November 14, 2022

VIA E-mail: cleanh2standard@ee.doe.gov

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

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

The Fuel Cell and Hydrogen Energy Association (FCHEA) appreciates the opportunity to provide these comments to the U.S. Department of Energy (DOE) in support of the Clean Hydrogen Production Standard (CHPS).[1]

FCHEA is the leading hydrogen energy association in the United States representing over eighty-five companies and organizations advancing innovative, clean, safe, and reliable hydrogen energy technologies and solutions for over thirty years. FCHEA's members represent the entire global supply chain of the hydrogen and fuel cell industry, including hydrogen producers, fuel cell and electrolyzer stack and system manufacturers, equipment and service suppliers, vehicle manufacturers, aviation companies, fuel distributors, utilities, transporters, end-users, and more.

FCHEA is a longtime advocate of hydrogen, its potential uses, and its contribution to a clean energy future. For years, FCHEA has provided advice, guidance, and served as a resource for the DOE, Department of Transportation (DOT), Department of the Treasury (Treasury), federal policymakers, and other industry leaders. FCHEA appreciates DOE's commitment to developing a Clean Hydrogen Production Standard and looks forward to being a resource to DOE throughout the development process. FCHEA offers these comments leveraging its leadership, mentorship, and expertise within the hydrogen industry.

[1] 87 Fed. Reg. 58,776 (Sep. 28, 2022).

I. FCHEA supports DOE's proposal that the Clean Hydrogen Production Standard establish an initial target for lifecycle greenhouse gas emissions of 4.0 $kgCO_2e/kgH_2$.

DOE's CHPS proposal to establish an initial target for lifecycle greenhouse gas emissions of 4.0 $kgCO_2e/kgH_2$ is both an appropriate target (4.0 $kgCO_2e/kgH_2$) and approach (lifecycle analysis) to mitigate emissions across the hydrogen production value chain.

The target and the approach combined create a standard that can accommodate a variety of hydrogen production processes and energy sources— renewables, biomass, nuclear, and traditional fossil fuels —while still encouraging emission reductions and investment. Striking this balance is critical for the growth and evolution of hydrogen technology and industry as a whole. A standard that is perceived as too aggressive could foreclose investment and slow the advancement of technology, whereas a standard that is perceived as business-as-usual will not provide the appropriate distinction for processes that achieve greater emissions reductions to warrant increased investment. By providing a lifecycle approach from which to meet the standard, DOE will allow a variety of production pathways the flexibility to meet the standard and will open the door to innovation and investment in clean energy technologies such as advanced electrolyzer systems and carbon capture technologies. This flexibility is particularly important as new production pathways are being established and existing production pathways are evolving.

DOE's proposed initial standard is consistent with the Bipartisan Infrastructure Law's (BIL) statutory obligation to develop a clean hydrogen production standard.[2] The BIL sets a series of requirements that a clean hydrogen standard (1) support clean hydrogen production from a variety of diverse pathways; (2) target 2.0 $kgCO_2e/kgH_2$ at the point of hydrogen production, and (3) take into account technological and economic feasibility. Within the BIL, each of these requirements is equally important; one cannot be prioritized at the expense of another. With the initial CHPS, DOE has created a standard that appropriately balances and aligns these requirements.

II. FCHEA supports DOE aligning CHPS with Section 13204 of the Inflation Reduction Act (IRA), IRC sec. 45V production tax credit for "qualified clean hydrogen."

Within the last year, the U.S. Congress has taken two significant actions to accelerate development of clean hydrogen to support the clean energy transition. First, in November 2021, the

[2] Infrastructure Investment and Jobs Act of 2021, also known as the Bipartisan Infrastructure Law (BIL), Section 40315.

Bipartisan Infrastructure Law was signed into law, directing $9.5 billion dollars to DOE to support clean hydrogen development. Included in the BIL is the requirement that DOE develop a clean hydrogen standard, which DOE published a proposal for on September 22, 2022, and which is the subject of these comments. The second significant action was the enactment of the Inflation Reduction Act, which among other things, created a Clean Hydrogen Production Credit.

Together, these actions have the potential to accelerate the deployment of clean hydrogen to support the clean energy transition. To fully realize the potential of these programs, it is critical that synergies exist across the programs that create alignment and harmonization. The calculation of the lifecycle greenhouse gas emission rate is key to this synergy. Otherwise, the same hydrogen may have different life cycle emissions under each program and may be considered "clean" under one program but not the other. This type of disparate treatment and uncertainty would have a significant chilling effect on investment, financing, and development of clean hydrogen production and the entire hydrogen value chain.

DOE recognizes the importance of this synergy and has proposed an initial standard under the BIL that "aligns with Section 13204 of the Inflation Reduction Act."[3] FCHEA appreciates and supports DOE creating a standard that aligns with both programs and encourages DOE to ensure that this alignment is maintained in subsequent versions of a standard.

III. The lifecycle boundary of CHPS is appropriately limited to "well-to-gate," *i.e.*, to include upstream emissions associated with hydrogen production through the point of hydrogen production, as well as downstream emissions associated with the transport and sequestration of CO_2.

The Draft Guidance suggests a proposal to implement the provisions of Section 43015 of the BIL by adopting a CHPS that "supports diverse feedstocks and allows for consideration of technological and economic feasibility of achieving overall emissions reductions by establishing a lifecycle greenhouse gas emissions target for clean hydrogen production."[4] FCHEA supports DOE's proposal to limit the lifecycle boundary as a "well-to-gate" emissions analysis. As DOE has proposed, a "well-to-gate" emissions boundary analysis should include upstream emissions associated with hydrogen production through the

[3] 87 Fed. Reg. 58,776 (Sep. 28, 2022), pp. 2.
[4] 87 Fed. Reg. 58,776 (Sep. 28, 2022), pp. 2.

point of hydrogen production, as well as downstream emissions associated with the transport and sequestration of CO_2. In order to provide certainty to stakeholders as they consider the requirements of the Infrastructure Investment and Jobs Act of 2021, in any final standard DOE should maintain a "well-to-gate" emissions analysis that provides appropriate flexibility to this diverse group in order to achieve the lifecycle targets within this boundary.

Establishing a "well-to-gate" emissions boundary analysis conforms with existing DOE work performed at the National Laboratories, the definition of "lifecycle greenhouse gas emissions" in Section 13204 of the Inflation Reduction Act, and international best practices. While flexibility within this framework is critical, DOE should provide further clarity that any frameworks or protocols used to inform the lifecycle boundary would be limited to the boundary described above and would not include downstream emissions associated with the distribution, storage, or consumption of hydrogen. FCHEA agrees with DOE's description of the system boundary described in footnote 11.[5] FCHEA believes that rather than providing this critical guidance in a footnote, DOE should clearly assert its position as part of the main text of the guidance itself. Furthermore, DOE should provide stakeholders with a clear list of hydrogen value chain elements hydrogen value chain elements not included within the well-to-gate boundary for the sake of transparency and clarity. DOE should also be clear that the lifecycle target excludes purity hydrogen pipelines, storage, and distribution methods downstream of the point of hydrogen production.

And finally with respect to footnote 11, FCHEA notes that the first sentence could be misinterpreted to suggest that any hydrogen transportation, storage and/or distribution occurring downstream of the hydrogen point of production but upstream of the hydrogen's end-use point should be included in the lifecycle analysis; FCHEA therefore suggests revising the first sentence of footnote 11 as follows:

In the CHPS, the lifecycle target corresponds to a system boundary that terminates (a) with respect to hydrogen, at the point of hydrogen production and does not include other post-hydrogen production, and (b) with respect to any CO_2 emissions captured at the point of production or upstream, at the point at which the CO2 is sequestered.

[5] 87 Fed. Reg. 58,776 (Sep. 28, 2022), pp. 5.

In Figure 1 of the draft guidance document, DOE depicts the proposed emissions sources for the lifecycle target. To complement the revision to footnote 11, FCHEA supports augmenting Figure 1 of the draft guidance document by including a clear list hydrogen value chain elements and related emission sources of emissions sources within the boundary depicted that would provide stakeholders with maximum flexibility with regard to diverse emission sources and production processes. Moreover, given the diverse methods of hydrogen production, DOE should provide additional examples of lifecycle system boundaries to better represent the current state of the industry. For example, for production facilities that use produced feedstocks, such as bio-propane, DOE should be explicit in its guidance that for the purpose of a lifecycle emissions assessment these feedstocks will be treated similarly to extracted feedstocks (such as fossil natural gas).

In establishing the upstream boundary, FCHEA notes that there are a variety of existing pathways and feedstocks for producing hydrogen production and new pathways and feedstocks are continuously being explored. FCHEA believes that the CHPS should allow hydrogen producers to demonstrate the upstream lifecycle boundary appropriate for their pathway or feedstock. Doing so will sustain technological neutrality with regard to production pathways and feedstocks. For example, where hydrogen is produced from a waste gas, the CHPS should recognize that the collection of the waste gas represents the extraction of the feedstock. The upstream boundary should not extend beyond the collection of waste gas to include the extraction and delivery of the original feedstock. These activities occur irrespective of hydrogen production. Adopting this approach in the CHPS will encourage investment, grow the hydrogen market, and reduce greenhouse gas emissions – fulfilling DOE's mission of establishing a robust clean hydrogen production standard.

Congress agrees that the lifecycle analysis of hydrogen production should include upstream emissions through the point of production. Limiting factors in section 13204 of the Inflation Reduction Act make it clear that "lifecycle greenhouse gas emissions shall only include emissions through the point of production (well-to-gate), as determined under the most recent Greenhouse gases, Regulated Emissions, and Energy use in Transportation model (commonly referred to as the 'GREET model')."[6] As noted above, aligning DOE's CHPS with the lifecycle greenhouse gas emissions definition in the Inflation Reduction Act will provide greater clarity and certainty to stakeholders as they navigate the parallel processes and allow for these programs to encourage the greatest amount of investment.

[6] Inflation Reduction Act Section 45(V)(1)(B).

The GREET "fuel-cycle" model is the best representation of "well-to-gate" emissions analysis for hydrogen that is familiar and trusted by stakeholders. In setting the lifecycle emissions boundary for CHPS, it would not be appropriate for DOE to utilize the "vehicle cycle" model, which incorporates the lifecycle emissions of automobiles, from raw materials mining to vehicle disposal. (Given the manner that hydrogen is produced, the "vehicle cycle" model would not provide the most accurate understanding of the lifecycle emissions for hydrogen.) For the purposes of establishing the CHPS, DOE should provide further clarity to stakeholders on the definition of "well-to-gate" system boundary and that use of the GREET "fuel cycle" model is the most appropriate for analyzing lifecycle emissions.

As DOE asserts in the draft guidance, various international best practices have adopted a "well-to-gate" lifecycle emissions boundary. According to the International Partnership for Hydrogen in the Economy's (IPHE) Hydrogen Production Analysis Task Force (H_2PA TF), current guidance covers a "well-to-gate" boundary.[7] Within this analysis, IPHE refers to emissions within this boundary as scope 1, scope 2, and partial scope 3 emissions.[8] DOE also asserts that a European entity known as CertifHy follows similar "well-to-gate" and "well-to-wheel" boundary analyses.[9] Further information regarding the methodologies for lifecycle emissions with regard to CertifHy should be provided to stakeholders in order to better understand key information such as the scope of boundary analysis, emissions sources, etc.

While on their face these international best practices appear to align with the DOE suggested "well-to-gate" boundary put forward in the draft guidance, further clarity should be provided with regard to what extent partial scope 3 emissions and "well-to-wheel" boundary methodologies factor into the boundaries established in the CHPS. For example, the IPHE working paper defines "Partial Scope 3 emissions" considered to include "associated impacts from the raw material acquisition phase, raw material transportation phase, hydrogen production and manufacture." As stated, such a definition could include emissions associated with production and manufacture of solar panels, wind turbines and natural gas compressors, i.e., emissions outside the scope of Figure 1. Whereas it may be appropriate to consider downstream scope 3 emissions only with regard to instances of transport and sequestration of CO_2, the inclusion of the international best practices in the draft guidance creates confusion over the extent that downstream emissions are included in the proposed CHPS. FCHEA believes that DOE should speak

[7] International Partnership for Hydrogen in the Economy's Hydrogen Production Analysis Task Force, "Methodology for Determining the Greenhouse Gas Emissions Associated with the Production of Hydrogen," Version 1 (October 2021).
[8] *Id*.
[9] https://www.certifhy.eu/

definitively in the CHPS guidance document with regard to the extent of downstream scope 3 emissions and affirm that the downstream lifecycle emissions boundary extends only to this extent in the above referenced scenario. FCHEA's members are increasingly spending significant development capital in pursuit of projects that would seek to export clean hydrogen produced in the USA to European and East Asian nations in the form of methanol or ammonia. FCHEA applauds DOE's efforts to integrate with global hydrogen markets to ultimately enable a cross-border standardized, recognized and easily-administered certification process, and believes the best way to enable such an international certification process to flourish is by providing exceptionally clear guidance complete with a multitude of examples based on actual project designs rather than by referencing "well-to-gate" or "well-to-wheel" and hoping that nothing gets lost in the shorthand or in translation.

To the extent that DOE is considering including Scope 3 emissions, DOE should appropriately limit the inclusion of scope 3 emissions associated to upstream activities of hydrogen production and clearly delineate that the Scope 3 emissions boundary is limited to what is calculated in the GREET model.

IV. The CHPS Should Allow the Use of Market-Based Mechanisms in Determining Lifecycle Emissions

DOE is seeking feedback on whether "renewable energy credits, power purchase agreements, or other market structures be allowable in characterizing the intensity of electricity emissions for hydrogen production."[10] As explained below, allowing these market-based mechanisms to align low- or zero-carbon energy sources with hydrogen production infrastructure is critical to the efficient and accelerated development of hydrogen production infrastructure—goals of both the Biden Administration and Congress. Moreover, it is Congress' intent that DOE allow for such market-based mechanisms.

FCHEA encourages DOE to allow for the use of a wide variety of these market-based mechanisms, including, but not limited to, renewable energy credits (RECs), power purchase agreements (PPAs), book-and-claim, the ability to treat energy commodities on an accounting basis, renewable thermal credits, renewable identification numbers, certified natural gas certificates, and biogas credits. RECs and similar certificates (Zero Emission Credits for nuclear and hydrogen etc.) enable tracking of zero-carbon power

[10] 87 Fed. Reg. 58,776 (Sep. 28, 2022), pp. 8.

generation and prevents double counting of carbon reduction. For the purposes of these comments, FCHEA generally uses the term market-based mechanisms to refer to these approaches.

As a threshold matter, FCHEA supports the applicability of these market-based mechanisms to demonstrate the emissions for all types of feedstocks and energy supplies that may be used for hydrogen production—electricity, natural gas, biogas, renewable natural gas, certified low-methane intensity natural gas, etc. In its request for comment, DOE describes these market-based mechanisms as being used to characterize the intensity of "electricity emissions." However, these market-based mechanisms can be used for all types of energy supplies, not just electricity. For instance, in the GREET 2022 technical report on Hydrogen Life Cycle Analysis, Argonne National Laboratories "[n]ote[s] that, in the US, upgraded LFG [landfill gas] is often virtually traded in lieu of NG [natural gas] use."[11] Limiting the use of these market-based mechanisms to electricity would inappropriately favor one production pathway over another and would stifle investment in a broad range of production pathways. It would be inconsistent with the BIL, which requires DOE to develop a CHPS that supports clean hydrogen production from a variety of sources. There is no justification for DOE to limit the use of the market-based mechanisms to hydrogen production pathways that use electricity.

If DOE were not to enable these mechanisms, the potential for negative consequences may arise. In particular, hydrogen production would either need to be collocated, perhaps even "behind the meter" of feedstock producers. Alternatively, an entirely independent supply of low-cost feedstocks would be needed, precluding any shared common carriers (natural gas pipelines, electricity grids, etc). In either case, this is extremely costly, requires non-deal operation (due to limited availability of feedstocks at any given moment) and will significantly and unnecessarily add to the cost and GHG footprint of these systems due to redundant investments and collection costs. This would severely limit the effectiveness of the program, reducing potential investments by orders of magnitude. Further, it is important to ensure that all types of hydrogen production have the ability to use market-based instruments to meet the CHPS. This includes the use of high quality certified low-carbon natural gas certificates for hydrogen producers that use natural gas as a feedstock.

Although DOE is developing the CHPS as directed by the BIL, as DOE notes, its proposed CHPS "uses the same lifecycle analysis system boundary as the IRA" and "create[es] alignment between the two

[11] Amgad Elogwainy et al., "Hydrogen Life-Cycle Analysis in Support of Clean Hydrogen Production" October 2022. https://greet.es.anl.gov/files/hydrogenreport2022

statutory provisions." The only way for there to be alignment between the two statutory provisions is if the inputs to the lifecycle analysis also are the same. And for the Clean Hydrogen Tax Credit, Congress has spoken directly on this matter.

During the Senate floor debate on the Inflation Reduction Act, Senator Ron Wyden, Chairman of the Senate Finance Committee, and Senator Tom Carper, Chairman of the Senate Environment and Public Works Committee, conducted a colloquy on this exact point. The relevant exchange is as follows:

> Mr. Carper: Section 13204 of title I of the Inflation Reduction Act of 2022 provides a production and investment tax credit for the production of clean hydrogen. In Section 13204, the term "lifecycle greenhouse gas emissions" for a qualified hydrogen facility is determined by the aggregate quantity of greenhouse gas emissions through the point of production, as determined under the most recent Greenhouse gases, Regulated Emissions, and Energy use in Technologies—GREET—model. It is also my understanding of the intent of section 13204, is that in determining "lifecycle greenhouse gas emissions" for this section, Inflation Reduction Act of 2022, renewable thermal credits, renewable identification numbers, or biogas credits. Is that the chairman's understanding as well?
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> Mr. Wyden: Yes[12]

From this exchange it is clear that it is Congress' intention that DOE ensure that these types of market-based mechanisms be allowed to support implementation of the Clean Hydrogen Tax Credit. The only way for there to be alignment between the two statutory programs is for DOE to allow for these market-based mechanisms to be used in the lifecycle analysis for both programs.

Allowing for market-based mechanisms is aligned with the Biden Administration's clean energy goals and the goals of both the IRA and the BIL—the largest ever federal investments in clean energy. IRA provides tax credits for clean energy technologies based on their emissions reductions through a "tech neutral" framework.[13] A requirement for co-location of renewables next to hydrogen production facilities

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[12] Congress.gov. "H.R. 5376 – 117th Congress (2021-2022): Inflation Reduction Act of 2022" August 6, 2022. https://www.congress.gov/congressional-record/volume-168/issue-133/senate-section/article/S4165-3?q=%7B%22search%22%3A%5B%22%5C%22HONORING+THE+DEDICATION+OF+THE+BALL+FAMILY%5C%22%22%2C%22%5C%22HONORING%22%2C%22THE%22%2C%22DEDICATION%22%2C%22OF%22%2C%22THE%22%2C%22BALL%22%2C%22FAMILY%5C%22%22%5D%7D&s=3&r=2

[13] Inflation Reduction Act Section 13204.

would contradict this framework, as it would provide a comparative advantage in qualifying for credits to facilities sited near wind, solar, or hydropower, instead of rewarding facilities for emissions reductions.

In June 2021, DOE launched its first Energy Earthshot—the Hydrogen Shot—which seeks to reduce the cost of clean hydrogen by 80% to $1 per 1 kilogram in 1 decade ("1 1 1").[14] Accelerating the clean hydrogen economy is driven by a multitude of factors working in tandem, including, but not limited to, increased investment and build out of hydrogen production, increased demand by end users of hydrogen, and a declining trend in costs associated with maturing technology, scale, and other factors. To align with the DOE's Hydrogen Shot goals, DOE programs must encourage these factors across the board. Allowing for the use of market-based mechanisms to capture the reduced emissions associated with low carbon intensity or zero-emission energy sources aligns with these goals by both reducing costs and encouraging clean hydrogen production. It allows investment in hydrogen production the flexibility to contract for cost-effective lower carbon intensive or zero-emission energy sources, thereby reducing the cost of clean hydrogen and accelerating its deployment.

Allowing these market-based mechanisms also supports President Biden's broader climate goals of reducing emissions economy-wide to net-zero by 2050.[15] By allowing hydrogen production to capture the reduced emissions associated with low- or zero-emission energy sources within the hydrogen production lifecycle, DOE would further the President's goal by creating and expanding demand for low- and zero-emission energy sources and thereby accelerating the deployment of these resources in furtherance of the President's goal: "The more consumers who buy RECs, the more renewable electricity the market will create to meet that aggregate demand."[16]

In enacting the IRA, Congress allocated $270 billion of the total $369 billion investment in clean energy to be delivered through tax incentives administered by the Treasury.[17] Senator Joe Manchin (D-WV), one of the chief architects of the Inflation Reduction Act, stated when he released the bill that "This

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[14] https://www.energy.gov/eere/fuelcells/hydrogen-shot

[15] The White House, "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," April 22, 2021, 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

[16] Center for Resource Solutions, "How Renewable Energy Certificates Make a Difference," March 7, 2016, https://resource-solutions.org/wp-content/uploads/2016/03/How-RECs-Make-a-Difference.pdf.

[17] Department of the Treasury, "Briefing on Inflation Reduction Act Climate and Clean Energy Tax Incentive Implementation Process," October 6, 2022.

legislation ensures that the market will take the lead, rather than aspirational political agendas or unrealistic goals, in the energy transition that has been ongoing in our country."[18] It is clear that Congress desired to push the nation towards a clean energy economy through primarily market-oriented solutions, so it would run counter to congressional intent to prevent industries from lowering their emissions portfolio by requiring low carbon intensity or zero-emission energy sources be co-located with hydrogen production.

Preventing the use of market-based mechanisms of low carbon intensity or zero-emission energy sources would be contrary to the goals of the Administration and Congress, and slow broader progress on both job creation and decarbonization. It is inefficient and costly to require that low carbon intensity or zero-emission energy sources be co-located with hydrogen production for the reduced emissions to be considered in the lifecycle analysis. The location of hydrogen production often is driven by hydrogen demand as well as other siting, permitting, and operating considerations. An appropriate location for hydrogen production is not always aligned with the availability of low carbon intensity or zero-emission energy sources or the most cost- or resource-efficient location of such low-carbon intensity or zero-emission energy sources. Allowing the use of market-based mechanisms that allow hydrogen producers to contract for the low carbon intensity or zero-emission environmental benefits overcomes these logistical constraints and inefficiencies. Limiting the use of market-based mechanisms would stifle the growth of the nascent hydrogen economy, particularly in geographic areas that have insufficient access to clean energy sources and would limit federal incentives for hydrogen production to parts of the country with an abundance of clean energy.

The use of these market-based mechanisms is well-established. According to a 2015 report from the Center for Resource Solutions, 36 states "recognize that RECs can be used to track and transact renewable electricity on the grid" and 35 states "recognize the supremacy of RECs to demonstrate compliance of regulated entities with state laws requiring provision of renewable electricity to grid customers, such as Renewable Portfolio Standards (RPSs), or participation in voluntary state programs for provision of renewable electricity to grid customers."[19] Further, FERC "has also recognized that 'environmental attributes' can be traded separately and are not necessarily bound to or conveyed with

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[18] Office of Senator Joe Manchin, "MANCHIN SUPPORTS INFLATION REDUCTION ACT OF 2022," July 27, 2022, https://www.manchin.senate.gov/newsroom/press-releases/manchin-supports-inflation-reduction-act-of-2022.
[19] Center for Resource Solutions, "The Legal Basis for Renewable Energy Certificates," June 17, 2015, http://resource-solutions.org/wp-content/uploads/2015/07/The-Legal-Basis-for-RECs.pdf

the 'energy or capacity.'"[20] Standards for certifying low-carbon intensity natural gas continue to develop and evolve. DOE should include the use of certified lower carbon intensity natural gas certificates as a viable pathway for hydrogen producers using natural gas a feedstock to meet the carbon intensity requirements of the CHPS. Without that option, such producers will be at a competitive disadvantage compared to other hydrogen producers, clearly violating the intent of the BIF and the CHPS.

Market-based mechanisms for validating clean energy credits would be most effective if calculated on an annual basis without geographic limitations or requirements to match time of generation with time of use.[21] This streamlined system would make it easier for both industry and government to ensure compliance with the proposed standard by requiring one determination of compliance, rather than requiring near-continuous monitoring of activity across the industry. This annual true-up would also ease the administrative burden on hydrogen producers and ensure their investments are directed towards industrial operations rather than hiring staff for the sole mission of ensuring real-time compliance. Additionally, placing geographic requirements on these market-based mechanisms would impede the growth of the clean hydrogen industry in areas that do not have readily abundant clean energy supplies. If a hydrogen production facility has purchased RECs, lower carbon intensive natural gas, or participated in a power purchase agreement to facilitate the expansion of clean energy, it should be rewarded even if that clean energy development is in another part of the country, as it is still accomplishing the core mission of the legislation.

V. It would be inappropriate for DOE to consider any indirect climate warming impact in the CHPS.

DOE notes that atmospheric modeling simulations have estimated hydrogen's indirect climate warming impact.[22] To the extent that DOE is considering incorporating this impact to its initial CHPS, FCHEA suggests that it would be inappropriate to do so for several reasons.

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[20] Center for Resource Solutions, "The Legal Basis for Renewable Energy Certificates," June 17, 2015, http://resource-solutions.org/wp-content/uploads/2015/07/The-Legal-Basis-for-RECs.pdf

[21] FCHEA recognizes that as technologies and markets develop these requirements might be appropriate. However, at this time, when technologies are in their early stages of growth, flexibility is needed. FCHEA notes that taking a financial investment decision on a significant capital project requires predictable revenues over the useful life of the asset, or at least over the term of the financing. Therefore, to the extent DOE decides to impose any conditions – such as a requirement that renewable energy generation be located within the same Regional Transmission Organization, or that time of generation and time of use be matched on a narrower interval than annually – FCHEA would suggest to DOE that grandfathering should be clearly addressed. If left unaddressed, capital projects will not be built for lack of certainty regarding revenues after the future imposition of such requirements.

[22] 87 Fed. Reg. 58,776 (Sep. 28, 2022), pp. 7.

The CHPS is intended to measure, among other things, the carbon intensity of hydrogen production pathways. Notably, the release of hydrogen into the atmosphere would occur downstream from the point of hydrogen production and therefore falls outside the lifecycle boundary that DOE has proposed. Moreover, any indirect climate warming associated with released hydrogen would be the same regardless of the production pathway and the carbon intensity of the hydrogen. As such, there is no reason to include this type of calculation within the standard because it would be the same across the board.

At this point, the science relating the indirect impact hydrogen could have on climate warming is preliminary and any quantification would be accompanied with significant uncertainty. This fact is confirmed by DOE's request for comment on the topic which recognizes that estimating methods are still in development. For these reasons, as DOE continues to consider this impact, DOE should not incorporate it into the CHPS.

VI. The CHPS should account for regional differentiation in natural gas production.

DOE is seeking comment on whether to incorporate estimates of regional fugitive emission rates from natural gas recovery and delivery. FCHEA notes that there is considerable regional differentiation in the emissions profiles of natural gas production across the U.S. based on a number of factors, including different technologies in use. Wherever possible, the CHPS should account for this regional differentiation where a developer can confirm the source of its natural gas.

VII. The CHPS should allow for flexibility in greenhouse gas allocation for hydrogen and hydrogen co-products.

DOE is seeking comment on how greenhouse gas emissions should be allocated to co-products from the hydrogen production process, noting systems such as "system expansion, energy-based approach, [and] mass-based approach."[23] DOE should develop a process whereby hydrogen producers can petition the agency, describing and justifying use of an approach that supports their unique process. As an example, steam is an important co-product in many hydrogen production facilities, and the use of steam often displaces carbon dioxide emissions that would have otherwise occurred from, for example, operating a natural gas fired boiler. In this case, a displacement allocation method would be most

[23] 87 Fed. Reg. 58,776 (Sep. 28, 2022), pp. 8.

appropriate. Mass-based allocation is another common method of greenhouse gas allocation among co-products that should be included. FCHEA suggests that DOE provide additional clarity with regard to the appropriate method of allocation for both coproducts and byproducts within the lifecycle assessment.

VIII. The CHPS should be implemented in a way that provides flexibility to and certainty to hydrogen production investments.

In order to provide further clarity and certainty to hydrogen production facilities, DOE should offer additional guidance regarding the finality of the lifecycle analysis performed by a facility and which iteration of the GREET model was used in its calculation. Because the GREET model adjusts emissions from various items, sometimes on a yearly basis, stakeholders often utilize internal benchmarks to meet an updated standard and enter into contractual agreements for feedstocks based on that benchmarking. These calculations are then used to determine qualifications for the production tax credit. Based on this standard business practice, once a hydrogen facility determines its levels of emissions, the lifecycle assessment and the GREET model used for that facility should be "locked-in" for the future of that facility. Any future iterations of the GREET model developed after that period should only apply to projects that commence after the effective date for the updated model. DOE should provide additional guidance with regards to the ability to "lock in" the lifecycle assessment using a GREET model at the time of the design finalization and hold that position for the duration of the 10-year period of the production tax credit. This will bring certainty to hydrogen plant developers and financers and provide the needed impetus to establish clean hydrogen production in the United States.

Furthermore, the CHPS should allow for (but not require) individualized use of emissions estimates. There are many different methods to produce hydrogen and all of them will have different emissions based on the detailed configuration of the plant. For hydrogen production site emissions and CO_2 sequestration, individualized emission estimates are preferable. Adopting this methodology will encourage private investment and innovation to continuously reduce the GHG emissions of hydrogen production pathways.

Additionally, as emerging technologies (radiolysis, photolysis, pyrolysis, catalysis, redox reactions, geologic hydrogen, biochemical reactions, etc.) continually develop, GREET should provide the opportunity to add or create new pathways supporting those technologies. If not, despite the many benefits of GREET, the tool will inhibit the development of those new technologies.

IX. Conclusion

FCHEA appreciates the opportunity to provide this feedback to DOE and continue our history of supporting the hydrogen industry. Please feel free to contact FCHEA CEO Frank Wolak at FWolak@FCHEA.org with any comments or questions you may have regarding this submission or any other hydrogen related issue.

Sincerely,

Frank Wolak
President & CEO
Fuel Cell and Hydrogen Energy Association