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Internal Revenue Service
CC:PA:LPD:PR (Notice 2022-58)
Room 5203
P.O. Box 7604,
Ben Franklin Station
Washington, DC 20044

RE: Comments on Notice 2022-58

On behalf of Plug Power Inc. ("Plug"), please see the below answers to Treasury Notice 2022-58 regarding the Request for Comments on Credits for Clean Hydrogen and Clean Fuel Production.

Plug is a leading provider of end-to-end green hydrogen and fuel cell solutions. Through our Proton Exchange Membrane ("PEM") fuel cell products, Plug successfully created the first commercially viable market for hydrogen fuel cells and has deployed more than 60,000 fuel cells to date. Plug is building an end-to-end green hydrogen ecosystem, from production, storage, and delivery to energy generation. Our capabilities cover all aspects of the hydrogen value chain. Plug is building green electrolytic hydrogen production plants to produce at least 500 tons of liquid green hydrogen daily by 2025. Plug is also a leader in PEM electrolysis technology, with nearly 50 years' experience in a variety of mission-critical naval and aerospace applications. Our electrolyzers can be paired with renewable energy resources such as solar, wind, and hydro-electric power to produce green hydrogen from water and can be delivered at gigawatt-scale.

<u>.01 CREDIT FOR PRODUCTION OF CLEAN HYDROGEN</u>

1) **<u>Clean Hydrogen. Section 45V provides a definition of the term "qualified clean hydrogen." What, if any, guidance is needed to clarify the definition of qualified clean hydrogen?</u>**

"Qualified Clean Hydrogen Production Facility" should be defined as the generational unit capable of producing "Qualified Clean Hydrogen":

Plug respectfully requests clarification regarding the definition of "qualified clean hydrogen production facility." Section 45V(c)(3) defines "qualified clean hydrogen production facility" as a "facility – (A) owned by the taxpayer, (B) which produces qualified clean hydrogen, and (C) the construction of which begins before January 1, 2033." Through this definition, Congress articulated three key criteria: (i) ownership; (ii) production of qualified clean hydrogen; and (iii) beginning of construction. Regarding criteria (ii), we recommend that the facility should be defined to solely include such property as is necessary to effectuate the production of the qualified clean hydrogen. Specifically, we propose and request confirmation that a qualified clean hydrogen production facility may be defined as each generational unit capable of producing qualified hydrogen. In the context of electrolytic pathways, each additional electrolyzer module at a hydrogen production situs would constitute a separate "qualified clean hydrogen production facility," whereupon the taxpayer can claim the Section 45V credit for ten years after such generational unit is placed in service (if in compliance with the other requirements of Section 45V). This proposed framework is consistent with the plain language of Section 45V(c)(3) and provides an important incentive to expand hydrogen production sites.

Relatedly, this framework could potentially drive reinvestment. In the wind industry, it is common practice to repower an existing wind facility to take advantage of new improvements in technology. This scenario is similarly applicable within the electrolytic hydrogen space. Proton exchange membrane stacks currently can operate for approximately 80,000 hours, at which point the stacks have degraded and use significantly more electricity than originally designed for. A significant capital expenditure investment is required to repower these stacks. Repowering these sites through electrolyzer/stack replacement should commence a ten-year period for each such repowered qualified clean hydrogen production facility/generational unit. This framework will ensure that first generation electrolyzer projects remain competitive with later generation projects benefitting from technological innovations and Section 45V.

A Qualified Clean Hydrogen Production Facility may include different or additional property for chlor-alkali byproduct hydrogen production:

Relatedly, a qualified clean hydrogen facility should be defined by the property necessary to effectuate the production of qualified hydrogen for sale or use. For chlor-alkali byproduct hydrogen facilities, specifically, a second appurtenant site may process and purify waste product into useable/saleable qualified clean hydrogen. Hydrogen-containing byproduct from certain industrial processes, for example chlor-alkali facilities, should not be considered "qualified clean hydrogen" under Section 45V unless it is of appropriate quality and purity to be for sale and use in the ordinary course (as required in Section 45V(c)(2)(B)). Such waste product hydrogen typically contains substantial impurities, such as nitrogen, argon, oxygen, and moisture that necessitate substantial purification to process the waste byproduct into saleable qualified clean hydrogen. Specifically for byproduct chlor-alkali sites, we request clarification that property which purifies hydrogen-containing waste byproduct and effects the availability for sale and use may be considered an extension of a "qualified clean hydrogen production facility." Section 45V(c)(3). This interpretation is consistent with the legislative intent – to incentivize deployment of generation sites and ensure a robust supply of qualified clean hydrogen for sale and use. If a site is constructed to perform purification and other activities necessary to process hydrogen-containing waste byproduct from a chlor-alkali site into "qualified clean hydrogen" available for "sale and use," such property may be properly deemed an extension of the "qualified clean hydrogen production facility."

a) **Section 45V defines "lifecycle greenhouse gas emissions" to "only include emissions through the point of production (well-to-gate)." Which specific steps and emissions should be included within the well-to-gate system boundary for clean hydrogen production from various resources?**

Section 45V specifically states that lifecycle greenhouse gas emissions "shall only include emissions ***through the point of production***" as determined under the most recent GREET model (emphasis added). Section 45V(c)(1)(B). This definition includes upstream emissions associated with hydrogen production through the point of production. The enumerated system boundary does not go past the point of production in any manner related to the hydrogen production pathway; it does not include any downstream emissions in the hydrogen production pathway, such as compression liquefaction, or dispensing into vehicles. However, "lifecycle greenhouse gas emissions" shall include downstream emissions associated with the transport and sequestration of CO2. Treasury and DOE could provide greater taxpayer certainty by explicitly clarifying that any frameworks or protocols used to inform the Section 45V lifecycle boundary are limited to the boundary described above and do not include downstream emissions associated with the distribution, storage, or consumption of hydrogen. Notably, footnote 11 of the draft DOE Clean Hydrogen Production Standard ("CHPS") properly acknowledges that "post-hydrogen production steps such as potential liquefaction, compression, dispensing into vehicles, etc." are not included as part of the CHPS lifecycle analysis. We recommend that final guidance explicitly acknowledge that post-production steps and any emissions downstream of the point of hydrogen production are beyond the Section 45V system boundary. The Section 45V "lifecycle greenhouse gas emissions" solely includes emissions through the point of production.

b) **(i) How should lifecycle greenhouse gas emissions be allocated to co-products from the clean hydrogen production process? For example, a clean hydrogen producer may valorize steam, electricity, elemental carbon, or oxygen produced alongside clean hydrogen?**
(ii) How should emissions be allocated to the co-products (for example, system expansion, energy-based approach, mass-based approach)?

Omitted.

(iii) What considerations support the recommended approaches to these issues?

Omitted.

c) **(i) How should lifecycle greenhouse gas emissions be allocated to clean hydrogen that is a by-product of industrial processes, such as in chlor-alkali production or petrochemical cracking?**

For chlor-alkali processes, the GREET model affords four methods for calculating emissions: venting method, substitution method, mass allocation method, and market allocation method. Each allocates lifecycle emissions according to respective criteria – for example, either the mass or market value of various co-products from an industrial process. We recommend that the market allocation method is most appropriate for chlor-alkali byproduct hydrogen lifecycle analysis. The energy methods and mass methods may be less appropriate for chlor-alkali facilities, given hydrogen's low molecular weight and that chlorine is a non-energy chemical. Alternatively, use of zero-carbon electricity (substantiated by environmental attributes) for the hydrogen produced, similar to other electrolysis process that produce pure hydrogen, may present a more-straightforward solution (substitution method not included in the GREET model but can be created in the GREET tool as a new pathway).

ii) How is byproduct hydrogen from these processes typically handled (for example, venting, flaring, burning onsite for heat and power)?

Omitted.

d) **<u>If a facility is producing qualified clean hydrogen during part of the taxable year, and also produces hydrogen that is not qualified clean hydrogen during other parts of the taxable year (for example, due to an emissions rate of greater than 4 kilograms of CO2-e per kilogram of hydrogen), should the facility be eligible to claim the § 45V credit only for the qualified clean hydrogen it produces, or should it be restricted from claiming the § 45V credit entirely for that taxable year?</u>**

Plug respectfully comments that a taxpayer/owner of a qualified clean hydrogen production facility should be able to claim the Section 45V credit for any amount of qualified clean hydrogen produced in a taxable year, if the taxpayer can comply with the definitional and verification requirements of Section 45V. This interpretation will help ensure that taxpayers constructing qualified clean hydrogen production facilities can utilize Section 45V in the event of unforeseen issues temporarily disrupting a facility's ability to produce "qualified clean hydrogen." The plain language of Section 45V(c)(3) states that a "qualified clean hydrogen production facility" is a facility "which produces qualified clean hydrogen." Furthermore, the credit amount articulated in Section 45V(b) is based upon the kilograms of hydrogen produced, and in no way limits the credit's applicability to facilities that only produced qualified clean hydrogen. In no way does Section 45V limit the credit to facilities that exclusively produce qualified clean hydrogen or preclude eligibility where a facility does not produce "qualified clean hydrogen" for a given duration.

e) **<u>How should qualified clean hydrogen production processes be required to verify the delivery of energy inputs that would be required to meet the estimated lifecycle greenhouse gas emissions rate as determined using the GREET model or other tools if used to supplement GREET?</u>**

A hydrogen generation site should have revenue grade energy meters and continuously recording process flow meters that can accurately measure the energy inputs related to the hydrogen production pathways and lifecycle greenhouse gas emissions rate analysis. The taxpayer should be responsible for keeping adequate records of energy consumption, as validated through reporting from revenue grade equipment meters, as well as a log of retired renewable energy credits ("RECs"). Such records should include region, period, and vintage of each credit retired. A qualified third party should own the processes analyzing lifecycle greenhouse gas emissions through the GREET model and verifying the taxpayer's inputs to the GREET model by tracing to source data. This third party would be responsible for compiling the report and ensuring accuracy and completeness of the computed lifecycle greenhouse gas emissions rate.

i) **<u>How might clean hydrogen production facilities verify the production of qualified clean hydrogen using other specific energy sources?</u>**

Omitted.

ii) **<u>What granularity of time matching (that is, annual, hourly, or other) of energy inputs used in the qualified clean hydrogen production process should be required?</u>**

First, we note that neither the plain language nor legislative history of Section 45V suggest a restrictive time matching requirement concerning energy inputs and/or RECs, environmental attributes, and other emissions factors. Rather, Section 45V(c)(1)(B) states that term "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')." Congress that the GREET model be determinative of measuring carbon intensity, which among many metrics, includes energy inputs. GREET analyzes the percentage of electricity allocated to different sources; furthermore, it allows the addition of different sources of electricity. GREET uses an annualized average for grid inputs, and we similarly recommend that an annualized matching of energy inputs used in qualified clean hydrogen production processes is appropriate. Congress did not specify any time-matching restrictions, when it easily could have. We recommend that an annualized matching of energy inputs is consistent with the language of Section 45V(c), legislative intent, and GREET methodology.

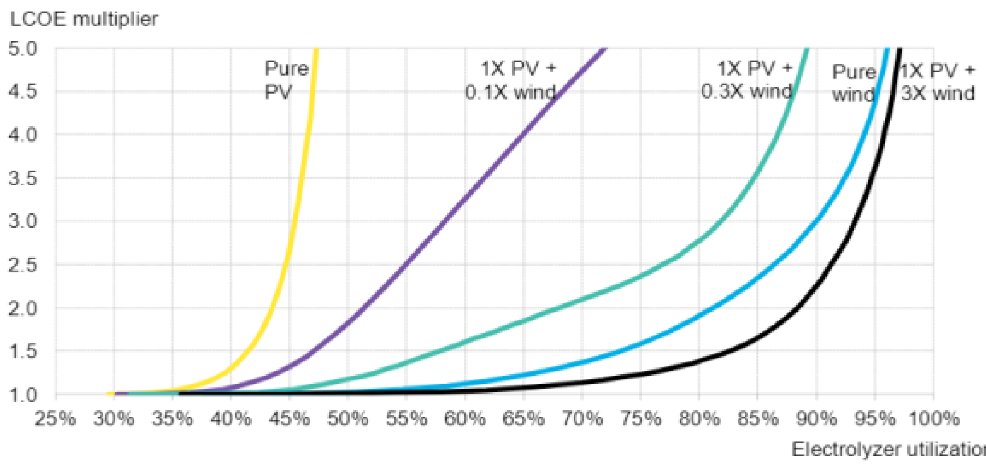
It is imperative that time matching requirements be practicable and not contradictory to broader policy goals of scaling the clean hydrogen economy. An unobtainable time-matching standard will irreparably stifle the development of clean hydrogen production facilities. At a minimum, we recommend conformity with existing frameworks, such as the California Low Carbon Fuel Standard (CA LCFS), which only requires matching in three quarter (nine month) periods. This duration is necessary to address seasonal variability of intermittent renewables. Under CA LCFS, book-and-claim accounting for low carbon intensity electricity may span only three quarters. If a quantity of low carbon intensity electricity (and all associated environmental attributes) is supplied to the grid in the first calendar quarter, the quantity claimed for CA LCFS reporting must be matched to grid electricity used for electrolytic hydrogen production no later than the end of the third calendar quarter.

We respectfully suggest a slightly altered standard for additional and/or co-located zero-carbon power sources, contracted for the specific use of a given clean hydrogen production facility. Due to the extra-risk these facilities are taking on, there should be relaxed timestamping standards on the environmental attributes. Intermittent renewable energy sources have an expected production profile (i.e. P50) that takes long-term weather patterns into consideration. However, any given year can significantly vary relative to the P50 production estimate; but the average production should trend towards P50 over the long-term. To address this specific scenario, co-located plants should not have any time-stamping requirements. This framework would incentivize renewable energy development alongside clean hydrogen development, while concurrently providing financing parties adequate assurance that they are truly facilitating green projects.

Shorter duration requirements for time matching are not technically appropriate, are inconsistent with the overarching intent of Section 45V, and would prevent the development of clean hydrogen production facilities. Furthermore, generation attribute tracking systems do not settle environmental attributes on an hourly basis. As a result, an hourly framework would be technically and administratively impractical. The seasonal variation of renewables similarly necessitates a time-matching framework longer than a monthly duration. Scaling and locating qualified clean hydrogen production facilities is dependent, in large part, upon the cost of renewable energy – on average comprising 60-80 percent of the total cost of green hydrogen. Because electrolyzers are currently capital-intensive investments, the cost of hydrogen production is also heavily impacted by utilization rates, or run-hours, of the electrolyzer.

Electrolytic hydrogen facilities must maintain high-capacity and utilization factors, and as a result, will need to operate at times of the day/night that would preclude the availability of RECs under any hourly-based time matching work. Electrolyzers are cost-effective when built in a single location and operated at high volume (i.e. high capacity factors). To buy electricity coming from a single renewable resource, with nearly 100 percent of the energy coming at constant power, the renewable plant would need to be significantly oversized and use a combination of solar and wind to achieve a near 100 percent capacity factor. Bloomberg New Energy Finance ("BNEF") has made an estimation of the average cost of electricity to achieve a high capacity factor renewable energy plant. Figure 48 (below) depicts the correlation between electrolyzers' utilization rate and the levelized cost of energy for wind and solar-based generation. The BNEF analysis suggests that the cost of electricity (LCOE – levelized cost of electricity) can be greater than five-times baseline. In order to have an electrolyzer plant with 100 percent constant power, the cost of hydrogen would increase by more than 300 percent (the previous 60-80 percent is now 300- 400 percent) without the appropriate incorporation of RECs and environmental attributes.

Figure 48: Correlation between electrolyzers' utilization rate and LCOE for integrated PV and wind power plants with different capacity ratios



Source: BloombergNEF. Note: Standalone PV and standalone wind are assumed to have the same LCOE here.

Near-term development of electrolytic hydrogen facilities must ensure resiliency and a robust supply of qualified clean hydrogen. This requirement is a prerequisite to drive early adoption of hydrogen and hydrogen-based applications (such as fuel cells). Without a reliable hydrogen supply, end-users will favor incumbent technologies. As a result, it is imperative to facilitate the deployment of near-term, grid-connected qualified clean hydrogen facilities that can operate continuously. These early facilities will ensure adequate supply, which will incent expanded adoption of hydrogen-based applications. These early facilities are, in many ways, the bridge to larger, behind-the-meter hydrogen production facilities that will be co-located with large-scale intermittent renewable deployments and not necessitate high capacity and utilization factors. The medium-term trend will see the economics of the clean hydrogen industry further drive the adoption in harder-to-decarbonize sectors, powered by low-cost renewable energy sources. Decreasing CapEx of electrolyzers will ultimately facilitate lower utilization rates (6-7 percent) – enough to ultimately enable production from curtailed renewables on-par with the costs of a dedicated large-scale producer. The near-term grid-connected facilities, however, are a necessary first step to achieve scale.

Alignment with the Clean Hydrogen Production Standard. On September 22, 2022, the Department of Energy (DOE) released draft guidance for a Clean Hydrogen Production Standard (CHPS) developed to meet the requirements of § 40315 of the Infrastructure Investment and Jobs

Act (IIJA), Public Law 117-58, 135 Stat. 429 (November 15, 2021).[4] The CHPS draft guidance establishes a target lifecycle greenhouse gas emissions rate for clean hydrogen of no greater than 4.0 kilograms CO2-e per kilogram of hydrogen, which is the same lifecycle greenhouse gas emissions limit required by the § 45V credit. For purposes of the § 45V credit, what should be the definition or specific boundaries of the well-to-gate analysis?

Section 45V articulates a rigid system boundary for lifecycle analysis that only goes through the point of production:

In its CHPS draft, DOE articulates that they will align the CHPS standard with certain elements of Section 45V lifecycle greenhouse gas emissions analysis. However, we would like to note important distinctions between these two frameworks. Section 45V specifically states that lifecycle greenhouse gas emissions "shall only include emissions through the point of production" as determined under the most recent GREET model. Section 45V(c)(1)(B). The IIJA, in contrast, articulates that "clean hydrogen" means "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." The draft CHPS notably examines emissions criteria that are potentially beyond the Section 45V lifecycle greenhouse gas emissions boundary. However, 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 CO2.

Plug would like to re-emphasize the importance of the lifecycle boundary for the Section 45V "lifecycle greenhouse gas emissions." Treasury and DOE should explicitly clarify that any frameworks or protocols used to inform the Section 45V 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. Notably, footnote 11 of the draft CHPS properly acknowledges that "post-hydrogen production steps such as potential liquefaction, compression, dispensing into vehicles, etc." are not included as part of the CHPS lifecycle analysis. It is important that Treasury and DOE explicitly acknowledge that post-production steps and any emissions downstream of the point of hydrogen production are beyond the Section 45V(c)(1)(B) system boundary. Section 45V solely includes emissions through the point of production.

The IIJA requires DOE to re-examine the CHPS within five years. This timeframe is a meaningful metric during which DOE and Treasury can evaluate the necessity of time matching, geographic, and additionality requirements:

Section 822(b)(2) of the IIJA provides that "not later than the date that is five years after the date on which the Secretary develops the [CHPS]," it shall re-evaluate whether the CHPS should be adjusted. Furthermore, the CHPS states that its lifecycle target and system boundary will align with Section 45V. This five-year period, though not directly tied to Section 45V, is an important timeframe that should similarly guide the deliberation of any requirements concerning potential additionality, geographic, and/or time matching. This process alignment would promote consistency across frameworks and between agencies and would afford necessary time for regulators and industry to evaluate the efficacy and necessity of such potential requirements. We strongly recommend that the imposition of any such requirements, if deemed necessary, should not apply to qualified clean hydrogen production facilities that have begun construction prior to the effective date of a newly updated CHPS and/or methodologies for assessing the lifecycle greenhouse gas emissions rate under Section 45V.

2) **Provisional Emissions Rate.**

Omitted.

3) **Recordkeeping and Reporting.**

a) What documentation or substantiation do taxpayers maintain or could they create to demonstrate the lifecycle greenhouse gas emissions rate resulting from a clean hydrogen production process?

Plug recommends that the guidance confirm that certification by a qualified engineer of the GREET (or similar model) calculation should be sufficient to allow a taxpayer to claim the Section 45V credit. In the instance that the guidance predicates eligibility to claim the credits upon taxpayer receipt of a government-issued approval of the taxpayer's environmental performance calculations, we urge that streamlined approval procedures be included that provide for a limited period for government review, with absence of a negative communication by the end of the review period to be deemed approval.

The taxpayer should maintain adequate records of energy consumption and flow rates, as validated through reporting from revenue grade equipment meters and standard flow meters used in the industry, as well as a log of retired RECs that offset energy inputs. Such records should include region, period, and vintage of each credit retired. While it is encouraged for taxpayers to frequently track and reconcile this operating data, if issued guidance requires submission of reports summarizing the data, it should be on an annual basis for the tax year the credit is claimed. Otherwise, the reports for the tax year should be kept in accordance with Section 6001, General Record Requirements. Also, Treasury may wish to address administrative procedures in environmental attribute tracking systems – and in particular – the interplay with tracking environmental attributes and the timing of tax filings.

b) What technologies or methodologies should be required for monitoring the lifecycle greenhouse gas emissions rate resulting from the clean hydrogen production process?

Supervisory control and data acquisitions ("SCADA") solutions are widely available for consolidating plant production data and are appropriate for monitoring the lifecycle greenhouse gas emissions from clean hydrogen production processes. Data collection and management programs can be submitted by the facility, which includes data reconciliation methods.

c) What technologies or accounting systems should be required for taxpayers to demonstrate sources of electricity supply?

Qualified clean hydrogen production facilities should be required to have revenue quality metering on electric feedstocks. We recommend that power monitoring solution packages from programmable logic controller ("PLC") and distributed control system ("DCS") vendors are appropriate. Furthermore, RECs and the existing generation attribute tracking systems should be deemed adequate systems for demonstrating sources of electricity supply.

d) **<u>What procedures or standards should be required to verify the production (including lifecycle greenhouse gas emissions), sale and/or use of clean hydrogen for the § 45V credit, § 45 credit, and § 48 credit?</u>**

Regarding electrolytic pathways, qualified clean hydrogen molecules should be measured at the point of production through revenue grade flow meter equipment that captures electrolyzer output. Alternatively, a facility should be able to measure and reconcile cumulative production in hydrogen liquid storage tanks using load cells, where applicable. This location of measurement will provide an accurate, precise, and verifiable metric of the clean hydrogen produced for sale or use. Furthermore, this point of measurement is consistent with the language of Section 45V(a), which articulates that "Amount of credit" is equal to "the kilograms of qualified clean hydrogen produced." The credit amount in Section 45V(a) is purposefully framed around the production amount. Tracking production further downstream than the point of production will not only contradict this plain language of Section 45V(a) but will also unnecessarily complicate the process of measuring production output.

e) **<u>If a taxpayer serves as both the clean hydrogen producer and the clean hydrogen user, rather than selling to an intermediary third party, what verification process should be put in place (for example, amount of clean hydrogen utilized and guarantee of emissions or use of clean electricity) to demonstrate that the production of clean hydrogen meets the requirements for the § 45V credit?</u>**

We recommend that the verification process should be consistent, regardless of whether the clean hydrogen user and producer are both the same taxpayer.

f) **<u>Should indirect book accounting factors that reduce a taxpayer's effective greenhouse gas emissions (also known as a book and claim system), including, but not limited to, renewable energy credits, power purchase agreements, renewable thermal credits, or biogas credits be considered when calculating the § 45V credit?</u>**

Plug is building the nation's first Green Hydrogen Highway. We are developing electrolytic hydrogen generation sites across the country, with plans to produce 500 tons per day by 2025. Plug is the first company to develop a commercially viable market for fuel cells – in material handling and goods movement. As a result, we are uniquely positioned as a first mover in this space and can provide valuable insight into the realities of deploying projects and scaling the clean hydrogen economy.

Environmental attributes are necessary to create a national clean hydrogen economy:

Environmental attributes are necessary to enable a national clean hydrogen economy and will advance the overarching policy intent of Section 45V – to incent the build out of clean hydrogen facilities and ensure a robust supply of clean hydrogen. The structure of sourcing zero-carbon electricity necessitates the inclusion of environmental attributes (including RECs) within Section 45V. The exclusion of such instruments would stifle development of electrolytic hydrogen facilities coupled with intermittent renewables, even when co-located.

Project developers will size clean hydrogen production facilities off the renewable power plant's P50 energy production model. The corollary to this approach means that the project is going to underperform its model in 50 percent of the years. This scenario could result in an inability to forecast the carbon intensity of the hydrogen production and could make financing such projects impractical, absent a secondary mechanism to replace the production shortfalls of intermittent resources. Failure to incorporate such a mechanism would only allow electrolytic hydrogen projects to be partially supported by intermittent renewables. This outcome would inhibit the development of electrolytic hydrogen projects in regions of the country with abundant intermittent renewable resources (e.g., much for the Midwest and Western United States). As discussed previously, it is imperative to have a national network of clean hydrogen supply to solve the availability and resiliency concerns of early adopters.

An environmental attribute trading methodology would accelerate the development process for electrolytic hydrogen projects. This methodology decouples zero-carbon generation and hydrogen production. This decoupling is beneficial because it would allow developers to site zero-carbon generators in their optimal locations (e.g., windy or sunny places) and allow hydrogen developers to locate facilities close to customers. This will reduce friction in the development process, decrease the costs to the end customer, and optimize the entire value chain. Furthermore, this framework should be inclusive of all zero carbon sources, including hydroelectric, nuclear, and intermittent renewables.

The first generation of hydrogen projects will have grid connections to ensure high capacity and utilization factors necessary to achieve early adoption and economies of scale. As discussed in question (1)(e)(2) above, concerns regarding time matching of RECs will lessen as we increasingly transition to renewable resources. However, near-term development of electrolytic hydrogen facilities must ensure resiliency and a robust supply of qualified clean hydrogen. This is a prerequisite to drive early adoption of hydrogen and hydrogen-based applications (such as fuel cells). Without reliable hydrogen supply, end-users will favor incumbent technologies. As a result, it is imperative to facilitate the deployment of these near-term, grid-connected qualified clean hydrogen facilities that can operate continuously. These early facilities will ensure adequate supply, which will drive demand for hydrogen-based applications. These early facilities are, in many ways, the bridge to larger, behind-the-meter hydrogen production facilities that will be co-located with large scale intermittent renewable deployments and not necessitate high capacity and utilization factors.

As economies of scale are realized through plant designs, supply chains, and longer-term trends in renewable energy pricing, projects will become decreasingly reliant on grid connectivity. Islanded projects reliant on hybrid wind and solar renewables will become more prevalent. Furthermore, to meet the size of the total addressable market for hydrogen-enabled decarbonization, terawatts of additional zero-carbon energy sources will be built. Near-term grid-connected facilities, however, are a necessary first step to achieve this scale.

IRA legislative history expressly included RECs, PPAs, and other market instruments:

RECs, Power Purchase Agreements (PPAs), and other book accounting factors should all be considered as factors to reduce a taxpayer's effective greenhouse gas emissions. A relevant colloquy between Senators Wyden and Carper during the floor debate on the IRA evidences the clear legislative intent to include these instruments as emissions reduction factors in the Section 45V lifecycle analysis. The colloquy provides:

> SEN. CARPER: "Section 13024 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, *the Secretary shall recognize and incorporate indirect book accounting factors, also known as a book and claim system, that reduce effective greenhouse gas emissions, which includes, but is not limited to, renewable energy credits, renewable thermal credits, renewable identification numbers, or biogas credits*. Is that your understanding as well?" (emphasis added).

SEN. WYDEN: "Yes."

This colloquy demonstrates clear legislative intent regarding the "lifecycle greenhouse gas emissions" definition under Section 45V. Furthermore, this colloquy is broadly inclusive and did not articulate an intent to limit such instruments based upon time matching, additionality, or geographic concepts.

Policy must incentivize hydrogen production pathways with the greatest long-term benefits:

The DOE and the Biden Administration's decarbonization and clean hydrogen goals necessitate a flexible Section 45V framework broadly inclusive of environmental attributes. This initial flexibility will help scale the hydrogen economy and drive decarbonization in difficult to abate sectors. Furthermore, market-based book-and-claim mechanisms also support President Biden's broader climate goals of reducing emissions economy-wide to net-zero by 2050 – specifically by driving demand for and deployment of low- and zero-emission energy sources.

In its 2020 report, "Road Map to a US Hydrogen Economy," McKinsey found that hydrogen is a key driver of economic growth and significant decarbonization, with the potential to meet 14 percent of the United States' energy demand by 2050. Clean hydrogen can also play a vital role in achieving Justice40 and workforce transition goals of the Administration. To achieve these goals, policy must incentivize hydrogen production pathways with the greatest long-term environmental and economic benefits. Advances and cost reductions in electrolyzers, rapidly increased renewable and zero-carbon generation deployment, and carbon intensity-based incentives each support our path to a green hydrogen economy. However, it is imperative that the Section 45V lifecycle analysis not inhibit the early deployment of electrolytic hydrogen projects with the greatest potential long-term environmental and socio-economic benefits. Overreaching requirements at the outset would only entrench existing fossil-based interests that, in many respects, are counter to our long-term decarbonization goals.

g) <u>If indirect book accounting factors that reduce a taxpayer's effective greenhouse gas emissions, such as zero-emission credits or power purchase agreements for clean energy, are considered in calculating the § 45V credit, what considerations (such as time, location, and vintage) should be included in determining the greenhouse gas emissions rate of these book accounting factors?</u>

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At present, it would be premature to impose additionality, regionality, and/or time matching requirements within the lifecycle greenhouse gas emissions rate analysis of Section 45V. Of note, such concepts are in no way explicitly included within the statutory text or its legislative history of Section 45V. As these concepts are deliberated, we believe it is imperative that any framework, if deemed necessary, must be phased-in over time and not take effect for several years. Any requirements must be cognizant of commercial realities and broader policy objectives. This approach is consistent with overarching congressional intent, as evidenced by the IIJA's directive for DOE to re-examine the CHPS within five years. Congress included this provision because they are acutely aware of the importance of flexibility within a policy framework aimed at scaling a nascent sector of the renewable energy economy. We strongly recommend that the imposition of any such requirements, if deemed necessary, should not apply to qualified clean hydrogen production facilities that began construction prior to the effective date of newly updated CHPS and/or methodologies for assessing the lifecycle greenhouse gas emissions under Section 45V.

Policy efforts in Europe have similarly concluded that these concepts must not be hastily imposed. For several years, the European Commission has been deliberating additionality, temporal, and geographic matching requirements – most notably in a Delegated Act defining renewable hydrogen within the Renewable Energy Directive (REDII). Through that hotly-debated and undecided process, the European Commission has increasingly tempered and lengthened the phase-in period before any potential requirements would take effect. Substantively, the strictures of each proposed requirement – whether geographic, additionality, or temporal – have been continuously modified to afford a more pragmatic framework. That deliberation remains ongoing and unfinalized, due to the complexity of such topics and cognizance of not imposing concepts counterproductive to broader decarbonization and energy objectives. Similarly here – and especially given the lack of congressional directive to mandate such requirements – these concepts should be approached with utmost pragmatism and care.

As outlined in questions 4(f) and 1(e)(ii), immediate imposition of impractical, poorly devised requirements will stifle the clean hydrogen economy. Such requirements would jeopardize our nation's ambitious, and necessary, decarbonization goals. There are many sectors – such as steel, ammonia, and marine applications – where clean hydrogen will be the only way to decarbonize. However, these sectors necessitate a fully-scaled clean hydrogen economy. We will not achieve this scale without a first generation of grid-connected hydrogen facilities. Temporal, geographic, or additionality restrictions attempt to address a short-term concern, that in many ways, could be counter to long-term decarbonization objectives.

In some respects, there is overlap between additionality, temporal, and geographic requirements – the goal of tracking the origin of electrons. Notably, these concepts have been almost exclusively deliberated within the confines of hydrogen policy, but are rarely, if ever, raised for numerous other sectors pursuing increased electrification. It is crucial to verify that clean hydrogen be truly clean and in support of decarbonization; however, the same can be said for other sectors. A level playing field is paramount to the formation of a sustainable clean energy economy.

Additionality (vintage): "Additionality" refers to the concept that projects must concurrently deploy new (i.e. additional) renewable electricity to offset demand from a new facility/project. Nothing within Section 45V's statutory text, legislative history, or the GREET model suggests that that new renewable power is a prerequisite to accurately verifying the lifecycle greenhouse gas emissions of qualified clean hydrogen. We respectfully suggest that the "additionality" concept is not germane to the

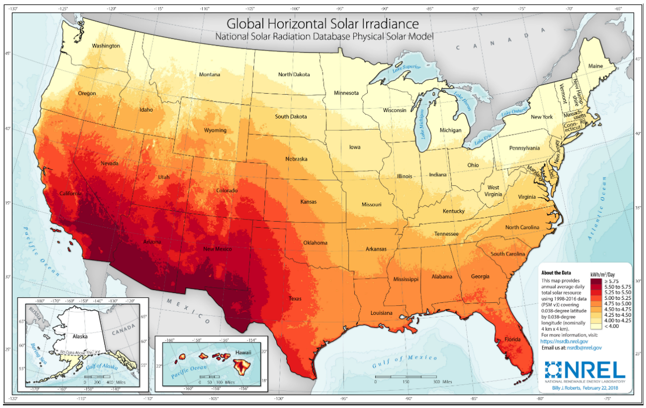
Section 45V framework. Instead, this concept is more properly addressed in other policies focused on renewable deployment. Federal- and state-level renewable energy mandates, among numerous other policies, are rapidly driving the deployment of renewable energy projects across the United States. The Section 45V framework is not the appropriate forum to advance additionality objectives.

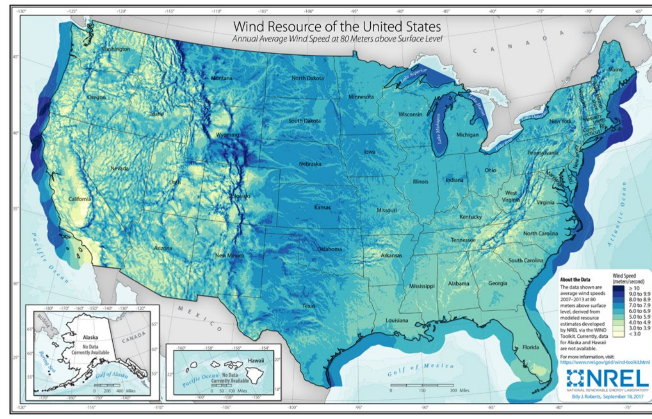
Furthermore, the additionality concept does not capture the full decarbonization value of clean hydrogen applications. One of the principal reasons for the additionality criteria is to channel renewable electricity towards decarbonizing the electricity grid, where it is most efficient and results in the greatest emissions savings. However, this concept fails to consider full decarbonization value in some instances – for example decarbonizing steel production with clean hydrogen. Taking the entire steel production value chain into consideration – one ton of green hydrogen can save up to 38 tons of CO_2. In this instance, even if the renewable energy taken from the grid would be replaced with fossil electricity, the net CO_2 emission balance would still be overwhelmingly positive (for example, if renewable energy was taken from the grid and replaced by electricity produced with a natural gas fired plant, net emission savings would amount to $14tCO_2/tH_2$).

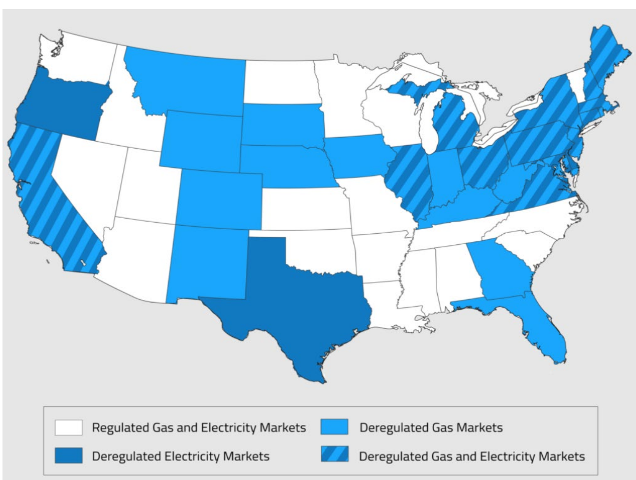
Again, we strongly recommend that "additionality" concepts are more properly and feasibly pursued within other policy efforts – not Section 45V. Even then, deliberation of additionality principles must recognize that the green hydrogen market is nascent and will not scale without a transitional period for electrolytic hydrogen facilities to source electricity from existing renewable plants and backed by RECs and other forms of environmental attributes.

Geographic: Geographic limitations on sourcing environmental attributes, if too onerous, would prevent electrolytic hydrogen projects from sourcing power from much of the United States' existing zero carbon feedstock. Solar and wind each present challenges for locating adequate resources in large swathes of the United States – particularly in areas of high population (and potential clean hydrogen offtake). As a result, there may be a geographic disconnect between hydrogen production and demand centers. Furthermore, these regions are frequent epicenters of disadvantaged communities and difficult-to-decarbonize applications. The Section 45V framework should be implemented to bolster the administration's broader policy objectives across the entire United States. For example, the IIJA's Regional Clean Hydrogen Hub program articulates the statutory goal of facilitating the development of an interconnected national clean hydrogen network. Ensuring a level playing field across the entire United States is paramount achieving our federal policy goal of creating a national clean hydrogen network. Renewables vary across geography, and policymakers should be mindful of these considerations in assessing the value of geographic requirements for book-and-claim factors within the Section 45V framework.

Renewable resources are not available in every state with cost-effective access and scale. Factors such as solar irradiance, wind speed, local utility rules, regulatory environment, and community acceptance will create winners and losers at the local level and could potentially hurt disadvantaged communities without a broader conception of the appropriate geographic range (i.e. regional or national) for procuring RECs. Below are two pictures of the solar/wind potential of the United States where renewable resources can be deployed cost-effectively. The below map of regulated versus deregulated markets is a basic indicator of the regulatory challenges at the state/local level, with respect to an ability to choose a power provider/procure behind the meter power services with ease (in addition to navigating the nearly 2000 utility providers in the United States).







Temporal: As detailed in question (1)(e)(2) above, granular timestamping of environmental attributes is impractical due to the natural production cycle of solar and wind, among other sources and uses of electricity. Shorter duration requirements for time matching are not technically appropriate, inconsistent with the overarching intent of Section 45V, would prevent the development of clean hydrogen production facilities, and would disproportionately benefit incumbent fossil hydrogen pathways. Electrolytic hydrogen facilities must maintain high-capacity utilization factors, in part due to the high cost of the equipment. Specifically, these facilities need high-capacity factors and utilization rates, and as a result, will need to operate at times of the day/night that would preclude the availability of RECs under any hourly-based time matching framework. Furthermore, generation attribute tracking systems do not settle environmental attributes on an hourly basis. As a result, an hourly framework would be technically and administratively impractical. Additionally, the seasonal variation of renewables similarly necessitates a time-matching framework greater than monthly duration.

As detailed in question 1(e)(2), we recommend that an annual matching of environmental attributes is appropriate. At a minimum, however, matching should not be more frequent than three-quarter intervals. We suggest conformity with existing frameworks, such as the California Low Carbon Fuel Standard (CA LCFS), which only requires matching in three quarter (nine month) periods. This duration is necessary to address seasonal variability of intermittent renewables. Under CA LCFS, book-and-claim accounting for low carbon intensity electricity may span only three quarters. If a quantity of low carbon intensity electricity (and all associated environmental attributes) is supplied to the grid in the first calendar quarter, the quantity claimed for CA LCFS reporting must be matched to grid electricity used for electrolytic hydrogen production no later than the end of the third calendar quarter.

Additionally, we respectfully suggest that an altered standard for additional and/or co-located zero-carbon power sources, contracted for the specific use of a given clean hydrogen production facility. Due to the extra-risk of developing a co-located renewable facility, such sites should have relaxed timestamping standards on the environmental attributes. Intermittent renewable energy sources have an expected production profile (i.e. P50) that takes long-term weather patterns into consideration. However, any given year can vary significantly relative to its P50 production estimate; over the long-term, however, the average production should trend towards P50. For this specific scenario, plants should not have any time-stamping requirements. This framework will incentivize renewable energy development alongside clean hydrogen development, while giving financing parties adequate assurance that they are truly facilitating green projects.

As we transition to a zero-carbon grid, additionality, geographic, and temporal considerations will become decreasingly relevant. It is imperative to facilitate the development of a clean hydrogen economy with the greatest potential for long-term sustainability and decarbonization. As seen through similar policy discussions abroad, these proposed requirements may likely be counterproductive to long-term decarbonization goals, administratively impractical, and prohibitive to our transition away from fossil fuels. Plug implores that a well-devised and phased-in approach is foundationally vital to maintaining conformity with the plain reading and intent of Section 45V and overarching policy objectives.

4) **Unrelated Parties.**

a) What certifications, professional licenses, or other qualifications, if any, should be required for an unrelated party to verify the production and sale or use of clean hydrogen for the § 45V credit, § 45 credit, and § 48 credit?

We recommend that a life cycle assessment certified professional ("LCACP") is an appropriate qualification for verifying lifecycle greenhouse gas emissions.

b) What criteria or procedures, if any, should the Treasury Department and the IRS establish to avoid conflicts of interest and ensure the independence and rigor of verification by unrelated parties?

Omitted.

c) **What existing industry standards, if any, should the Treasury Department and the IRS consider for the verification of production and sale or use of clean hydrogen for the § 45V credit, § 45 credit, and § 48 credit?**

Omitted.

5) **Coordinating Rules**.

(a) Application of certain § 45 rules.

(i) Section 45V(d)(3) includes a reduction for the § 45V credit when tax-exempt bonds are used in the financing of the facility using rules similar to the rule under § 45(b)(3)). What, if any, additional guidance would be helpful in determining how to calculate this reduction?

Omitted.

(ii) Section 45V(d)(1) states that the rules for facilities owned by more than one taxpayer are similar to the rules of § 45(e)(3). How should production from a qualified facility with more than one person holding an ownership interest be allocated?

26 U.S.C. 45(e)(3) provides that production "shall be allocated among such persons in proportion to their respective ownership interests in the gross sales from such facility." We recommend that this language is similarly appropriate for Section 45V, in that production should be allocated consistent with the ownership interests in the gross sales of qualified clean hydrogen. Furthermore, taxpayers should be afforded sufficient flexibility to contractually allocate production of qualified clean hydrogen at a jointly owned qualified clean hydrogen production facility.

b) **<u>Coordination with § 48</u>**.

(i) What factors should the Treasury Department and the IRS consider when providing guidance on the key definitions and procedures that will be used to administer the election to treat clean hydrogen production facilities as energy property for purposes of the § 48 credit?

We recommend that Treasury must carefully articulate the scope of qualified property applicable to the Section 48(a)(15) election for a specified clean hydrogen production facility. We request confirmation that "specified clean hydrogen production facility" solely includes property types up to and including the point of hydrogen production. This interpretation is consistent with statutory text and congressional intent. Property downstream from the point of production is more directly relevant to the Section 48(c)(6) energy storage technology credit. In Section 48(c)(6), Congress explicitly referred to hydrogen in its definition of energy storage technology. This definition is broadly worded, insofar as it includes property which receives, stores, and delivers hydrogen. Thus, utilizing the "point of production" as the boundary for a Section 48(a)(15) election is consistent with the system boundary for lifecycle greenhouse gas emissions in Section 45V(c)(1). Only property upstream of the point of production (at an electrolytic hydrogen facility) should be relevant to a Section 48(a)(15) specified clean hydrogen production facility election.

(ii) What factors should the Treasury Department and the IRS consider when providing guidance on whether a facility is "designed and reasonably expected to produce qualified clean hydrogen?"

Omitted.

c) **<u>Coordination with § 45Q</u>. Are there any circumstances in which a single facility with multiple unrelated process trains could qualify for both the § 45V credit and the § 45Q credit notwithstanding the prohibition in § 45V(d)(2) preventing any § 45V credit with**

respect to any qualified clean hydrogen produced at a facility that includes carbon capture equipment for which a § 45Q credit has been allowed to any taxpayer?

6) **Please provide comments on any other topics related to § 45V credit that may require guidance**.

Plug respectfully requests clarification on Section 45V(d)(4) concerning the modification of existing facilities. The plain statutory language of Section 45V(d) articulates that a facility placed in service before 2023 that did not produce qualified clean hydrogen would be eligible under Section 45V for ten years following the completion of a modification "to produce qualified clean hydrogen." Section 45V(d)(4)(B)(i). Specifically, no statutory text or legislative history suggests any substantive requirement as to what activity would constitute a modification under Section 45V(d), except the facility did not produce qualified clean hydrogen prior to the modification. The plain meanings of the words "modification" or "modify" further support this interpretation. Merriam-Webster dictionary defines "modification" as "the making of a limited change in something" and "modify" to mean "to make minor changes in" or "to make basic or fundamental changes in often to give a new orientation to or to serve a new end." We recommend that the plain reading of Section 45V(d)(4) and the meaning of "modification" evidences the full intent of this provision: the sole criteria is whether the modification to the facility, whatever its nature and scope, effectuated the production of qualified clean hydrogen at a facility that previously did not.

This interpretation is consistent with both: (i) the intent Section 45V to incent production of qualified clean hydrogen, as well as (ii) overarching policy goals. Many existing facilities may be able to achieve substantial decarbonization through modifications to produce clean hydrogen. Creating unnecessary limitations to this framework, which are entirely absent from the statutory text and history, would only discourage low-hanging decarbonization opportunities. The sole criteria under Section 45V(d) should be criteria explicitly articulated in statute. Specifically: (i) the facility is modified to produce qualified clean hydrogen; and (ii) the amounts paid for the modification are properly chargeable to the capital account of the taxpayer. Regarding Section 45V(d)(4)(B)(i), we recommend that a taxpayer must demonstrate that the facility did not produce qualified clean hydrogen prior to the modification.

Plug is appreciative of the opportunity to provide these comments. We are dedicated to supporting the Administration however necessary to ensure that the Inflation Reduction Act guidance on hydrogen tax incentives accurately reflects the scientific and business realities of the hydrogen sector. Please feel free to contact us with any comments or questions you may have regarding this submission or any other hydrogen related issue.