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Green Hydrogen Coalition Comments on Research into Clean Energy Alternatives to Diesel Backup Generator Systems

Additional submitted attachment is included below.

Comments of the Green Hydrogen Coalition (GHC)

on

Research into Clean Energy Alternatives to Diesel Backup Generator Systems

to

the California Energy Commission (CEC)
Docket # 19-ERDD-01
Research Idea Exchange

Green Hydrogen Coalition

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A. Introduction

The Green Hydrogen Coalition ("GHC"), a California 501 (c)(3) educational non-profit corporation, is pleased to provide comments in response to the California Energy Commission ("CEC") Workshop to Discuss Research into Clean Energy Alternatives to Diesel Backup Generator Systems held on January 21, 2021.

The GHC was formed in 2019 in recognition of the game-changing potential of green hydrogen to accelerate multi-sector decarbonization to combat climate change, including providing a commercially viable and cost-effective solution as a renewable fuel source for microgrids, transportation, and long-duration energy storage to effectively and reliably realize decarbonization goals. The GHC's mission is to facilitate policies and practices that advance green hydrogen production and use at scale in all sectors of the economy where it will accelerate a carbon-free energy future and result in multi-sector decarbonization, investment, and jobs. Our sponsors include both renewable electricity users and providers and those in the renewable natural gas industry.

In the aftermath of the 2019 and 2020 public safety power shutoff ("PSPS") events, as well as the summer 2020 heatwave rolling blackouts, the CEC's hosting of this workshop is timely. Clean alternatives to diesel backup generator systems can be deployed and coordinated to provide customer resiliency, enhance grid reliability, and support the state's decarbonization goals. Green hydrogen can serve as a clean alternative fuel.

GHC appreciates and supports the CEC's explicit focus on accelerating the deployment of clean backup and resiliency solutions.

B. Green Hydrogen's Critical Role in Ensuring Clean, Safe, and Reliable Backup Power

GHC believes that all clean, safe, and reliable backup generators should be explored to ensure California can mitigate the impacts of planned and unplanned outages, including PSPS

events. Critical facilities, disadvantaged communities, remote locations, medical baseline customers, and data centers across California use diesel, natural gas, and/or battery energy storage as backup generators to maintain electricity supply during emergency events and support system resilience (event recovery). However, based on commercially available technology, GHC believes that green hydrogen can be used today as a clean alternative to diesel backup generator systems. Adding green hydrogen to California's clean energy toolkit supports mitigating the impact of energy disruptions and emergencies and will provide for the deployment of clean technologies to meet resiliency requirements. For example, hydrogen fuel cells running on green hydrogen can provide backup power to vulnerable communities and critical facilities during PSPS events. Green hydrogen can offer a clean, safe alternative to diesel and natural gas generators as either a drop-in replacement fuel for existing generators or use in a hydrogen fuel cell.

Green hydrogen can be used as a form of multi-day energy storage, providing a flexible and dispatchable clean resource with greater energy capacity than most commercially available energy storage backup solutions. In California, renewable generation combined with battery energy storage is increasingly a solution to provide backup power.[1] However, battery energy storage systems are energy-limited resources that may be capable of providing backup power for a short outage but may not be able to meet resiliency needs for multi-day PSPS events. In contrast, green hydrogen, used as either a replacement fuel for backup generators or input into fuel cells, can provide clean, long-duration energy storage during multi-day PSPS. This use of green hydrogen can reduce the need to overbuild or overspend on paired renewable and battery storage capacity by providing a more cost-effective solution.

Additionally, while renewable generation and battery energy storage are cost-effective in some cases, siting renewable generation, such as solar PV, presents key implementation challenges. Not all sites are viable for solar PV installations, and areas with dense populations and/or high land costs may be better suited for a green hydrogen backup power solution. In these cases, data centers and other commercial and industrial customers that may be using diesel

[1] *Tesla Powerwall, Powerpack deployment grows 81% to 415 MWh in Q2,* Utility Dive (July 30, 2019) https://www.utilitydive.com/news/tesla-powerwall-powerpack-deployment-grows-81-to-415-mwh-in-q2/559790/

generators in these areas may not be able to leverage these types of clean alternatives. Once the enabling technology is deployed, green hydrogen can be produced on-site using an electrolyzer and stored for resiliency uses, transported from a local green hydrogen production facility, such as a grid-connected electrolyzer, or one coupled with renewable generation, or distributed through supply infrastructure from a centralized green hydrogen production facility.

C. Hydrogen Fuel Cells as Backup Power

For moving to 100% clean energy for commercial customers, fuel cells are the most energy-efficient devices for extracting power from fuels (such as hydrogen).[2] Fuel cells produce electricity without combustion requiring only a constant source of fuel and oxygen, and, since there are no moving parts, fuel cells operate silently and with extremely high reliability. Hydrogen fuel cells using green hydrogen are completely carbon-free, only producing electricity, heat, and water, and fuel cells are modular and can be designed in arrays that can accommodate a wide range of applications.

Fuel cells fall into three main categories:

1. **Portable fuel cell** uses including recharging batteries, directly powering consumer electronics, and supplying off-grid backup power.
2. **Stationary** installations are used for combined heat and power (CHP), uninterruptible power supplies (UPS), backup power, and baseload distributed primary power.
3. **Motive fuel cells are used in transport applications** such as power for buses, boats, cars, scooters, forklift trucks, and even aircraft.

Onsite hydrogen fuel cells can provide backup power to buildings, such as multi-unit dwellings and commercial buildings, which enhances resiliency. However, onsite hydrogen fuel cells can also stack this backup use case with other benefits, such as providing a building with heat, and promoting self-generation to meet onsite load, export power, or provide other grid support even when the grid is operating under "blue sky" conditions. Onsite fuel cells also provide energy

[2] U.S. Department of Energy, Office of Energy Efficiency & Renewable Energy, 2015, Fuel Cells Fact Sheet.

diversity and can be operated for an individual site in island mode or as part of a microgrid, ensuring resiliency and continued, uninterrupted service when the electric grid is down, providing days of power to facilities. In contrast, most customer-sited behind the meter battery-based energy storage applications can provide no more than eight hours of backup energy.

D. Recommendations

Given the near-term capabilities of green hydrogen use in backup power applications, including use in fuel cells to provide long-duration energy storage, the GHC appreciates the CEC's consideration and inclusion of green hydrogen as a game-changing resource for microgrids, long-duration energy storage, energy reliability, and resilience, and as a unique resource to provide multi-sector decarbonization. GHC recommends the CEC promote a portfolio of research initiatives focused on rigorous field testing for green hydrogen-fueled backup power applications. Specifically, GHC recommends the CEC aim to advance research into the following applications and configurations of hydrogen fuel cells for backup power:

1. Distribution substation level
2. Commercial buildings and multi-unit dwellings
3. Sites in high fire-threat districts ("HFTD")
4. At risk communities experiencing a considerable level of service interruption due to PSPS

Any such research initiatives should be thoroughly funded and executed by experienced, unbiased teams of experts such that meaningful key lessons learned related to deployment and operation can be shared broadly with policymakers and industry stakeholders.

Given the near-term capabilities of green hydrogen backup power applications and the pressing need for backup power ahead of the 2021 wildfire season, we recommend the CEC expedite solicitations for such projects to ensure that stakeholder feedback on the solicitation(s) can be incorporated and grants can be awarded before the 2021 wildfire season.

In addition to the need for additional real-world testing and data of green hydrogen fuel cells as backup power systems, a fundamental challenge that remains relates to commercially viable pathways to *produce* green hydrogen today: how to *achieve scale* and reduce cost. Globally, the production of green hydrogen is currently being pursued to help get to scale, accelerate decarbonization, and meet climate goals. Expanding green hydrogen use to offset fossil fuels by supporting backup power applications for green hydrogen is critical to achieving scale, reducing delivered cost, and increasing use across multiple sectors.

Technologies exist today to produce green hydrogen, and near-term opportunities are available for the development of hydrogen storage, fuel cells, and large-scale commercial operations. However, to realize the backup power benefits of green hydrogen, California must send strong signals to industry to promote private investment in green hydrogen infrastructure. Producing *green hydrogen at scale will drive down its production cost and further accelerate the use of green hydrogen to decarbonize the energy system as a fuel for back-up generation, transportation, and fuel cells.*

As such, GHC recommends the CEC play a significant role in breaking down market barriers for green hydrogen production through its leadership role in modeling and planning efforts. By providing support for green hydrogen infrastructure, including through its assessment in the upcoming 2021 Integrated Energy Policy Report ("IEPR"), the CEC can expand California's clean energy system and accelerate the diversity of clean fuel resources for power and transportation, as well as across other multi-sector applications, and create the clean, reliable energy network needed to meet California's renewable energy and climate goals. Expanded infrastructure will necessarily include the deployment of fuel cells for providing back up generation and grid services for flexibility and reliability. As part of the IEPR's overview of energy policy, the GHC recommends identifying the critical role of both hydrogen fuel cells and green hydrogen infrastructure to meet the state's policy climate and energy goals.

The CEC is a powerful voice to demonstrate that there is a vision for meeting California's climate goals through the production and utilization of green hydrogen. We commend CEC's hosting of this workshop, as well as the hydrogen infrastructure and emerging

technologies workshop sessions as part of the 2020 IEPR Update. GHC respectfully requests the CEC host additional workshops dedicated to *green* hydrogen and its many applications for power, gas, industry, transportation, and agriculture to further build planning and momentum for meeting California's clean energy future.

As a non-profit aligned with the decarbonization goals among states nationally, the GHC is focused on the role of green hydrogen to transition our energy systems to a cleaner future. We believe that green hydrogen is a critical backbone for California's clean, reliable energy future and an accelerated transition to a carbon-free system that benefits everyone.

GHC appreciates the leadership of the CEC in addressing this foundational issue as part of its Research Idea Exchange forum.

Respectfully submitted,
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