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Modern Hydrogen response to CA Carbon Management Hub RFI

Additional submitted attachment is included below.

Introduction

Modern Hydrogen ("Modern") is pleased to respond to CEC Docket 25-ERDD-01 requesting information regarding the California Carbon Management Hub.

Modern is a pioneering clean energy technology company focused on decarbonizing energy systems through distributed natural gas pyrolysis (DNG pyrolysis). DNG pyrolysis is a breakthrough process that converts methane into two valuable products: clean hydrogen to power clean energy and solid carbon to sequester climate pollution into enhanced construction materials.

DNG pyrolysis avoids the limitations of previously available hydrogen production techniques. Conventional steam methane reforming (SMR) emits significant amounts of carbon dioxide, both through burning natural gas for the process heat and in the water-gas shift reaction that produces hydrogen. Electrolysis of water requires massive inputs of renewable electricity, which is intermittent and faces challenges in siting, permitting, and financing infrastructure to produce and deliver green electrons. Electrolysis also consumes water, which is a precious and increasingly scarce commodity in many parts of California. Both SMR and electrolysis are geographically limited, requiring extensive and expensive investments in hydrogen delivery and storage that represent the majority of the final cost of hydrogen.

DNG pyrolysis prevents CO_2 emissions entirely by separating carbon from methane in a solid form. Our technology is self-powered by using a slipstream of the hydrogen produced to generate heat for the pyrolysis process. Our approach uses ~1/8 the energy of electrolysis, making it a highly energy efficient method of clean hydrogen production. Additionally, DNG pyrolysis produces, rather than consumes, water. Lastly, our distributed design makes it possible to produce clean hydrogen at the point of consumption, eliminating the significant cost and complexity of hydrogen delivery and storage.

Clean hydrogen produced through Modern's systems is a versatile energy resource, supporting industrial applications, heavy duty transportation, and grid decarbonization. The solid carbon generated can be sequestered through application into sustainable building materials, including as a decarbonization additive to bind asphalt aggregates. Incorporating carbon into asphalt offers a low-cost means of improving material strength and durability while locking away carbon for long-term storage, providing a dual benefit of sustainability and innovation.

We further note that blending modest (12-14%) blends of biogenic methane, such as renewable natural gas (RNG) from agriculture, landfills, and wastewater treatment into the feedstock for our DNG pyrolysis process results in zero- or even negative-carbon intensity. In effect, our approach enables removal of carbon from the atmosphere, working alongside upstream photosynthesis to result in what can accurately be understood as indirect air capture. It is the only energy-positive atmospheric carbon removal technology of which we are aware.

Modern is committed to enabling scalable, low-cost decarbonization technologies that align with California's carbon neutrality goals and contribute to global emissions reductions.

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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.

Modern is keen to collaborate with industry, academia, and governmental partners to apply for DOE funding for carbon management hubs. Our expertise in decentralized clean hydrogen production and solid carbon utilization positions us as a key technology provider. We can contribute by integrating our methane pyrolysis technology into hub frameworks, enabling local hydrogen production and value-generating carbon sequestration. Our past collaborations, including pilot programs with utilities and industrial stakeholders, have provided insights into scaling innovative energy technologies, ensuring project success and alignment with federal and state carbon neutrality goals.

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?

Modern highly values stakeholder convenings to foster cross-group collaboration and information sharing, given the new nature of our innovations. We believe that technical assistance may be helpful in streamlining permitting for our hardware deployments in the field. We see research access as vital for testing, certifying, and further optimizing our carbon sequestration and utilization methods. Community engagement will be essential to address safety questions, ensure alignment with local priorities, and support equitable project implementation. Streamlined regulatory processes are particularly critical in California to accelerate technology deployment, while access to pilot facilities and demonstration projects would enhance innovation within hub-based approaches.

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.

Modern's methane pyrolysis technology presently stands at TRL 7+, with multiple successful pilot deployments demonstrating operational efficacy under real-world conditions. Our forthcoming commercial-scale units, currently being assembled and commissioned, are scheduled for field deployment in late 2025. Each unit will produce up to 500 kg of hydrogen per day and capture as much as 700 metric tons of solid carbon annually.

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Solid carbon produced during our DNG pyrolysis process offers utilization opportunities as a binder additive to improve the performance and reduce the cost of widely-used construction materials, such as asphalt, while also permanently sequestering climate pollution. Co-benefits include on-site clean hydrogen production, reduced climate emissions, and improved air quality.

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 California?

Our primary challenges include securing agreements with end-use customers for clean hydrogen and solid carbon products, financing construction costs, and navigating regulatory hurdles. Scaling within a hub-based approach in California also involves overcoming widespread favoritism for electrolytic hydrogen, aligning with local environmental standards, and addressing community concerns/expectations. Financial challenges include mitigating risks common to new technologies while remaining competitive with traditional energy sources. We seek robust policy frameworks and appropriate incentives to raise customer awareness and stimulate market demand, alongside collaborative efforts to overcome infrastructure and supply chain limitations.

Thank you for this opportunity to respond to this request for information related to the California Carbon Management Hub. We look forward to further engagement on this important topic to ensure a climate-compatible future for California and beyond.

Sincerely,

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