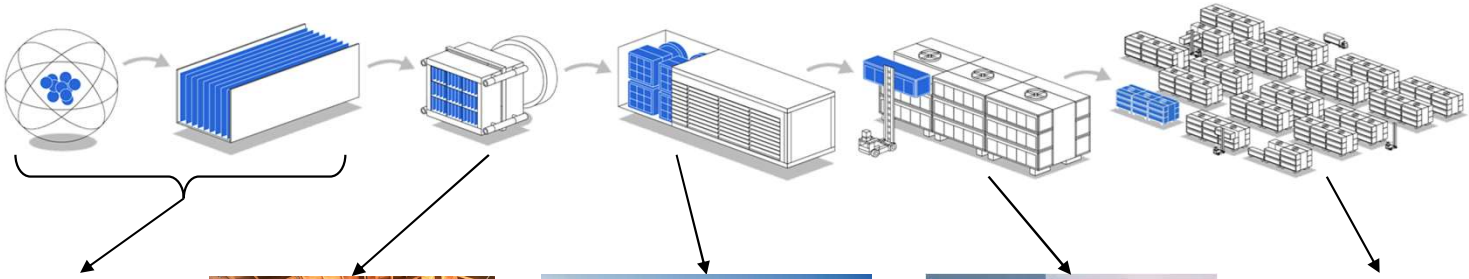
Phase 0b: 02/01/25 – 04/30/26 (Pre-FEED)

1) SOPO – Statement of Project Objectives
2) CBP – Community Benefits Plan

CCI Technology Fundamentals | Structured solid sorbents heated with low-temperature steam and cooled under vacuum

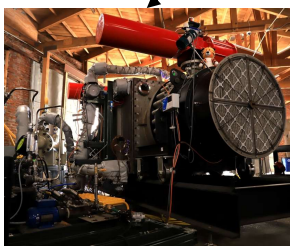


CCI Commercialization Progress | Mesa, AZ Fabrication Site in 2025



Ongoing

Structured sorbent development



2022 (operational)

1st commercial scale reactor with structured sorbent
Los Angeles
Single reactor (35 tons/year)

2024 (operational)

1st commercial scale module with structured sorbent
Los Angeles
Multi-reactor module
(500 tons/year)

2025 (in construction)

Commercial pilot
Multi-module cluster
(2000 tons/year)

2026+

1st commercial scale project

CCI Advantages | Modular Open System

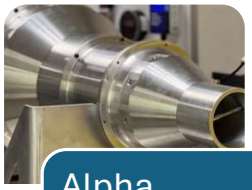
- **Highly advanced technology** centered around structured sorbent (TRL 7) reduces risk and accelerates deployment of commercial projects.
- **Modular design** accelerates deployment timelines while fostering continuous improvements in design and cost efficiencies at scale.
- **Open Systems Architecture** allows for the upgradability of existing sorbents and hardware, ensuring ongoing enhancements in performance throughout its lifespan.
- **Extensive development programs** yield structured sorbents tailored for diverse climates.
- **State-of-the-art test facility** evaluates new sorbents across various scales, from grams to hundreds of kilograms, using specialized DAC-specific test protocols.
- **Experienced team** excels in engineering, manufacturing, procurement, deployment, and community engagement.

Mosaic Technology Fundamentals | MOF (Metal Organic Framework)

Stage 1	Ambient air flows through our MOF (Metal Organic Framework) material, >90% of CO_2 is captured, other gases flow through
Stage 2	MOF heated below 100°C, CO_2 is released in highly concentrated form
Deliver CO_2	CO_2 delivered downstream to be sequestered or utilized

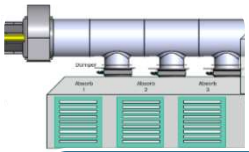
Mosaic Commercialization Progress | Validating materials and process with increasing scales and integration

Lab Scale
- New formulations
- New chemistries



Alpha
- 1 tpy system
- Alameda, CA

Bravo
- 125 tpy system
- Houston, TX

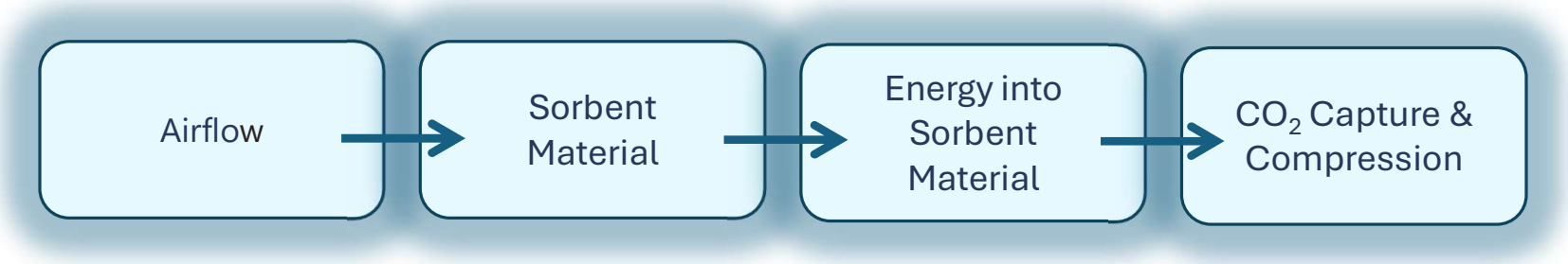


Charlie
- 1000 tpy system
- Field demonstration

Commercial
- 10,000+ tpy system
- Customer site

Year	2016	2022	2024	2025-26	2026-27
Key Validation Points	Chemistry & MOF material mfg capabilities	System & material integration development	Cont'd system development & design, material mfg at scale	Demonstrate system performance, path to low cost carbon capture ($X/ton CO_2)	Multi-module integration, develop partners & carbon credit capabilities

Mosaic Advantages | Smaller units; Less sorbent



4x less airflow required per ton of CO_2 vs. other sorbents

4x of CO_2 capacity vs other sorbents

Small temperature difference required to adsorb vs. desorb

>90% Capture Fraction
Cleaner CO_2 stream

Smaller DAC unit needed
Less sorbent needed
Lower energy requirements

CBP[1] | TA-1 will produce plan for CBP by collaborating closely with local university (CSUB[2]) and various Kern communities

Utilization of assessment tools, community partnerships and listening sessions

TARGETS

- Identify communities with linguistic and economic barriers
- Provide disinvested communities access to clean energy
- Provide job training and skills development for local workers
- Share best practices to increase clean energy enterprise creation and contracting
- Build partnerships to increase parity in clean energy technology access and adoption
- Share best practices to improve energy resilience

COLLABORATIONS

- Community-based organizations representing local residents
- Businesses
- Labor unions and worker organizations
- Local government
- Emergency responders
- Communities with environmental justice concerns throughout Kern County

1) CBP – Community Benefits Plan
2) California State University Bakersfield

Best Practices and Lessons Learned | Project Management

- Best Practices
  - Flowing down company's Ts & Cs[1] early to gain alignment with sub-recipients and subcontractor.
  - Developing RACII table to assist different parties in how to collaborate.

- Lessons Learned
  - Flow-downs with sub recipients and subcontractor took time.
  - Familiarization of required reporting procedures and formats.

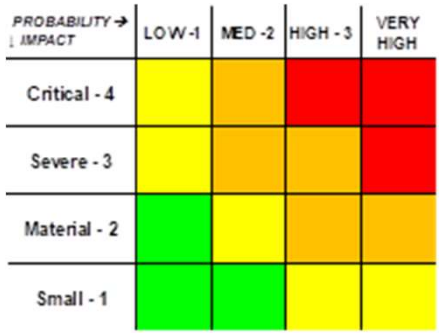
1) Terms and Conditions

Project Challenges and Risks | Technology is rapidly growing and ability to scale up is key

- **Technology**
  - DAC technologies are growing fast
  - Providers and moving forward in technology readiness / TRL
- **Scaling Up and Investment**
  - Lowering energy consumption required deployment at a minimum viable scale to optimize the efficient operation of technologies
  - Advanced sorbents tailored for DAC from laboratory to commercial scale demands substantial investments in capital, time, and resources.
- **Cost and Supply Chain**
  - Four to six times higher cost than flue gas carbon capture, attributed to the energy intensity of extracting CO_2 from low concentration (0.04%) sources of ambient air.
  - Economy of scale

Project Management Risks | Identified and to be refined as TA-1 work progresses

Category	Risk	Impact (1-4)	Prob (1-4)	Risk (I*P)	Mitigation
PM	DAC hub initial capacity concept evolution increases scope of work and budget in Phase 0a and/or Phase 0b	2	2	4	Scope and budget hours for each task will be closely monitored, including as frequent as weekly work planning meetings to monitor progress
PM	Project Team Communications	2	2	4	Ensure clear communication and expectations upon initial project team kickoff meeting. Plan appropriately consistent meetings with clear roles and responsibilities. of each organization.
Resource	Resources proposed for project not available at time of award	2	2	4	The prime and subrecipients will plan for resource availability assuming project award, to the extent possible. Subcontractor resource commitments would be confirmed upon selection notification, and alternative resourcing arranged as needed.
Technical	Renewable energy storage feasibility	3	2	6	Low-carbon energy supply has been identified as critical to success of the DAC hub, including renewable energy storage feasibility. Specific project tasks have been included to address this risk.
Technical	Renewable energy seasonal output fluctuation	4	3	12	Low-carbon energy supply has been identified as critical to success of the DAC hub, including renewable energy seasonal output fluctuation. Specific project tasks have been included to address this risk.



Next Steps | TA-1 completion to get ready for future FOA

- Complete Phase 0a by Jan. 31, 2025
- Complete Phase 0b by April 30, 2026
- Monitor future FOA and plan for path forward
  - Net-zero target (2045 and internal company target)
  - Permitting timeline
  - CarbonFrontier timeline
- (In parallel) DAC Strategy
  - Technology
  - Market / Business Model

Next Step - DAC Strategy | Overall approach to determine the best path forward

Deliverables (Focus Items)	***Resources***
1. Technology and Costs (CAPEX / OPEX)	*DAC Partners / Tech. Providers*
• Technology TRL – research the best technology alternative to proceed with	
• Over time cost curve – study future cost decline curve (energy costs; projections; etc.)	
2. Revenue	*Research*
• Market – research market demands for carbon capture / credits	
• Regs – Policies / incentives (45Q; LCFS; C&T, etc.)	
3. Business Model	*DAC Partners / Tech. Providers*
• JV / others – research best business model to operate DAC Hub.	
4. Timing	*SMEs & DAC Partners*
• Permitting – determine best permitting strategy	
• Investment / stage gates – determine investment schedule	
5. Project Economics	*Internal*

Project Success Criteria | Technology and Project Management

- DOE Acceptance of Continuation Decision Package by Jan. 31, 2025
- DOE Acceptance of Final Science/Technical Report by April 30, 2026
- Pre-FEED package completed for:
  - 1MTA DAC Hub Conceptual Design inc. BOP
  - 50 KTA Integrated DAC Pre-FEED Study
  - DAC Hub Data Tables
  - Energy Supply Design (50 KTA and 1 MTA)
  - Community Benefit Plan

Summary

1. Aera Federal LLC was **awarded a $2.8MM DOE** corporative agreement for the *DAC Hub Kern* project, with **project start date in June 2024**
2. *DAC Hub Kern* will test two advanced CO2 capture technologies
3. Aera's technical and community benefits coalitions position Aera for TA-1 success and future award opportunities
4. *Aera Federal was formed as a federally-compliant business entity to execute government projects*

Key Takeaways

1. DAC Hub Kern TA-1 Project provides an opportunity to vet **two** advanced-state capture technologies to meet net-zero targets
2. Unlocks **potential markets** for DAC-related services and selling carbon credits
3. *Unlock future **government projects** under Aera Federal*

Milestone Status and Look Ahead | All fronts are ramping up

Milestone Status

- Official DOE Kick-Off – July 18, 2024
- Sub-recipients Kick-Off – July 24, 2024
- Q2-2024 Reports submitted – July 29, 2024

Look Ahead

- Coordination between technology providers and BOP Engineering team – week of Aug. 5, 2024
- Project starts in each sub-recipient shop
- Kickoff with CBP partner
- Rolled-up project Schedule and cost estimates from sub-recipients and subcontractor
- Enable BOP work to commence by sharing battery limit conditions

Thank You / Q&A

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