Independence Hydrogen

DATE: 3 December 2022

TO: The Internal Revenue Service

FROM: Independence Hydrogen

SUBJECT: Response to Notice 2022-58: Request for Comments on Credits for Clean Hydrogen and Clean Fuel Production

Section 3 questions and responses. Responses in **bold and blue:**

(1) 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?

Provide clarity between the DOE CHPS and the IRA definitions of "qualified clean hydrogen":

- **The DOE defines clean hydrogen as '<2 kg CO2/kg H2 at the site of production' in the Clean Hydrogen Production Standard (CHPS).**
- **The IRA defines cleans as '<4 kg CO2/kg H2 throughout the entire lifecycle'**

Provide clarification on the "functional unit" of the qualified hydrogen product. The DOE CHPS states it is "1 kilogram of hydrogen at 99% purity and 3 megapascals (MPa) pressure."

a. Section 45V defines "lifecycle greenhouse gas emissions" to "only include emissions through the point of production (well-to-gate)."[3] Which specific steps and emissions should be included within the well-to-gate system boundary for clean hydrogen production from various resources?

Specific emissions should include the feedstock (as applicable) and process utility usage (electrical, water, natural gas, etc). Inputs are well-defined and largely captured within the GREET 2022 model and 45V guidance should be consistent with the GREET or other named validation method/model.

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.

Co-products (and by-products) of the hydrogen production process should inherit the emissions attributable to the production of the co-product. Specifically, co-products should inherit emissions on a mass-basis to maintain consistency. For example, steam produced in an SMR that is used on another process should inherit the emissions attributable to its production, and allow the producer to deduct the emissions costs of the steam production from the overall H2 production. Considering the GREET model as the currently named tool for calculation process emissions, this is most reasonably done by tracking the production of co-products and subtracting the relevant emissions from the final hydrogen product.

ii. How should emissions be allocated to the co-products (for example, system expansion, energy-based approach, mass-based approach)?

Emissions should be allocated on a mass-based approach. This is consistent with the GREET 2022 model which addresses allocation of co-products on a per-mass basis.

iii. What considerations support the recommended approaches to these issues?

The recommendations above are consistent with the GREET model Life-Cycle Analysis (LCA) for co-product allocation on a mass basis.

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 existing processes that currently produce H2 as a by-product, H2 that is used as a feedstock should be considered a carbon-neutral feedstock, and bear no burdens from the upstream production processes. This is a specific concern because the 2022 GREET model release contains a change from the 2021 GREET model in which there was an option for "H2 diverted from vented emissions (carrying no energy/emissions burdens)," which was classified as an emission-free feedstock, and that is no longer available. The attribution of carbon-free feedstock can be accomplished in several ways and is most appropriately addressed in the context of the GREET model, especially in light of the changes from the 2021 to the 2022 version:

Situation:

With the release of the 2022 GREET model, waste off-gas is treated as a co-product by mass, and the waste off-gas assumes a mass-weighted portion of the emissions from the operation when used as a feedstock. This is a change from the 2021 GREET model in which waste off-gas was classified as "H2 diverted from vented emissions (carrying no energy/emissions burdens)," and was an emission-free feedstock.

Issue:

This materially impacts the CI (Carbon Intensity) score of processes using by-product off-gas as a feedstock, increasing the CI score of the final product by approximately 0.7 kg CO2 /kg H2 produced*. This change does not capture the value of using an otherwise wasted resource that is currently being vented (hydrogen). Additionally, this change does not appropriately credit the producers of the off-gas hydrogen based on the impact vented hydrogen has on greenhouse gas emissions, explained further in 1.c.ii.

Recommendation:

1. Allow projects that utilize a feedstock from a process that is currently venting hydrogen (waste off-gas) to retain the emission-free feedstock designation that existed in previous GREET models for the purposes of calculating the Carbon Intensity.

-OR-

2. Authorize an emissions credit to be applied to processes that use a feedstock of hydrogen where it is a co-product being produced at 3% or less of the total product mass. Two proposed options for determining the credit:

a. A credit of at least 0.7 kg CO2/kg H2 produced should be applied to the final CI score, to directly account for the change to the GREET model

b. A credit determined based on the quantified impact of the GHG effects of vented hydrogen, as defined by Argonne National Labs or another reputable source, in accordance with 1.c.ii

***Calculated using the GREET 2021 Excel model with default assumptions:**

- **Emission-free feed = 7,321 g CO2/mmBtu (0.8327 kg CO2/kg H2)**
- **Co-product feed = 13,382 g CO2/mmBtu (1.5220 kg CO2/kg H2)**
- **This results in a difference of 6,061 g CO2/mmBtu, or 0.6894 kg CO2/kg H2**

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

These processes typically involve venting or flaring the hydrogen as a waste product, both of which have GHG implications. During the 2022 GREET training at Argonne National Labs, Dr. Elgowainy, the lead developer of the hydrogen model within GREET, stated the negative GHG effects of vented hydrogen are quantifiable and significant enough that there is a strong case to be made for processes that eliminate vented hydrogen to receive a credit.

d. 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 CO_2-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?

Any clean hydrogen produced should be claimable under 45V even if the production facility output is split between qualified and non-qualified production. This is important and practical for certain processes to support the goal of developing a hydrogen economy. Certain processes, such as electrolysis and SMR facilities, have the option for both qualifying and non-qualifying feedstocks, which allows producers to offer early adopters of hydrogen technology a much higher certainty of supply. For example, an electrolysis process may use both electricity from a grid and electricity from renewable sources (wind, solar, nuclear, etc), and alternate between the two based on availability. Similarly, an SMR facility may use both RNG and NG as a feedstock. Both plants have redundant sources of power/feedstock to maintain security of supply for their customers, who may be powering critical infrastructure with hydrogen as the fuel. Therefore, non-qualifying production should not invalidate qualified production. Additionally, by having hourly qualification granularity as required in 1.e.ii allows for accurate accounting of the production for qualified and non-qualified production.

e. 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?

Qualified clean hydrogen processes should have energy inputs verified through metered connections to the energy provider (electrical, NG, etc). If metered connections are not available or not practicable, alternative methods of input should be applied, such as applicable power purchase agreement for non-metered connections. Additionally, process data recorded in a telemetry system can be used to provide more granular detail on the usage, and may be necessary for matching energy inputs to qualified outputs on the time domain specified in 1.e.ii. For the purposes of this submission, a telemetry system is a digital system for automatically recording and transmitting process data through instrument readings. The system should be digital and have appropriate data lineage to support validation of the process data.

i. How might clean hydrogen production facilities verify the production of qualified clean hydrogen using other specific energy sources?

Specific energy sources should be documented and measured using data that is readily available or without unnecessary burden to produce. For example, if an operator is using a telemetry system providing real-time data, this should be used. In the absence of data, the producer should be able to demonstrate best efforts to verify energy consumption using different, but justifiable methods.

ii. 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?

Hourly would be the most appropriate timeframe, although daily would also be appropriate. An hourly to daily time frame allows for several benefits:

1. **Normal deviations or non-constant processes to average out over a reasonable time frame. For example, a site with a compressed air storage tank may have the compressor cycle on for a few minutes at a time to refill the tank. This high energy usage would likely materially alter the score of the product during those few minutes, perhaps even disqualifying the production. However, when the energy usage is spread across a longer time of production, the effect would be accurately represented and accounted for. Therefore, overly restrictive requirements should be avoided, and there should be an avenue available for producers to submit for special consideration for processes that should reasonably be judged under different time frames.**
2. **Hourly to daily time domains avoid excessive accounting requirements or undue burden on the producers while providing enough flexibility for both established and new businesses to participant.**
3. **In addition to supporting process engineering, further consideration should be given to data frequency needs for business purposes. For**

example, invoicing and billing cycles are typically conducted on a monthly cycle. Financial reporting is typically conducted on a weekly, monthly, and quarterly basis. Time matching should support requirements for process engineering and business operations.

(2) 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 CO_2-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?

The well-to-gate analysis should mirror the 'cradle-to-grave' mentality that Argonne National Lab uses when modeling processes with GREET.

(3) Provisional Emissions Rate. For hydrogen production processes for which a lifecycle greenhouse gas emissions rate has not been determined for purposes of § 45V, a taxpayer may file a petition with the Secretary for determination of the lifecycle greenhouse gas emissions rate of the hydrogen the taxpayer produces.

a. At what stage in the production process should a taxpayer be able to file such a petition for a provisional emissions rate?

A taxpayer should be able to file a petition between when a final technology design is completed for the production process and the completion of the first year of operations of hydrogen production. To the extent possible, prior to production, the petition for a provisional emissions rate should be supported by an independent engineer and other relevant third-party professionals with qualifications to support the petition.

b. What criteria should be considered by the Secretary in making a determination regarding the provisional emissions rate?

As stated in 3.a, the Secretary should require sufficient representations from the producer that give the highest degree of confident provisional rates will transition to permanent rates and not be revoked.

(4) 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?

Taxpayers can use utility statements, telemetry data, production reports (including feedstock information), bills-of-lading, Certificates of Analysis, contracts, and other documentation containing cost information.

The use of a qualified, independent, and objective party to provide validation through a reasonable auditing and reporting process is encouraged.

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

Lifecycle GHG emissions should be monitored through telemetry systems tracking energy utilization. Telemetry systems are able to provided the granularity required in 1.e.ii and also track energy relative to process equipment, thereby proving production conditions are producing clean hydrogen. Additionally, bill-of-lading or similar receipts can be used to validate amounts produced. This allows for specific utility tracking (electricity, Cooling water, compressed air, nitrogen, etc) while making it possible to deduct exempted energy usage (such as the proposed compression of 3 MPa in the draft of the CHPS). Automating this process provides for an unmolested data stream that can be verified by third parties and governmental audit services.

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

Metered connections, sub-metered connections, and power purchase agreements (PPAs) from the provider should be the basis for determining electrical usage. Additional documentation can be provided by telemetry systems, such as current transmitters on key electric consuming process steps to delineate specific process use as applicable.

d. 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?

The standard should be a telemetry system in which data is fed into a model to track the productions emissions score in near-real time, based on the specified time domain. For example, a 1-hour moving average calculation for CI would be an appropriate standard in accordance with the decision for 1.e.ii. This approach allows a highly granular approach with easily auditable data lineage that is accurate and flexible should changes to the model for emissions calculations be made.

e. 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?

The same standards for verification should be applied regardless of if the end use is internal or external to maintain a standardized process.

f. 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?

Yes, a book and claim system should be approved for the production of clean hydrogen and the claiming of 45V credits. There should be reasonable application of transportation costs for delivery of fungible goods. For example, RNG put into a pipeline that is nominated for use should have the emission burdens from pipeline transportation associated with it, and green electrical usage should be constrained to the same grid in which the electricity is used. This is both in accordance with the GREET model and serves to prevent greenwashing through unrealistic, cross-country attribute transfer.

g. 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?

As stated in 4.f, there should be reasonable application of transportation costs for delivery of fungible goods. For example, if RNG is put into a pipeline, the process that is nominated for that RNG use should have pipeline transportation emissions costs associated with it based on the proximity of the process to the feedstock. Similarly, low-emission electrical usage should be constrained to the same grid in which the electricity is produced. This is accordance with the GREET model and prevents greenwashing. The time of purchase and use should also coincide with resource generation to avoid abuse of cyclical resource availability and/or energy grid arbitrage. For example, solar power generated during daylight hours should not be claimable against production that occurred in the night, as that is not realistic.

(5) 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?

No response to be provided.

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?

No response to be provided.

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?

No response to be provided.

(6) 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?

No response to be provided.

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?

"In the case of a facility in which more than 1 person has an ownership interest, except to the extent provided in regulations prescribed by the Secretary, production from the facility shall be allocated among such persons

in proportion to their respective ownership interests in the gross sales from such facility."

Full support.

b. Coordination with § 48.

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?

No response to be provided

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?"

No response to be provided

a. Coordination with § 45Q. 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?

No response to be provided

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

No response to be provided