Electrochaea Corporation • 9921 Carmel Mountain Rd. #325 • San Diego, CA • 92129-2813

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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: Request for Comments on the Credits for Clean Hydrogen and Clean Fuel Production, Notice 2022-58

Electrochaea Corporation appreciates the opportunity to provide comments in response to the U.S. Department of Treasury notice released on November 3, 2022 (Notice 2022-0058) regarding Credits for Clean Hydrogen and Clean Fuel Production. Electrochaea is a provider of a power-to-gas biomethanation solution for the industrial-scale production of synthetic methane, a process that utilizes clean hydrogen as a feedstock. The power-to-gas biomethanation process can decarbonize the gas grid by replacing fossil natural gas with renewable synthetic methane and providing long-duration renewable energy storage. Implementing the Inflation Reduction Act of 2022 should proceed in a technology-agnostic manner to encourage new and innovative technologies consistent with the legislative goals. Clear definitions for the achievement of the legislative goals, without specification of technologies that can be deployed for such achievement, are needed to facilitate the implementation of current and emerging technologies supporting the energy transition.

Electrochaea's comments address the importance of the 45V credits on clean hydrogen end use, particularly in the synthesis of clean methane during the production of clean synthetic fuels. Notably, we recommend that (1) the well-to-gate system boundary of clean hydrogen production should include all relevant upstream and downstream emissions except infrastructure and facility construction, (2) indirect book accounting of clean electricity should be allowed to reduce a taxpayer's emission burden with yearly matching and nationwide geographical scope, and (3) 45Q credits should be allowed for separate carbon capture processes that do not act on the CI of the produced hydrogen.

I. Power-to-gas biomethanation stores clean hydrogen in synthetic renewable methane.

Innovative hydrogen utilization technology. Electrochaea's industrial-scale power-to-gas biomethanation technology produces grid-quality renewable synthetic methane, a replacement for all uses of fossil natural gas, using clean hydrogen and carbon dioxide (CO_2). Clean hydrogen can be used from any source that delivers hydrogen with a qualified Carbon Intensity (CI). The CO_2 feedstock can come from raw biogas or purified CO_2. The use of synthetic methane avoids extraction and combustion of fossil natural gas. Analogous to the greening of the power grid by solar and wind, energy delivered in the gas grid is becoming decarbonized as the percentage of renewable natural gas and renewable synthetic methane is increased in the gas infrastructure.

Storage of clean hydrogen in synthetic methane. Hydrogen is more difficult and expensive to store and transport than natural gas. Instead of storing hydrogen directly, hydrogen can be used to produce synthetic methane, a natural gas replacement, which can be easily stored and transported in the existing gas infrastructure.

Multiple end-uses for hydrogen support the clean hydrogen market. As markets for clean hydrogen develop, risks will be reduced if multiple end users are supported. New sectors which use clean hydrogen will drive the clean hydrogen market[1]. Incentives, such as the 45V credit, supporting multiple types of end-users for clean hydrogen, is an essential means to sustain and grow the hydrogen market. Figure 1 provides a prediction for hydrogen demand, with increasing use of hydrogen for synfuel (synthetic fuels) production, through 2070 under a sustainable development scenario (SDS)[2].

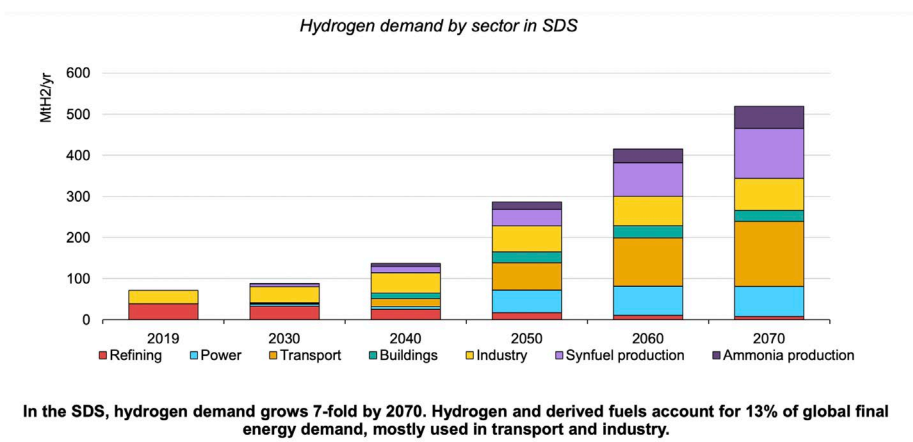

Figure 1. The international Energy Agency predicts the clean hydrogen demand. This chart highlights the need for multiple end users and shows that production of chemicals, including fuels, is an important use of hydrogen.

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[1] In the 2021 tracking report from the International Energy Agency on hydrogen, it is concluded that "demand growth in new sectors (e.g. for some transport and industrial applications, production of synthetic fuels and electricity storage)," will drive the expansion of the clean hydrogen market.
https://www.iea.org/reports/hydrogen

[2] https://iea.blob.core.windows.net/assets/a76b2cc9-f7e3-459e-945e-91b8ff54d0fc/210318_IEA_Kristiansen.pdf

II. Comments on specific questions posed in Notice 2022-0058 regarding Clean Hydrogen and Clean Fuel Production

.01 Credit for Production of Clean Hydrogen.

(1) 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?

'Qualified clean hydrogen' is defined as "hydrogen which is produced through a process that results in a lifecycle greenhouse gas emissions rate of not greater than 4 kilograms of CO_2e per kilogram of hydrogen." Additional requirements include that the hydrogen must be produced in the United States, in the ordinary course of business, and for sale or use, and be verified by an unrelated party. Electrochaea agrees that basing the definition on greenhouse gas emissions supports the development and implementation of any technology that can meet the emissions benchmark. As discussed below, the emissions that are included in the calculation of CO2e per kilogram of hydrogen produced must be clearly defined.

(1)(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?

For the well-to-gate system boundary for clean hydrogen production, Electrochaea recommends including important emissions sources that affect the CI of the produced hydrogen. This boundary should include emissions that are directly caused by the production process as well as indirect upstream and downstream impacts. Direct process emissions include any greenhouse gases released at the production facility via combustion or other chemical reaction. Indirect upstream emissions should include the extraction, processing, and delivery of any energy source including fuel or electricity, or other feedstocks used in the process. Indirect downstream emissions include the processing, transport, or disposal of any waste or emissions generated at the hydrogen production facility, especially when carbon capture and sequestration is used to reduce the produced hydrogen's CI.

We recommend excluding the impact of the construction of any electrical infrastructure including generating and transmission infrastructure. We also recommend excluding the impact of the construction of the clean hydrogen production facility. These types of impacts are relatively small when distributed across the technology's lifespan of 20-25 years and would likely vary by site and manufacturer.

(1)(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)?
(iii) What considerations support the recommended approaches to these issues?

Lifecycle greenhouse gas emissions should be allocated to co-products from the clean hydrogen production process in a way that reflects the actual displacement of other energy sources or industrial processes. Therefore, we recommend a system expansion approach to best capture the benefits of utilizing these co-products. For example, a co-product of steam should be credited with the emissions savings associated with the amount of natural gas combustion required to produce that same steam. We also advocate for the explicit inclusion of any utilized process heat as an eligible co-product, even if it is not steam. The electrolysis process releases heat that can be incorporated into other processes, and if that heat is incorporated into another process, it can promote emissions savings. Likewise, oxygen is a potentially valuable co-product of electrolysis and should be compared against the displacement of traditional oxygen production methods such as through cryogenic methods.

> *(1)(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 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?*

To reflect the spirit of a clean hydrogen production tax credit, facilities should be eligible to claim the § 45V credit for all the qualified clean hydrogen it produces. Disqualifying a facility for the entire year for any amount of hydrogen greater than 4 kg CO2e/kg H_2 would increase the risk calculated by investors on these types of projects and discourage investments that would provide substantial qualifying clean hydrogen to the market. Additionally, some of the hydrogen production technologies, such as electrolysis, are not cost-competitive currently without the tax credit. This market force naturally encourages producers to ensure that they are producing qualified clean hydrogen.

> *(1)(e)(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?*

We recommend an annual matching of energy inputs when evaluating the qualified clean hydrogen production process to encourage the maximum amount of investment to scale clean technologies. Electrolysis is a technology that suffers from both high capital costs and operating costs, and being able to operate a plant continuously helps mitigate at least the high initial investment required. Allowing yearly matching of clean electricity ensures operational stability which could result in a quicker scale-up of the technology and reliability of supply for offtakers of clean hydrogen.

> *(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). 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?*

Electrochaea agrees that it is important to align with the DOE CHPS. See the answer above to question (1)(a) for our recommendation on the well-to-gate system boundary.

> *(4)(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?*
> *(4)(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?*

Indirect book accounting factors should be included to reduce a taxpayer's effective greenhouse gas emissions because it will allow operational stability and encourage investment in a variety of technologies. For electrolysis, being able to secure clean electricity from the grid helps simplify project logistics and reduces the investment risk for the installation of electrolyzers. The use of the indirect book accounting factors of RECs is encouraged to allow clean electricity procurement using a grid connection.

Timing and vintage should consist of yearly matching in the same calendar year and a wide geographical scope of the continental United States should also be considered to maintain coherent markets and operational stability for electrolyzers.

> *(6)(c) 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?*

We recommend that both 45V and 45Q credits be permitted in cases where the carbon capture is unrelated to or outside the well-to-gate scope of clean hydrogen production. In such cases, carbon capture is not an enabling qualification for clean hydrogen production regardless of whether these or other process trains are contained within a single facility. The combination of multiple trains within a facility can result in efficiencies in capital use, logistics, or transportation that can improve economic efficiency, the efficiency of energy use, or both. Synthetic fuel production, including power-to-gas biomethanation, is a suite of technologies that require both hydrogen and carbon dioxide, but the processes of acquiring those feedstocks are typically unrelated. For example, in synthetic methane production, the CO_2 may come from biogenic sources such as ethanol plants or anaerobic digestors, while the hydrogen comes from an unrelated process – electrolysis using clean electricity. In this case, the carbon capture does not affect hydrogen production, nor does the carbon capture appear in the well-to-gate scope of the 45V tax credit.

We believe that the Inflation Reduction Act of 2022 is an important step to accelerate the decarbonization of the USA's energy supply by incentivizing new innovative technologies such as our power-to-gas biomethanation process. Accordingly, Electrochaea appreciates the opportunity to submit these comments.

Sincerely,

Mich Hein
President
Electrochaea Corp.
Mich.Hein@Electrochaea.com