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Via Electronic Submission to: http://www.regulations.gov (IRS-2022-58)

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

Re: Comments of Air Products and Chemicals, Inc. to the U.S. Department of Treasury's Request for Comments on Credits for Clean Hydrogen and Clean Fuel Production (Notice 2022-58)

To Whom It May Concern:

Please find below and attached the comments of Air Products and Chemicals, Inc. ("Air Products") on the U.S. Department of Treasury's ("Treasury") Request for Comments on Credits for Clean Hydrogen and Clean Fuel Production issued on November 3, 2022.[1]

Air Products appreciates the opportunity to comment in response to Treasury's request related to §45V qualified clean hydrogen production credits. The United States will need all sources of clean energy to decarbonize our economy and policies that are technology neutral and focused on emission reductions will be the keys to this success. This will more rapidly position the United States to be a leader in clean energy production, deployment, and export.

Background on Air Products

Air Products is a global leader that provides essential industrial gases, related equipment, and applications expertise to over 150,000 customers across over 30 industries, including energy, chemicals, metals, electronics, manufacturing, water treatment, and food and beverage. Founded over eight decades ago, the company now has over 750 production facilities and over 21,000 employees in 50 countries around the world. It is headquartered in Allentown, Pennsylvania, with significant operations throughout the United States.

Air Products is the world's largest producer of hydrogen, with over 60 years of experience in the industry. Air Products has a proven record of innovation—including researching, piloting, and

[1] Notice 2022-58; 2022-47 I.R.B. 1, Request for Comments on Credits for Clean Hydrogen and Clean Fuel Production (irs.gov)

adopting the best technologies available. Indeed, the company has invested billions of dollars in low-carbon hydrogen projects and focuses on delivering safe end-to-end solutions, developing clean energy projects at scale, and driving the industry forward to a cleaner future. Air Products leads efforts to decarbonize heavy transportation such as trucks, buses, and ships, as well as industrial sectors that are difficult to electrify or where hydrogen is used as feedstock, such as steelmaking and chemicals processing.

On July 25, 2022, Air Products announced[2] that it will spend or commit at least $4 billion in additional new capital for the transition to clean energy over the next five years. In the two years preceding this announcement, Air Products had announced approximately $11 billion in clean energy investments, including:

- A $4.5 billion blue hydrogen clean energy complex in Louisiana, which represents the company's largest investment ever in the United States and will sequester more than five million tons of CO_2 per year. This project will capture 95% of the facility's CO_2 emissions and produce blue hydrogen with near-zero carbon emissions.

- A green hydrogen facility based in Casa Grande, Arizona, just outside Phoenix, is expected to be onstream in 2023 and is anticipated to produce zero-carbon liquid hydrogen for the transportation market.

- A $2.5 billion major expansion project with World Energy to develop North America's largest sustainable aviation fuel production facility in Paramount, California. The project will expand the site's total fuel capacity to 340 million gallons annually, and among other investments, includes an extension and capacity increase of Air Products' existing hydrogen pipeline network in Southern California. The project is scheduled to be onstream in 2025.

- A multi-billion-dollar project in Neom, Saudi Arabia which will be the world's largest green hydrogen project and require more electrolyzer capacity than has been deployed throughout the world to date. This project alone will serve to scale global electrolyzer production capacity and manufacturing, helping to bring down the costs of this important technology.

- An innovative $1.6 billion net-zero carbon hydrogen production complex in Alberta, Canada, which achieves net-zero emissions through the combination of

[2] Air Products, Air Products Announces Additional "Third by '30" CO2 Emissions Reduction Goal, Commitment to Net Zero by 2050, and Increase in New Capital for Energy Transition to $15 Billion (July 25, 2022)

> advanced hydrogen reforming technology, carbon capture and storage, and hydrogen-fueled electricity generation. Air Products recently won the Best Carbon Management Initiative Award for this project at the 2021 *Chemical Week* Sustainability Awards.

In the most recent example of Air Products' role as the world leader in hydrogen production, Air Products announced plans to invest about $500 million in a large-scale facility to produce clean hydrogen at a greenfield site in Massena, New York.[3] The facility will be powered by 94 MW of low-cost St. Lawrence River hydroelectric power and create 90 jobs in New York.

Hydrogen Production is Key to Decarbonization

Hydrogen is a versatile energy carrier, which can be used to generate heat and electricity, to store energy or to serve as a feedstock in a variety of applications.[4] Hydrogen is particularly useful in replacing fossil energy in hard-to-abate sectors like heavy-duty transportation (trucks, rail, shipping, aviation), industrial heat (where electric heat is insufficient), and power.

There is a large infrastructure of hydrogen today that meets the needs of many industrial applications, such as energy, chemical production, and electronics processing. Currently, much of that hydrogen is produced by steam methane reforming (SMR) from natural gas (so called "grey hydrogen") and almost 95% of that hydrogen production is captive, meaning it is used on the site where it is produced. For the 5% of hydrogen production that is delivered to customers (a.k.a. "merchant" hydrogen), delivery can be by truck or pipeline. The infrastructure associated with today's hydrogen production and distribution serves as the foundation for the transition to cleaner low carbon hydrogen in the future. Incentives, such as the newly enacted §45V and expanded §45Q, will be valuable tools to stimulate the transition to clean hydrogen for use in decarbonizing hard-to-abate sectors.[5]

Air Products Supports Treasury's Efforts to Implement §45V

Air Products supports Treasury's efforts to advance concepts for implementing §45V crediting for qualified clean hydrogen production. Clarity and certainty for how to qualify hydrogen for

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[3] Air Products, *Air Products to Invest About $500 Million to Build Green Hydrogen Production Facility in New York* (Oct. 6, 2022), https://www.airproducts.com/news-center/2022/10/1006-air-products-to-build-green-hydrogen-production-facility-in-new-york

[4] For additional discussion of hydrogen basics, including how hydrogen is produced and why it is an efficient fuel, visit Hydrogen Basics (airproducts.com)

[5] For additional discussion, visit https://www.airproducts.com/industries/hydrogen-energy/hydrogen-energy-faqs. For discussion of hydrogen fuel safety, visit https://www.airproducts.com/industries/hydrogen-energy/hydrogen-fuel-safety.

credits is vital to driving the investments envisioned by the Inflation Reduction Act ("IRA"). It also will serve as a foundation to determine domestic competitiveness in the energy transition taking place throughout the American economy in the years to come.

Certainty is Urgently Needed

Treasury must establish the lifecycle greenhouse gas ("GHG") emissions rate calculation methodologies and inputs soon to promote the use of clean hydrogen as a meaningful part of the energy transition. Without this certainty, investment decisions and important projects will be delayed. To that end, Air Products encourages Treasury to establish clear guidelines and efficient mechanisms to obtain certainty when guidelines are unclear, or when customization is desired by the applicant.

Another important element of this certainty is consistency between the U.S. Department of Energy ("DOE") Clean Hydrogen Production Standard ("CHPS") guidance ("CHPS Draft Guidance") and the guidance provided by Treasury. The Treasury Department and the Internal Revenue Service will need to draw on DOE's deep expertise in the standards for evaluating lifecycle GHG emissions to properly implement these hydrogen credits, as has been done in the context of carbon sequestration tax credits under §45Q. It is notable that the CHPS Draft Guidance proposes a "well to gate" boundary and a lifecycle GHG emissions rate of 4.0 kg carbon dioxide equivalent (CO2e)/kg hydrogen as an upper bound which is consistent with the requirements of §45V(c)(2)(A).[6] A taxpayer's eligibility to claim the credits, as well as the amount of the credits, will depend on the lifecycle GHG emissions rate of the hydrogen production process used at the facility, as determined under §45V(c)(1). Alignment between what hydrogen qualifies as clean hydrogen for hydrogen hubs and as qualified clean hydrogen for §45V will promote the kinds of investments that these policies are targeting.

Flexibility is Needed to Drive Innovation

While certainty is needed in many respects, we urge Treasury to provide flexibility for hydrogen producers to elect custom modeling approaches to incorporate site-specific energy inputs, feedstocks, and operational parameters. These modeling approaches will follow conventional lifecycle analysis frameworks and resulting emission rates will be independently verified. We believe that overly prescriptive restrictions on specific pathways to meet §45V might inadvertently favor specific technologies and project configurations. Also, while §45V focuses on domestic hydrogen production, it should not constrain the sale of clean hydrogen in the United States in view of the growth potential of the global hydrogen market. Given the pace of innovation,

[6] *Notice of Availability of Draft Guidance on Hydrogen and Fuel Cell Program*, 87 Fed. Reg. 58,776 (Sept. 28, 2022) (hereinafter "Draft Guidance"). The complete Draft Guidance document is located at U.S. Department of Energy Clean Hydrogen Production Standard (CHPS) Draft Guidance

"choosing the winners and losers" could slow down technology development and energy transition which is the opposite outcome of what the §45V credits are intended to promote. The promotion of both certainty and flexibility is not without precedent in the tax code.[7]

* * *

Air Products appreciates the opportunity to provide comments on this important request and stands ready to assist the Treasury Department in its efforts to spur the development of clean hydrogen. Please do not hesitate to contact me with any questions or if Air Products or I can otherwise be of assistance to the Treasury Department.

Sincerely,

Eric Guter
Vice President, Hydrogen for Mobility

Attachment

[7] Treasury and the IRS have promulgated rules in existing energy tax guidance that provide taxpayers with the certainty and flexibility similar to what we seek. For example, the begin construction requirements for the §45 and 48 energy credits provide taxpayers with certainty through an objective rule (5% safe harbor) and flexibility through a subjective rule (physical work of a significant nature). These alternatives provide taxpayers with the choice of either the ability to be certain when their projects begin construction or the flexibility to begin activity in a variety of ways for purposes of their financing or construction. timelines. Providing taxpayers with both certainty and flexibility has worked well for the renewable industry over the past two decades and would be appropriate in this instance.

Attachment
Air Products' Comments on Credits for Clean Hydrogen and Clean Fuel Production

Executive Summary

As detailed in the responses below, Air Products recommends the following:

1. Treasury should define the "well-to-gate" system boundary and emission sources to be consistent with the recommendations from CHPS Draft Guidance.[1] (Response 1a)

2. The "well-to-gate" system boundary should be set to exclude any post-hydrogen production processes including hydrogen purification, compression, liquefaction, transport, and other activities. (Response 1a)

3. Treasury should recognize the variety of feedstock options used to produce hydrogen including, but not limited to, natural gas, renewable electricity, ammonia (NH_3), renewable natural gas and other biogenic gaseous or solid feedstocks, and recognize that some feedstocks, like renewable natural gas, have a negative GHG emissions rate under the Greenhouse Gases, Regulated Emissions, and Energy Use in Technology Model ("GREET") model. (Response 1a)

4. Treasury should clarify that the cracking of ammonia (NH_3) qualifies as production for purposes of §45V (Response 1a).

5. Treasury should adopt all co-product allocation methodologies allowed in the GREET model and allow taxpayers to elect the methodology best suited for their facility. (Response 1b)

6. Air Products recommends that whenever hydrogen is extracted from hydrogen-containing offgases, it should be burdened with the lifecycle GHG emissions of the fuel that replaced the hydrogen content of these offgases plus the energy used to extract and purify the hydrogen. (Response 1c)

7. Treasury should allow taxpayers to quantify emissions for hydrogen produced in a taxable year using either an average lifecycle GHG emissions rate for all annual production or alternatively for separate quantities of eligible clean hydrogen produced. (Responses 1d and 1e)

8. Treasury should allow taxpayers to trace different feedstocks and power sources to separate quantities of hydrogen produced when feedstocks and power sources of varied carbon intensity are processed or consumed concurrently. (Response 1d)

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[1] *Notice of Availability of Draft Guidance on Hydrogen and Fuel Cell Program*, 87 Fed. Reg. 58,776 (Sept. 28, 2022). The complete CHPS Draft Guidance document is located at [U.S. Department of Energy Clean Hydrogen Production Standard (CHPS) Draft Guidance]

9. Treasury should establish numeric factors that can be used in the GREET model as "defaults" so project developers can calculate lifecycle GHG emissions rate in conjunction with project design and cost estimates. Treasury should enable taxpayers by election to use actual, verified emission values in lieu of established default values. (Response 1)

10. Treasury should establish a procedure for taxpayers to obtain a timely provisional emission rate estimate approval if desired. This procedure should be available to taxpayers early in the project design phase. (Response 3)

11. The lifecycle GHG emissions rate documentation should be consistent with the key parameters that were used in calculating the lifecycle GHG emissions rate including when an applicant has requested a provisional emission rate. (Response 4a)

12. Treasury should recognize renewable energy certificates, power purchase agreements, and thermal and biogas (renewable natural gas) credits when calculating the lifecycle GHG emissions rate of hydrogen, subject to specified geographic limitations described in more detail below (commonly referred to as a "book and claim" approach). Treasury should permit the book and claim approach for both production feedstocks and process energy required to produce hydrogen. (Responses 4f and 4e)

13. Treasury should confirm there is no minimum dollar threshold for capitalized expenses required to satisfy the requirements of §45(d)(4)(B)(ii). (Response 7)

14. Treasury should confirm that the §45V(d)(4) provision treating a facility as newly placed in service prevents application of §45V(d)(2) related to pre-modification §45Q credit claims. (Response 7)

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?

Answer: Overall, Air Products supports the definition of clean hydrogen in §45V, which defines clean hydrogen based on "well-to-gate" lifecycle GHG emissions and references the GREET model for determining carbon intensity. We note also that taxpayers should be allowed to use either the Excel version of the GREET model or the web version (GREET.NET) both of which are managed by Argonne National Labs. To further clarify the definition of qualified clean hydrogen, additional guidance is required. This additional guidance falls into two categories: 1) specific guidance about how the GREET model is used, and 2) more specifics on the scope of the "well-to-gate" (see response 1a).

Specific guidance about how the GREET model is used

Standard values for upstream GHG emissions and power production

Several standard (default) values currently are necessary to estimate lifecycle emissions for hydrogen production using the GREET model and should be adopted for purposes of §45V. Default values are most helpful for energy input parameters that the hydrogen producer may not be able to control or impact in certain scenarios. For example, a hydrogen producer may not know the emissions associated with the energy inputs that it acquires from an unrelated party. Some default values are already built into the GREET model as options, and Treasury should allow taxpayers to elect to use these default values when calculating emissions. Examples of existing default values include the upstream emissions associated with natural gas processing and the emissions associated with producing the power used by the hydrogen plant. Treasury should make these default values available as soon as possible so that developers can be confident that their plant designs will be eligible for the expected §45V credit. Moreover, Treasury should update these default values periodically to reflect the anticipated emission reductions as both the electricity and natural gas grids decarbonize. Taxpayers should have the option to use the latest established default values for their emissions calculations – or provide project-specific inputs where the default values are not representative as discussed further below.

Project specific data for hydrogen plants

Treasury should allow hydrogen producers to use project-specific data in lieu of published defaults for the calculation of the lifecycle GHG emissions rate, so long as it is accurate and verifiable. In some cases, the hydrogen producer may make additional investments or operational changes that impact the energy inputs or other parameters that make customization desirable. Treasury could require a certain level of analysis and data, certification, or reference to a similar, previously approved pathway in the cases where a producer chooses to customize the modeling and lifecycle GHG emission calculation. The California Air Resources Board provides this flexibility as an example, using modified GREET model values for lifecycle analysis and a similar optional mechanism to ensure that producers benefit from maximizing carbon reduction.[2] There are many methods of hydrogen production, and each method will have different emissions given the configurations of unique plants. Accordingly, individualized emissions estimates will often be necessary to achieve credible results, spur innovation, and encourage private investment.

One example where an individualized emission estimate would be beneficial is related to the emissions for natural gas production upstream of hydrogen plants. A hydrogen producer may choose to partner with or buy natural gas from suppliers that have worked to reduce fugitive

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[2] *See* Cal. Code Regs. tit. 17 §95486.1(a)(2) ("[T]he carbon intensity of the fuel or blendstock [is] measured in gCO2e/MJ, determined by a CA-GREET pathway *or a custom pathway* and incorporates a land use modifier."); *see also* Cal. Code Regs. tit. 17 §95488.5; California Air Resources Board, *Lookup Table for Gasoline and Diesel and Fuels that Substitute for Gasoline and Diesel* (undated), Table 7.1: Lookup Table for Gasoline and Diesel and Fuels that Substitute for Gasoline and Diesel (ca.gov)

methane emissions and other GHG emissions. Other hydrogen producers may also choose to construct hydrogen plants in proximity to natural gas production facilities or locate production facilities in areas where GHG emissions from natural gas production are low. Allowing these reductions, derived from project-specific data, to be counted in the calculation of the hydrogen lifecycle GHG emissions rate will spur innovation and GHG reductions by incentivizing producers to develop ways to minimize upstream GHG emissions – and will complement other decarbonization efforts to reduce methane as a potent GHG in the fossil energy sector.

(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?

Answer: Treasury should adopt the definition of "well-to-gate" emissions as described in the CHPS Draft Guidance. The steps and emission sources as described in the CHPS Draft Guidance and illustrated by Figure 1 therein capture the appropriate system boundaries for lifecycle emissions from hydrogen. The CHPS Draft Guidance states that, "The lifecycle system boundary accounts for these tradeoffs by including all key emission sources associated with feedstock extraction and production." Consistent with this statement, Air Products recommends a minor clarification of the term "Extraction of feedstock" to include "Extraction or Production of Feedstock." on Figure 1. Modifying this term provides clarity that *produced* feedstocks such as biopropane, biogenic off-gases, ammonia, and solid fuels (both fossil and biogenic), are intended to be treated similarly to *extracted* feedstocks like natural gas for the purpose of lifecycle analysis.[4] The definition of "well-to-gate" should clarify that only lifecycle emissions from hydrogen production are included, and that emissions related to downstream purification, compression, liquefaction, transport, and other activities. are not included. For example, the definition should provide a purity level to qualify as clean hydrogen and exclude emissions from additional hydrogen purification steps. Air Products proposes to limit the impurity level to only carbon-containing impurities and allow at least 2 mole % carbon containing impurities, such as carbon monoxide and methane which are present in typical hydrogen production processes. A limit on carbon-containing impurities will limit the downstream CO_2 emission impact of using the

[3] The well-to-gate system boundary for hydrogen production includes emissions associated with feedstock growth, gathering, and/or extraction; feedstock delivery to a hydrogen production facility; conversion of feedstock to hydrogen at a production facility; generation of electricity consumed by a hydrogen production facility (including feedstock extraction for electricity generation, feedstock delivery, and the electricity generation process itself); and sequestration of carbon dioxide generated by a hydrogen production facility.

[4] *See* CHPS Draft Guidance at 4 ("The lifecycle system boundary accounts for these tradeoffs by including all key emissions sources associated with feedstock *extraction* or production, generation of electricity, feedstock delivery, hydrogen production, potential releases during CO2 transport, and carbon capture and sequestration of GHGs generated by the production process." (Emphasis added)).

hydrogen while allowing for flexible hydrogen production configurations for a variety of end-use applications.

In contrast to the hydrogen purity restriction proposed in the CHPS Draft Guidance,[5] Air Products recommends that any purity requirement should only consider carbon containing impurities and not include species that do not contain carbon. Including non-carbon species would be unnecessarily restrictive and, when it comes to non-carbon species content, provides no climate-related benefit. For instance, when hydrogen is used for combustion applications, removing nitrogen can be detrimental because the nitrogen has a positive impact on combustion characteristics such as flame temperature and generation of nitrogen oxides. Restricting non-carbon impurities from the value would not provide climate-related benefits.

Use of renewable natural gas – either through direct connection or via a book and claim crediting approach when applied to hydrogen production will substantially lower the lifecycle GHG emissions rate of the produced hydrogen within the GREET model "well-to-gate" definition and may even result in a negative lifecycle GHG emissions rate. <u>Treasury should recognize the negative lifecycle GHG emissions rate of some renewable gases (e.g., renewable natural gas from agricultural waste) and enable the lifecycle GHG emissions rate calculation methodology, including the attributes that contribute to a negative lifecycle GHG emissions rate throughout the entire 10-year crediting period.</u> The benefits of renewable gases can be enhanced when coupled with carbon capture,[6] which may result in a negative lifecycle GHG emissions rate of hydrogen production. Production of hydrogen from biogenic resources frequently results in net removal of lifecycle carbon from the environment, and this benefit should be accounted for in the lifecycle GHG emission rate. Once an entity has made such an investment in low carbon feedstocks, we urge Treasury to recognize ("grandfather") the negative carbon attributes of processed feedstock for the duration of the crediting period if there is a subsequent methodology change that would impact the attributes of that feedstock. It is important for entities to have this investment certainty for the full crediting period.

§45V does not provide a definition of production but the lifecycle analysis boundaries detailed in the CHPS Draft Guidance include the energy associated with both the extraction and production of feedstock. One such "produced" feedstock is ammonia from which hydrogen can be produced through ammonia cracking. Ammonia cracking is a technology by which ammonia is dissociated in the presence of heat to produce hydrogen and nitrogen. The nitrogen is typically emitted to the atmosphere from where it was originally sourced, while the hydrogen is recovered. The energy for

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[5] See CHPS Draft Guidance footnote 11 which states "the target corresponds to a functional unit of 1 kilogram of hydrogen at 99% purity and 3 megapascals (MPa) pressure."

[6] Air Products notes that if §45 V production tax credits are provided based on the lifecycle GHG emissions rate of a production employing carbon capture that they are precluded from receiving §45Q credits.

the heat could be supplied by natural gas, renewable natural gas (directly connected or by renewable/biogas credits via book and claim crediting), or by using some of the ammonia itself to provide the energy. In many respects, this process is like the production of green hydrogen via electrolysis. Electrolysis uses energy to crack a molecule of water into hydrogen and oxygen. Ammonia cracking uses energy to crack a molecule of ammonia into hydrogen and nitrogen. Both hydrogen production technologies fit within the "well-to-gate" definition and should qualify as production for the purposes of the §45V credit. Hydrogen can be derived from a number of feedstocks including natural gas, water through electrolysis, and ammonia. Given that the IRA ties the tax credit to carbon intensity and not feedstock, tax law should not discriminate or treat production differently based on the feedstock. As long as the feedstock and production of hydrogen from said feedstock meets the clean hydrogen production requirements, it should be eligible for the tax credit. <u>We therefore request that Treasury clarify that the cracking of ammonia (NH_3) qualifies as production for purposes of §45V</u>.

Ammonia will become an important part of the hydrogen hub networks serving as a low carbon hydrogen feedstock. Since bulk storage and transport of hydrogen will be critical to the success of the hydrogen economy, in some cases ammonia will provide advantages over conventional compressed and liquefied hydrogen where transport distances are long, or long-duration energy storage is required. For example, it could be used for bulk storage and transport between hubs over long distances or where existing ammonia pipeline infrastructure is already in place.

Hydrogen is also a feedstock for the synthesis of ammonia. This raises the possibility that the §45V credit could be available for both the original production of the hydrogen feedstock and subsequent ammonia cracking, or §45Q and §45V if the hydrogen was originally produced with CCS. Treasury should address this potential for duplicate credit claims by limiting availability of the §45V credit for hydrogen production via ammonia cracking when either the §45V or §45Q credit has already been claimed for the hydrogen feedstock so that the credit can be claimed only once. The operator of the ammonia cracker who desires to claim the credit should be required to ensure that the credit has not been claimed previously.

(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?

<u>Answer</u>: Hydrogen plants often produce marketable co-products, such as steam, power, or carbon monoxide, along with the main hydrogen product. To compute the lifecycle GHG emissions rate of the hydrogen products, it is necessary to allocate the GHG emissions among the hydrogen and various co-products. Various methods are available within the GREET model to accomplish this allocation, including energy-based allocation, mass-based allocation, and displacement-based allocation. We request that taxpayers have the flexibility to select from any of these allocation methodologies prescribed in the GREET model on a facility-by-facility basis and allow method changes when circumstances change.

All allocation methods could work in a variety of different ways. For example, a typical blue or gray hydrogen production plant will often use natural gas and electric power as the main energy inputs and will produce a hydrogen product and a steam co-product. Such hydrogen production will lead to lifecycle GHG emissions from the following sources: (1) the upstream GHG emissions associated with producing the natural gas feed, (2) the emissions associated with generating the power required to operate the plant, and (3) the direct carbon dioxide emissions from the plant operations. The allocation method will determine how the total GHG emissions are allocated between the hydrogen product and the steam co-product. For example, in an energy allocation, the GHG emissions would be divided between hydrogen and steam based on the ratio of the energy content of each product or co-product. Alternatively, in a displacement-based allocation, the first step is to calculate the GHG emissions that are avoided due to the presence of the co-product. In the case of a steam co-product, GHG emissions are avoided because the steam co-product displaces steam that would have been otherwise produced in a fossil fuel fired boiler. These avoided GHG emissions are subtracted from the emission of the hydrogen plant to arrive at well-to-gate emissions of hydrogen, and the remaining GHG emissions are allocated to the hydrogen product.

The use of displacement method for allocating GHG emissions is a standard method used for life cycle analysis and has recently been described by members of the GREET model development team.[7] With reference to the "well-to-gate" emissions, the authors state that, "In calculating the WTG CI[8] of H2 from the SMR process, a credit is calculated for exported steam, assuming emissions have been avoided from a natural gas fired boiler that would have been needed to produce the same amount and quality of SMR exported steam." In this context, exporting steam from the hydrogen plant is the most efficient use of steam and serves to reduce GHG emissions. Hence, by ensuring that the displacement method is an allowed method within §45V, the life cycle emissions will be most accurately computed, and hydrogen producers will be incentivized to develop a process that most efficiently utilizes the steam. While steam production has been the focus in the example and citation given, the flexibility for alternate co-product allocation methods apply to electricity, carbon monoxide, and other coproducts as well. The key is to enable the taxpayer the flexibility to propose different co-product allocation methods that best fit their

[7] *Hydrogen Life-Cycle Analysis in Support of Clean Hydrogen Production*, Amgad Elgowainy, Edward D. Frank, Pradeep Vyawahare, Clarence Ng, Adarsh Bafana, Andrew Burnham, Pingping Sun, Hao Cai, Uisung Lee, Krishna Reddi, and Michael Wang, October 2022. Available at Hydrogen Life Cycle Analysis in Support of Clean Hydrogen Production (Technical Report) | OSTI.GOV

[8] CI stands for 'Carbon Intensity' has the same meaning as 'GHG emissions rate.'

operation, are consistent with the GREET model methodologies, and can be independently verified.

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

Answer: Air Products recommends that whenever hydrogen is extracted from hydrogen-containing offgases, it should be burdened with the lifecycle GHG emissions of the fuel that replaced the hydrogen content of these offgases plus the energy used to extract and purify the hydrogen. This is important as the offgases are normally used as an energy source and if they are redirected for hydrogen extraction, then replacement of the portion of the energy the hydrogen provided and associated CO_2 emissions would occur. The taxpayer would have the burden of proving that the hydrogen was used for a productive purpose and not simply vented or flared. According to the International Partnership for Hydrogen and Fuel Cells in the Economy ("IPHE") draft report titled "Methodology for Determining the Greenhouse Gas Emissions Associated with the Production of Hydrogen," much of the byproduct hydrogen produced in this process "is used to produce hydrochloric acid, ammonia, hydrogen peroxide, or is burned for power and/or steam production." [9]

(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?

Answer: Treasury should allow taxpayers to elect to claim the §45V credit for any amount of clean hydrogen produced in a taxable year by a facility provided it meets the definition of qualified clean hydrogen and can be independently verified to meet an emission rate tier[10]. We support the flexibility to calculate emissions either by excluding nonqualifying clean hydrogen production or by including it in an annual average lifecycle GHG emissions rate calculation. This determination should be made annually on a facility-by-facility basis. We provide examples below to illustrate this point.

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[9] H2PATF Methodology for GHG Quantification in H2 Production_A4FINAL (iphe.net).

[10] We use the term 'emission rate tier' to indicate a range of well-to-gate GHG emission rates, corresponding to the same §45V credit.

- If half of the hydrogen production at a facility in a given a taxable year meets the 0.45 kg of CO2e/kg hydrogen because it was derived using zero-carbon electricity, but the other half of the year the lifecycle GHG emissions rate significantly exceeded the 4 kg CO2e/kg hydrogen because it was derived from a high emitting grid electricity source, the taxpayer should be able to claim credit for the quantity of hydrogen that met the limit produced during part of the year.

- If that same facility produced hydrogen with a lifecycle GHG emissions rate lower than the 0.45 kg CO2e/kg hydrogen tier limit for most of the year but intermittently exceeds the tier limit (e.g., during start-ups or shutdowns), the taxpayer should be able to claim all the production as eligible clean hydrogen on an annual average basis. Similar flexibilities should exist when clean hydrogen is produced during a taxable year where some meets a lower tier level, and some meets a higher tier level. Taxpayers should have the flexibility to claim credit for each quantity produced with a lifecycle GHG emissions rate meeting their respective tier levels or at the tier level met when the carbon intensities are averaged in proportion to the quantity of each produced.

- Equally important, Treasury should provide this same flexibility for simultaneously processed feedstocks. For example, in a given taxable year, a steam methane reforming hydrogen plant might simultaneously process a biogenic feedstock like renewable natural gas with fossil natural gas. The hydrogen molecules produced from each feedstock are identical and commingled, but the quantity of hydrogen produced from each feedstock can be properly apportioned based on the quantity of each feedstock used. Our understanding is that the commonly accepted treatment of such situations is to recognize co-feedstocks – in this example renewable natural gas and fossil natural gas – as a blend and produced hydrogen as having a single mass-averaged GHG emissions rate. The CHPS Draft Guidance[11] and a 2021 study by National Energy Technology Laboratory ("NETL")[12] appear to use this approach. Similarly, when natural gas is delivered by pipeline and used, it is common practice to assume a single average GHG emission rate of methane molecules, although in actuality they might have been produced at different locations with different rates of fugitive or process emissions.

  We suggest, however, that the entity should have the flexibility to claim either that all hydrogen is produced with single mass averaged GHG emissions rate, or that only a portion of hydrogen produced corresponding to the share of biogenic feedstock consumed is qualified clean

[11] CHPS Draft Guidance at 3 (proposing, for instance, that certain systems "could also achieve emissions lower than 4.0 $kgCO_{2e}/kgH_2$ through optimized design choices, such as the *use of greater shares* of clean electricity and *low-carbon forms of biomass*") (emphasis added).

[12] NTEL "Comparison of Commercial, State-of-the-Art, Fossil-Based Hydrogen Production Technologies" (2021): "*Blending RNG with pipeline NG* may reduce the LCA GHG profile depending on the GWP of the RNG considered" (emphasis added).

hydrogen. Allowing such flexibility will, in our view, incentivize partial conversion of existing hydrogen facilities to clean hydrogen, when full conversion is not commercially practical. We note that California Low Carbon Fuel Standard ("LCFS") offers similar flexibility,[13]and has successfully stimulated growth in production of renewable hydrogen for mobility purposes through use of renewable natural gas (alongside fossil natural gas) at existing hydrogen production facilities and claiming that a proportionate share of produced hydrogen is renewable.

Allowing the flexibility in these examples will enable the fastest transition to clean hydrogen because it enhances a facility operator's ability to optimize operations and still claim credit when upsets or abnormal operations occur, or to tailor production to customers' needs by using several feedstocks with different carbon intensities. No single approach produces a more taxpayer-friendly result in all circumstances and requiring a single approach in all cases arbitrarily favors some projects over others. In all cases, the data and quantification methods used to determine distinct or averaged carbon intensities in proportion to hydrogen produced under varying operating scenarios or varied feedstock conditions are easily verifiable and auditable.

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

Answer: Air Products believes that there should be an annual independent third-party verification system to ensure that facilities operate in a way that supports the credit claim made to Treasury. There are many forms of documentation that can be used to substantiate energy inputs including utility invoices for energy purchased. For example, to the extent that a plant utilized grid electricity with an established emission rate based on the mix of electricity generation sources for that grid (as established in the GREET model), a credit applicant should simply be required to provide the record(s) of electricity purchased over the course of the taxable year. If the applicant instead purchases or produces its electricity or natural gas based on source and/or site-specific parameters, the recordkeeping to validate the emission rate of these energy sources would need to be kept by

[13] "General Rule. […] fuel producers and fuel reporting entities shall assign all units of fuel produced while a given set of production parameters is in effect the same CI, regardless whether those units will be sold in California. For example, where a producer uses both biogas and natural gas as process fuel, the producer shall assign all units produced a single CI that reflects the mix of process fuels used to produce those units", exception: "a producer or fuel reporting entity may assign different CIs to portions of the fuel produced […]. For example, a renewable diesel production facility may feed a mixture of soy oil, tallow, and used cooking oil into its production process. Or a hydrogen production facility may use *both natural gas and renewable natural gas as feedstock* for steam methane reformation. (the other exception relates to co-products) […]" (emphasis added).

the applicant and independently verified. Air Products continues to engage in substantial efforts to ensure its products demonstrate verifiable climate benefits including all energy inputs that are required to determine the lifecycle GHG emissions rate of qualified clean hydrogen.

Air Products also believes that Treasury guidance should allow a taxpayer to account for natural variations in lifecycle GHG emissions rate for commercial-scale deployments over the course of the taxable year. Actual lifecycle GHG emissions rate values "vary over time due to a variety of factors, including but not limited to seasonality, feedstock properties, plant maintenance, and unplanned interruptions and shutdowns."[14] Such normal variations would not necessarily include major plant modifications, changes in feedstock, or new, permanent energy inputs, which may require a new lifecycle analysis and lifecycle GHG emissions rate certification. Small temporary changes can cause large relative variations, especially when emissions are low. As a result, the Treasury guidance should account for natural variation by evaluating over an annual averaging period, which would reduce the regulatory burden for producers and create greater predictability. Moreover, adopting an annual period will prevent producers from benefiting or being punished for temporary variation that does not reflect the overall carbon reduction benefits of a facility. In any event, producers also should be allowed to demonstrate their own methodology to Treasury, given sufficient robustness and independent verification. All the energy inputs and data sources – whether from monitoring inside the operation (e.g., self-generated electricity or steam) or from outside the operation (e.g., utility purchases and records), would need to be detailed in the entity's methodology and verified independently at the time of credit application.

The ability to average operational variations annually should apply even in the cases detailed in response to question 1(d), when an entity might elect to report two different carbon intensities in a crediting period either due to operational or feedstock variability.

(2) <u>Alignment with the Clean Hydrogen Production Standard</u>. 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).[15] 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?

[14] *See* Cal. Code Regs. tit. 17 §95488.4(a).

[15] CHPS Draft Guidance is available at https://www.hydrogen.energy.gov/pdfs/clean-hydrogen-production-standard.pdf.

Answer: Please see our response to question 1(a). Air Products supports alignment between the CHPS Draft Guidance and §45V with respect to "well-to-gate" boundaries as modified in our response above.

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

Answer: Air Products supports a system where producers can petition for provisional emissions rates as early as the conceptual engineering stage of a project. The §45V(c)(2)(C) petitioning process should provide a timely way for project developers to get certainty in both the calculation methodology (including the GREET model options chosen), the input values used, and ultimately the lifecycle GHG emissions rate or emission rate that can be relied on for future §45V credits. Air Products recommends that concurrence with the provisional emission rate be provided by Treasury within 90 days of application.

Hydrogen production projects are typically developed over several years from initial conception to onstream hydrogen production. During this period, initial process designs are completed, and often multiple plant configurations are considered. This design work happens concurrently while the financial viability of the project is being assessed. Because the §45V tax credit will be a critical factor in determining the project's viability, when application of the GREET model is uncertain or project-specific details necessitate customization, it will be important that developers can petition for and receive certainty for the approach to emissions calculation from the design data which is often available at very early project stages and well before plant construction begins. The developer should be able to petition for this approval early in the project stages, so that approval can be received well before a final investment decision is made and before detailed engineering is completed. The emissions estimates can be updated by the developer as the design is refined, and in later stages, when operational data becomes available, and the tax credit is determined.

The final tax credit should be based on either published default emissions values or verified operational data, with the provisional estimate rates providing the needed certainty for producers about how the emissions calculation will be done once operational data is available. This certainty will spur innovations by giving producers confidence about how their new, innovative designs will be evaluated within the §45V regulatory framework.

The provisional emission rate estimates should focus on the methodology to calculate GHG emissions and the input parameters used within the calculation. These should be well-defined and approved by the Treasury during the conceptual project estimate stage. The preliminary design data used for the provisional estimates will be of secondary importance because the final value of tax credits will instead be based on operational data.

(*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?

Answer: The documentation should be consistent with the key parameters used in calculating the lifecycle GHG emissions rate. This documentation may include carbon dioxide measurement; product and co-product flow measurement; analysis of stream composition; utility invoices for purchased energy; and related materials. These parameters and the related monitoring documentation or plan could be included in a provisional emission rate request and approved by Treasury or kept on file by the applicant.

(b) What technologies or methodologies should be required for monitoring the lifecycle greenhouse gas emissions rate resulting from the clean hydrogen production process? (c) What technologies or accounting systems should be required for taxpayers to demonstrate sources of electricity supply? (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? (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?

Answer: Air Products continues to review these questions and may provide information to Treasury in the future.

(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?

Answer: Treasury should allow these market structures for both renewable electricity and biogas or renewable natural gas to reduce the lifecycle GHG emissions rate for §45V eligibility. Allowing such accounting credits enables the renewable energy source to be developed in the optimal location, which will likely not coincide with the best location for hydrogen production without the additional energy and associated emissions required to transport the renewable energy.

We believe that this was the clear congressional intent during the Senate floor debate on the IRA. Senator Ron Wyden, Chairman of the Senate Finance Committee, and Senator Tom Carper, Chairman of the Senate Environment and Public Works Committee, conducted a colloquy on this subject. The relevant exchange is as follows:[16]

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

<u>Treasury should allow the use of both renewable electricity and renewable natural gas credits to reduce the lifecycle GHG emissions rate whether used as feedstock and/or fuel for processing of other feedstocks in the production of hydrogen.</u> As an example, in a steam-methane reforming hydrogen plant, natural gas is used both as a feedstock for the chemical reaction that creates the hydrogen, but also provides the additional thermal energy required to promote the reaction. To promote additional renewables development and ensure the lowest hydrogen lifecycle GHG emissions rate, these low carbon credits should be applied to replace any fossil energy utilized in the production of hydrogen. Because there is a GHG reduction regardless of whether the fossil energy is used as feedstock or thermal energy, Treasury should use the §45V credits to encourage the replacement of fossil fuel whenever possible in the hydrogen production process. In all cases, robust lifecycle accounting methods must be used in the application of these credits and independent third-party verification employed to ensure validity of the claimed lifecycle GHG emissions rate.

(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?

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[16] 168 Cong. Rec. S4166 (daily ed. Aug. 6, 2022) (statement of Sen. Carper).

<u>Answer:</u> Air Products supports the use of renewable energy certificates or power purchase agreements if accompanied by geographical constraints to minimize congestion on the transmission grid. For example, the geographical constraints could be drawn based on the territories of Regional Transmission Organizations and similar entities. For renewable thermal or biogas credits, Air Products supports a geographic limitation based on connection to the North America pipeline system to encourage the development of renewable gas recovery and reuse projects wherever the sources are accessible within North America.

<u>(5) Unrelated Parties.</u>
(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? (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? (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?

<u>Answer</u>: Air Products continues to review these questions and may provide information to Treasury in the future.

<u>(6) Coordinating Rules.</u>
<u>(a) Application of certain §45 rules.</u> (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? (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? (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? (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?" (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?

<u>Answer</u>: Air Products continues to review these questions and may provide information to Treasury in the future.

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

Answer: Treasury should interpret §45V(d)(4) broadly in allowing existing facilities to be treated as newly placed in service for purposes of §45V(a)(1) following certain modifications. The provision generally states that if a facility placed in service before January 1, 2023, did not produce qualified clean hydrogen, and (1) is modified to produce qualified clean hydrogen, and (2) amounts paid with respect to the modification are chargeable to capital, then the modified facility is deemed to have been originally placed in service as of the date the assets required to complete the modification are placed in service.

Feedstock changes can substantially reduce GHG emissions from hydrogen production facilities. Hydrogen produced via typical processes, including steam methane reforming, autothermal reforming, or partial oxidation, but using certain biogenic and renewable feedstocks can qualify as qualified clean hydrogen, even absent carbon capture. In some cases, changing feedstock from fossil natural gas to biogenic or renewable feedstocks requires substantial plant modifications. These modifications might include process equipment to pre-treat, heat, compress and/or pre-reform the feedstock so it can be used in an existing hydrogen production facility. In other cases, little or no modification to a facility is required when substituting a renewable natural gas feedstock for a fossil natural gas feedstock, especially when the substitute feedstock is purchased through existing supply chains under a book-and-claim method. All such projects that enable production of eligible clean hydrogen should be encouraged regardless of the extent of physical modification.

To clarify the application of §45V(d)(4), we request that Treasury:

- Confirm there is no minimum dollar threshold for capitalized expenses required to satisfy the requirements of §45(d)(4)(B)(ii). If a taxpayer capitalizes expenses in connection with a modification, and the plant could not produce qualified clean hydrogen had the modification not been made, the test should be met. The statute does not impose a minimum threshold or suggest one is required. Because §45V(d)(4) is included in the statute itself, Treasury and the IRS do not need to create a separate test similar to the 5% start of construction safe harbor in §45Q, or another subjective test; and

- Confirm that the §45V(d)(4) provision treating a facility as newly placed in service prevents application of §45V(d)(2) related to pre-modification §45Q credit claims. Because §45V(d)(4) deems a plant to be newly placed in service, it is impossible for the deemed new facility to have any prior §45Q history.[17] This confirmation would encourage

[17] The treatment of capital expenditures giving rise to a new qualified facility (and eliminating the history of the prior facility) is consistent with other provisions of the IRA. For example, §45Y(b)(1)(C) provides that capital expenditures to increase the

continued use of facilities with existing carbon capture capability through conversion to qualified clean hydrogen production.

Clean Fuel Production Credit (§45Z).

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

Answer: Some clarity is needed with respect to §45Z(d)(4), which provides that the term "qualified facility" does not include any facility for which the §45V clean hydrogen credit is allowed for the taxable year. In some cases, a hydrogen producer could supply qualified clean hydrogen to a clean fuel producer from a hydrogen plant located immediately adjacent to the fuel producer's plant. In other cases, the hydrogen producer could supply the hydrogen to the fuel producer via truck or long-distance pipeline. In the second case, it seems clear that the hydrogen production facility and fuel production facility are two separate facilities and the §45Z credit would be available to the fuel producer. There is no policy reason to make the §45Z credit available in the second case, but not the first. Disallowing the §45Z credit for the first case would incent inefficient behavior. Treasury should clarify that when unrelated taxpayers own a hydrogen production facility and a fuel production facility, the hydrogen production facility and the fuel production facility will be considered separate facilities for purposes of §45Z(d)(4), no matter the facilities' proximity.

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capacity of a qualified clean electricity facility creates a new qualified facility to the extent of such increase in capacity. This deemed new facility is not subject to the prohibitions of §45Y(b)(1)(D), which disallows the §45Y credits to the extent certain other tax credits were claimed with respect to the original facility. A similar analysis should apply for purposes of §45V(d)(4). That is, improvements to an existing facility to allow it to produce qualified clean hydrogen will create a new qualified facility even if the §45Q credit had been claimed with respect to the prior, existing facility.