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Onsite Distributed Hydrogen Production and End Use Solicitation Concept

Additional submitted attachment is included below.

Avina Clean Hydrogen response sheet for Draft Solicitation Concept for Distributed Clean Hydrogen Production with Onsite End Use (H2ONSITE)

1. Are the Project Elements in Section IV of this document realistic, reasonable, and feasible?

- Certain challenges will restrict the project from being realistic, reasonable, and feasible.
  i. The proposed project has 3 scopes of work that include hydrogen production, storage, and end-use. These 3 scopes of work have been bound to be on the same property, which is difficult to establish practically. For example, At Avina, we are planning to set up a central liquid hydrogen production facility, which, in its way, is a unique project. It is planned to produce, store, and supply hydrogen to refueling stations planned in nearby regions. It will be a cost-effective solution for meeting the hydrogen demand of multiple refueling stations. But if, as per this document, the liquid hydrogen facility is planned, we will be bound to reduce the production capacity, setting up a hydrogen refueling station on the same property and catering only to a specific hydrogen demand. The decarbonization impact will for the project also be very small, and the cost will be comparatively higher.
  Therefore, it is recommended that an option be provided of meeting only 2 of the 3 given scope of work to apply for this grant, or the end use should be defined within a definite distance from the production site like the end use should be within 300 miles range from the production site.

  Reference:

  "Ideal conditions for clean hydrogen production aren't necessarily co-located with large demand centers," said Bram Smeets, a partner at McKinsey. For example, the U.S. Midwest wind corridor from the Dakotas to Texas is an ideal region to produce hydrogen, but chemicals plants, ideal buyers of hydrogen, are scattered far away, along the East, West and Gulf Coasts[1].

  ii. There should be an option to couple this grant with the other available CEC grants for developing hydrogen refueling stations so that it can ensure complete support for hydrogen application in the mobility sector.

2. What would be the appropriate level of project funding that would leverage private investments associated with the work proposed in this draft concept, and why?

Based on our recent experience, a co-located hydrogen electrolysis plant of 4 tonnes of compressed gaseous hydrogen per day with a refueling station with two dispensers allowing for simultaneous filling of two trucks costs $25M installed. Co-location with a new (additional) renewable energy asset could be an additional $40M for a 40 MW solar PV system based on the need for a solar facility that is 4x in capacity and an additional $20M+ for an on-site BESS (e.g. 10 MWh system) to capture the excess from the PV system.

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[1] https://wallstreetjournal-ny.newsmemory.com/?publink=2592f9c70_134ad8f

50% cost share would be the most effective in leveraging private investment. Not including the $60M for the on-site renewable energy system, this would be $12.5M for the project.

a. **How would limiting the use of grant funds to Eligible Project Costs in Section III impact the project? What changes do you recommend if any, and why?**

- While limiting grant funds to Eligible Project Costs helps ensure that funds are used efficiently and effectively, there is a need for flexibility and adaptability to accommodate the unique requirements of different projects. It is recommended to strike a balance between strict cost controls and the ability to support a diverse range of clean hydrogen initiatives, including those that may require adjustments to the predefined cost categories.

3. **Provide any feedback on the two-phase solicitation approach. Are the 1-month abstract deadline and 3-month full application deadline realistic?**

- The 1-month abstract deadline may not provide sufficient time for potential applicants to develop well-rounded project proposals. It can be especially challenging for complex projects that require coordination with multiple partners.

4. **To ensure that funded projects and their impacts can inform future deployment of hydrogen in California, should the CEC consider additional performance metrics beyond those proposed for the M&V plan in Section IV?**

- CEC may consider additional performance metrics such as Economic Viability, Technology Scalability, Market and Growth. This information will be invaluable for shaping future policies, investments, and deployment strategies for hydrogen technologies in California.

5. **What type of technical assistance is needed to ensure equitable participation and project success, if any?**

- N/A

6. **Are there specific end uses we should target with the one to five metric ton hydrogen capacity? If so, why?**

- The end use should be more inclined towards hydrogen refueling stations. CEC has given a major push for the adoption of hydrogen vehicles by providing grants in the form of setting up hydrogen refueling stations and purchasing hydrogen vehicles. However, a specific area that is cost-intensive and requires support from CEC is a dedicated hydrogen production facility that can supply hydrogen to the planned refueling facilities. This will ensure all-round support from CEC for hydrogen adoption in mobility applications.

  It is also recommended that the upper limit of the production capacity should be more than 5 metric tons so that the entity planning to produce hydrogen at a feasible central location and wants to supply it to nearby hydrogen refueling stations can be supported. It will also help to achieve a scale in hydrogen production.

7. Are there any concerns with this solicitation allowing the use of CCUS for a project to be carbon neutral? If so, why?

- Depending on the technology, the region, and the project, CCUS systems' efficiency in capturing and storing carbon dioxide can change. There can be doubts about the effectiveness of CCUS systems to reduce carbon emissions as promised. So, allowing the use of CCUS for a project to be carbon-neutral may become a challenging task. We recommend that the use of CCUS be reserved for a separate grant, if such a pathway is desired.

8. Please provide relevant comments regarding other considerations not explicitly listed above.

- The text from the document "Exhibit a carbon intensity of 0.45 kilograms of carbon dioxide equivalent per kilogram of hydrogen produced and demonstrate technologies enabling a project to achieve a carbon intensity of 0.00 kilograms of carbon dioxide equivalent per kilogram of hydrogen produced with a well-to-gate assessment."– please confirm that a renewably powered electrolytic hydrogen (with the RE consisting of either wind or solar or a mixture of both and potentially battery energy storage) will qualify for the 0.45 kg of CO_2e per kg H_2 produced requirement.

  Reference:

  i. "Cetinkaya and her colleagues analyzed the global warming potential along the life cycle for five methods of hydrogen production. Electrolysis using wind emerged as the best option, emitting 0.97 kg CO_2 eq. per kg of H_2, followed by solar electrolysis, with 2.4 kg of CO_2 eq.. "[2]

  ii. "Figure 2 shows how the CO_2-equivalent emissions are divided among the different process blocks for the wind/electrolysis system. Because of the steel and concrete requirements, the construction and operation of the wind turbines account for 78% of the total GWP. Hydrogen storage and compression accounts for 18% of the GWP"[3]

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[2] https://www.sciencedirect.com/science/article/pii/S0306261919300017

[3] https://www.nrel.gov/docs/fy04osti/35404.pdf