SUBMITTED ELECTRONICALLY

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U.S. Department of Energy
James V. Forrestal Building
1000 Independence Avenue Southwest
Washington, D.C. 20585

Re: Comments on DOE's Proposed Clean Hydrogen Production Standard (CHPS)

Thank you for the opportunity to provide comments to the U.S. Department of Energy (DOE) regarding the draft guidance promulgated for a Clean Hydrogen Production Standard (CHPS) under the Infrastructure Investment and Jobs Act of 2021 (IIJA).

Electric Hydrogen Co. (EH2) is a manufacturer of low-cost electrolyzer systems that produce fossil-free hydrogen at industrial scale. Our technology is designed to enable users to efficiently and cost-effectively take advantage of variable renewable energy resources to generate clean power and clean feedstock for multiple industries, including steel manufacturing, fertilizer production, chemical processing, refining, and long-distance heavy transportation. Passage of the IIJA and the Inflation Reduction Act of 2022 (IRA) has created new opportunities for hydrogen to become a significant tool in transitioning the United States to a net zero carbon economy that enjoys enhanced energy security and resilience. To ensure that clean hydrogen realizes its full potential in this transition, EH2 believes that DOE's leadership will be vital. With respect to greenhouse gas emissions, DOE is uniquely situated to guide the establishment of clear criteria that will ensure emission reduction assumptions underlying both IIJA and IRA are truly realized.

DOE is currently seeking comments on its proposed CHPS, which was prepared to meet the requirements of Section 40315 of the IIJA. More specifically, DOE has explained that CHPS is intended to account for Congress' definition of "clean hydrogen" under the statute and to establish "a lifecycle greenhouse gas emissions target for clean hydrogen production." In addition, DOE has noted that the lifecycle target proposed under CHPS "also aligns with Section 13204 of the 2022 Inflation Reduction Act (IRA), which creates a new 10-year production tax credit (the 45V Credit) for 'qualified clean hydrogen' defined with reference to the lifecycle greenhouse gas emissions rate of hydrogen production." In other words, DOE is promulgating a standard for lifecycle greenhouse gas emissions accounting that will be used to determine hydrogen production eligibility under IIJA and hydrogen tax credit eligibility under IRA.

Attached please find EH2's narrative comments on DOE's CHPS proposal, focused particularly on emission-related questions that DOE has posed regarding market-based mechanisms, together with a summary of emissions-related data related to grid electricity feedstock.

Electric Hydrogen CHPS Comments

Achievement of emission reduction targets is a central tenet of both the IIJA and IRA. To carry out that tenet effectively, the integrity of lifecycle greenhouse gas emissions accounting must be maintained. In other words, CHPS must be promulgated in a manner that directly supports one of the more time-critical goals of IIJA and IRA – **reduction of greenhouse gas emissions.**

To that end, EH2 comments focus on the use of renewable energy credits, power purchase agreements, and other market structures ("Market Mechanisms") to demonstrate that a hydrogen production plant is "using" a source of clean energy.[1] Under this approach, rather than receiving clean electricity directly from a renewable energy asset, the hydrogen production plant would be physically powered by grid electricity. To offset the high-carbon content of grid electricity, the plant would secure renewable energy offset credits through one of the Market Mechanisms. These types of credits, which can be unbundled from the underlying energy, would be created from renewable energy generation assets located elsewhere. Upon retirement of the credits, the claim can be made that the electricity feedstock for the plant is carbon-free, even though the hydrogen is generated at a physical level using high-carbon grid electricity.

DOE has asked whether use of such Market Mechanisms should be allowed, and if so whether any requirements should be placed on these instruments. Allowing the use of Market Mechanisms is expected to increase development flexibility and therefore speed up the deployment of clean hydrogen technology, production, and use. Certainty around the use of Market Mechanisms will also help establish a financing market for clean hydrogen projects. For these reasons, EH2 generally supports the use of Market Mechanisms, provided that appropriate emission accounting measures are established. **Such measures are critical because unfettered use of Market Mechanisms, without any effort to virtually match the renewable energy generation and hydrogen production, could have the perverse result of increasing, rather than decreasing, greenhouse gas emissions.** Moreover, laying out a path for the adoption of such measures will go a long way towards protecting projects from future unwanted emissions claim challenges.

I. Time-Matching to Support Emission Accounting Integrity

The unfortunate reality is that using grid electricity to produce 24/7 hydrogen in the United States today results in greenhouse gas emissions that are higher than emissions generated from using natural gas to produce 24/7 hydrogen. This is because the electricity on the typical grid in the United States comes

[1] DOE has asked the following questions about Market Mechanisms:

1. Should renewable energy credits, power purchase agreements, or other market structures be allowable in characterizing the intensity of electricity emissions for hydrogen production?
2. 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)?
3. What are the pros and cons of allowing different schemes?
4. How should these instruments be structured (e.g., time of generation, time of use, or regional considerations) if they are allowed for use?

from different generation sources throughout the day. To the extent electricity on the grid is sourced to a greater extent from renewable energy assets, the greenhouse gas emissions associated with grid electricity is lower. The reverse is true when electricity on the grid is sourced to a greater extent from fossil fuel assets. In other words, the greenhouse gas emissions associated with grid electricity vary significantly throughout the day. For example, as illustrated on slides 4-6 in the attached presentation, there is a high degree of emission-related variability throughout the day and throughout the year on the CAISO grid. Only in a limited number of hours in certain seasons, would the CAISO grid have emissions low enough to result electrolyzed hydrogen production that is even marginally cleaner than SMR-produced hydrogen.

What this means is that hydrogen production can more accurately be characterized as "clean" if the production is matched to grid electricity generated during periods of high renewable energy penetration. In other words, to maintain emissions accounting integrity, the temporal variability of grid-associated emissions should be factored into the criteria for using Market Mechanisms. **Specifically, where a plant relies upon Market Mechanisms to qualify for IRA benefits, time matching would ensure that subsidized hydrogen production is linked to low emission grid electricity. EH2 encourages DOE to establish time-matching criteria within CHPS.**

We have engaged with stakeholders who oppose the use of time-matching criteria. Their primary concern is that it will be difficult to establish a liquid market for time sensitive Market Mechanisms. Without a liquid market, the argument is that time-matching criteria will impede the ability to get clean hydrogen projects financed. In our experience, the market for time sensitive Market Mechanisms is already evolving in this direction. In response to requests from companies seeking 24/7 clean energy products, aggregators are already using Market Mechanisms to shape products that account for the variability of renewable energy generation. It is possible that establishing timing-matching criteria under CHPS may serve to expedite the 24/7 clean energy product evolution that is already occurring, which could in turn expedite the reduction of greenhouse gas emissions more broadly.

II. Geographic-Matching to Support Emission Accounting Integrity

Like temporal variability, greenhouse gas emissions associated with grid electricity also vary significantly by region. Grids with higher clean energy penetration have lower associated greenhouse gas emissions than grids with less clean energy penetration. Geographic matching between hydrogen production and the renewable energy assets sourcing Market Mechanisms will improve emissions accounting integrity in the same way that temporal matching achieves that outcome. **EH2 encourages DOE to establish appropriate geographic matching criteria within CHPS, whether that is based on emissions-related data or grid operation parameters.**

III. Additionality to Support Emission Reduction Claims

Beyond temporal and geographic matching, EH2 also encourages DOE to consider the concept of additionality as yet another tool that can be used to validate emission reductions claims. Additionality requires that certificates underlying Market Mechanisms be sourced from newly built generation assets. Without additionality, the concern is that Market Mechanisms may move emission reductions from existing renewable energy assets over to the hydrogen side of the ledger, but with no incremental reduction in overall greenhouse gas emissions. **Additionality is already widely used by companies making greenhouse gas reduction claims.** It is seen as a useful mechanism to address greenwashing concerns from environmental stakeholders. For example, in the United States, it has become routine to use green energy certificates sourced from newly added projects to support corporate claims regarding the attainment of clean energy goals. This approach allows companies using Market Mechanisms, like virtual power purchase agreements, to claim that their investment is causing incremental clean energy generation. Additionality is an easy-to-validate measure that has become widely accepted by a broad range of stakeholders, including developers, eNGOs, and financing parties. We recommend that DOE consider application of the additionality standard to validate the use of Market Mechanisms under IIJA and IRA. Such a step will strengthen the overall credibility of these programs and reduce potential challenges to the legitimacy of carbon displacement claims.

Imposition of criteria under CHPS related to temporal and geographical matching, along with additionality, will improve the long-term integrity of emission reduction accounting and protect projects against negative press that could arise if grid-related emission accounting is not proactively addressed. In a perfect world, these criteria would be implemented at the onset of reliance on Market Mechanisms. That said, EH2 recognizes that DOE is subject to multiple directives and emission accounting integrity is not DOE's only mandate. DOE is also charged with supporting diverse feedstocks that can facilitate widespread use of hydrogen technologies and with considering the technological and economic feasibility of the standards it promulgates. Certainly, EH2 is supportive of the fast deployment of green hydrogen technology. We also see the importance of DOE balancing long-term accounting integrity with short-term feasibility assessments.

IV. Phased Approach

To strike an appropriate balance, EH2 recommends a phased approach for the implementation of standards applicable to the use of Market Mechanisms to validate electrical feedstock claims. Additionality is an existing and widely used mechanism that is easy for financing parties to validate. To grab the "low hanging fruit" on emissions accountability, we encourage DOE to consider integrating additionality into Market Mechanism standards from the onset. For the reasons outlined above, however, additionality alone will not ensure accurate long-term emission reduction accounting.

Over time, temporal and geographical matching requirements should be integrated into Market Mechanism standards. It is always difficult to predict how long it will take to deploy a new technology at scale. If past experience scaling wind and solar technologies is any indicator, scaling clean hydrogen technologies may occur faster than anticipated. Once the deployment of clean hydrogen at scale is proven up and a financing market for such projects is confirmed, temporal and geographic matching

requirements should be applied to the use of Market Mechanisms. At that point, technological and economic feasibility will be established, and it will be easier to completely shore up the integrity of emission accounting. EH2 encourages DOE to set a phasing schedule for implementation of temporal and geographic matching requirements. The schedule could be based on achievement of critical feasibility criteria (e.g., technology availability at scale, number of projects financed, etc.), or the schedule could rely on firm dates for the application of temporal and geographic matching requirements. If firm dates are established, DOE could reserve flexibility to make adjustments in the event feasibility criteria are met sooner or later than the pre-established date.

By establishing a clear path upfront for phasing in the application of temporal and geographic requirements, developers and financing parties will be able to plan accordingly with respect to using Market Mechanisms. In general, markets adjust most efficiently when clear regulatory parameters are established in advance. **By applying additionality now and promulgating a set schedule for phasing in temporal and geographic requirements over time, DOE will establish a well understood trajectory for increasing emission accounting credibility. Such credibility will bolster long-term integrity of the overall program and ensure its ultimate success in reducing greenhouse gas emissions.**