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on Clean Hydrogen Program

Additional submitted attachment is included below.

electro-active technologies

December 16, 2022

California Energy Commission
Clean Hydrogen Program
Sacramento, CA

Subject: Comments on "Clean Hydrogen Program", Docket number 22-ERDD-03

Dear CEC Program Officer,

We greatly appreciate the opportunity to comment on the "Clean Hydrogen Program" proposed by CEC. We are excited to provide our comments related to the technology options available for clean hydrogen production, at scale, in the state of California. A new and novel technology under development for clean hydrogen production is ***Microbial Electrolysis***, which is a process that combines the efficiency of biocatalysis as well as electrolysis to generate hydrogen. It utilizes renewable organic or bio-waste and electricity to generate hydrogen, reducing the carbon intensity of hydrogen production.

The examples included in the distributed hydrogen production list did not specifically call out for this technology, although it was mentioned in the Table presented on slide 24 related to the water use for hydrogen production in combination with fermentation. We would like to suggest consideration of microbial electrolysis as a stand-alone method for clean hydrogen production as it offers a number of advantages. One of them is its potential to generate hydrogen in a distributed manner, in the 1-5 tons/day range, and other is its ability to integrate use of electricity with chemical energy derived from organic waste to generate hydrogen. It is also capable of generating hydrogen at a higher electrical efficiency than water electrolysis[1,2]. Electro-Active Technologies, Inc., has been involved in developing this technology for commercialization of clean hydrogen production. We believe support of pilot studies for early-state technologies like microbial electrolysis can be highly instrumental in bringing this technology to market rapidly. We request the Commission to consider inclusion of this technology.

Microbial Electrolysis offers a feasible and impactful approach for promoting clean hydrogen production and it's role in helping California achieve deep decarbonization. We would like to make a suggestion with respect to the scale of hydrogen production. There are a number of use cases that are being developed for use of hydrogen in a distributed manner at a lower scale. While the range of 1 to 5 tons/day is suitable for supply to gas stations, this amount may not be necessary for localized, distributed operations such as for use in fork-lifts, emergency power to minimize impacts of blackouts or weather-related outages, and remote fuel or electricity needs. Thus, the lower limit may be brought down below 1 ton per day.

We firmly believe that a strong focus on technologies such as microbial electrolysis, which are approaching pilot-stage can support cost-effective, clean hydrogen production in the state of

California. We thank the Commission for taking the initiative on supporting development of clean hydrogen technologies across a range of production volumes and including distributed production, in addition to centralized production.

Sincerely,

Abhijeet P. Borole
President and Co-Founder,
Electro-Active Technologies, Inc.

References:

1. Satinover, S. J.; Schell, D.; Borole, A. P., Achieving High Hydrogen Productivities of 20 L/L-day via Microbial Electrolysis of Corn Stover Fermentation Products. *Applied Energy* **2020,** *259,* 114126.
2. Lewis, A. J.; Ren, S.; Ye, X.; Kim, P.; Labbe, N.; Borole, A. P., Hydrogen production from switchgrass via a hybrid pyrolysis-microbial electrolysis process. *Bior. Technol.* **2015,** *195*, 231-241.