November 14, 2022

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U.S. Department of Energy
James V. Forrestal Building
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RE: Green Hydrogen Coalition's Response to the U.S. Department of Energy's Clean Hydrogen Production Standard Draft Guidance

The Green Hydrogen Coalition (GHC)[1] appreciates the opportunity to submit this response to the U.S. Department of Energy (DOE) regarding the Draft Guidance for the Clean Hydrogen Production Standard (CHPS),[2] which was developed to meet the requirements of the Infrastructure Investment and Jobs Act of 2021, also known as the Bipartisan Infrastructure Law (BIL), Section 40315.[3]

GHC is a California educational 501(c)(3) non-profit organization. GHC was formed in 2019 to recognize 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 to accelerate a carbon-free energy future and a just energy transition. Our sponsors include renewable energy users and developers, utilities, and other supporters of a reliable, affordable green hydrogen fuel economy for all.

Overall, GHC supports the CHPS draft guidance for three key reasons: (1) it adopts a well-to-gate life cycle assessment approach for evaluating hydrogen production, which in turn promotes technology neutrality and feedstock diversity, (2) the methodology that underpins the CHPS will allow the nascent hydrogen economy to develop using international best practices, and (3) the lifecycle threshold aligns with the hydrogen production tax credit in the Inflation Reduction Act

[1] See https://www.ghcoalition.org/
[2] See https://www.hydrogen.energy.gov/pdfs/clean-hydrogen-production-standard.pdf
[3] See https://www.congress.gov/bill/117th-congress/house-bill/3684/text

(IRA).[4] To further enhance the CHPS, the GHC believes first, it should guide the Clean Hydrogen Research and Development Program to prioritize research on the lowest carbon-intensive hydrogen and second, that renewable energy certificates (RECs) should be allowable in characterizing the intensity of electricity emissions for grid-connected hydrogen production.

In the following sections, we outline our rationale for supporting the CHPS and provide considerations for further development.

GHC RESPONSE:

1. **The Well-To-Gate Methodology is Key to Supporting Hydrogen Production from Diverse Low-Carbon Energy Sources and is Central to Achieving Our Climate Goals.**

The GHC supports the DOE using a well-to-gate life cycle assessment (well-to-gate LCA) on the basis that it will better support sustainable reductions in greenhouse gas (GHG) emissions as compared to a "point of production" methodology. We believe a well-to-gate LCA approach is crucial since it accounts for the climate impacts associated with all aspects of hydrogen use, including production. This helps reduce market misrepresentations by accurately capturing the true GHG emissions of fuels, thereby facilitating the development of a credible clean hydrogen market.

Furthermore, the GHC believes this approach ingrains a more sustainable view of hydrogen into the market and reduces ambiguity in several ways. First, the well-to-gate LCA perspective – which adopts a carbon intensity (CI) specific approach instead of one focused on "colors"– will reduce the subjectivity inherent in the conversation about what constitutes "green hydrogen." Additionally, this approach is inclusive of all production types – so long as they have a low CI – and thereby is inherently technology-agnostic. The GHC supports taking this perspective since it opens other pathways for competition on the basis that hydrogen, regardless of how it is produced, can flourish if it meets the desired life cycle emissions threshold.

2. **Adopting the Boundary Conditions from the International Partnership for Hydrogen in the Economy is an Important Step in Enabling the Nascent Domestic Industry to Better Integrate with Global Hydrogen Markets.**

[4] See https://www.congress.gov/bill/117th-congress/house-bill/5376/text

The GHC believes the methodology employed by the International Partnership for Hydrogen in the Economy (IPHE) will be important for developing the hydrogen economy in the United States for four main reasons. This methodology, created by IPHE's Hydrogen Production Analysis Task Force (H2PA TF), is intended to account for the emissions from each unit of hydrogen across the supply chain. First, IPHE includes the collaboration of 21 countries and is aligned with international best practices,[5] which makes the GHC confident that the boundary condition methodology put forth will be a helpful guide for the United States.

Second, and related to the above point, the GHC appreciates that the methodology is intended to be used across all hydrogen production pathways and is aligned with internationally agreed-upon approaches for evaluating the emissions of fuel production.[6] This is beneficial since local and state governments can replicate these well-established and carefully considered conditions. To this end, the U.S. market – even at a micro level – will have the advantage of being in sync with the global market from its inception. This may lead to more straightforward international trade as well as shared best practices for the production of hydrogen, all of which would benefit our hydrogen economy.

Third, the GHC particularly supports the IPHE methodology because of the principles that underpin it: (1) inclusiveness, (2) flexibility, (3) transparency, (4) comparability, and (5) practicality.[7] From GHC's perspective, these criteria will be essential for transforming the nascent hydrogen market into a robust one. Inclusiveness is necessary because, by not prohibiting certain primary energy sources from being candidates for hydrogen production,[8] we can safeguard against hamstringing the market. Flexibility is also a crucial element since the hydrogen market will likely be dynamic as it emerges, which implies that the methodology should be ready to adapt as new barriers and opportunities materialize. Transparency regarding the assumptions within the IPHE methodology will also be necessary for not only building confidence in this approach but also

[5] See https://www.iphe.net/iphe-working-paper-methodology-doc-oct-2021
[6] The proposed emissions accounting methodology aims at being applied to all hydrogen production pathways utilizing the different standards ISO 14067, ISO 14040, and ISO 14044.
[7] See IPHE Hydrogen Product ion Analysis Task Force working paper *Methodology for Determining the Greenhouse Gas Emissions Associated with the Production of Hydrogen*.
[8] Ibid.

having the potential to spur innovation and engagement amongst all stakeholders. Compatibility is critical for the hydrogen market since it will allow for an 'apples-to-apples' comparison of emissions from hydrogen to emissions from other sources, which may highlight where hydrogen is excelling relative to other fuel sources and where it can grow further. Lastly, ensuring that this methodology is practical will allow it to be adapted widely and reasonably incorporated.

Fourth, the GHC believes a strength of the IPHE methodological approach is that it will mature as the hydrogen market grows, both internationally and domestically. As stated by the IPHE, this approach will be "built upon over time, potentially covering additional production pathways and other parts of the value chain such as different hydrogen physical states and energy carriers, and emissions due to the transportation to the usage gate."[9] The ability of this methodology to develop in tandem with the market will establish best practices that are inclusive of as many stakeholders and hydrogen production pathways as possible.

Ultimately, these four criteria, when taken together, lead the GHC to believe this methodology will help usher in a sustainable, clean, and just energy transition that is inclusive of hydrogen.

3. Two Ways to Further Enhance the CHPS

While the GHC is confident the CHPS will be integral to the development of the hydrogen market, this section details two ways in which the GHC believes it can be more robust: (1) by guiding the Clean Hydrogen Research and Development Program to prioritize research and development of lower carbon intensive hydrogen solutions than the current target (4.0 kgCO2e/kgH2) and (2) allowing renewable energy certificates (RECs) to characterize the intensity of electricity emissions for grid-connected hydrogen production.

a. The DOE's Clean Hydrogen Research and Development Program should focus on the lowest carbon-intensive hydrogen solutions utilizing the CHPS framework.

The GHC believes that - to establish a competitive clean hydrogen market in the United States - it is essential that federal research prioritizes the lowest possible carbon-intensive hydrogen solutions. The CHPS, which is designed to guide both the DOE's Regional Clean Hydrogen Hubs

[9] Ibid.

(Hubs) and the Clean Hydrogen Research and Development Program (CHRDP),[10] has the opportunity to direct federal research accordingly and thereby help the Nation achieve its emissions reduction goals.[11]

As mentioned previously, the GHC fully supports the CHPS's 4.0 kgCO2e/kgH2 target for the Hubs program since feedstock diversity is required for the program.[12] However, in the case of federal research under the Clean Hydrogen Research and Development Program, the GHC believes the CHPS should prioritize research on hydrogen that is not produced from fossil fuel feedstock sources and produces near-zero greenhouse gas emissions (e.g., <=0.45 kg CO2e per kg H2) on a well-to-gate lifecycle basis.[13] The CHPS' current focus on the entire spectrum of clean hydrogen,[14] while useful for the Hubs program, has a limitation when it comes to research since there is no prioritization for the development of carbon-negative or low-carbon options[15] over those that approach the high end of the target.[16] From a market development perspective, this lowers the incentive for the development of near-zero emission hydrogen solutions and does not encourage the market to drive down carbon emissions ***below*** the 4.0 kgCO2e/kgH2 threshold.

Therefore, to address this limitation and ensure the necessary market forces are in place to incentivize clean technological advancement, the GHC believes the CHPS should guide the CHRDP to focus entirely on research and demonstrations of the least carbon-intensive hydrogen production pathways. Creating incentives that benefit incrementally lower CI targets below a certain standard – a defining feature of the IRA production tax credit (PTC)[17] - helps create the momentum needed to get the clean hydrogen market off the ground. The CHPS could achieve this

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[10] See https://www.hydrogen.energy.gov/pdfs/clean-hydrogen-production-standard.pdf, p. 2.
[11] See https://www.whitehouse.gov/briefing-room/statements-releases/2021/04/22/fact-sheet-president-biden-sets-2030-greenhouse-gas-pollution-reduction-target-aimed-at-creating-good-paying-union-jobs-and-securing-u-s-leadership-on-clean-energy-technologies/
[12] "(i) at least 1 regional clean hydrogen hub shall demonstrate the production of clean hydrogen from fossil fuels; (ii) at least 1 regional clean hydrogen hub shall demonstrate the production of clean hydrogen from renewable energy; and (iii) at least 1 regional clean hydrogen hub shall demonstrate the production of clean hydrogen from nuclear energy;" See: https://www.congress.gov/bill/117th-congress/house-bill/3684/text
[13] The <=.45 kg CO2e per kg H2 threshold is also the lowest CI per DOE's PTC.
[14] "Clean hydrogen" is defined as hydrogen with life cycle emissions less than or equal to 4.0 kgCO2e/kgH2.
[15] Hydrogen with life cycle emissions less than or equal to 0.45 kg CO2e per kg H2.
[16] Approaching 4.0 kgCO2e/kgH2
[17] See https://www.congress.gov/bill/117th-congress/house-bill/5376/text

same result by following the IRA PTC stair step scale[18] (see below) and prioritizing research and development on hydrogen with the lowest kgCO2e/kgH2 threshold.

Kg of CO2e per kg of H2	Credit Value ($)
4 - 2.5 kg CO2e	$0.60 / kg of H2
2.5 - 1.5 kg CO2e	$0.75 / kg of H2
1.5 - 0.45 kg CO2e	$1.00 / kg of H2
0.45 - 0 kg CO2e	$3.00 / kg of H2

Through this approach, the crucial 4.0 kgCO2e/kgH2 target would remain in place and only the research focus would be altered, generating two key benefits: (1) keeping the CI target ensures that progress is not stalled on developing diverse feedstocks required for the Clean Hydrogen Hubs Program, and (2) guiding federal research will help create the momentum needed to support the technologies that generate the lowest carbon intensity (CI) hydrogen. Ultimately, the IRA's preferencing for green hydrogen[19] is an important market lever and the GHC believes its support for near-zero emission hydrogen should be mirrored within the CHPS.

b. Renewable Energy Certificates (RECs) Should Be Allowable in Characterizing the Intensity of Electricity Emissions for Grid Connected Hydrogen Production.

The GHC believes the CHPS could be further strengthened by allowing RECs to characterize the intensity of electricity emissions for grid-connected hydrogen production.

Overall, the GHC supports mechanisms that ensure "green hydrogen" is genuinely green. The existing infrastructure and mechanisms today, however, are not sufficiently mature to track and account for the physical delivery of renewable electricity to grid-connected green hydrogen production. A primary goal of the GHC is to support the development of this infrastructure and mechanisms in a sustainable way rather than hinder green hydrogen market development. To this

[18] Ibid.
[19] Hydrogen that is not produced from fossil fuel feedstock sources and produces near-zero greenhouse gas emissions (e.g., <=0.45 kg CO2e per kg H2) on a well-to-gate lifecycle basis.

end, the GHC supports leveraging existing infrastructure and systems that have worked for decades under the REC scheme to accelerate green hydrogen market development.

Specifically, in the short term,[20] GHC supports a "book-&-claim" approach in which RECs can be used to satisfy the "renewable" component of grid-connected hydrogen production. By uncoupling the renewable electricity from the production of hydrogen, GHC believes this allows for more flexibility for producers and end-users since RECs can be traded in such a way that emissions decrease on a net basis. We believe this flexibility is especially evident in the ramp-up phase of the hydrogen market while policies are being developed (*see list of policy considerations below*). This principle builds on existing principles that allowed REC markets to flourish in the past~ by providing more flexibility for producers and end-users, increasing competition, and helping overcome near-term barriers to large-scale infrastructure development.

However, in the medium- to long-term[21] – or as soon as enabling traceability, reporting, and verification tools to track real-time grid injection and withdrawal points are broadly utilized in regard to REC allocation – we support the creation of a "mass balancing" principle that links renewable electricity with the respective physical delivery. This primarily traces a renewable energy carrier from its use to its production. Thus, as infrastructure is developed, a physical link (*e.g., physical connectivity and deliverability between the source of the renewable feedstock and the location of the hydrogen production*) is established throughout the value chain. This physical link can be made through the electricity grid, provided there is no congestion. A physical link between renewable generation and grid-connected hydrogen production will be important because it will be an easy way to verify the cleanliness of the hydrogen produced. To achieve this principle, several vital policies will need to be implemented to ensure market growth and equitable needs for the whole ecosystem. Key policy considerations that need to be explored in greater detail include the following:

- **Additionality:** How should hydrogen production facilities contribute to the build-out or financing of new renewable electricity capacity to avoid its development leading to

[20] GHC defines "short-term" as today through 2030 or until infrastructure and mechanisms are in place.
[21] GHC defines "medium- to long-term" as 2030 and beyond.

increased shares of fossil-generated electricity elsewhere in the electricity system and promote decarbonization?

- **Deliverability:** What requirements should be set in place for physical connectivity and deliverability between the source of the renewable feedstock and the location of the hydrogen production?

- **Temporal correlation:** Should there be contemporaneous matching requirements between renewable electricity and hydrogen production (e.g., annual, monthly, weekly, hourly)?

- **Geographical connection:** Should there be a geographic boundary between the feedstock and production facility (e.g., western/eastern/ERCOT interconnect, ISO/RTO, or balancing authority)?

Addressing these policy considerations and developing a strategy to support market development will take time. However, the GHC advocates for relaxed, introductory standards that only last a prescribed period of time – no later than 2030. For this reason, work needs to be conducted today to begin developing this vision and addressing these complex questions. The GHC proposes that the DOE leads or supports an initiative to create this plan with policymakers, industry, and interested stakeholders. The GHC would welcome the opportunity to support this effort. In the meantime, the DOE should set policies in place that encourage market development and ratchet up policies (*such as those outlined above*) after interested stakeholders have had the opportunity to dive deep into the issues.

CONCLUSION

In summary, the GHC supports the CHPS and is confident it will generate unprecedented progress toward the Nation's clean energy transition. The GHC believes the DOE is establishing essential rules of the road that will help the nascent hydrogen economy develop. To further this goal, the GHC believes that flexibility should be at the forefront of the CHPS. Specifically, we believe the most effective approach for developing a robust hydrogen market would be for the CHPS requirements to begin more broadly and then get more stringent with time. The flexibility at the beginning of CHPS requirements would allow more stakeholders to participate and thereby generate healthy competition in the market.

Respectfully submitted,

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