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Capture6 Carbon Management Hub RFI

Additional submitted attachment is included below.

Capture6

Carbon Management Hub RFI

California Energy Comission
January 28, 2025

CAPTURE6

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Capture6 Response

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

Capture6's patented process technology is designed to integrate in existing industrial processes to generate multiple forms of commercial and environmental value. By operating on a partnership-led business model, Capture6 understands that collaboration is essential to achieving meaningful progress in scaling carbon removal.

One of Capture6's strongest advantages is its ability to manage and reduce brine waste streams produced by industrial activities. Capture6 eliminates harmful saltwater generated through carbon injection. This saltwater becomes the feedstock for Capture6's process, which produces freshwater for human use and generates *additional* carbon removal as well as *further decarbonization* through point-source capture and green chemical production. This integration has multifold benefits. First, it addresses many of the wider environmental impacts of DAC technologies (water consumption, energy consumption, brine disposal). Second, its circular economy approach helps address justified concerns about the isolated costs and benefits of this necessary climate mitigation sector.

Additionally, Capture6's process unlocks more flexible and affordable carbon storage by outputting an alkaline fluid rather than CO2. While our technology can also generate gaseous / liquified CO2 for sequestration, alkaline fluids as a sequestration medium offer multiple advantages over traditional pathways:

1. **Storage and Transportation Flexibility**: Unlike traditional CO2-based sequestration, which faces challenges such as community opposition to pipelines, high transportation costs, deep wells, narrow subsurface conditions, and slow permitting processes, our alkaline fluid allows for storage via multiple pathways, including subsurface injection into geological reservoirs with Class I or Class V-permitted wells, rock mineralization, ocean dispersal, and surface storage of evaporites / minerals, reducing reliance on specific geologic conditions and mitigating risks.
2. **Geographic Flexibility**: Our technology is highly adaptable, as it utilizes widely available brine inputs and offers diverse storage options for outputs. This geographic flexibility ensures that our solutions can be deployed in a variety of regions, making them accessible and scalable.
3. **Integration with Green Industrial Activities**: Our technology transforms DAC from an isolated activity with limited co-benefits into an integrated and diverse green industrial activity. Capture6 can use its process to enable enhanced water recovery, saltwater brine reduction, direct lithium extraction (DLE), enhanced geothermal energy, green hydrogen production, and other outputs while simultaneously capturing CO2 from the atmosphere.

Challenges and Collaborative Opportunities

As a start-up, we face significant barriers to large-scale deployment, particularly the high infrastructure costs and project development and management expenses associated with such initiatives. Partnering within a carbon management hub would allow us to overcome these challenges by pooling resources, sharing expertise, and leveraging collective infrastructure. Our prior experience in collaborative projects has demonstrated the value of partnerships in driving innovation and achieving shared goals, and we are eager to bring this collaborative mindset to a hub-based partnership.

Conclusion

By joining forces with other entities in a carbon management hub, Capture6 can contribute a unique value proposition of enabling new forms of value creation, dramatically increasing storage flexibility, and integration with green industrial processes while addressing the challenges of scale and infrastructure. Together, we can accelerate the development and deployment of innovative carbon management solutions, making a meaningful impact on global decarbonization efforts.

2. **Which types of state-level support beyond grants — such as stakeholder convening, streamlined processes, technical assistance, research access, and community engagement — is your organization most interested in, and which does your organization believe would be most effective for advancing carbon management efforts, particularly with regards to a hub based approach?**

Capture6 sees several different forms of support as critical to enabling carbon management across California. Beyond direct investment and capital support, we believe the following would be most effective:

- **Streamlined Permitting Processes:** Permitting challenges present a significant barrier to deployment. The current disconnect between the timing and costs of permitting processes and the financial support available to emerging companies and developers presents a significant risk to scaling carbon management in California. Streamlining these processes for both facility construction and carbon storage wells is crucial for enabling innovation and timely responses to the critical nature of the climate crisis in a state that is highly susceptible to its impacts. Absent changes, carbon removal will likely scale elsewhere.
- **Subsurface Characterization:** Providing technical assistance with subsurface characterization for storage would significantly de-risk projects and expedite development. Specifically, providing expertise in geological surveys, seismic interpretation, and reservoir modeling for sequestration would significantly de-risk carbon capture and storage projects and potentially open up new geographies to development. Current characterizations were typically motivated by oil and gas extraction, rather than carbon dioxide sequestration, which leaves public information and databases outdated or frequently non-existent for substantial areas of the state. By reducing the geological and technical uncertainties associated with subsurface storage, this assistance would expedite project development while creating public resources for widespread scaling of carbon management activities.

- **Regulatory Clarity on Subsurface Storage:** In addition to the above, clear regulatory guidance on the subsurface storage of alkaline fluids and other non-CO2 storage materials, including proper UIC well classification, is essential for providing certainty to developers and investors.
- **State-Funded Monitoring Network:** A state-funded or led monitoring network to assist with long-term monitoring, reporting, and verification (MRV) is highly desirable, as this activity is a collective requirement. However, funding on an individual company level is insufficient and duplicative across the entire sector. We understand that initiatives like this are already under consideration (e.g., by the California Geological Survey), and we strongly support their implementation. This effort would provide crucial data and transparency, building public trust and facilitating accurate accounting of carbon reductions.
- **Incentives for Decarbonization of Industrial Processes:** Beyond direct purchases or grants, the state can take steps to create a supportive commercial environment through incentives for or regulations on emitters. Decarbonization will accelerate when the cost of emitting CO2, currently set at 0 for many in the state, is higher than the cost of alternatives that either reduce or remove CO2 from the atmosphere. Current CDR purchases are voluntary initiatives, largely by corporations that have committed to net zero targets under pressure from their shareholders. This dynamic is insufficient in the face of the need for carbon removal, and California can be a leader in modernizing markets for this challenge. Furthermore, solutions to address the negative impacts industries have on the local environment should be subsidized and presented to the industries to expedite integration.
- **Pooled Issuance:** Implementing pooled vehicles and strategies to de-risk supply and demand for market participants would enable faster scale-up and foster greater competition within the carbon management sector. In the current market structure, individual purchasers must assess a broad portfolio of removal pathways (DAC, mCDR, Biochar, etc.), as well as individual companies with different technologies, requiring significant investment in expertise, time, and other resources. This requirement leads to delays and costs associated with entering the market, even on a voluntary basis. Further, it does not address the risk that an individual company or technology may not deliver on its expected volumes and/or timeframes. With a pooled procurement and/or issuance mechanism, these risks can be managed through a single vehicle or agency, with common, standardized information to purchasers and replacement mechanisms for non-delivery. This would dramatically reduce the risks borne by any individual purchaser, creating a more stable market environment conducive to investment and innovation.

By focusing on these areas of support, the state can create a more favorable environment for carbon management projects, accelerating deployment and facilitating the development of effective carbon management hubs.

3. **What is the current Technology Readiness Level (TRL) of your technology and/or the development stage of your project (e.g., preliminary front-end engineering and design, demonstration)? Please provide potential outcomes from partnering with your organization, including estimated annual carbon capture capacity (in tonnes per year), description of product (if carbon utilization), co-benefits (e.g., hydrogen or water production), and other relevant details.**

Capture6's technology strategy enables commercial-scale deployments today, rather than decades in the future. This is accomplished by deploying available commercial and industrial scale equipment configured to reach our goals. Our electrochemical DAC process utilizes abundant saltwater resources or waste streams as a feedstock to generate our capture solvent, sodium hydroxide (NaOH). This liquid solvent mineralizes atmospheric CO2 in a cooling tower, producing net negative carbonates that are sequestered, utilized, or reacted to generate high-purity CO2 for utilization or storage.

Our process has numerous differentiating features to traditional DAC processes, including:

- **Saltwater valorization**: Many industrial processes generate large volumes of saltwater brine, a costly environmental byproduct. Our process transforms this waste stream into a valuable resource, solving multiple industrial challenges and supporting climate adaptation.
- **Freshwater generation**: Our process can generate significant volumes of freshwater for industrial, agricultural, or human uses from this saltwater input.
- **Sequestration flexibility**: By producing carbonate solutions, Capture6's process allows flexibility for downstream sequestration pathways, including traditional supercritical CO2 injection.

Capture6's process relies heavily on the availability of mature, widely available industrial components to maximize scalability and minimize development risks. The process comprises four principal stages:

1. **Pretreatment**: Saltwater feedstocks with impurities are converted into purer sodium (Na) chloride (Cl) solutions using standard water treatment components (RO, NF, clarifiers, etc.).
2. **Electrochemical conversion**: Electricity is applied to split NaCl in water into NaOH solution and hydrogen chloride (HCl) byproduct using either electrolyzers or electrodialysis using bipolar membranes (EDBM).
3. **Direct air capture**: Atmospheric CO2 reacts with NaOH solution in cooling towers to form sodium carbonate (Na2CO3).
4. **Downstream**: This stage is tailored to project-specific requirements, such as injecting carbonate solutions or recombining the HCl and carbonate streams to generate high-purity CO2.

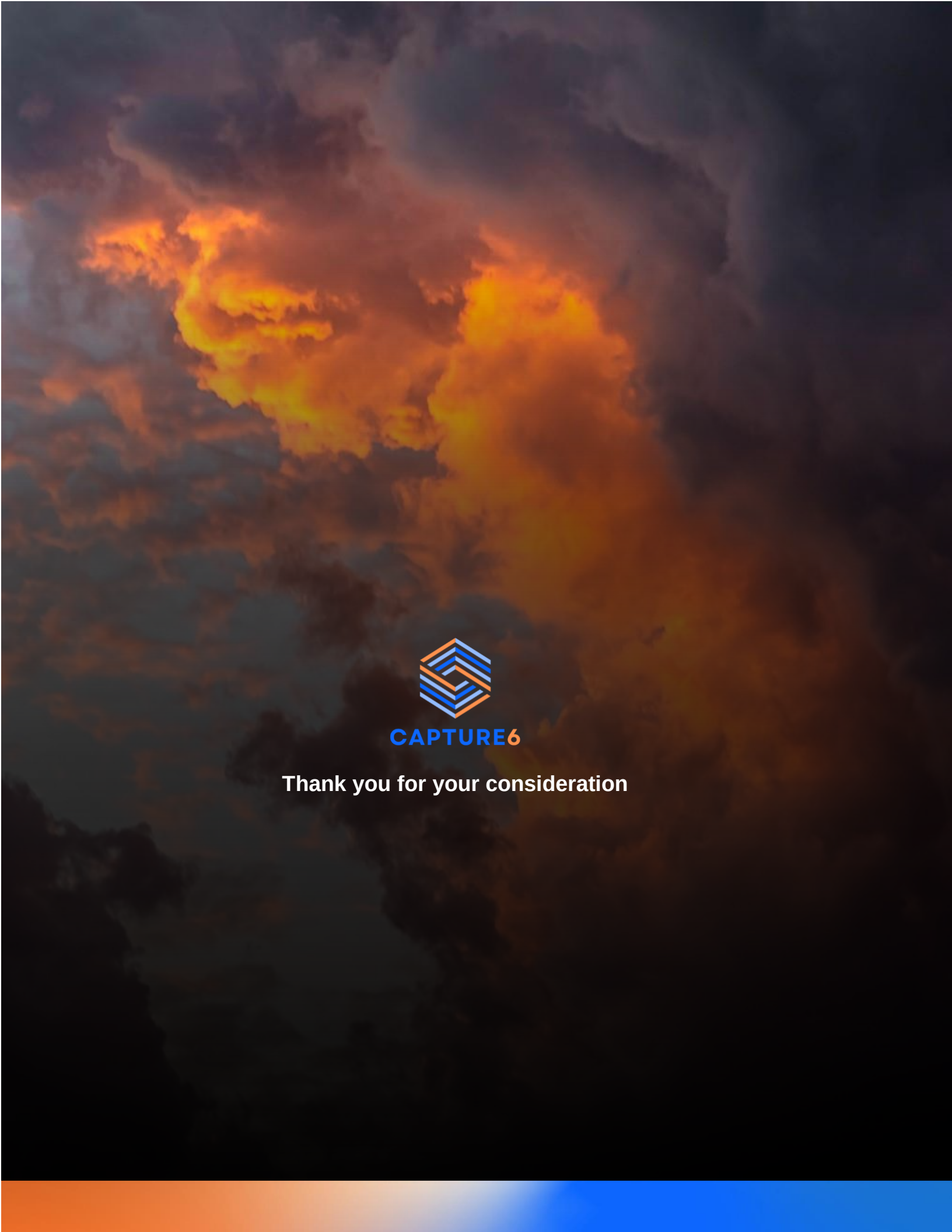
Each of these stages has a TRL level of 7 or higher. With the support of EPC firms experienced in the water, chemical, and oil & gas industries, Capture6 facilities integrate these stages into a single process train tailored to the specifications of the inlet water composition. Ongoing engagement with vendors ensures supply chain readiness for DAC Hubs deployments and subsequent scaled facilities with far greater scales.

Reference Facility

Given its technology strategy and the high TRLs associated with each stage of its process, Capture6 is commencing on commercial-scale project deployments alongside our OEM & EPC partners for capacities of 10,000 tpa and greater. We are ready to provide reference data for the end-to-end process and sub-systems.

5. **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 California?**

Generally, Capture6's proposition is significantly eased within a hub model. Due to our integrated water and carbon DAC process technology, we generate significant value within a hub system. Our feedstock solves downstream saltwater brine treatment and disposal challenges for carbon sequestration projects; likewise, our freshwater generation capacity can provide a new source of water to overcome water permitting issues while providing co-benefits to community stakeholders. However, this value proposition requires careful coordination and consideration to ensure that value generation is accurately accounted for within the Capture6 business model.


CAPTURE6
Thank you for your consideration