COMMENTS BY THE GREEN HYDROGEN COALITION ON THE JUNE 8 CALIFORNIA AIR RESOURCES BOARD PUBLIC WORKSHOP TO COMMENCE DEVELOPMENT OF THE 2022 SCOPING PLAN UPDATE TO ACHIEVE CARBON NEUTRALITY BY 2045

I. Introduction

The Green Hydrogen Coalition (GHC)[1] appreciates the opportunity to comment on the California Air Resources Board's (ARB's) June 8, 2021 *Public Workshop Series to Commence Development of the 2022 Scoping Plan Update to Achieve Carbon Neutrality by 2045.* The GHC applauds ARB and Staff, as well as the California Energy Commission (CEC), the California Energy Commission (CPUC), and other participants for the comprehensive set of information presented at the workshop. The breadth and depth of scope envisioned for the 2022 Scoping Plan and the level of interagency coordination and collaboration is inspiring. GHC strongly supports the 2022 Scoping Plan effort and looks forward to engaging in the process.

The GHC is a California educational non-profit organization. GHC was formed in 2019 in recognition of the game-changing potential of "green hydrogen" to accelerate multi-sector decarbonization and combat climate change. 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 renewable energy users and developers, utilities, and other supporters of a reliable, affordable green hydrogen fueled economy for all.

Below is a summary of GHC's recommendations, which are elaborated on in the section that follows. In the subsequent sections, we share specific comments on the presentations, followed by an overview of the HyDeal project in development in Los Angeles, which aims to showcase green hydrogen as a pathway to accelerating multisectoral decarbonization and an example of the urgency of creating state policies and regulatory frameworks that enable green hydrogen development.

Summary of GHC Recommendations

[1] https://www.ghcoalition.org/

GHC respectfully encourages ARB to consider the following suggestions, as it develops the 2022 Scoping Plan:

a. **Clarify the definition and potential uses of green hydrogen, ensure that this definition is technology neutral and based on carbon intensity, and use this definition to determine eligibility of different types of hydrogen to participate in programs.**

b. **Develop a comprehensive strategic plan to enable the production and use of green hydrogen as a critical tool for multi-sectoral decarbonization ,including a roadmap for achieving at scale production consistent with US federal goals of achieving $1/kg clean hydrogen by 2030, the necessary infrastructure for transport and storage, as well as prioritized uses to reduce carbon emissions and improve local health outcomes.**

c. **As part of all future energy system modeling and other evaluation activities going forward, consider all the multi-sectoral impacts of various green hydrogen production pathways, and its at scale potential for cost reduction and benefits**

d. **Evaluate all the state pathways to compensate for carbon reduction (cap and trade and LCFS) and ensure that consistent, and transparent access to carbon reduction compensation be available for all applications of green hydrogen going forward. Appropriate market design and equitable access will help ensure that green hydrogen is used wisely to achieve California's equitable clean energy and climate goals.**

II. GHC Recommendations

a. **Clarify the definition and potential uses of green hydrogen, ensure that this definition is technology neutral and based on carbon intensity., and use this definition to determine eligibility of different types of hydrogen to participate in programs.**

Specifically, we recommend that the ARB define green hydrogen as hydrogen produced from non fossil fuel feedstocks that does not produce incremental new (non biogenic) GHG emissions, and that is inclusive of, but not limited to:

1) *renewable hydrogen* produced from RPS eligible feedstocks. For example, the CEC's RPS eligibility guidebook should clarify that renewable hydrogen made solely from RPS eligible feedstocks is eligible toward meeting the RPS.

2) *zero carbon SB 100 eligible hydrogen* produced from renewable and SB 100 eligible feedstocks

We also recommend that ARB consider including a definition of *low carbon hydrogen* produced from other low carbon feedstocks and set minimum required carbon intensity thresholds for each pathway.

Regulatory clarity on the eligibility of green hydrogen made from RPS and SB 100 eligible resources to comply with RPS and SB 100 requirements is needed urgently for projects that are underway right now. The largest is the conversion of the Intermountain Power Project (IPP) from an 1800 MW coal fueled generator to a 100% green hydrogen-fueled turbine. When the new turbine is commissioned in the summer of 2025, it will be fueled by 30% green hydrogen made exclusively from wind and solar. That percentage will be increased over time to 100%. While IPP serves many off takers, the largest is the Los Angeles Department of Water and Power. Regulatory certainty is needed to ensure that California can continue to help lead the way as an innovator on this groundbreaking green hydrogen project.

b. **Develop a comprehensive strategic plan to enable the production and use of green hydrogen as a critical tool for multi-sectoral decarbonization, including a roadmap for achieving at scale production consistent with US federal goals of achieving $1/kg clean hydrogen by 2030, the necessary infrastructure for transport and storage, as well as prioritized uses to reduce carbon emissions and improve local health outcomes**

California currently lacks a comprehensive hydrogen strategy to guide policymaking and provide investors with the confidence to invest in rapidly developing green hydrogen at the scale needed to unleash its full potential as a carbon neutrality solution across sectors. Numerous countries around the world now have hydrogen strategies, notably several being climate policy frontrunners like the European Union and individual European countries that have made green hydrogen development a cornerstone of their strategy to achieve carbon neutrality. We strongly encourage California, as one of the largest global economies, to join this international effort and recommend ARB help by creating a comprehensive hydrogen strategy a pillar of the 2022 Scoping Plan.

Given the Scoping Plan's focus on multi-sectoral decarbonization by 2045 and the unique capacity for green hydrogen to support this goal, GHC believes it is prudent for the ARB to develop a dedicated strategic plan to promote the production and use of green hydrogen as a critical tool for multi-sectoral decarbonization. Specifically, GHC recommends the ARB develop recommendations on how to overcome market barriers and accelerate progress in green hydrogen production, scaling and use, including through the use of public-private partnerships, demonstration projects, incentives, financing mechanisms, or other policies. In addition, ARB's strategic plan should include recommendations to

maximize economic, environmental, public health, workforce, and equity benefits resulting from increased utilization of green hydrogen. The strategic plan should include a description of strategies supporting hydrogen infrastructure and end uses in difficult-to-decarbonize sectors of the economy for the purpose of preparing infrastructure and end uses for green hydrogen deployment. This plan should also identify policies that promote the reduction of economywide emissions of greenhouse gases through the deployment of green hydrogen.

The US Department of Energy recently announced that its first "Energy Earthshot" program to accelerate breakthroughs of more abundant, affordable, and reliable clean energy solutions will be the "Hydrogen Shot," which targets reducing the cost of clean hydrogen 80% to $1/kg within a decade.[2] This target is consistent with the forecasted green hydrogen cost reductions made by analysts, NGOs and many countries around the world. Aligned with this, GHC recommends that the 2022 Scoping Plan include modeling green hydrogen at scale at delivered cost scenarios of $1/kg, $1.50/kg and $2/kg.

c. As part of all future energy system modeling and other evaluation activities going forward, consider all the multi-sectoral impacts of various green hydrogen production pathways, and its at scale potential for cost reduction and benefits

Green hydrogen can provide many benefits across sectors that ought to be integrated into modeling and other types of evaluation, as part of the 2022 Scoping Plan. For example, using green hydrogen as bulk seasonal storage in the power sector can help strategically scale green hydrogen production for large scale use in targeted locations, enabling the development of shared pipeline and storage infrastructure that other hard to electrify and hard to decarbonize sectors could leverage. Other beneficial uses that ought to be evaluated as part of the 2022 Scoping Plan include, but are not limited to 1) providing ancillary services with electrolytic hydrogen pathways, 2) reducing short lived climate pollutants (SLCPs) by avoiding methane and black carbon from organic waste pathways, as well as displacing natural gas via all green hydrogen pathways; and 3) reducing carbon, which all uses of green hydrogen can help to achieve.

d. Evaluate all the state pathways to compensate for carbon reduction (cap and trade and LCFS) and ensure that consistent, and transparent access to carbon reduction compensation be available for all applications of green hydrogen going forward.

[2] https://www.energy.gov/eere/fuelcells/hydrogen-shot

Appropriate market design and equitable access will help ensure that green hydrogen is used wisely to achieve California's equitable clean energy and climate goals.

Notably, California's current incentive programs for carbon reduction – Cap and Trade and LCFS – do not address all potential uses of green hydrogen. For example, there are no incentives available to cement plants, which could reduce carbon emissions by deploying green hydrogen.[3] GHC recommends that as part of the 2022 Scoping Plan, ARB evaluate all the pathways to compensate for carbon reduction, including the cap and trade and LCFS programs, and ensure that consistent and transparent access to carbon reduction compensation be available for all applications of green hydrogen going forward. This may result in recommendations to modify existing cap and trade and LCFS programs**.** Appropriate market design and equitable access will help ensure that green hydrogen is used wisely to achieve California's equitable clean energy and climate goals.

III. Specific GHC Comments on Workshop Presentations

A. GHC appreciates the CEC's SB 100 Joint Agency report and findings – in particular, the recommendation to further consider green hydrogen as a resource and consideration of the zero carbon firm resources scenario, which forecasts decreased annual electricity cost of $2B in 2045.

GHC strongly supports the CEC's recommendations to continue to evaluate effects of emerging technologies like green hydrogen.[4] We also support the recommendation to verify the scenarios to ensure compliance with the state's grid reliability requirements. For planned future analysis of long duration energy storage (LDES) and green hydrogen, GHC suggests that the Joint Agencies also concurrently explore how scaled use of green hydrogen in the power sector can rapidly reduce the cost of green hydrogen, which can further accelerate its use in other sectors that are difficult to directly electrify.

[3] While the Low Carbon Fuel Standard and Cap and Trade regulations could result in compensation for carbon abatement for natural gas suppliers, oil refineries, mobility fuel dispensers, and power plants, cement plant operators would not be able to monetize the carbon abatement value from using green hydrogen.
[4] 2021 SB 100 Joint Agency Report Summary: Achieving 100% Clean Electricity in California. Slide 12. https://ww2.arb.ca.gov/sites/default/files/2021-06/cec_cp_sp_kickoff_june2021.pdf

GHC believes green hydrogen can play an important role in storing California's unlimited low cost solar and wind energy for days, weeks, and seasons. That energy can be dispatched using existing gas turbines when needed, enhancing reliability as well as affordability by repurposing existing infrastructure. GHC notes that in April 2021, California experienced a new curtailment record – almost 350,000 MWh – presenting a challenge that will only intensify as the state progresses toward its SB 100 targets. This challenge is an opportunity for green hydrogen. Curtailed – along with purpose built new low cost – wind and solar represents a scalable pathway to producing green hydrogen.

B. We applaud the CPUC for considering procurement pathways for increased deployment of green hydrogen as a resource in the state's Integrated Resource Plan (IRP).

The presenter from the CPUC mentioned that the agency has proposed investment signals for up to 300 MW of green hydrogen as part of California's IRP.[5] GHC supports this direction and hopes that the 2022 Scoping Plan will build on this by setting even larger targets for green hydrogen production and deployment at the gigawatt scale. To offer perspective, Germany, which is roughly twice the size of California, is aiming for 5 GW of electrolytic hydrogen by 2030 as part of its climate strategy.[6]

C. GHC appreciates the 2022 Scoping Plan's focus on disadvantaged communities and a just transition.

GHC shares these goals and points out that green hydrogen can help ensure California's climate planning is equitable and just in several ways. For example, green hydrogen can:

- Repurpose existing infrastructure – e.g. thermal power plants, gas pipelines – from a climate problem to a climate solution and displace fossil fuels for many applications, particularly natural gas, gasoline and diesel, the lifecycle of which disproportionately impacts disadvantaged communities.
- Provide zero carbon, zero emission fuel for medium and heavy duty trucks, as well as port and warehouse equipment, helping to eliminate sources of pollution that especially burden lower income neighborhoods.
- Provide zero emissions vehicle options for multi-family unit dwellers and others who cannot easily plug in at home, as well as commuters who rely on fast refueling times to make it to work.

[5] CPUC Perspectives on Scoping Plan Update. Simon Baker. June 8, 2021. Slide 7. https://ww2.arb.ca.gov/sites/default/files/2021-06/cpuc_sp_kickoff_june2021.pdf

[6] https://www.euractiv.com/section/energy/news/germany-plans-to-promote-green-hydrogen-with-e7-billion/)

- Displace diesel in backup generators that create pollution hazards in vulnerable locations like wildfire prone regions and hospitals.
- Create good new green jobs, as well as help retain existing jobs by converting existing gas infrastructure into a carrier of low and zero carbon hydrogen.

D. **GHC appreciates the Scoping Plan's continued focus on reducing SLCPs, as this is critical in the near term to reduce climate change and improve public health, and supports prioritization of disadvantaged communities when designing programs.**

Green hydrogen can help mitigate SLCPs by repurposing the harmful methane from landfills and dairies to produce green hydrogen. Solid organic waste, agricultural waste and forest waste can also be thermochemically converted to green hydrogen instead of open burning, reducing black carbon and fugitive methane emissions. Green hydrogen can furthermore dramatically reduce black carbon by displacing diesel-fueled vehicles with green hydrogen fueled FCEVs. These attributes can be of particular benefit to agricultural regions and other disadvantaged communities where SLCP emissions are highest.

IV. HyDeal LA: Showcasing a pathway to accelerate multisectoral decarbonization

NGOs, analysts and experts around the world agree that green hydrogen production is poised for dramatic cost reduction and that the time is now to put into place policies and programs that enable this important climate solution. The promise of low cost, low carbon hydrogen and the urgency to realize this promise is underscored by the US Department of Energy recently announcing the Hydrogen Shot program described above in Section II(b).

In May 2021, in line with the federal government vision, GHC launched the green hydrogen commercialization initiative HyDeal LA[7], which aims to help enable not only low-cost production, but also importantly low *delivered* cost of green hydrogen. The project will implement several key strategies needed for green hydrogen to reach economies of scale. These include shared use of infrastructure to transport and store high volumes green hydrogen and designing ways to appropriately value all benefits green hydrogen can provide. The latter can be challenging for green hydrogen because there are so many pathways to produce and use it, but this is also full of opportunities. For example, electrolytically produced green hydrogen as a modifiable load can also provide ancillary services. Producing green

[7] https://www.ghcoalition.org/hydeal-la

hydrogen from organic waste can help reduce SLCP by reducing methane leakage from landfills and reducing open burning of organic solid waste. Currently, the full value proposition of green hydrogen to the climate and reliability of energy services is not captured by policies and market mechanisms. The HyDeal LA project aims to help address this.

Specifically, the HyDeal project will architect the green hydrogen ecosystem at scale to achieve a low delivered cost of $1.50/kg to multi sectoral off-takers in the LA Basin by 2030. Near term 'anchor' off takers include four power generation facilities owned by LADWP: Haynes, Harbor, Scattergood and Valley Generating Stations, as well as oil refineries and hydrogen fueling stations. Two pathways are concurrently being explored: 1) using available electric transmission capacity to electrolytically produce green hydrogen with zero carbon electricity in the basin, and 2) using 100% hydrogen pipelines to bring electrolytically produced green hydrogen to the LA basin. This effort includes multi-sectoral demand aggregation, creating a hypothetical system map, identifying potential areas of low cost mass scale production, and developing high level contract terms and conditions that could underpin large scale investment. By aggregating multi-sectoral demand, we believe the vision for achieving very low cost delivered green hydrogen to the LA basin can become reality. This, in turn, will further accelerate decarbonization of hard to electrify applications, such as medium/heavy duty trucking, shipping, industrial heat and aviation. This can lead to California leading the way on innovative carbon neutral technologies, such as capturing in-basin CO2 emissions (e.g. from cement plants) and re-purposing them by combining the CO2 with low cost green hydrogen to produce decarbonized liquid fuels for shipping and aviation. However, much work needs to be done to ensure at a state and regional level that mass-scale green hydrogen projects like HyDeal LA can ultimately be built, financed and commissioned. ARB's intent to consider green hydrogen as an essential tool toward achieving the objective outlined for the 2022 scoping plan is foundational to realizing the benefits of green hydrogen for California.

GHC intends to share findings from HyDeal LA and looks forward to working more closely with ARB and other agencies as part of 2022 Scoping Plan.

V. Conclusion

GHC thanks ARB for its thoughtful leadership on framing the 2022 Scoping Plan and for this opportunity to provide comments on this initial part of the process. We look forward to continuing to work with ARB

to understand how green hydrogen can become an important piece of California's carbon neutrality strategy.

Respectfully submitted,

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