March 14, 2022

Honorable Jennifer Granholm
Secretary
U.S. Department of Energy
1000 Independence Ave., SW
Washington, DC 20585

Re: IIJA "Clean Hydrogen" Carbon Intensity Framework

Dear Secretary Granholm:

The undersigned organizations support the recently passed Infrastructure Investment and Jobs Act ("IIJA"). The hydrogen provisions in the IIJA will undoubtedly help shape our nation's clean hydrogen economy. The IIJA includes many critical areas for the Department of Energy ("DOE") to implement. One of the most critical areas for immediate implementation is the requirement set forth in Section 822(a) of the IIJA that no later than May 14, 2022, "the Secretary, in consultation with the Administrator of the Environmental Protection Agency and after taking into account input from industry and other stakeholders, as determined by the Secretary, shall develop an initial standard for the carbon intensity of clean hydrogen production that shall apply to activities carried out under [the IIJA]." This standard for determining the carbon intensity of clean hydrogen production is central to achieving our climate goals. It will play a significant and impactful role in the pace and progress of our clean energy transition, as it will likely be mirrored by local, state, and national governments and international bodies worldwide.

While the IIJA has given significant discretion to your honorable Madam Secretary in developing the initial carbon intensity standard, the IIJA also has set some boundaries on that discretion. Specifically, Section 822(b)(1)(B) of the IIJA states that the carbon intensity standard that the Secretary is to develop shall "define the term 'clean hydrogen' to mean hydrogen produced with a carbon intensity equal to or less than 2 kilograms of carbon-dioxide equivalent produced at the site of production per kilogram of hydrogen produced," and that 2kg standard is to apply for the first five years pursuant to Section 822(b)(2). At first glance, the IIJA has effectively prescribed the carbon intensity standard to be used for the first five years. However, a close reading of Section 822(b)(1)(B) allows your honorable Madam Secretary the discretion to interpret the scope of "at the point of production" and to define the precise system boundary for purposes of including or excluding upstream emissions.

Due to this discretion, the undersigned organizations strongly encourage the DOE to adopt a carbon intensity framework based on well-to-gate life cycle emissions accounting.

To achieve reductions in greenhouse gas emissions, it is critical to quantify and track the carbon intensity of all hydrogen pathways based on onsite *and* upstream production emissions. This accounting approach includes all emissions associated with feedstock production, transportation, losses, flaring, hydrogen production, and carbon capture and storage (*if applicable*). This life cycle accounting is referred to as "well-to-gate."[1] A well-to-gate carbon intensity framework is crucial because it rigorously accounts for the climate impacts associated with hydrogen production pathways. It helps reduce market misrepresentations and facilitates the development of a credible clean hydrogen market.

[1] We define a well-to-gate life cycle emissions boundary to include the scope set forth by the IPHE in its recent white paper. Methodology for Determining the Greenhouse Gas Emissions Associated with the Production of Hydrogen, IPHE Hydrogen Production Analysis Task Force, https://www.iphe.net/_files/ugd/45185a_ef588ba32fc54e0eb57b0b7444cfa5f9.pdf

Further, evaluating hydrogen production from well-to-gate will help reduce subjectivity and support a scientific approach focused on decarbonizing systems, not individual value chains. It is also a technology-agnostic approach, as it only considers the GHG emissions associated with hydrogen production based on a common and appropriately inclusive methodology. As a result, it opens a pathway for competition to flourish if the hydrogen can meet the desired life cycle emissions threshold, regardless of production technology.

Utilizing Point of Production to Evaluate Hydrogen's Carbon Intensity Will Have Unintended Consequences and Impede DOE's Goal of Technology Neutrality and Fighting Climate Change.

To illustrate our point, the following two examples would achieve a less than 2kgCO2e/kgH2 threshold under the point of production methodology, yet still produce significant GHGs upstream from the production.

- An SMR plant that captures as much as 90% of carbon dioxide produced onsite but sources gas with an upstream methane leakage rate of 2.3% would record a life cycle carbon intensity on the order of 4 kgCO2e/kgH2.[2] However, if upstream methane leakage is excluded from the carbon intensity calculation, the same hydrogen resource would record an onsite carbon intensity of less than 1kgCO2e/kgH2 – It would presently qualify as "clean" hydrogen under the IIJA-proposed 2kgCO2e/kgH2 point of production emissions limit.

- Similarly, hydrogen produced from electrolysis of water using U.S. electricity grid mix (which includes coal and natural gas) would have a very low carbon intensity score if it was evaluated under the IIJA-proposed 2kgCO2e/kgH2 point of production emissions limit. However, if the upstream emissions were considered, an electrolyzer powered by the average U.S. electricity grid mix would have a carbon intensity as high as 20kgCO2e/kgH2. This carbon intensity score is nearly double the carbon intensity of today's incumbent and unmitigated gas-based hydrogen production pathways.[3]

Just as importantly, focusing only on emissions at the point of hydrogen production could exclude hydrogen derived from organic waste that is carbon negative on a life cycle basis. Excluding organic waste-based hydrogen will slow the United States' efforts to reduce methane and other Short-Lived Climate Pollutants and achieve carbon neutrality, both high priorities of President Biden. 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.[4] This is true even if the conversion from biomass or biogas to hydrogen produces more than 2kgCO2e/kgH2 at the point of hydrogen production. 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 hydrogen that can be carbon negative – significantly carbon negative in some cases – even though it may emit more than 2kgCO2e/kgH2 at the point of conversion to hydrogen.

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[2] Alvarez, Ramón A., Daniel Zavala-Araiza, David R. Lyon, David T. Allen, Zachary R. Barkley, Adam R. Brandt, Kenneth J. Davis, et al. 2018. "Assessment of Methane Emissions from the U.S. Oil and Gas Supply Chain." Science 361 (6398): 186–88. https://doi.org/10.1126/science.aar7204.

[3] Decarbonized Hydrogen in the US Power and Industrial Sectors: Identifying and Incentivizing Opportunities to Lower Emissions, December 2020, https://www.rff.org/publications/reports/decarbonizing-hydrogen-us-power-and-industrial-sectors/

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

Including hydrogen from organic waste will also further the Biden Administration's goal of reducing wildfire and restoring healthy forests on federal lands. The U.S. Forest Service has entered into an agreement with California to conduct forest fuel removal on one million acres per year.[5] The most beneficial use of that forest biomass would be to convert it to carbon-negative hydrogen. California approved $50 million in the current budget year to incentivize pilot projects that do just that. U.S. DOE will seriously undermine this effort if its definition of clean hydrogen excludes the hydrogen generated from forest waste that is removed to mitigate wildfire hazards and restore healthy forests.

For The Reasons Above, We Urge DOE To Assess Hydrogen Emissions On A Well-To-Gate Life Cycle Basis.

This will ensure a technology-neutral, performance-based approach to hydrogen development that will help to reduce methane and other Short-Lived Climate Pollutants and generate carbon negative emissions needed to achieve carbon neutrality.

We look forward to working with the DOE on additional parameters around this life cycle accounting.

Please reach out with any questions.

Sincerely,

Green Hydrogen Coalition
Advanced Power and Energy Program at the University of California, Irvine
Bioenergy Association of California
California Association of Sanitation Agencies
California Hydrogen Business Council
Colorado Hydrogen Network
Microgrid Resource Coalition
Stationary Fuel Cell Collaborative

cc: David Turk
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[5] 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.