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Aircapture Response to CEC RFI

Additional submitted attachment is included below.

California Carbon Management Hub RFI
Docket # 25-ERDD-01
Responses from Aircapture

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1. Your interest in partnering with other entities to apply for DOE funding and the role and expertise your organization would contribute to a carbon management hub. Also interest in any relevant experience from prior collaborative projects that could help inform and strengthen a hub-based partnership.

Aircapture has participated in five CCUS projects funded by the DOE. Aircapture built, commissioned and ran its first operational DAC unit at the National Carbon Capture Center in as a subawardee of Southern States Energy Board (SSEB) under DOE award DE-FE0031961. This work generated significant advancements in the TRL of Aircapture's DAC system from TRL 4 to TRL 7+ during the project timeline, including the construction and successful operation of Aircapture's integrated liquefaction skid to generate liquid CO2 at over 99.9% purity. The DAC unit operated for 3,395 hours, running 167,025 adsorption cycles, equating to over 141 days of operation.

Aircapture also conducted Front End Engineering Design (FEED) studies focused on deploying DAC systems at the Joseph M. Farley nuclear power plant in Columbia, AL (DE-FE-0032160) and the Nutrien fertilizer manufacturing plant located in Kennewick, WA (DE-FE-). The Farley project explored the use of waste heat generated by the nuclear plant to satisfy the steam needs of the DAC while capturing a minimum of 5,000 net TPA. The Nutrien project designed a process to utilize excess steam generated during fertilizer manufacturing to facilitate DAC, along with a downstream conversion of the captured CO2 into formic acid. Both of these FEED studies generated detailed, actionable plans on how Aircapture's technology could be scaled to fit the needs of different facilities and how the process can be structured to facilitate downstream utilization of the captured CO2. This work has laid the foundation for Aircapture's participation in large scale DOE infrastructure projects, such as the recently released Regional DAC Hub Program (DE-FOA-0003442). Finally, Aircapture conducted a combination FEED study and bench-scale research program to investigate the potential for generating carbon neutral methanol from captured CO2 under DE-FE-0032414.

Aircapture is currently participating in the Southeastern DAC Hub (DE-FE0032392) run by Southern States Energy Board (SSEB) as one of two DAC technology providers. This program is in the TA-2/"Design" stage of the original FOA and is focused on executing a FEED study to plan and prepare for the construction of a large-scale 50,000 tonne DAC Hub in Mobile County, Alabama. The project will include the complete plant engineering and design, as well as the regulatory, risk and safety provisions that need to be put in place prior to construction.

These projects have involved significant collaborative efforts with project participants ranging from utility companies, engineering firms, research universities, technology developers, fellow DAC companies, regional and local non-profits, and other entities. Aircapture has found these projects to be highly valuable in developing the DAC technology and accelerating the timeline for large-scale commercial deployment of the systems. We are very interested in continuing this kind of work.

2. Which types of state-level support beyond grants — such as stakeholder convening, streamlined processes, technical assistance, research access, community engagement, etc. — are most helpful, and which do you think would be most effective for advancing carbon management efforts, particularly with regards to hub-based approach?

The most important form of state-level support would likely come from the introduction of a streamlined permitting process for new DAC Hub build-outs as well as potential feasibility work conducted by CEC to identify zones that would be most amenable to these types of projects. State-level support for infrastructure to support CO2 offtake, such as pipelines, wells or transportation, would be highly beneficial.

Additionally, local area outreach and identification of partnerships, such as job training programs, certificate programs, or other job growth opportunities for the communities these projects would be located in would be desirable.

3. What is the current Technology Readiness Level (TRL) of your technology and/or the development stage of your project (e.g., pre-FEED, FEED, demonstration)?

Aircapture's DAC technology is at TRL 7+. The foundational development work was conducted by building a multiple monolith DAC system with integrated heat recovery skid and CO2 upgrading skid in 2022. Testing commenced at the NCCC in April 2023 as part of Aircapture's work under DE-FE0031961. It was operated for over 141 days and 167,025 desorption cycles. The DE-FE0031961 project significantly advanced the maturity of the technology and provided a cost basis demonstrating commercially relevant operations in a real-world environment. Concurrently, a similar DAC system has operated outside in Berkeley for over 140 days. A second generation DAC system that is more economical has also been installed and commissioned in Berkeley and has operated for over 75 days.

A group (or "grove") of 8 individual DAC systems has been manufactured and shipped to the United Arab Emirates to participate in a commercial project (Project Hajar). In total with the recent developments of contactors for Aircapture the facility has a nameplate capacity of 1,000 tons per year of carbon dioxide. The equipment includes all supporting Balance of Plant (BoP) equipment including an electric steam boiler, supercritical CO2 compressors, a flexible bladder tank for low pressure CO2 storage, a control room and workshop for local operations and maintenance, and all required instrumentation and controls for MRV (monitoring, reporting, and verification). The project delivered a high-fidelity commercial prototypical system and is currently operating under relevant real-world operation conditions. The system integration and design

match the expected commercial design in almost all respects. This facility has an intended capture capacity of 1,000 Tonnes per annum (TPA) of CO2 and will have well in excess of 1,000 hours of operational data by the end of the second quarter of 2025.

4. *What challenges are you currently facing, particularly related to funding (e.g., offsetting construction or operating costs, securing offtake agreements)? What challenges – financial or otherwise - do you anticipate in scaling these technologies within a hub-based approach, and are there any challenges unique to establishing a hub in CA?*

Particularly in California, the major challenge is identifying low-cost, low carbon intensity/decarbonized power sources that can be utilized with DAC, because the cost of power has a direct impact on the total project economics. In addition to this with respect to project economics, the land required to build and operate Hub-type facilities can be difficult to identify and secure based on higher than average land prices compared to the national average.

Secondarily, although 45Q tax credits are simply additive to our business model rather than fundamental or required, they can be a selling point to attracting project partners. Due to the relative difficulty in securing sequestration opportunities in California compared to other states, it can be more difficult to take advantage of 45Q opportunities.

With regards to participating in Hub-based projects, there can be difficulty aligning the readiness timelines of multiple different technology provider participants. However, it appears that DOE has become more adept at managing this with the introduction of an annual Hub funding opportunity.