March 9, 2022

The Honorable Richard Bloom, Chair
The Honorable Steve Bennett
The Honorable Laura Friedman
The Honorable Kevin Mullin
The Honorable Luz M. Rivas
The Honorable Thurston "Smitty" Smith
The Honorable Philip Y. Ting, Democrat Alternate
The Honorable Vince Fong, Republican Alternate

Submitted via email

Re: Proposed 2022-23 Budget for Green Hydrogen RD&D

Dear Assembly Budget Subcommittee No. 3 on Climate Crisis, Resources, Energy, And Transportation,

The Green Hydrogen Coalition ("GHC") expresses strong support for the $100 million budget proposal to scale electrolyzers for green hydrogen production included in Governor Newsom's Proposed Budget. These funds will undoubtedly expand installed capacity, create many new jobs, and lower the cost of electrolyzers, a critical and scalable pathway for producing green hydrogen. Last week, on March 3, 2022, the GHC also provided a support letter to Governor Newsom and the Senate Subcommittee 2 on Resources, Environmental Protection, and Energy (*see Appendix A*) and included recommendations to the Governor and the Legislature to adjust the proposed budget with the following changes:

- Include sizable funding for the creation of the California Clean Hydrogen Hub account to provide match funding to position California for as much as $2 billion state bid of the expected $8 billion federal clean /green hydrogen hub RFP.
- Increase the $100 million budget allocation to allow green hydrogen production from a full range of renewable feedstocks, in addition to electrolytic pathways.
- Increase the $100 million budget allocation to incorporate additional near-term funding needed to accelerate the uptake of high volume, green hydrogen off-takers in multiple sectors.

Moreover, for this letter, we want to take the opportunity to address some of the green hydrogen policies outlined in the Governor's Trailer Bill. Below we've included three concerning policies for the Assembly Budget Subcommittee's attention:

1. **The Current Definition Only Identifies Electrolytic Hydrogen Production And Does Not Account For Other Renewable Hydrogen Production Pathways.**

The State has tremendous supplies of agricultural waste, forest waste, and municipal waste – which can be commercially converted into green hydrogen today. Using organic waste to produce green hydrogen is a viable pathway to responsible disposal of these waste streams and minimizing their cost to taxpayers and their environmental impact. Excluding organic waste-based hydrogen will slow California's efforts to reduce methane and other Short-Lived Climate Pollutants and achieve carbon neutrality. Lawrence Livermore National Lab, in its 2020 report on getting to carbon neutrality, found that converting organic waste to bioenergy with carbon capture and storage ("BECCS") can provide significant carbon negative

emissions.[1] That is because the reductions in methane and black carbon from avoided landfilling or open burning of waste are far more significant than the CO2 emitted at the point of conversion to hydrogen. Hydrogen derived from organic waste is the only form of renewable hydrogen that can be carbon negative.

Including hydrogen from organic waste will also further California's goal of reducing wildfire and restoring healthy forests. The U.S. Forest Service has entered into an agreement with California to conduct forest fuel removal on one million acres per year.[2] The most beneficial use of that forest biomass would be to convert it to carbon-negative hydrogen. California will seriously undermine this effort if its definition of green hydrogen excludes hydrogen generated from forest waste that is removed to mitigate wildfire hazards and restore healthy forests. Therefore, the Governor's Trailer Bill should be modified to allow green hydrogen production from a full range of renewable feedstocks, including RPS and SB 100 eligible resources, in addition to electrolytic pathways.

2. **Eligible Hydrogen Projects Should Be Able To Access Renewable Energy Certificates (RECs) And Other Forms Of Compliance Credits In The Near Term, So Long As The Certificates or Credits Are Not Double-Counted.**

We appreciate the intent in the trailer bill to disallow projects that use feedstock or eligible renewable energy resources for which offset credits, renewable energy credits, swaps, or other forms of indirect compliance credits are provided. GHC supports the intent of this proposed policy -- to ensure incremental renewable energy production. However, this provision would limit green hydrogen project development only to co-located renewable hydrogen production projects. In the case of electrolysis, this would mean that only electrolyzers that are sited at renewable electricity generating facilities would be eligible. It would prohibit the use of non-co-located renewable energy to be delivered by the electric grid. The net result is that the electrolyzer utilization will be very low (limited to only when the co-located renewable generation resource is available), and the resulting green hydrogen production costs will be unnecessarily high.

Further, prohibiting REC use and electric infrastructure delivery mechanisms would undermine the realization of other benefits from electrolysis – namely, the fact that it is a useful and modifiable load that can provide significant system benefits through demand response and help absorb increasing levels of renewable energy curtailment and provide needed long-duration storage to support multi-day and seasonal renewable capacity shortages. Of course, more work needs to be done to develop low-cost green-electrolytic electric tariffs to enable a viable value proposition for green electrolytic hydrogen production using power system infrastructure to displace multiple fossil-fuel end uses.

Finally, this policy would discriminate against green hydrogen producers because it would hold them to a higher standard than commercial and industrial customers who can purchase and retire RECs or credits for their electricity load. Electrolytic green hydrogen producers should be able to utilize the same REC and voluntary credit and compliance markets that all other electricity users have access to today and under the same rules. Therefore, the GHC recommends that this requirement be struck from the Governor's Trailer Bill.

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[1] Lawrence Livermore National Lab, "Getting to Neutral – Options for Negative Carbon Emissions in California," January 2020.

[2] Agreement for Shared Stewardship of California's forest and Rangelands Between the State of California and the USDA, Forest Service Pacific Southwest Region, August 12, 2020. Available at: https://www.gov.ca.gov/wp-content/uploads/2020/08/8.12.20-CA-Shared-Stewardship-MOU.pdf.

3. **Eligible Facilities Should Also Include Municipal Operations Such As Municipal Fleets, Maritime Ports And Airports To Ensure A Just Energy Transition For Communities Of Concern.**

Maritime ports and airports are at the heart of domestic and international shipping and travel, but they also are often fossil-fueled pollution hotspots. These ports are often located in communities of concern where the pollution they generate results in devastating health and economic impacts. These consequences overwhelmingly affect those already suffering from equity, environmental, and energy justice. Therefore, these communities must not be left behind in the energy transition. For this reason, GHC recommends that the Governor's Trailer Bill be modified to include municipal operations, such as maritime ports and airports, and related municipal fleets as eligible facilities.

Thank you for your clean energy leadership and for this opportunity to provide this letter.

Sincerely,

/s/ Janice Lin

Janice Lin
President and CEO
Green Hydrogen Coalition

Cc: Hazel Miranda, Office of Governor Newsom

Appendix A

March 3, 2022

The Honorable Gavin Newsom, Governor
The Honorable Toni Atkins, Senate President *Pro Tempore*
The Honorable Anthony Rendon, Speaker of the Assembly
The Honorable Nancy Skinner, Senate Budget Committee Chair
The Honorable Phil Ting, Assembly Budget Committee Chair

Submitted via email

Re: Proposed 2022-23 Budget for Green Hydrogen RD&D

Dear Governor Newsom, *Pro Tempore* Atkins, Speaker Rendon, Chair Skinner, and Chair Ting:

The Green Hydrogen Coalition ("GHC") applauds California's $100 million budget proposal to scale electrolyzers for green hydrogen production. These funds will undoubtedly expand installed capacity, create many new jobs, and lower the cost of electrolyzers, a critical and scalable pathway for producing green hydrogen. These efforts will provide an essential baseline from which production and use of electrolytically produced green hydrogen can grow throughout California to meet our clean energy policy goals. GHC respectfully offers this letter outlining suggestions to build upon the Governor's proposed budget and help establish California as a national, and ultimately, a global leader in green hydrogen, building on its clean energy leadership, large domestic market, and abundant renewable feedstocks to produce green hydrogen.

As the sixth-largest economy globally, California has many scalable, multi-sectoral opportunities to rapidly displace fossil fuels with green hydrogen. Given this potential, the State is well-positioned to compete for a large share of the $9.5 billion federal clean hydrogen infrastructure, electrolysis, and manufacturing funding included in the Bipartisan Infrastructure Bill enacted last fall. To strategically increase California's competitiveness on a national scale, GHC recommends that substantial additional funding be allocated to serve as match funding for federal awards.

Of the $9.5 billion of available federal funding, $8 billion is directed towards creating a program to facilitate the development of at least four regional clean hydrogen hubs. Over the last two years, the GHC has architected a green hydrogen hub for southern California called HyDeal Los Angeles (LA), which positions California well for a significant award. HyDeal LA has established a vision and system plan for delivering low-cost, mass-scale green hydrogen at less than $2/kg to multi-sectoral off-takers in the LA basin, including port cargo operations, heavy-duty transport, industrial, clean firm dispatchable power, and even zero-carbon aviation.

This hub will attract significant private investment, stimulate job creation, and accelerate California's environmental justice and clean air goals. State support, including GAN exempt funding, is critical to helping public and private sector investors meet the federally required 50% match funding. This funding will be key to developing needed infrastructure and accelerating climate progress.

A scaled green hydrogen hub that accelerates our transition away from fossil fuels will require mass scale green hydrogen supply, transport infrastructure and new downstream application-specific infrastructure at ports, airports and industrial centers. California is blessed with an abundance of feedstocks to produce green hydrogen. In addition to California's plentiful low-cost renewable electricity, the State has tremendous supplies of agricultural waste, forest waste, and municipal waste – which can be commercially converted into green hydrogen today. Using organic waste to produce green hydrogen is a viable pathway to

responsible disposal of these waste streams and minimizing their cost to taxpayers and their environmental impact. California's budget allocation for green hydrogen should encourage and allow green hydrogen production from a full range of renewable feedstocks, in addition to electrolytic pathways. Technology neutrality will stimulate competition, innovation, and lower costs.

To commence California's green hydrogen economy, scalable off takers must be able to sign long term contracts for green hydrogen supply. This requires not only a low-cost supply agreement, but also investment to repurpose existing assets and install new infrastructure. For example, diesel forklift engines must be replaced, and local hydrogen storage and dispensing facilities installed at the port. Even gas turbines, which can already operate on a blend of hydrogen and natural gas, must be retrofitted with new safety and emissions control equipment. Finally, to achieve a low-cost mass scale hydrogen economy, new 100% green hydrogen pipelines must be built to achieve low *delivered* cost – similar to how we already use pipelines to transport oil and natural gas.

To establish California as a national and global leader in green hydrogen production and use, GHC respectfully recommends that the Governor and the Legislature adjust the proposed budget with the following changes:

- Include sizable funding for the creation of the California Clean Hydrogen Hub account to support a $2 billion state bid for the federal hub grants. Funds in this account will be used for the Bipartisan Infrastructure Bill cost-share requirements for demonstration and commercial application projects.
- Increase the $100 million budget allocation to allow green hydrogen production from a full range of renewable feedstocks, in addition to electrolytic pathways. Using organic waste to produce green hydrogen is a viable pathway to responsible disposal of these waste streams and minimizing their environmental impact.
- Increase the $100 million budget allocation to incorporate additional near-term funding needed to accelerate the uptake of high volume, green hydrogen off-takers in multiple sectors. Additional funding should include application-specific infrastructure investments in the following shovel ready areas:
    - ***$50 million for decarbonizing seaports via green hydrogen***. Funds will be used to accelerate the shift from fossil fuels to green hydrogen to power medium-and heavy-duty vehicles, including heavy equipment such as forklifts, drayage trucks, and cranes. Investments may include scaling up green hydrogen production and fueling, storage infrastructure, and offsetting fuel cell fleet upgrade costs. This investment will dramatically improve air quality for disadvantaged communities located near port areas and along heavy-duty trucking routes.
    - ***$50 million for green hydrogen synthetic fuels, chemicals, and polymers.*** Funds will be used to produce green synthetic fuels, chemicals, and polymers from green hydrogen and carbon dioxide, offering even more ways to meet the needs of various transportation applications and existing liquid fuel infrastructure for hard-to-decarbonize end uses such as maritime shipping, aircraft, and long-haul rail as well as to develop routes for negative carbon chemicals and polymers that will still be needed in a Net Zero world. Investments may include scaling up production and the demonstration and initial use of these green products in critical applications. This investment should prioritize reuse of existing oil refinery assets and operations and land.
    - ***$10 million for green hydrogen aircraft demonstration and infrastructure.*** Funds will be used to develop green hydrogen production and fueling operations at two intrastate airports to support

weekly commercial passenger aircraft routes for 1-2 years, demonstrating coverage of the entire State. Investments may include electrolyzer + solar system costs, permitting and construction, and hydrogen transportation via refueling trucks (Investments will also be usable for refueling airport ground transportation) With this modest investment, California can be the first State in the nation to offer zero carbon, zero emission passenger flight.

- ***$50 Million for green ammonia production, storage, and infrastructure.*** Funds will be used to accelerate the transition away from fossil fuel use for ammonia, fertilizer and shipping fuel. Investments may include developing green ammonia production and storage facilities, permitting, construction, and distribution infrastructure at existing port locations. The investment will offer even more ways for various hard-to-decarbonize industrial, agriculture, and transportation applications opportunities –especially maritime shipping -- to meet the requirements of a Net Zero world.

- ***$20 million for research, development and demonstration efforts to advance green hydrogen long-duration energy storage ("LDES") technologies, including surface and subsurface storage options.*** Green hydrogen hubs require mass scale, low-cost geologic storage as well as application specific surface storage, similar to how natural gas is stored and dispensed today. Hydrogen is already commercially stored underground in salt caverns in the Gulf of Mexico and central Utah – unfortunately California does not have this type of rock formation. California does have many retired oil wells, aquifers and natural gas caverns that should be explored for conversion to green hydrogen storage. Funds will support the development of a range of green hydrogen LDES projects throughout the State to continuously scale up the size of the projects to meet seasonal storage needs. The knowledge gained will move these green hydrogen LDES technologies into commercialization for rapid deployment. This will enable these technologies to compete commercially for future utility and other contracts.

- ***$20 million for hydrogen delivery through local pipeline distribution infrastructure for refueling stations and stationary power sites.*** Pipeline transport is the lowest cost means of transporting large quantities of hydrogen. Funds be used to lower the cost and energy use of the hydrogen delivery infrastructure between local mass scale off takers. This includes developing improved, lower-cost materials for pipelines; breakthrough approaches to hydrogen liquefaction; lighter weight and more robust materials and structures for high-pressure hydrogen storage and transport; and novel in-state low-pressure solid and liquid carrier systems for hydrogen delivery and storage.

- ***$20 million to support in-state manufacturing of products that produce/consume green hydrogen to support CA jobs.*** Funds will be used for multiyear grants for eligible California-based entities to advance new green hydrogen manufacturing technologies and techniques and create innovative and practical approaches to increase the reuse and recycling of clean hydrogen technologies.

- ***$20 million for green hydrogen-powered rail and infrastructure.*** Funds will be used to shift from fossil fuel to green hydrogen regional and commuter passenger rail service, freight locomotives, and shunters. Investments may include fuel cell upgrades and green hydrogen fueling and storage infrastructure.

- ***$10 million for demonstration sites for hydrogen fuel cell assisted (HFCA) microgrids.*** Funds will be used to identify optimal locations (e.g., areas with high-capacity needs and/or reliability and resiliency needs) and develop zero-carbon HFCA microgrids that initially utilize stationary fuel-cell generation and eventually incorporate on-site electrolysis and vehicle-to-grid support from medium/heavy-duty fuel-cell electric vehicle (FCEVs) fleets.

- ***$5 million for research to enable the use of hydrogen as a gas turbine fuel.*** Funds will support R&D to resolve scientific challenges and applied engineering issues of combustion turbines fueled with pure hydrogen, hydrogen, natural gas mixtures, and other carbon-free hydrogen-containing fuels. Research findings should be used to inform zero-carbon power generation conversions for the State's reliability power needs.

- ***$5 million to support green hydrogen workforce development.*** Funds will be used to identify and implement workforce training requirements needed to support the State's green hydrogen economy. Such investments should support the State's clean and just energy transition -- workforce development grounded in the principles of social equity, environmental sustainability, energy resilience and family-sustaining jobs.

Thank you for your clean energy leadership and for this opportunity to comment.

Sincerely,

/s/ Janice Lin

Janice Lin
President and CEO
Green Hydrogen Coalition

Cc: Members of the Assembly and Senate Budget Committees
Hazel Miranda, Office of Governor Newsom