September 9, 2020

The Honorable Richard Corey, Executive Officer
California Air Resources Board
1001 I Street
Sacramento, CA 95814

Re: Comments on Draft E3 Report on Carbon Neutrality

Dear Mr. Corey:

The Green Hydrogen Coalition ("GHC") is pleased to submit these comments on E3's Draft Report on Carbon Neutrality ("Draft Report"), presented during the August 19, 2020 ARB public workshop. GHC is a California educational non-profit organization formed in 2019 in recognition of the game-changing potential of green hydrogen to accelerate multi-sector decarbonization and combat climate change. The GHC's mission is to facilitate policies and practices that advance green hydrogen production and use in all sectors of the economy where it will accelerate a carbon-free energy future. Our sponsors include both renewable electricity users and providers and those in the renewable natural gas space.

WHY GREEN HYDROGEN IS A GAMECHANGER IN FIGHTING CLIMATE CHANGE

As a mainstream commodity, hydrogen can be utilized for many applications across sectors of the economy, including displacing the use of fossil fuels in existing pipeline infrastructure. Hydrogen is widely used today for many industrial processes, however, more than 99% of the hydrogen used today is produced from fossil fuels, which produce greenhouse gas emissions ("GHGs").

Green hydrogen, in contrast, is commercially produced today from renewable electricity by electrolysis, from biogas by steam reforming, and from biomass through thermal conversion. Green hydrogen is a clean and safe energy carrier that can be used as a fuel for transportation and electricity production, as well as a means for multi-day and seasonal dispatchable renewable energy storage. It can also be used as a feedstock for industry, displacing millions of metric tons of hydrogen made from fossil fuels today (grey

hydrogen)[1]. Green hydrogen, once scaled, has the potential to be *lower* cost than hydrogen made from fossil fuels. It will not only displace grey hydrogen in multiple current industrial uses, but also serve to decarbonize the most challenging sectors of the economy such as heavy industry, heavy-duty transport, and aviation.

Today, hydrogen is transported by ships, trucks, and dedicated pipeline infrastructure. It is also blended into existing natural gas pipelines to displace methane and reduce its carbon content, cutting short-lived climate pollutant emissions and helping to decarbonize many gas end uses, including thermal electric generation. For example, Hawaii's natural gas pipeline system on the island of Oahu already has a 12% hydrogen content.[2] Injecting green hydrogen into California's natural gas pipeline system would be a huge step towards decarbonizing the natural gas pipeline system and many downstream end uses. Green hydrogen thus has an inextricable role in helping to decarbonize California's natural gas pipeline system.

The fundamental challenge for all commercially viable pathways to produce green hydrogen today is how to achieve scale and reduce cost. Globally, production and use of green hydrogen are currently being pursued at the gigawatt-scale for multiple applications to help get to scale, accelerate decarbonization, and to meet climate goals.

THE DRAFT REPORT SHOULD FURTHER EXPLORE THE KEY ROLES GREEN HYDROGEN NEEDS TO PLAY TO ACHIEVE CALIFORNIA'S CARBON NEUTRAL FUTURE

The GHC appreciates the ARB's consistent leadership and support of hydrogen. The 2017 Scoping Plan very clearly highlighted an important role for renewable gas, including green hydrogen, to help the state meet both its 2030 and longer-term greenhouse gas reduction goals and specifically highlights green hydrogen's role in reducing emissions from waste, transportation, industrial, and water sectors.

[1] The definition of Green Hydrogen should ultimately be harmonized with low GHG definitions as adopted by the European Commission - Link

[2] https://www.hawaiigas.com/about-us/ and https://www.hawaiigas.com/clean-energy/hydrogen/

Notably, the Draft Report explored several key roles that green hydrogen needs to play and considered green hydrogen in all three scenarios modeled. GHC commends the Report and Workshop for reflecting the expected declines in green hydrogen costs and capturing the numerous useful applications as an alternative fuel. Furthermore, GHC appreciates that green hydrogen was given consideration as a viable input for hard-to-decarbonize applications, such as industrial processing and heating applications. GHC also believes it is critical to leverage green hydrogen to provide dispatchable and clean capacity in the power sector. California faces mounting pressure to simultaneously meet its decarbonization goals, maintain affordability, and ensure electric grid reliability. GHC believes the production and utilization of green hydrogen are necessary to ensure all three goals are met. Although not reflected in the Report and Workshop, the GHC recognizes that green hydrogen can play a critical role in meeting the pressing reliability events occurring, such as those that have recently been experienced as a result of the August 2020 heatwave, fires, and rolling blackouts.

Notably, the Workshop discussion highlighted the need for incentives to achieve economies of scale, capturing California's abundant solar and wind resources. GHC supports the use of incentives and targets to advance the market development necessary to scale green hydrogen use and production where it will help decarbonize multiple sectors and combat climate change.

Economies of scale in producing green hydrogen can also be achieved via smart demand aggregation - in other words, identifying and convening large green hydrogen off-takers that may exist across sectors within a particular geographic location. For example, the aggregation of actual demand for green hydrogen for transportation refueling, industrial applications, and as an alternative fuel for thermal electric generation will not only justify large scale production but also enable infrastructure planning and development for storing and distributing of the green hydrogen at a much lower marginal cost in a concentrated geographic footprint. The GHC believes that CARB is in a unique and excellent position among California agencies to spearhead this demand aggregation strategy across sectors, and in a targeted way prioritizing disadvantaged communities in California. CARB's 2022

Scoping Plan could serve as a convenient pre-existing process to lead a demand aggregation strategy for green hydrogen.

We commend ARB for their initiative and focus on developing the Draft Report and hosting the subsequent workshop, and encourage ARB to consider all of the key roles that green hydrogen needs to play, even those not covered by the Draft Report. Specifically, GHC noted that the zero carbon scenarios include a maximum of 5-10% hydrogen in pipelines by 2045-2050. Notably, 5-10% is viewed as a *floor* for policymakers leading the green hydrogen transition, including in Europe, rather than a *ceiling*. Several countries are road mapping their journey toward 100% hydrogen in the gas system.[3] The GHC recommends the ARB consider lower injection values as near-term targets with scale-up over time to reach higher levels of green hydrogen injection over time.

Furthermore, GHC recommends hydrogen made from thermal conversion (i.e., gasification of organic matter and/or waste) be given full consideration as a viable pathway to produce green hydrogen. Although this method of creating green hydrogen is in early commercialization, the U.S. Department of Energy estimates that one billion dry tons of biomass could be available for energy use annually.[4] Similar to steam methane reformation of biogas, this green hydrogen production pathway is carbon neutral and can help create value for waste, encouraging the recycling of biomass and other organic material into useful fuels.[5] Developing a diverse toolkit of resource solutions, including various pathways for the production of green hydrogen, will be key to encouraging innovation and achieving California's carbon-neutral future.

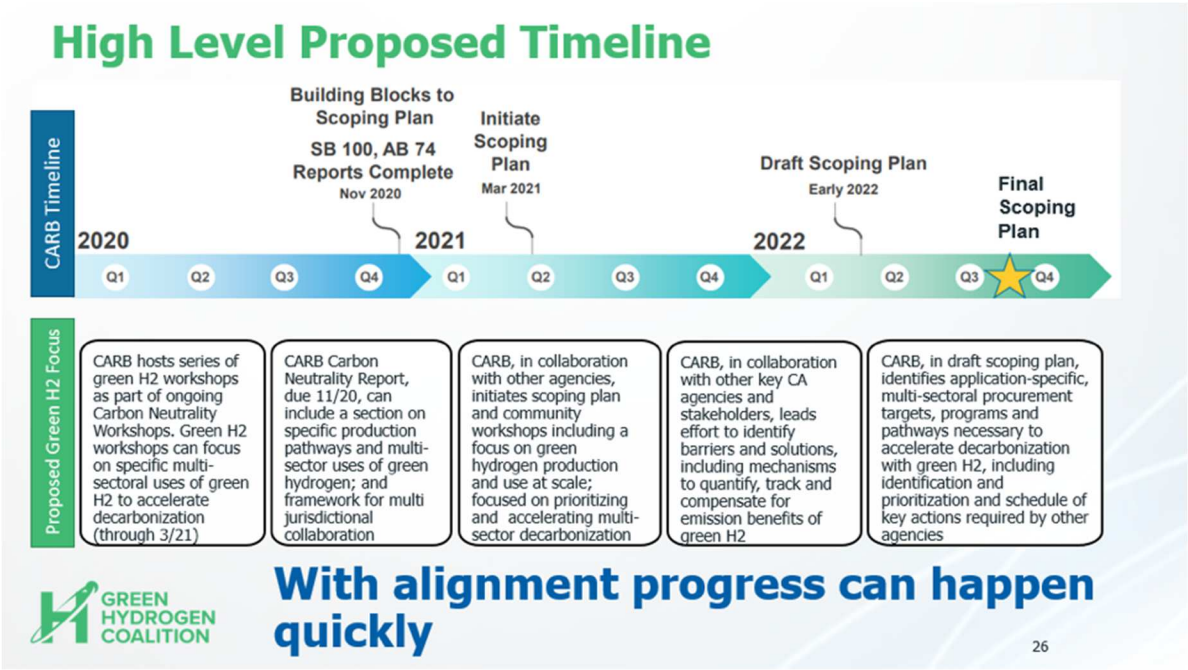
ARB CAN COORDINATE A CROSS-AGENCY COLLABORATION FOCUSED ON THE ROLE OF GREEN HYDROGEN TO ACCELERATE MULTI-SECTORAL DECARBONIZATION

[3] See, for example, Europe Commission, 2020, A Hydrogen Strategy for a Climate-Neutral Europe.
[4] U.S. Department of Energy, 2011, *U.S. Billion-Ton Update: Biomass Supply for a Bioenergy and Bioproducts Industry*. R.D. Perlack and B.J. Stokes (Leads), ORNL/TM-2011/224. Oak Ridge National Laboratory, Oak Ridge, TN. 227p
[5] See *Green Hydrogen Guidebook,* Green Hydrogen Coalition https://www.ghcoalition.org/guidebook

We encourage ARB and other state agencies to continue to look at the role of green hydrogen broadly to displace fossil fuels – *and* also to specifically consider its unique and important role in the power sector to achieve 100 percent clean energy; affordably and reliably.

We also encourage consideration of policies to bring the promise of green hydrogen forward as quickly as possible. Because of green hydrogen's cross-cutting capabilities that span multiple sectors and multiple jurisdictions, we respectfully recommend that ARB and other agencies engage in significant collaboration to create regulatory pathways for green hydrogen production and use in order to realize effective market design and accelerate multi-sectoral decarbonization to achieve the State's clean energy and climate goals, especially SB 100. For example, a coordinated effort would address demand aggregation opportunities in disadvantaged communities and might look at regulations and policies necessary for blending renewable hydrogen into the existing natural gas pipeline (as mentioned in the Scoping Plan) as well as strategies to repurpose organic waste from working lands and municipal waste to increase the production of green hydrogen to expand its availability for multiple applications and sectors.

Additional policies and regulations are needed to increase the production and use of renewable gas broadly in California per SB 1369 and SB 1383. The flexibility of green hydrogen as a vector resource touching multiple carbon sources and sinks lends itself to a focused effort to ensure well-coordinated progress toward establishing appropriate market design to stimulate investment and accelerated realization of carbon neutrality. GHC offers the below timeline for ARB's consideration of a strong leadership role on green hydrogen as a core component of its 2022 Scoping Plan:



The GHC appreciates the opportunity to provide these comments and looks forward to collaborating with the ARB and other agencies, including the California Energy Commission (CEC) and California Public Utilities Commission (CPUC), the California Independent System Operator (CAISO) on this initiative.

Sincerely,

Janice Lin
Founder and President
Green Hydrogen Coalition
jlin@ghcoalition.org
Telephone: 415-595-8301