Submitted Electronically to Cleanh2standard@ee.doe.gov

November 8, 2022

RE: Clean Energy Group Response to U.S. Department of Energy, Energy Efficiency and Renewable Energy, Hydrogen and Fuel Cell Technologies Office Request for Stakeholder Feedback on Draft Guidance on a Clean Hydrogen Production Standard

Clean Energy Group (CEG), a national nonprofit organization working to advance an equitable and inclusive transition to clean energy, appreciates the opportunity to provide this response to the U.S. Department of Energy, Energy Efficiency and Renewable Energy, Hydrogen and Fuel Cell Technologies Office request for stakeholder feedback on draft guidance on a Clean Hydrogen Production Standard (CHPS). These comments reflect the position of CEG, and do not necessarily reflect the positions of CEG's partner organizations or funders.

For the past two years, CEG has worked extensively with environmental justice and community-based partners on topics intersecting with hydrogen production, demonstration, and storage. Through its national Hydrogen Information and Public Education initiative, CEG is working to counter hydrogen misinformation by developing a repository of research and information on the viability of and issues related to the production and use of hydrogen, in addition to supporting the efforts of frontline organizations challenging hydrogen development that may negatively impact their communities.

These comments are focused on Stakeholder Feedback Section 3 – Implementation, subsection c in the draft CHPS guidance document:

> 3) Implementation
>
> > c) Should renewable energy credits, power purchase agreements, or other market structures be allowable in characterizing the intensity of electricity emissions for hydrogen production? Should any requirements be placed on these instruments if they are allowed to be accounted for as a source of clean electricity (e.g. restrictions on time of generation, time of use, or regional considerations)? What are the pros and cons of allowing different schemes? How should these instruments be structured (e.g. time of generation, time of use, or regional considerations) if they are allowed for use?"

Clean Energy Group strongly recommends that 1) the CHPS fully accounts for the carbon emissions associated with powering electrolysis production of hydrogen through grid electricity and 2) the CHPS does not allow for offsetting these emissions through market-based procurement mechanisms, such as renewable energy credits (RECs) and power purchase agreements (PPAs). Allowing for the offsetting of grid-powered hydrogen production emissions through these types of market mechanisms will not result in the level of low-carbon hydrogen production required to meet the initial "clean hydrogen" target for lifecycle greenhouse gas emissions of 4.0 kgCO2e/kgH2. Only behind-the-meter clean energy resources, such as solar and wind, directly tied to a hydrogen production facility can verifiably meet the emissions definition of clean hydrogen proposed in the CHPS draft guidance.

These recommendations are primarily based on new research from Princeton University's Zero-carbon Energy systems Research and Optimization Laboratory (ZERO Lab), titled "Enabling grid-based hydrogen production with low embodied emissions in the United States."[1] The purpose of the ZERO Lab study is to inform and support the effective implementation of the 45V Clean Hydrogen Production Tax Credit.

The ZERO Lab researchers found that electrolysis production of hydrogen powered by electricity from California's grid in 2030, likely to be one of the cleanest grids in the country, would have a carbon emissions intensity of roughly double that of hydrogen produced through steam methane reforming (SMR), known as grey hydrogen – meaning that grid-powered electrolysis in California would result in approximately 20 kgCO2e/kgH2 versus 10 kgCO2e/kgH2 for grey hydrogen, or five times higher than the draft guidance clean hydrogen threshold of 4 kgCO2e/kgH2. The study went on to find that allowing for an annual matching of energy use for electrolysis (contracting with clean resources to match total annual electricity consumption) would do little to improve, and in some cases worsen, the emissions intensity of a hydrogen production facility.

In fact, the researchers determined that non-behind-the-meter clean energy resources could only result in verifiable emissions benefits under a set of extremely narrow and difficult to enforce conditions. The conditions include:

- *Hourly matching*: Market-based procurements were only found to be substantively beneficial in reducing hydrogen production emissions when they are required to produce electricity at the same time and magnitude as the facility is consuming electricity. To be effective, production and consumption must be matched on at least an hourly basis. While some energy procurements have begun to emerge that can track and measure hourly production-consumption matching, the process for reliably doing so is still in the early stages of development and verification.

[1] Ricks, Wilson, Xu, Qingyu, & Jenkins, Jesse D. (2022). Enabling grid-based hydrogen production with low embodied emissions in the United States. Zenodo. https://doi.org/10.5281/zenodo.7183516

- *Local and unconstrained*: To be effective in limiting emissions impacts, the region over which clean resources can be procured must be free of transmission congestion constraints. Grid congestion can result in a misalignment of production and consumption, leading to an overall increase in carbon emissions. The ZERO Lab study found that the presence of transmission constraints would result in significant emissions increases even when hourly matching conditions were enforced. It may be possible to define appropriate procurement areas in regions of the grid where locational marginal electricity pricing can indicate congestion points, such as areas overseen by regional transmission organizations. However, much of the power grid lacks this level of granular insight into where there are constraints on the flow of electricity. As noted in the ZERO Lab paper, "it is physically impossible to reliably track flows of power between individual producers and consumers."

- *New, additional resources*: The concept of additionality requires that procured clean energy resources would not have been developed if not for a contractual agreement with a hydrogen production facility. Unlike behind-the-meter resources that are specifically developed for and physically interconnected to a facility, additionally can be extremely challenging to verify for resources located somewhere else on the grid. The ZERO Lab study found that procurement of existing resources, and even new resources that would be required to be developed to meet state procurement mandates, "completely eliminates the emissions benefits of an hourly matching policy." In order for procured resources to reduce emissions, there would need to be a verifiable way to validate that they would not have been built if it were not for a contractual agreement with a hydrogen electrolysis production facility.

Clean Energy Group agrees with the conclusion of ZERO Lab researchers that "If the use of clean electricity cannot be reliably established, it may be impossible for grid-connected electrolysis to meet the statutory requirements for the 45V clean hydrogen PTC." Based on the many challenges that would need to be overcome to verifiably enforce the hourly matching, unconstrained production-consumption, and additionality requirements necessary to ensure low-emissions hydrogen production, CEG recommends that RECs, PPAs, and other market-based procurement structures <u>not be allowed</u> in the determination of carbon intensity for grid-connected hydrogen production.

In addition to increasing greenhouse gas emissions, the inclusion of market-based mechanisms in qualifying hydrogen as "clean" under the CHPS would run counter to the Biden-Harris Administration's Justice40 Initiative. Misalignments between the emissions impacts of electricity production and consumption powering hydrogen electrolysis will likely fall hardest on environmental justice communities already overburdened by fossil fuel emissions, exacerbating existing inequities and further deepening health and environmental injustices.

In conclusion, CEG strongly encourages the Hydrogen and Fuel Cell Technologies Office to consider the implications of ZERO Lab's paper, "Enabling grid-based hydrogen production with low embodied emissions in the United States," in considering the role of market-based clean energy procurement in characterizing whether electrolysis hydrogen production should be considered a clean process. The research makes it abundantly clear that market-based procurement of clean resources does not present a viable path forward to produce low-emission hydrogen at this time. Therefore, RECs, PPAs, and other market-based structures should have no place in reducing emissions intensity of hydrogen electrolysis within the CHPS guidance framework.

We would welcome a conversation to discuss these issues further if that would be of interest.

Respectfully submitted,

Seth Mullendore
President and Executive Director
Clean Energy Group
50 State Street, Montpelier, VT 05602
Email: seth@cleanegroup.org
www.cleanegroup.org