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Internal Revenue Service
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Room 5203
P.O. Box 7604,
Ben Franklin Station
Washington, DC 20044

RE: IRS and REG-117631-23

Plug Power Inc. ("Plug") submits these comments in response to the Department of Treasury's Notice of Proposed Rulemaking for the Section 45V Credit for the Production of Clean Hydrogen and Section 48(a)(15) Election to Treat Clean Hydrogen Production Facilities as Energy Property, 88 Fed. Reg. 89220 (Dec. 26, 2023) (the "NPRM").

Plug is a leading provider of end-to-end green hydrogen and fuel cell solutions. Through our Proton Exchange Membrane ("PEM") fuel cell products, Plug successfully created the first commercially viable market for hydrogen fuel cells and has deployed more than 65,000 fuel cells to date. Plug is building an end-to-end green hydrogen ecosystem – from production, storage, and delivery to energy generation. Our capabilities cover all aspects of the hydrogen value chain. Plug is building electrolytic hydrogen production plants at multiple locations across the United States – several of which are in operation, have already begun construction, or are in varying stages of development. Concurrently, Plug is exploring and investing in electrolytic hydrogen generation facilities in other countries, with such decisions driven in part by favorable policies on the production of electrolytic hydrogen and long-term decarbonization.

Plug is also a leader in PEM electrolysis technology, with nearly 50 years' experience in a variety of mission-critical naval and aerospace applications. Our electrolyzers can be paired with renewable energy resources such as solar, wind, and hydroelectric power to produce green hydrogen from water and delivered at gigawatt-scale. In the past three years, Plug has created thousands of new U.S. jobs and made an aggressive commitment to expanding U.S.-based manufacturing capabilities of its PEM fuel cell and electrolyzer systems, with a 200,000 square foot Gigafactory in Rochester, New York and 500,000 square foot manufacturing facility at Vista Technology Campus in Albany County, New York.

Plug appreciates the opportunity to submit comments on the NPRM. Enacted as part of the landmark Inflation Reduction Act of 2022 ("IRA"), Section 45V is a crucial mechanism for advancing the objective—shared by both Congress and the Biden administration—of jump-starting the nascent clean hydrogen industry. Through sufficient economic incentives, first-mover companies can make the early investments needed to begin scaling the clean hydrogen economy and drive cost-parity with cheaper fossil-based technologies. The successful implementation of Section 45V, faithful to the statutory scheme, will be pivotal to accomplishing this goal. To that end, Plug commends certain aspects of Treasury's NPRM—in particular, Treasury's recognition that hydrogen producers must be allowed to use Energy Attribute

Certificates ("EACs") when calculating the lifecycle greenhouse gas emissions associated with their clean hydrogen production processes and that "EACs are an established mechanism for substantiating the purchase of electricity from zero GHG-emitting sources[1]

At the same time, however, Plug has grave concerns about numerous aspects of the NPRM—most significantly Treasury's proposal to cabin the flexible use of EACs by codifying the highly restrictive "three pillars" of (i) "incrementality," (ii) hourly time-matching (after a period of annual time-matching), and (iii) "deliverability." The burdens imposed by this trio of restrictions will drastically stunt the growth of the clean hydrogen industry and prevent many promising projects from ever getting off the ground. The NPRM also proposes to lump together all hydrogen produced at a facility, including both "qualified clean hydrogen" (the defined term that Congress used in Section 45V) and non-qualified hydrogen for purposes of calculating the applicable annual emissions rate under Section 45V. Worse still, the entire foundation for the NPRM's adoption of the three pillars is built on regulatory quicksand—a speculative theory of "induced grid emissions" that is inadequately supported and does not remotely justify the blunt instrument of an across-the-board incrementality mandate, much less the imposition of all three pillars together. As we explain below, both individually and collectively, these requirements are statutorily questionable, unworkable, and unwise. At the very least, Plug urges Treasury to adopt crucial modifications of the proposed rules.[2]

EXECUTIVE SUMMARY

As discussed below,[3] Plug respectfully submits that the proposed regulations suffer from serious legal infirmities and would be highly vulnerable to vacatur in the event of litigation, including on the grounds that they exceed the limited statutory authority that Congress delegated to Treasury in 26 U.S.C. § 45V ("Section 45V") and violate the Administrative Procedure Act ("APA"). To avoid exacerbating the legal vulnerabilities of the proposed regulations, at a minimum, Plug requests the following modifications (which would help mitigate the most onerous concerns about the proposed rules and their unworkability):

a. **Grandfathering/First-Mover Protections are Essential for U.S. Energy Leadership:** The final regulations should include grandfathering provisions that (i) allow hydrogen producers to rely on the regulatory framework in place at the time of the facility's "beginning of construction" date for the entirety of the producer's ten-year Section 45V credit; and (ii) exempt from the incrementality, time-matching, and deliverability requirements clean hydrogen projects that began construction prior to the publication of the final regulation in the Federal Register (and after passage of the IRA). Within these grandfathering protections, Treasury should also adopt a "beginning of construction" exception to incrementality that would allow all hydrogen projects under construction by Dec. 31, 2026, to use existing clean power resources to produce clean hydrogen through the term of the Section 45V tax credit.

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[1] NPRM, 88 Fed. Reg. at 89227.

[2] *See infra* Sections I and V.

[3] *See infra* Sections III through V.

b. **<u>Section 45V Should Afford Meaningful Access to Clean Baseload Power</u>:** Plug respectfully maintains that the proposed incrementality requirement would exceed Congress' delegation of authority to Treasury in Section 45V and violate the APA. However, if the final rules impose any incrementality requirement, at the very least, such provisions should afford several pathways for hydrogen producers to access hydroelectric, nuclear, and other clean baseload power resources. The NPRM seeks comments on several alternative frameworks.[4] Plug appreciates Treasury's willingness to consider these alternatives and submits that, at a minimum, any incrementality framework should include: (i) a carveout for facilities located in jurisdictions with renewable portfolio standards, clean power mandates, or other similar policies; (ii) an allowance of 10% of a power producer's minimal or zero-emitting resources, measured at the owner level; (iii) exceptions for facilities with renewed or relicensed operations; and (iv) an option for hydrogen producers to submit data demonstrating zero or minimal induced grid emissions in any given case (or category of cases). We respectfully suggest that the full suite of alternative incrementality metrics should be included. In addition to formulaic incrementality approaches, Treasury should also adopt a pre-December 31, 2026 "beginning of construction" exception to incrementality, to address multi-year interconnection queues and better align with the goals of the U.S. Department of Energy's ("DOE") Regional Clean Hydrogen Hub program.

c. **<u>Any Amount and Duration of Qualified Clean Hydrogen Production Should Be Eligible</u>**: Proposed §1.45V-4(a) should be modified to allow a qualified clean hydrogen production facility to claim the Section 45V credit for any amount of qualified clean hydrogen produced via any process that makes the hydrogen eligible for the credit within a given year. As currently drafted, the proposed provision would require a taxpayer to lump together all hydrogen produced via different processes (e.g., hydrogen produced using grid energy without applying EACs and hydrogen produced using wind energy) in a given year. This proposed requirement is inconsistent with the plain statutory language of Section 45V and would create perverse incentives counter to Section 45V's objectives of incentivizing clean hydrogen projects. This draft provision's detrimental impact is compounded by the extremely onerous proposed hourly temporal matching requirement.

d. **<u>Hourly Temporal Matching Should Not Be Imposed Until Commercially Appropriate</u>**: The final regulations should not impose hourly temporal matching until hourly EAC tracking products are broadly available on the market. EAC tracking would need to be commercially available within the next 12 months to comply with the draft regulation's proposed January 1, 2028 phase-in. Treasury should only apply an hourly matching requirement if the hourly EAC market is appropriately developed and commercially available at a reasonable rate for clean hydrogen production. To verify this market development, DOE should conduct a study to ensure the market is viable for clean hydrogen producers. Treasury could also consider a potential good faith exemption for clean hydrogen projects that operate where no such market is available.

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[4] *See* NPRM, 88 Fed. Reg. at 89228–32.

We appreciate Treasury's consideration of these recommendations and look forward to the public hearing on the draft regulations. Attached hereto as Appendix A, please see in-person testimony request and outline.

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I. The Proposed Rule Would Drastically Undermine Incentives to Invest in the Production of Clean Hydrogen, Contrary to Congress's Objectives.

The whole point of Section 45V, as well as related policies enacted by Congress, is to provide sufficient economic incentives to spur hydrogen producers, such as Plug, to make the extraordinarily capital-intensive investments required to decarbonize hard-to-abate sectors. Congress enacted the Section 45V tax credit as part of a comprehensive suite of tax incentives and subsidies designed to spur investment in, and expansion of, clean hydrogen production.[5] This was consistent with the objectives of a package of complementary and roughly contemporaneous legislation, including the Infrastructure Investment and Jobs Act.[6]

At present, the clean hydrogen industry is at an inflection point. There is overwhelming consensus among federal policymakers, industry, and academia that clean hydrogen is vital to economy-wide decarbonization; and further, our decarbonization timelines demand scaled clean hydrogen generation by early 2030s at the latest. The need for rapid deployment of clean hydrogen generation is even more urgent given (i) the availability of low-cost existing fossil-based hydrogen and (ii) large hydrogen volumes required for difficult to decarbonize sectors, such as steel and ammonia production. Congress recognized Section 45V as a necessary policy to scale clean hydrogen generation. Despite this clear policy directive, proponents of hourly temporal matching, incrementality, and deliverability have sought to impose non-statutory requirements into a tax credit rooted in driving cost parity between new, more-costly technologies and traditional fossil fuels. The three pillar concepts are both absent from the statutory text and counter to Section 45V's legislative objectives.

Plug has conducted extensive analyses on the economic and decarbonization impacts of incrementality, deliverability, and temporal-matching (attached hereto as Appendix B). These analyses demonstrate that the three pillars have adverse economic impacts that jeopardize economy-wide decarbonization, domestic energy security, and job creation. Each pillar increases the levelized cost of hydrogen ("LCOH"). When compounded, the three pillars erode Section 45V's economic benefit and quell clean hydrogen investment. As a result, the three pillars do little more than reduce clean hydrogen opportunities, job creation, and emissions reductions for hard-to-abate sectors. The analyses attached as Appendix B demonstrate the following:

a. Incrementality:

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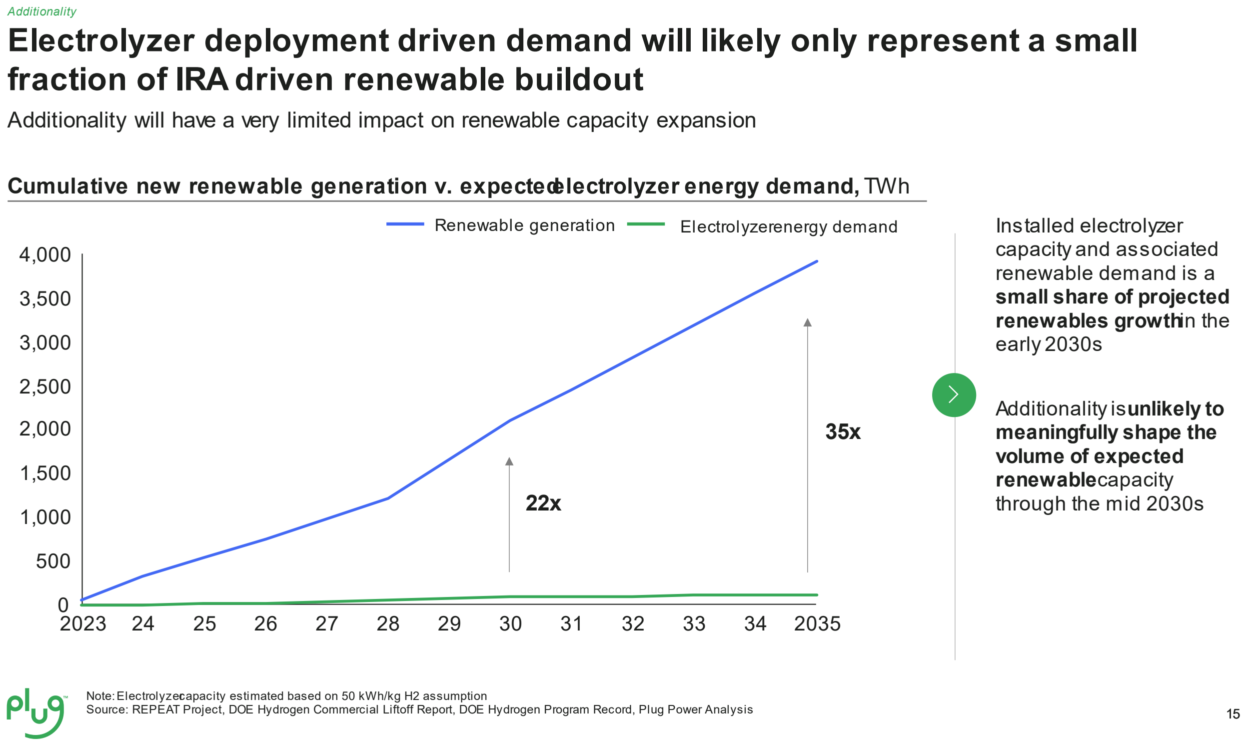
[5] *See, e.g.*, H. Rep. No. 117-130, p. 5 (2021) (discussing "comprehensive investments" implemented by legislation, including, among other things, "clean energy and transportation tax credits, to help us reduce our carbon footprint" and to "incentiviz[e] private sector development and investment"); Building a Clean Energy Economy: A Guidebook to the Inflation Reduction Act's Investments in Climate Action (The White House Jan. 2023, Version 2) at 74 ("Clean hydrogen is a major component of President Biden's plan to decarbonize the industrial sector . . . The Inflation Reduction Act creates a new Hydrogen Production Tax Credit to incentivize the domestic production of clean hydrogen, which will make this emerging low-carbon fuel source more cost-competitive and help the country meet the ambitious goals of the Hydrogen Shot.").

[6] *See, e.g.*, 42 U.S.C. § 16151(1) (stating Congress's purpose to "enable and promote comprehensive development . . . and commercialization of hydrogen and fuel cell technology in partnership with industry"); *id.*, Note to § 16151 ("Congress finds that . . . hydrogen plays a critical part in the comprehensive energy portfolio of the United States") (enacted in Pub. L. 117-58, Div. D, Title III, § 40311).

The number of renewable resources projected to come online, particularly attributed to the IRA, will far exceed the projected electrolytic hydrogen production capacity. Incrementality would unnecessarily tie hydrogen production projects to renewable generation interconnection queues. Multi-year interconnection delays will jeopardize decarbonizing hard-to-abate industries. Heavy emitting industries, like steel and ammonia, would not be able to begin their decarbonization transitions, as the clean hydrogen supply would be delayed and necessary price decreases would not be guaranteed. An immediate incrementality requirement would reduce clean hydrogen demand (~10%), associated investments (~$1.8B), job creation (~570,000 jobs), and cumulative GHG abatement potential (56 Mt CO2eq).



Additionality

Electrolyzer deployment driven demand will likely only represent a small fraction of IRA driven renewable buildout

Additionality will have a very limited impact on renewable capacity expansion

Cumulative new renewable generation v. expected electrolyzer energy demand, TWh

Installed electrolyzer capacity and associated renewable demand is a **small share of projected renewables growth** in the early 2030s

Additionality is **unlikely to meaningfully shape the volume of expected renewable** capacity through the mid 2030s

Note: Electrolyzer capacity estimated based on 50 kWh/kg H2 assumption
Source: REPEAT Project, DOE Hydrogen Commercial Liftoff Report, DOE Hydrogen Program Record, Plug Power Analysis

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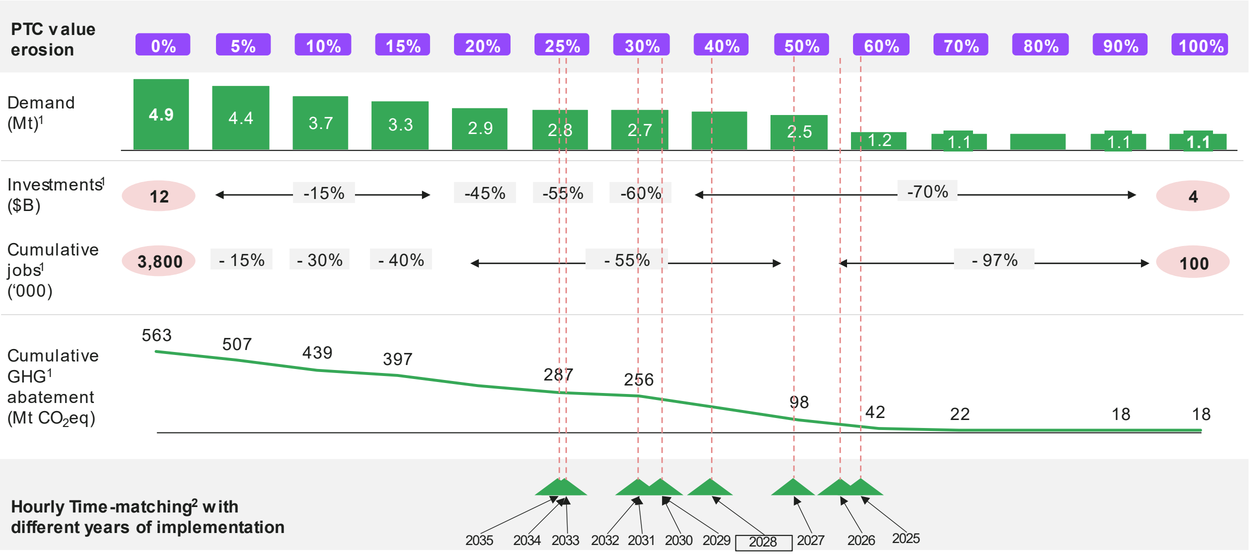
b. Hourly Temporal-Matching:

A transition beginning in 2028 would increase the cost of hydrogen by up to $1.3/kg, effectively eroding ~40% of the production tax credit ("PTC") value, and increasing the LCOH to such a point that applications and industries with higher price sensitivity would be priced out. Disincentivizing price-sensitive, carbon intensive industries would reduce clean hydrogen demand by ~50%, associated investments by ~$8.4B, job creation by ~2,000,000 jobs, and cumulative GHG abatement potential by ~400 Mt CO2eq.

Impact of increased LCOH costs on demand, investments, jobs and GHG emissions across different hourly time-matching scenarios



1. Values correspond to 2032 for investments made (final year for PTC eligibility), 2035 for cumulative jobs, and 2040 for green hydrogen demand and cumulative GHG emissions abatement
2. Impact is measured at the ISO/RTO level

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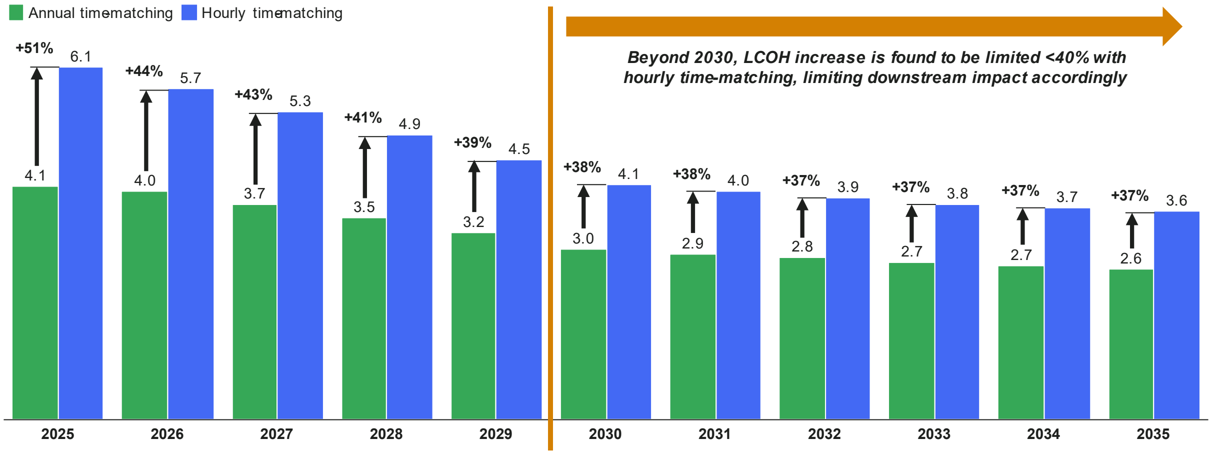
Time Matching Comparison

Annual vs Hourly Time Matching

Increasing the LCOH too much will prevent industries from decarbonizing with green hydrogen by pricing them out…

Difference in LCOH between annual and hourly time-matching[1], $/kg H2



Beyond 2030, LCOH increase is found to be limited <40% with hourly time-matching, limiting downstream impact accordingly

There is always a significant impact upon the LCOH and emissions abatement potential. However, this becomes more manageable if implemented after 2030. NOTE: This is highly dependent upon the regionality definition. This data is using regions defined as the ISO/RTO zones.

1. Representative results for Georgia, considering VPPAs within ISO/RTO

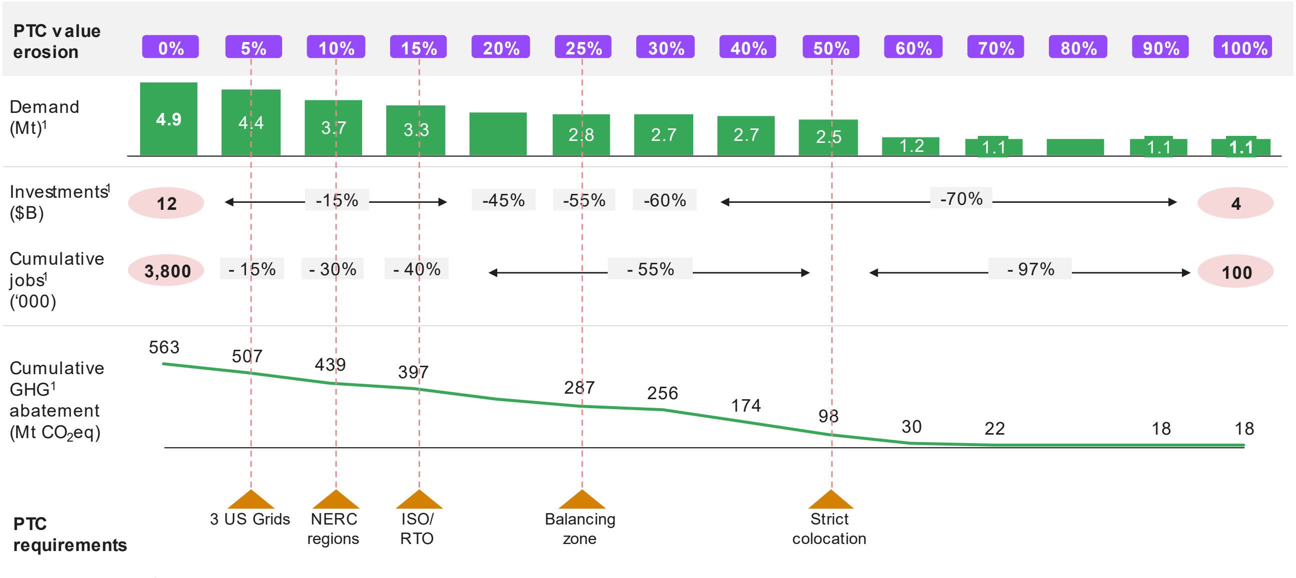
Source: Plug Power analysis

c. Regionality/deliverability:

Deliverability would create regional winners and losers and drive hydrogen projects to limited regions of the United States. Regions with challenging grid dynamics would have untenably unfavorable environments to develop clean hydrogen projects. This is directly counter to the goals of the DOE Regional Clean Hydrogen Hubs (H2Hubs) program, where the H2Hubs are to form a foundation of a national clean hydrogen network that would contribute substantially to decarbonizing multiple sectors of the economy. A deliverability requirement would increase the cost of hydrogen by up to $1/kg due to project and logistics/distribution costs increasing. Up to 50% of the PTC value could be eroded in the most stringent scenarios, where ~10% is possible if less granular regions are adopted (e.g., three U.S. grids or NERC regions).

Regionality

Impact of increased LCOH costs on demand, investments, jobs and GHG emissions across multiple scenarios



1. Values correspond to 2032 for investments made (final year for PTC eligibility), 2035 for cumulative jobs, and 2040 for hydrogen demand and cumulative GHG emissions abatement

Regionality

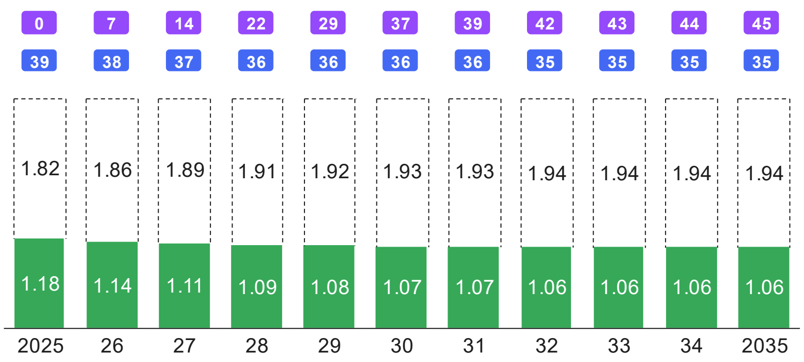
Delayed implementation of regionality likely has a limited effect on reducing cost impacts; establishing the right regions will likely be a crucial driver

🟩 Increase in LCOH ($/kg) ⬚ Effective PTC ($/kg)

x % capex reduction from 2025 baseline

x % reduction in effective PTC

LCOH change[1] due to hard deliverability requirement across archetypes (nat. av.), $/kg



Regionality's negative impacts on PTC effectiveness remain, even when capex reduces over time.

Therefore, **establishing the right regions will likely be a crucial driver** for successful PTC implementation.

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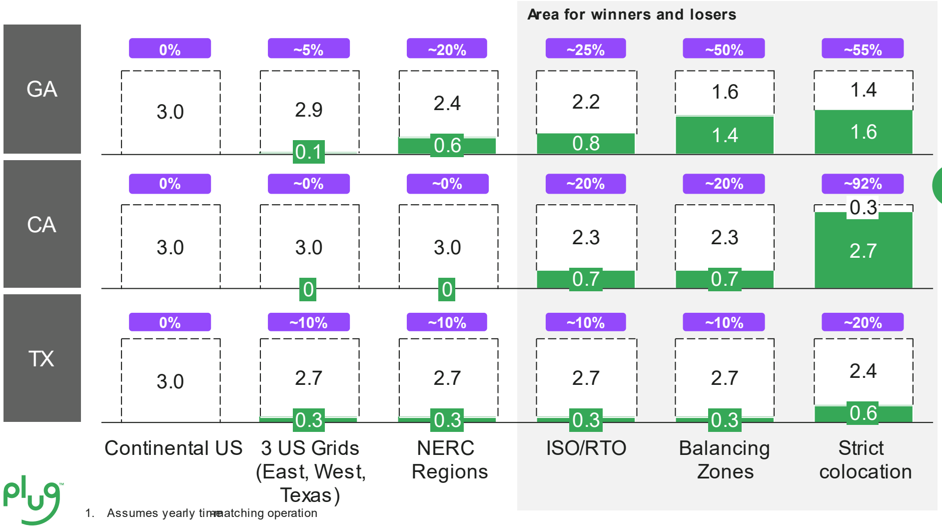
1. Impact is measured with production moving from at the ISO-level to strict-colocation over time, yearly time-matching operatio

Regionality

…and narrower region definitions could preemptively disadvantage certain regions/ states in the US

LCOH impact as a function of deliverability requirements[1] across archetypes, 2025, $/kg

🟩 Increase in LCOH ($/kg) ⬚ Effective PTC ($/kg) x % reduction effective PTC



Different locations are subject to **wider or narrower geographic definitions below the NERC level** thereby disadvantaging certain US regions/ states

For example, when going from 3 US Grids down to a Balancing Zone:

- Locations in TX see no impact since Texas is its own Grid, NERC Zone, ISO/RTO, and Balancing Zone
- Location in GA sees a new impact at every different level going from East Grid, to SERC, to Southeast RTO, to the Southern Co. Balancing Zone

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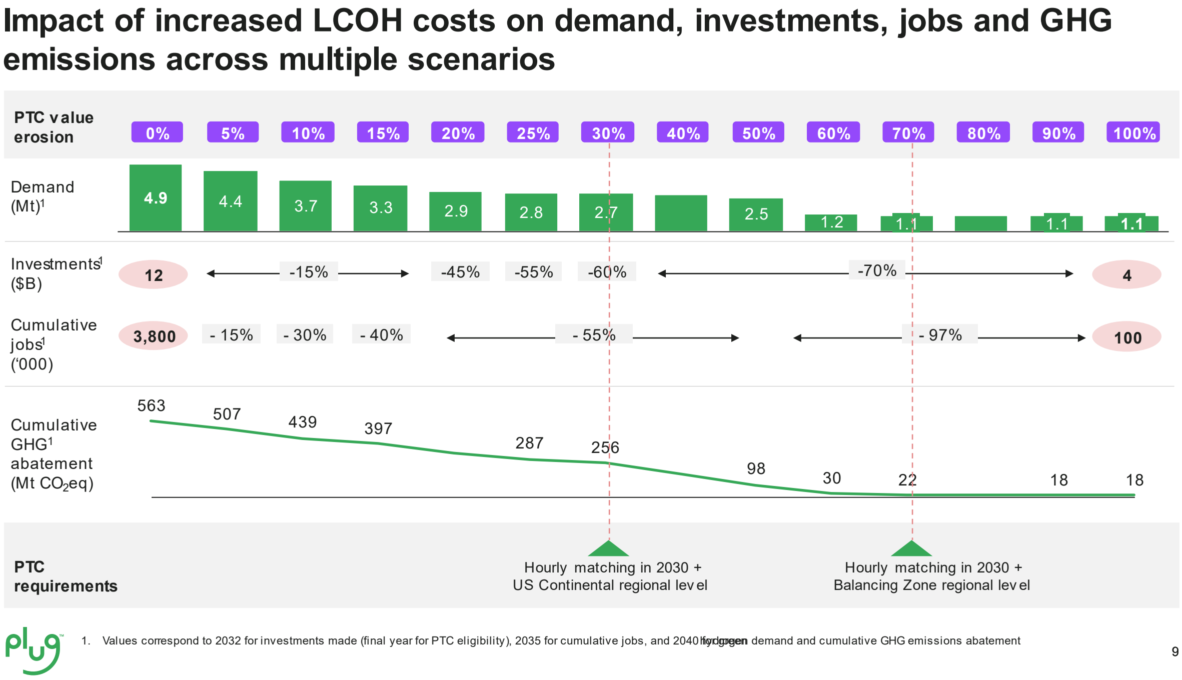
1. Assumes yearly time-matching operation

d. The Three Pillars Have Compounding Effects:

Even if hourly time-matching and regionality requirements are both imposed in 2030, those requirements could still erode between 30-70% of the PTC value ($0.9 - $2.10 LCOH increase), depending upon geographical boundaries and given location. **This increase is an average value across regions and does not directly include the impact of incrementality; constraining the quantity of eligible clean generation resources would likely further increase the LCOH and correspondingly erode more, if not all, of the $3/kg credit value.**



Impact of increased LCOH costs on demand, investments, jobs and GHG emissions across multiple scenarios

1. Values correspond to 2032 for investments made (final year for PTC eligibility), 2035 for cumulative jobs, and 2040 for hydrogen demand and cumulative GHG emissions abatement

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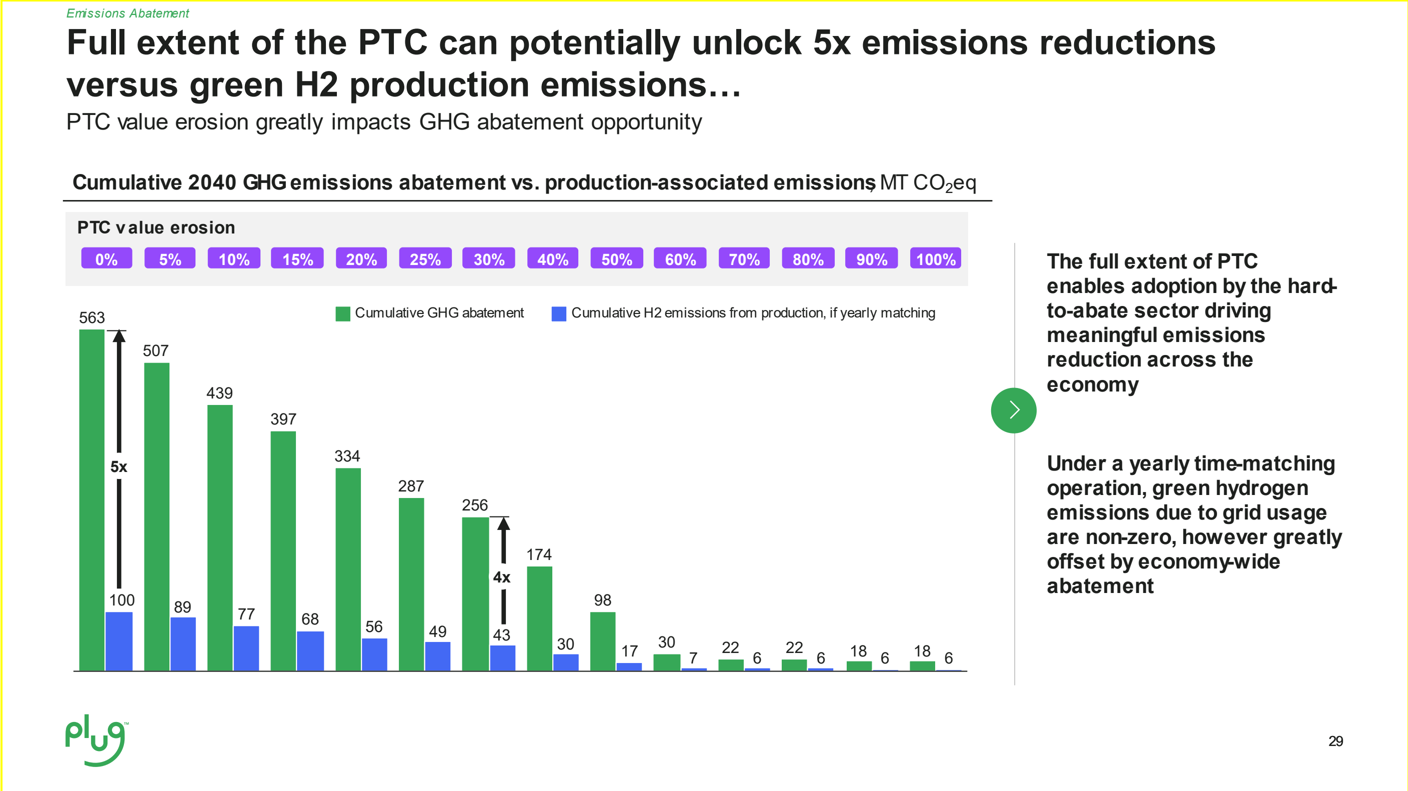
e. Full Realization of the Section 45V Credit:

The decarbonization, job creation, and environmental justice benefits of scaling nascent clean hydrogen generation cannot be overstated. Full realization of the credit, under the plain text of Section 45V, results in:

i. **5 MMT of green hydrogen demand created per annum in 2040**, through enabling economical adoption of green hydrogen across multiple end-uses.
ii. **$12B+ of new yearly infrastructure investments in 2032**, triggered by electrolyzer capacity deployments and related engineering, procurement, and construction activities.
iii. **3.8 million cumulative direct and indirect jobs by 2035**, driven by impacts along the value chain including production, transportation, and utilization.
iv. **560 Mt CO2e cumulative GHG abatement by 2040**, attributed to reduced end-use emissions as green hydrogen adoption displaces existing fuels.

v. **4.4µg/m^3 of avoided particulate matter 2.5 concentration in 2040**, improved by air quality due to avoided combustion of fossil fuels, significantly reducing mortality and morbidity.



Emissions Abatement

Full extent of the PTC can potentially unlock 5x emissions reductions versus green H2 production emissions…

PTC value erosion greatly impacts GHG abatement opportunity

Cumulative 2040 GHG emissions abatement vs. production-associated emissions, MT CO_2eq

The full extent of PTC enables adoption by the hard-to-abate sector driving meaningful emissions reduction across the economy

Under a yearly time-matching operation, green hydrogen emissions due to grid usage are non-zero, however greatly offset by economy-wide abatement

In sum, the NPRM's proposed rules proposed would obstruct, rather than advance, the core objectives of Section 45V.

II. The Proposed Regulations Exceed the Secretary's Statutory Authority.

Treasury should not adopt the proposed regulations—in particular, the proposed requirements of incrementality, temporal-matching, and deliverability (collectively, the "three pillars")—for a simple, threshold reason: Doing so would exceed the limited authority that Congress delegated to the Secretary of the Treasury under Section 45V. If adopted, the proposed rules would effectively rewrite—rather than permissibly implement—the statute.

Like other administrative agencies, Treasury has "no power to act unless and until Congress confers power upon it."[7] Here, Congress authorized Treasury to "issue regulations or other guidance to carry out the purposes of [Section 45V], including regulations or other guidance for determining lifecycle greenhouse

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[7] *Mozilla Corp. v. FCC*, 940 F.3d 1, 74 (D.C. Cir. 2019) (citation omitted).

gas emissions."[8] The Treasury Secretary's authority, however, is limited by the statutory text and structure, and it can only be used "to carry out the purposes of" Section 45V.[9]

The limited grant of rulemaking authority under Section 45V does not authorize the Secretary to introduce new eligibility criteria for clean hydrogen production tax credits—especially where, as here, doing so would contravene the detailed statutory scheme Congress created and undermine its central objective to incentivize large-scale clean hydrogen production.[10] Because Congress has provided highly specific eligibility criteria, the Secretary cannot introduce entirely new substantive requirements.[11] And Congress plainly has not authorized the Secretary to introduce criteria that thwart the fundamental objectives of the statutory scheme by unduly limiting the ability of producers of electrolytic hydrogen to qualify for the credits at issue.[12]

As we explain below, the adoption of the Proposed Rule, § 1.45V-4, would contravene the text and structure of Section 45V and run counter to its purpose. Section 45V was designed to jump-start the nascent and promising clean hydrogen industry, and the proposed requirements would upend that goal by imposing such massive and prohibitive costs on Plug Power and other hydrogen producers that they will be unable to continue to expand their production of clean hydrogen in the way Congress intended. As a result, the proposed rules, as drafted, exceed the Secretary's delegated authority and, if adopted, would be "unlawful" and highly vulnerable to being "set aside" on judicial review under the APA.[13]

a. Requiring Compliance with the Three Pillars Contravenes Section 45V.

i. ***Section 45V establishes a detailed scheme for the calculation of clean hydrogen production credits and does not authorize Treasury to impose additional eligibility requirements.***

In Section 45V, Congress authorized an annual tax credit for taxpayers who produce some quantity of "qualified clean hydrogen" (starting in 2023) at a "qualified clean hydrogen facility" within 10 years of the facility being "placed into service."[14] Congress defined "[q]ualified clean hydrogen" as "hydrogen which is produced through a process that results in a lifecycle greenhouse gas emissions rate" that does not exceed four kilograms of CO2e per kilogram of hydrogen.[15] The statute also ties the size of the credit to the "lifecycle greenhouse gas emissions rate": Producers are eligible for a credit per kilogram of qualified clean hydrogen that is "produced through a process that results in a lifecycle greenhouse gas emissions

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[8] 26 U.S.C. § 45V(f); *see also id.* § 45V(e)(5). Unless otherwise indicated, all statutory section citations are to Title 26 of the U.S. Code.

[9] § 45V(f).

[10] *See supra* Section I.

[11] *See, e.g.*, *Ethyl Corp. v. EPA*, 51 F.3d 1053, 1058–60 (D.C. Cir. 1995) (holding agency "acted contrary to the plain language of" the statue when it based its decision on criteria not included in the statute).

[12] § 45V(f).

[13] 5 U.S.C. § 706(2)(C).

[14] § 45V(a).

[15] § 45V(c)(2)(A).

rate" within one of three ranges, with lower emissions receiving a higher credit.[16] And producers are eligible for an even higher credit (the maximum under the statute) if they meet detailed labor requirements specified by Congress, including paying prevailing wages and offering apprenticeships.[17]

Section 45V expressly defines the key term "lifecycle greenhouse gas emissions." As a starting point, the statute incorporates by reference the definition of lifecycle greenhouse gas emissions in the Clean Air Act.[18] The Clean Air Act reference provides:

> The term "lifecycle greenhouse gas emissions" means the aggregate quantity of greenhouse gas emissions (including direct emissions and significant indirect emissions such as significant emissions from land use changes), as determined by the [EPA] Administrator, related to the full fuel lifecycle, including all stages of fuel and feedstock production and distribution, from feedstock generation or extraction through the distribution and delivery and use of the finished fuel to the ultimate consumer[.][19]

Importantly, however, Congress ***narrowed this general definition*** for purposes of the Section 45V credit: It specified that "[t]he term 'lifecycle greenhouse gas emissions' shall only include emissions through the point of production (well-to-gate) as determined under the most recent Greenhouse gases, Regulated Emission, and Energy use in Transportation model (commonly referred to as the 'GREET' model) developed by Argonne National Laboratory, or a successor model (as determined by the Secretary [of the Treasury])."[20] Congress thereby provided explicit direction to Treasury concerning the measurement of hydrogen production emissions. As drafted by Congress, Section 45V focuses on the "process" through which hydrogen is produced; it is not concerned with emissions outside that production process.[21] Moreover—and relatedly the statutory definition limits the relevant emissions to those determined under the "most recent" GREET model or a "successor model."[22]

At the time that Congress enacted Section 45V, the "most recent" GREET model was "GREET 2021."[23] The GREET model was (and remains in its current incarnation as "R&D GREET 2023"[24]) a general-purpose "life cycle analysis (LCA) tool, structured to systematically examine the energy and environmental effects of a wide variety of transportation fuels and vehicle technologies in major transportation sectors (i.e., road, air, marine, and rail) and other end-use sectors, and energy systems."[25]

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[16] § 45V(b)(2).

[17] § 45V(e).

[18] *See* § 45V(c)(1)(A) (providing that "subject to subparagraph (B), the term 'lifecycle greenhouse gas emissions' has the same meaning given such term under … the Clean Air Act (42 U.S.C. 7545(o)(1)), as in effect on the date of enactment").

[19] 42 U.S.C. § 7545(o)(1)(H).

[20] § 45V(c)(1)(B).

[21] § 45V(b)(2).

[22] § 45V(c)(1)(B).

[23] *See* Argonne Nat'l Lab., GREET Model Platforms, https://greet.es.anl.gov/greet.models; U.S. Dep't of Energy Office of Scientific and Technical Information Summary of Expansions and Updates in GREET® 2021 (Oct. 2021), https://www.osti.gov/biblio/1824336 ("Summary of Expansions and Updates in GREET 2021"); *see generally Rocky Mountain Farmers Union v. Corey*, 30 F.3d 1070, 1081-82 (9th Cir. 2013) (describing GREET, a well-recognized and peer-reviewed tool for the calculation of lifecycle emissions).

[24] *See* Argonne Nat'l Lab., Energy Systems and Infrastructure Analysis: R&D GREET® Model, https://greet.anl.gov/.

[25] *See* Summary of Expansions and Updates in GREET 2021 at 1, https://www.osti.gov/servlets/purl/1891644.

As we discuss below, GREET 2021—like all prior versions of the GREET model—did not consider or incorporate any of the "three pillars" in its emissions calculations: It did not distinguish between *existing* renewable energy sources and *new or incremental* energy sources; nor did it consider the distance or time elapsed between the generation of the electricity source and the use by the hydrogen production facility.

To be eligible for a tax credit, Section 45V further requires the hydrogen be produced at a "qualified clean hydrogen facility." Congress specified that such a facility must be located in the United States but declined to impose any further geographic limitations.[26] Provided that qualified clean hydrogen is produced after December 31, 2022,[27] the only temporal or durational limits Congress imposed are that "construction" of the qualified facility is required to begin before January 1, 2033, and the credit is available for hydrogen produced at such a facility only for 10 years after the facility's opening.[28]

Congress's detailed scheme includes additional "[s]pecial rules" governing such scenarios as when more than one taxpayer owns the qualified hydrogen production facility and as noted above, where an existing facility is modified.[29] Of particular note, Congress considered the interactions between Section 45V and other tax credits being offered. It disallowed taxpayers from claiming credits under both Section 45V *and* Section 45Q for "carbon capture equipment."[30] But Congress allowed cumulative credits in other instances.[31] As relevant here, Congress delegated to the Treasury Secretary authority to "issue regulations or other guidance to carry out the purposes" of Section 45V.[32] Congress gave no indication, however, that this was intended to allow the Treasury Secretary to impose additional threshold eligibility requirements. To the contrary, to the extent that Congress sought to advance other policy objectives, it explicitly addressed them in the statute—for example, by offering an "[i]ncreased credit amount" to producers who satisfy certain labor "[r]equirements."[33] The specificity with which Congress legislated as to eligibility is a clear indication that it did not intend to yield such broad authority to the Treasury Secretary.[34]

Crucially, nowhere in the statutory scheme does Congress mention (or even a hint of) an intent to adopt additional eligibility criteria such as the three pillars. Take incrementality as just one example. Under the proposed regulations, "incrementality" refers to the concept that the facility that generated electricity used by the hydrogen producer is no more than 36 months old. In other words, it is not enough to obtain

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[26] § 45V(c)(2)(B)(i)(I) (requiring "hydrogen" subject to the credit must be "produced … in the United States" or a "possession of the United States").

[27] *See* § 45V note (effective date).

[28] *See* § 45V(a) (providing for the credit during the "10-year period beginning on the date such facility was originally placed in service"); § 45V(c)(3) (defining "qualified clean hydrogen facility" as one "(A) owned by the taxpayer [generating the credit], (B) which produces qualified clean hydrogen, and (C) the construction of which begins before January 1, 2033"); *see also* § 45V(d) (providing conditions under which existing facilities modified after January 1, 2023 to produce clean hydrogen may qualify). Though it is not an eligibility requirement for obtaining a credit under Section 45V, the statute provides that the maximum credit can be obtained if construction of the qualified clean hydrogen production facility either (i) meets both prevailing wage and apprenticeship requirements, § 45V(e)(2)(B), or (ii) "beg[an] prior to the date that is 60 days after the Secretary publishe[d] guidance with respect to the" prevailing wages requirements and which meets those requirements with respect to alterations or repairs occurring after that date, § 45V(e)(2)(A).

[29] § 45V(d).

[30] § 45V(d)(2).

[31] *See, e.g.*, § 38(b) (allowing § 45(a) credits based on production of renewable electricity and § 45V credits to be cumulative).

[32] § 45V(f).

[33] § 45V(e).

[34] *Cf. Ethyl Corp. v. EPA*, 51 F.3d at 1060 ("The level of specificity" in these lists of criteria "effectively closes any gap [the Secretary] seeks to find and fill with additional criteria.").

the Section 45V credit that the producer creates hydrogen using clean electricity; the electricity also must have been produced at a new facility.

This engrafts onto the statute a new, threshold eligibility requirement that Congress neither created nor intended. For example, an "incrementality" requirement is found nowhere in the statutory text or GREET 2021 model. To the contrary, the text of Section 45V limits the definition of "qualified clean hydrogen," considering only the established GREET model. Whether the electricity used to produce the hydrogen comes from a new or existing source has no bearing on either that process or its emissions.[35] Congress clearly knew how to include specific eligibility criteria.[36] Had Congress intended for the Secretary to include an incrementality requirement, it could have done so in its definition of "lifecycle greenhouse gas emissions," or in the other detailed and explicit criteria it set forth. It did not. The same is true of the time-matching and deliverability proposed rules.

ii. The "major questions doctrine" and basic principles of constitutional avoidance undercut Treasury's unbounded theory of rulemaking authority.

In short, the proposed rules rest on an entirely unbounded reading of the delegation to the Secretary. And that reading—if accepted—would implicate the major question doctrine and raise serious concerns about an unconstitutionally broad delegation to an agency on important issues of public policy without any governing intelligible principle.[37] It is particularly concerning where, as here, the delegation is to an agency without relevant subject matter expertise.

iii. Imposing the three pillars restricts the flexible use of EACs contrary to congressional intent.

The legislative history of Section 45V confirms that Congress did *not* authorize Treasury to impose restrictions on hydrogen producers' use of EACs from existing renewable energy facilities. A key colloquy between Senators Carper and Wyden underscored this point:

> Mr. CARPER: … Section 13024 of Title I of the Inflation Reduction Act of 2022 provides a production and investment tax credit for the production of clean hydrogen. In Section 13204, the term "lifecycle greenhouse gas emissions" for a qualified hydrogen facility is

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[35] §§ 45V(b)(2), (c)(1).

[36] For example, Congress specifically defined the types of "facilit[ies]" that may qualify for the Section 45V credit. *See* § 45V(a)(1) (credit available for qualified clean hydrogen produced via specified process at a "qualified clean hydrogen facility"), 45V(c)(2)(B)(i)(I) (specifying "[a]dditional requirements," including that hydrogen must be "produced … in the United States" or a "possession of the United States"). And, as noted above, Congress included detailed eligibility requirements (including paying laborers, mechanics, and contractors at facilities "wages at rates not less than the prevailing rates") for the maximum available credit. § 45V(e). Furthermore, other provisions in the IRA include detailed temporal requirements for eligibility. For example, the "domestic content bonus credit amount" in Section 45Y specifies certain percentages linked to specific time periods. And more broadly still, the IRA creates tax credits for new carbon-free electric generators, including new nuclear plants. Given Congress' deliberate inclusion of temporal requirements where it saw fit to include them, it is clear that Congress did not intend for any such restriction to apply to the Section 45V tax credit.

[37] *See, e.g.*, *Biden v. Nebraska*, 143 S. Ct. 2355, 2374 (2023) ("'A decision of such magnitude and consequence' on a matter of 'earnest and profound debate across the country" must 'res[t] with Congress itself, or an agency acting pursuant to a clear delegation from that representative body.'") (quoting *W. Virginia v. EPA*, 142 S. Ct. 2587, 2616 (2022)); *see also Gundy v. United States*, 139 S. Ct. 2116, 2123 (2019) ("The constitutional question is whether Congress has supplied an intelligible principle to guide the delegee's use of discretion."); *Edward J. DeBartolo Corp. v. Fla. Gulf Coast Bldg. & Const. Trades Council*, 485 U.S. 568, 575 (1988) (explaining the interpretive "rule" of constitutional avoidance).

> determined by the aggregate quantity of greenhouse gas emissions through the point of production, as determined under the most recent Greenhouse gases, Regulated Emissions, and Energy use in Technologies — GREET—model. It is also my understanding of the intent of Section 13204, is that *in determining "lifecycle greenhouse gas emissions" for this Section, the Secretary shall recognize* and incorporate indirect book accounting factors, also known as a book and claim system, that reduce effective greenhouse gas emissions, which includes, but is not limited to, *renewable energy credits*, renewable thermal credits, renewable identification numbers, or biogas credits. Is that the chairman's understanding as well?
>
> Mr. WYDEN: Yes.[38]

This colloquy makes no mention of restricting the use of EACs based on the three pillars. Congress clearly did not anticipate, or intend for, Treasury to impose such restrictions.

b. Section 45V's cross-references to the GREET model and Section 211 of the Clean Air Act do not provide support for the proposed rules.

i. 45VH2-GREET is not the "most recent" version of GREET or a "successor."

In Section 45V, Congress incorporated by reference the "most recent" version of GREET or a "successor model" for purposes of calculating lifecycle greenhouse gas emissions for purposes of determining eligibility for the credit.[39] Importantly, the general-purpose GREET 2021 model in effect at the time of Section 45V's enactment—before the suspect issuance of a newly-minted "45VH2–GREET" model in conjunction with Treasury's NPRM—did not distinguish between new and old renewable energy sources. Indeed, there was no way to distinguish between such sources under GREET 2021; the model has "drop down" options for various types of energy used for production (e.g., wind, solar, hydro, nuclear, electric grid) but does not distinguish between wind or solar energy produced using existing facilities and such energy produced using purpose-built new facilities. The same is true of the general-purpose GREET model now known as "R&D GREET 2023."[40] Had Congress intended for the Secretary to impose new

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[38] 168 Cong. Rec. 133, S4165-S4166 (daily ed. Aug. 6, 2022) (emphasis added). Renewable energy credits (or certificates) are a form of EACs.

[39] *See* § 45V(c)(1)(B).

[40] *See* Argonne Nat'l Lab., Energy Systems and Infrastructure Analysis: R&D GREET® Model, https://greet.anl.gov/. The Argonne National Laboratory recognizes that, at present, R&D GREET 2023 is the current version of the general-purpose GREET model and an updated version of GREET 2021. *See, e.g.*, Argonne Nat'l Lab., Energy Systems and Infrastructure Analysis: Summary of Expansions and Updates in R&D GREET® 2023 (Dec. 2023), https://publications.anl.gov/anlpubs/2023/10/185721.pdf, at 1 ("Given the explicit reference for GREET in certain tax credit provisions as well as other third-party regulatory implementations, this version of GREET, intended to support RD&D purposes, will be called R&D GREET going forward to avoid confusion and clearly delineate between the versions of GREET."); Argonne Nat'l Lab., Energy Systems and Infrastructure Analysis: R&D GREET® Model, https://greet.anl.gov/ ("R&D GREET 2023 is being released, consistent with Argonne National Laboratory's routine annual R&D GREET update process. Consistent with annual updates since 1995, R&D GREET (also historically called "ANL GREET") includes representation of new fuel pathways and updates to underlying assumptions.").

requirements based on the indirect effects of clean energy use on other users of the grid, it would not have adopted the existing GREET model.[41]

Treasury cannot enlarge the limited statutory authority Congress conferred simply by collaborating with another quasi-governmental entity (the Argonne National Laboratory) to devise an entirely new model, custom-designed to buttress the NPRM, and call that model "the most recent" GREET model—in place of the model Congress actually incorporated by reference in the text of Section 45V. That is especially so where, as here, the general-purpose GREET model still exists (with technical updates of the type that the Argonne National Laboratory typically performs on an annual basis) as "R&D GREET 2023"[42] This sleight of hand—effected almost simultaneously with Treasury's issuance of the NPRM—contravenes Section 45V and congressional intent.

As explained above, in enacting Section 45V, Congress called for the calculation of emissions based on the "most recent" GREET model developed by Argonne National Laboratory or a "successor model."[43] Yet it is clear—and, as discussed below, EPA has acknowledged—that assessment of indirect emissions (the theoretical foundation for the three pillars, *see infra* at Section II(b)(ii)) is incompatible with the standard GREET model that existed at the time that Congress legislated (GREET 2021).[44] Due to that incompatibility, Treasury is now proposing to simply substitute the relevant GREET model that Congress adopted for an entirely new and unproven model custom-designed to advance the agency's proposed policy choices. That flies in the face of the statutory text, statutory structure, and Congress's intent.

First, Treasury's attempt to rely on "45VH2-GREET" cannot be reconciled with the plain text of Section 45V. That provision refers to a ***single*** GREET "***model***,"[45] yet the Argonne National Laboratory—perhaps at Treasury's urging—has now created ***multiple GREET models***. These include the newly minted 45VH2–GREET model designed solely for the Section 45V credit, even though the general-purpose GREET model still exists (with technical updates such as the addition of certain fuel production "pathways") as R&D GREET 2023.[46] Congress spoke clearly when adopting "the most recent" GREET model then in effect.[47] And Treasury cannot simply adopt a new one and call it the relevant GREET model.

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[41] *See* § 45V(c)(1)(B).

[42] *See* Argonne Nat'l Lab., Energy Systems and Infrastructure Analysis: R&D GREET® Model, https://greet.anl.gov/. *See also infra* note 40.

[43] § 45V(c)(1)(B).

[44] *See* Letter from EPA to Treasury (Dec. 13, 2023), https://home.treasury.gov/system/files/136/Final-EPA-letter-to-UST-on-SAF-signed.pdf. As explained below, the NPRM purports to borrow a theory of indirect emissions (so-called "induced grid emissions") from EPA's prior analyses in the distinct context of assessing greenhouse gas emissions caused by certain biofuels such as corn or soy. In that context, EPA has considered "indirect emissions"—that is, emissions that EPA deems are indirect consequences of the biofuels creation process, such as indirect effects on land use. In its current NPRM, Treasury purports to justify the three pillars based on the speculative theory that, absent application of the pillars, hydrogen production that relies on feedstock electricity derived from renewable energy sources may lead to increased load on the electric grid and, in turn, increased "induced emissions."

[45] *See* § 45V(c)(1)(B) (emphasis added).

[46] *See* https://www.energy.gov/eere/greet (identifying (i) R&D GREET 2023; (ii) 45VH2-GREET; (iii) 40BSAF-GREET; and (iv) a California-specific variation of GREET ("California Low-Carbon Fuel Standard (LCFS) GREET"). As noted above, the Argonne National Laboratory recognizes that, at present, the most recent version of the general-purpose GREET model is R&D GREET 2023. *See* note 40, *supra*.

[47] Under well-established principles of statutory interpretation, courts look to the meaning of statutory language at the time of enactment. *See, e.g.*, *Carcieri v. Salazar*, 555 U.S. 379, 388, (2009) ("We begin with the ordinary meaning of the word 'now,'

Second, even if the NPRM's theory that "the most recent" version of GREET reflects a floating benchmark that refers to whichever version of GREET is in effect at some post-enactment point in time, the most recent version of the relevant GREET model at the present time is R&D GREET 2023. Indeed, the Argonne National Laboratory has admitted as much.[48] Thus, the "most recent version" of GREET does *not* refer to the novel 45VH2-GREET model invented solely for the Section 45V tax credit—a model that, as explained above, does not incorporate the three pillars. The upshot is that even if the NPRM were correct in assuming that Congress intended to adopt the latest iteration of GREET at any given time (at present, R&D GREET 2023), Congress did *not* authorize the application of a newly designed model that departs fundamentally from the established general-purpose GREET model. And merely attaching the moniker "GREET" to the new model does not make it so.

Third, given that the version of GREET that Congress adopted still exists as R&D GREET 2023, 45VH2-GREET also could not reasonably be viewed as a "successor model." The term "successor" ordinarily refers to something that supersedes or takes the place of another thing—not, as here, a novel *addition* (45VH2-GREET) that exists alongside the still-existing (and supposed) predecessor.[49] Examples of this common usage are legion, such as the dictionary example of a "successor to the throne."[50] Of course, it would not make sense to speak of a "successor" to the throne while the original monarch still retains that role. So too here, 45VH2-GREET could not be a successor to the general-purpose GREET model while that model still exists in the form of R&D GREET 2023.

Fourth, and finally, even if a "successor" could exist simultaneously with its supposed predecessor, the term "successor"—rather than "alternate" or "replacement"—imposes its own limits on the Secretary's

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as understood when the IRA was enacted."); *Tanzin v. Tanvir*, 592 U.S. 43, 48, 141 S. Ct. 486, 491, 208 L. Ed. 2d 295 (2020) ("Without a statutory definition, we turn to the phrase's plain meaning at the time of enactment.").

[48] *See, e.g.*, Argonne Nat'l Lab., Energy Systems and Infrastructure Analysis: Summary of Expansions and Updates in R&D GREET® 2023 (Dec. 2023), https://publications.anl.gov/anlpubs/2023/10/185721.pdf, at 1 ("Given the explicit reference for GREET in certain tax credit provisions as well as other third-party regulatory implementations, this version of GREET, intended to support RD&D purposes, will be called R&D GREET going forward to avoid confusion and clearly delineate between the versions of GREET."); Argonne Nat'l Lab., Energy Systems and Infrastructure Analysis: R&D GREET® Model, https://greet.anl.gov/ ("R&D GREET 2023 is being released, consistent with Argonne National Laboratory's routine annual R&D GREET update process. Consistent with annual updates since 1995, R&D GREET (also historically called "ANL GREET") includes representation of new fuel pathways and updates to underlying assumptions.").

[49] *See, e.g.*, Black's Law Dictionary (11th ed. 2019) (defining "successor" as one "who succeeds to the office, rights, responsibilities, or place of another; one who replaces or follows a predecessor"); Merriam-Webster Online Dictionary (defining "successor" "as in *replacement*"); *see also Tithonus Partners II, LP v. Chicago Title Insurance Company*, 566 F. Supp. 3d 314, 322 (W.D. Pa. 2021) (crediting the argument that the term successor "implies that the predecessor entity has ceased to exist and has been replaced for all purposes by the successor entity"); *White v. Cone-Blanchard Corp.*, 217 F. Supp. 2d 767, 772 (E.D. Tex. 2002) ("[F]or the court to find that CBC was a successor corporation of CBMC, it would have to find that both the successor and its predecessor existed simultaneously for a period of roughly four years. Such a ruling would seem to strain the definition of successor."); *AA Sales & Associates, Inc. v. JT&T Products Corp.*, No. 98-C-7954, 2000 WL 1557940 t *2(N.D. Ill. 2000) ("To be a successor, a corporation must entirely absorb its predecessor: its business, assets, rights and liabilities. At that point, the predecessor ceases to exist . . ..").

[50] Merriam-Webster Online Dictionary, , https://www.merriam-webster.com/dictionary/successor. For similar common uses, *see, e.g.*, "Chevy Camaro RIP, but a successor may be in the works," *The Detroit News* (March 22, 2023), https://www.detroitnews.com/story/business/autos/general-motors/2023/03/22/gm-to-stop-making-the-camaro-but-a-successor-may-be-in-works/70038314007/ (reporting on the retirement of the Chevrolet Camaro and a potential "successor"). The latter example also illustrates why a successor would bear the same fundamental attributes as the precursor model.

authority.[51] And in technical fields, the term "successor model" refers to an updated or refined version of a predecessor model. These modest and incremental revisions are reflected in the prior changes to the GREET model by its creators at the Argonne National Laboratory.[52] Put another way, if GREET is an iPhone, a "successor model" is an iPhone 2—not an entirely different product with substantively different features (e.g., a MacBook laptop computer). It does not suggest any authority for a radical overhaul or the ad hoc addition of substantive criteria.[53] Yet that is exactly what Treasury is trying to do: overhaul the well-understood and existing GREET model by smuggling in by the back door the highly controversial three pillars based on the theory that they are already embodied in the supposedly "now-most-recent" version of GREET (the December 2023 "45VH2–GREET") or a "successor model" to GREET that has been custom-designed to support the NPRM's preferred policy outcome. Respectfully, Plug submits that a reviewing court would not accept Treasury's theory.

It is highly implausible that Congress intended to delegate to Treasury (and the Argonne National Laboratory) freewheeling authority to create new GREET models that incorporate fundamental changes of the type here. That would amount to a blank check. And where, as here, the issues presented are by any account "major questions" of profound national importance—with implications for billions of dollars in investments—a clear delegation of statutory authority to support Treasury's rules would be required.[54] Furthermore, such a sweeping interpretation of Treasury's authority must be rejected, as it would amount to an unbounded delegation to the Secretary—necessarily raising serious constitutional concerns.[55]

Judicial skepticism toward the NPRM's interpretation of Section 45V would be all the likely given the highly unusual manner in which the Argonne National Laboratory issued its new GREET model in conjunction with the NPRM, while at the same time, a related DOE handbook model as already "adopted by" Treasury.[56] The upshot is that DOE treats the new GREET model as definitively incorporating the three pillars—a *fait accompli*, even while NPRM purports to seek comment on the three pillars. The NPRM, however, fails to grapple with the clear inconsistency between (i) asserting that 45VH2-GREET, in which the three pillars are fully baked in, is the "the most recent version" of GREET referenced in Section 45V and (ii) at the same time treating the three pillars as mere proposals for further consideration. This inconsistency raises additional red flags about the irregular process by which the purportedly new GREET model has been issued. In no way could this effort to impose the three pillars into the operative GREET

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[51] *See* Black's Law Dictionary, *supra*. This is even more clearly true with respect to the "most recent version" of GREET. To be the most recent version of GREET, there must be substantial continuity—nothing like the radical, substantive changes incorporated into 45VH2-GREET.

[52] For example, the updates to the 2021 general-purpose GREET model and more recent updates to that model in 2023 (to create R&D GREET 2023) were incremental and technical, such as adding new fuel production pathways and updating averages used in lifecycle emissions calculations based on more recent data.

[53] *Cf. Biden v. Nebraska*, 143 S. Ct. at 2368 (the term "modify" carries "'a connotation of increment or limitation,' and must be read to mean 'to change moderately or in minor fashion.'") (quoting *MCI Telecomm's Corp. v. AT&T Co.*, 512 U.S. 218, 225 (1994)).

[54] *See, e.g.*, *Biden v. Nebraska*, 143 S. Ct. 2374 at 2374.

[55] *Gundy*, 139 S. Ct. at 2123; *Edward J. DeBartolo Corp.*, 485 U.S. at 575.

[56] *See* DOE Guidelines to Determine Well-to-Gate Greenhouse Gas (GHG) Emissions of Hydrogen Production Pathways using 45VH2-GREET 2023 (Dec. 2023) at Forward ("45VH2-GREET has been adopted by the U.S. Department of the Treasury for the purposes of calculating well-to-gate emissions of hydrogen production facilities for the clean hydrogen production tax credit established in Internal Revenue Code (I.R.F section 45V ["45V tax credit"]"); *id.* at 14 ("It is important to note that the 45V NPRM provides criteria that must be met in order for a taxpayer to determine an emissions rate for a hydrogen production facility using electricity by using 45VH2-GREET"); *id.* at 20-21 (mandating compliance with three pillars when applying model and using EACs), available at https://www.energy.gov/sites/default/files/2023-12/greet-manual_2023-12-20.pdf.

model have been what Congress intended to authorize when it adopted a definition of "lifecycle greenhouse gas emissions" by cross-referencing Section 211 of the Clean Air Act and modifying that definition by reference to "the most recent version" of GREET or a "successor model."

ii. EPA's statements and positions concerning Section 211 of the CAA undermine, rather than support, the proposed rules.

The NPRM's reliance on prior EPA interpretations of Section 211 of the Clean Air Act ("CAA") fares no better than its attempt to conjure a new and "most recent" GREET model. Pursuant to a December 20, 2023 letter to Treasury, EPA: (i) has acknowledged that the version of GREET that existed when Congress enacted Section 45V in the IRA is incompatible with the indirect-emissions and induced-grid-emissions approach that undergirds the proposed rules; and (ii) disregarded the fact that Section 45V doesn't simply borrow wholesale the CAA definition of "lifecycle greenhouse-gas emissions."

In an effort to bolster its three pillars approach, the NPRM notes that Treasury asked EPA for input on its interpretation of CAA § 211(o)(1)(H)—in particular, the term "significant indirect emissions."[57] Specifically, Treasury asked whether, in EPA's view, inclusion of the three pillars would be consistent with EPA's prior interpretation of Section 211(o)(1)(H) in the context of its Renewable Fuel Standard ("RFS") program (a program that involves the calculation of greenhouse gas emissions from production of biofuels such as soy and corn). The NPRM states that:

> The EPA has advised that, based on its prior implementation of section 211(o)(1)(H) of the Clean Air Act in other contexts, it would be reasonable and consistent with the EPA's precedent for the Treasury Department and the IRS to determine that induced grid emissions are an anticipated real-world result of electrolytic hydrogen production that must be considered in lifecycle GHG analyses for purposes of the section 45V credit. Such interpretation would be consistent with the EPA's long-standing interpretation and application of section 211(o)(1)(H) of the Clean Air Act in the context of the Renewable Fuel Standard (RFS) program.[58]

The NPRM's description, however, neglects to acknowledge both the significant qualifications to EPA's informal staff opinion and the distinctions between the renewable fuel context and the present context of emissions created by hydrogen production. EPA's informal advice (embodied in a December 20, 2023 letter to Treasury) acknowledges that EPA's prior application of Section 211 in the renewable fuel context did not consider grid emissions, except at a broad level.[59] And it concedes that EPA "has not analyzed the lifecycle greenhouse-gas emissions associated with or conducted a lifecycle analysis for

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[57] As explained above, the definition of lifecycle greenhouse gas emissions" under Section 45V partially borrows from the definition in Section 211 of the CAA, which includes in the definition of "lifecycle greenhouse gas emissions" "direct emissions and significant indirect emissions such as significant emissions from land use changes," 42 U.S.C. § 7545(o)(1)(H), but also modifies that definition by incorporating by reference the "most recent" version of GREET or a "successor model."

[58] NPRM, 88 Fed. Reg. at 89228.

[59] *See* EPA Letter to Treasury (Dec. 20, 2023), available at https://home.treasury.gov/system/files/136/45V-NPRM-EPA-letter.pdf; DOE, "Assessing Lifecycle Greenhouse Gas Emissions Associated with Electricity Use for the Section 45V Clean Hydrogen Production Tax Credit." Washington, DC: U.S. Department of Energy, available at *www.energy.gov/45vresources.*

electrolytic hydrogen production."[60] EPA also emphasized that it "***has not considered the use of three-pillar EACs in conjunction with its lifecycle analyses for fuels that involve the use of grid electricity under the RFS program***."[61]

Furthermore, only days before the EPA letter discussed above, EPA's Office of Air Radiation issued another opinion letter to Treasury regarding aviation fuel standards.[62] In that letter, EPA noted that it had included "significant indirect emissions" when considering "lifecycle greenhouse gas emissions" under Section 211 of the CAA in its RFS rulemaking. In deciding what "significant indirect emissions" to include when evaluating renewable fuels, EPA considered "indirect" emissions such as those attributed to international land use changes—a specific type of indirect emissions spelled out in Section 211.[63] EPA also considered whether and how to account for increased "grid emissions" but "concluded that the analytical tools available at the time were not sufficient to include induced grid emissions."[64]

Notably, the December 13 letter expressly stated EPA's view that an indirect-emissions approach under the CAA is <u>not</u> compatible with the pre-December 2023 version of GREET (*i.e.*, the version that Congress adopted in Section 45V). EPA wrote: "With respect to [Treasury's] specific question on the current version of ANL GREET, the ***EPA has previously determined that the 2010 version of ANL [Argonne National Laboratory] GREET by itself is not sufficient to calculate lifecycle GHG emissions for purposes of CAA section 211(o)(1)(H)***. Moreover, … the EPA has not been able to determine that the current version of ANL GREET is consistent with CAA section 211(*o)(*1)(H)."[65] EPA specifically noted that it has "stated that ***GREET did not satisfy the [CAA] relevant statutory criteria because it did not include these indirect emissions***."[66] In sum, EPA did not incorporate anything like the three pillars in prior implementation of Section 211—the interpretation on which the present NPRM relies. And EPA has clearly acknowledged that the existing GREET model that Congress incorporated by reference in Section 45V is incompatible with the indirect emissions (including induced grid emissions) approach that undergirds the three pillars.

As a result, far from supporting Treasury's proposed adoption of the three pillars, EPA's prior statements and positions *undermine* it.

III. Each of the Three Pillars Is Inconsistent with Section 45V for Additional Reasons.

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[60] *Id.* at 2.

[61] *Id.* at 5 (emphasis added).

[62] *See* EPA Letter to Treasury (Dec. 13, 2023) (explaining that EPA utilized Section 211(o)(1)(H) in setting the applicable standards for its RFS program and promulgated regulations in 2010, *see* 75 Fed. Reg. 14670, 14765-67 (Mar. 26, 2010) ("RFS2 Final Rule"), available at https://home.treasury.gov/system/files/136/Final-EPA-letter-to-UST-on-SAF-signed.pdf.

[63] *See* 42 U.S.C. § 7545(o)(1)(H) (including in the definition of "lifecycle greenhouse gas emissions" "direct emissions and significant indirect emissions such as significant emissions *from land use changes*") (emphasis added). Section 211 contains no similar reference to grid emissions.

[64] *See* EPA Letter to Treasury (Dec. 20, 2023) at 4.

[65] *Id.* at 2 (emphasis added).

[66] *Id.* at 3 (emphasis added).

a. The proposed incrementality requirement, § 1.45V-4(d)(3)(i) is counter to the statutory text and purpose and squarely contravenes Section 45V.

The proposed incrementality requirement runs counter to Congress's purpose in enacting Section 45V and is arbitrary and capricious. Treasury's conclusory assertion that new clean electricity generation will not produce any induced emissions is unsupported and wrong. The counterproductivity of the proposed incrementality requirement has not been lost of members of Congress:

> We hope the final guidance will avoid evolving and complex eligibility criteria—such as overly stringent additionality [*i.e.*, incrementality], deliverability, and time matching requirements—that could raise costs, suppress hydrogen production, feedstock and production pathway innovation, and private-sector investment, while discriminating against some regions based on their existing clean energy mixes."[67]

The delay inherent in creating *new* clean energy sources would create a massive roadblock to the *rapid* expansion of clean hydrogen energy networks that Congress intended to promote with Section 45V's credits. This proposed requirement runs counter to the "purposes of" Section 45V, § 45V(f), and therefore exceeds the Secretary's rulemaking authority for that reason alone.[68]

Furthermore, incrementality is ineffectual, unnecessary, and arbitrary. Throughout much of the United States, there is already more demand for clean generation than can be supplied. New clean generation and existing clean generation are identically situated in such regions: once online, either one would be serving other loads on the grid if they were not being used to produce hydrogen. As a result, their use to produce hydrogen results in the same "induced emissions." In other regions, new clean power generation is economic or built as part of the traditional vertically integrated regulated utility framework and would enter service regardless of Section 45V. In these regions, the Section 45V credit does not bring about any incremental clean generation—it simply results in new clean generation that would otherwise be serving the grid being used for hydrogen production instead. From the standpoint of grid emissions, using a new resource for hydrogen production that would otherwise be used somewhere else on the grid is no different than using an existing resource for hydrogen production that would otherwise be used somewhere else on the grid. The proposed rule fails to acknowledge this crucial point; and further, fails to account that the grid will get cleaner with time —especially in states with clean energy goals.

The proposed incrementality requirement is also incompatible with the statutory text in other respects. Congress directed Treasury to focus narrowly on the hydrogen production process, which does not include attenuated effects like induced grid emissions. As noted, the production tax credit applies in tiered fashion to any "qualified clean hydrogen" as: "hydrogen which is *produced through a process* that

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[67] November 6, 2023 Letter from Sens. Cantwell, Brown, Manchin, Durbin, Gillibrand, Murray, Fetterman, Duckworth, Sinema, Casey, and Peters to Secretary Yellen, Secretary Granholm, and Mr. John Podesta; *see also* Dec. 22, 2023 Statement of Sen. Manchin ("For an Administration that wants to reduce emissions and fight climate change, it makes no sense to kneecap the hydrogen market before it can even begin.").

[68] *See, e.g.*, *Util. Air Regul. Grp. v. EPA*, 573 U.S. 302, 321 (2014) (finding EPA's greenhouse gas requirements "would be inconsistent with—in fact, would overthrow—the Act's structure and design" and rejecting requirements as "'incompatible' with 'the substance of Congress' regulatory scheme'"); *Maislin Indus. U.S. v. Primary Steel* 497 U.S. 116, 131 (1990) ("Stripped of its semantic cover, the [Commission's] policy and, more specifically, the Commission's interpretation of 'unreasonable practices' … stand revealed as flatly inconsistent with the statutory scheme as a whole.").

results in a lifecycle greenhouse gas emissions rate of not greater than 4 kilograms of CO_{2e} per kilogram of hydrogen."[69] Thus, hydrogen must be "produced through a process" that yields "lifecycle greenhouse gas emissions" below specified thresholds. The word "process" means "a series of operations performed in the making or treatment of a product."[70] Through this language, Congress distinguished between new hydrogen production processes that differed from conventional ones – like steam-methane reforming.[71] Emissions from direct inputs to the production process, such as electricity usage, may be considered under the statute. Whether an existing generator or a new one is utilized does not alter the "process" for hydrogen production.

In addition to the fact an indirect-emissions approach is incompatible with the GREET model that Congress adopted in Section 45V (*see supra* Section II(b)(ii)), such emissions are speculative, uncertain, and not proximately caused by the hydrogen production process.[72] Emissions produced by other power plants dispatched to meet other consumers' needs are not part of a taxpayer's hydrogen production process. Treasury's consideration of these emissions in the proposed regulations goes well beyond the cabined inquiry into the production process that Congress specified. Demand elsewhere on the grid is in constant flux – due to a myriad of factors – and the grid's emissions will change as different plants are dispatched to meet demand.

The timing of the Section 45V credit also evidences the impermissibility of incrementality. Congress specified that the Section 45V tax credit would be available at the start of 2023. Any new resource actually available in 2023 would have been online anyway and thus could not be considered "incremental" under the offered rationale, meaning Treasury has administratively created a tax credit scheme in which no one could actually earn credits when they were initially offered.[73] That result is analogous to the outcome that the Supreme Court rejected in *King v. Burwell* whereby tax credits in the Affordable Care Act would not apply in states with a federal exchange, a reading that would have undermined the efficacy of the legislation.[74] As the Court explained, would be "implausible that Congress meant the Act to operate in this manner."[75] So too here. The only reading of the statute consistent with the text is that existing resources

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[69] 26 U.S.C. § 45V(c)(2)(A). The statute also provides that the hydrogen must be produced in the United States or a U.S. territory; (ii) in the ordinary course of a trade or business of the taxpayer; and (iii) for sale or use. These limitations again show that where Congress sought to limit availability of § 45V, it knew how to say so.

[70] American Heritage Dictionary of the English Language (2011 ed.); *see also* Oxford Pocket American Dictionary of Current English (2002) (defining "process" as "a course of action or proceeding, esp. a series of stages in manufacture or some other operation").

[71] H.R. 5192, a precursor to § 45V introduced in the 117th Congress, suggests that Congress was focused on this distinction between new and conventional processes. That bill made the tax credit available to "any qualified clean hydrogen which is produced through a process that, *as compared to hydrogen produced by steam-methane reforming*, achieves a percentage reduction in lifecycle greenhouse gas emissions" set at various specified thresholds.

[72] An analogy can be drawn here to case law under the National Environmental Policy Act, which has recognized that a but-for relationship between a proposed action and an indirect effect is insufficient. Rather, proximate causation must be shown, in part because indirect effects are highly speculative, uncertain, and insufficiently specific to be considered. *See, e.g.*, *Dep't of Transp. v. Public Citizen*, 541 U.S. 752, 767 (2004); *City of Dallas v. Hall*, 562 F.3d 712, 719 (5th Cir. 2009). Here, too, Congress was plainly focused on effects that are readily quantifiable, as seen in its further specification of the model to be used to quantify lifecycle greenhouse gas emissions. 26 U.S.C. § 45V(c)(1)(B).

[73] While the proposed 3-year lookback provision could result in some early eligibility for the tax credit, Treasury has provided no rationale for that provision, as discussed in Section IV.B below.

[74] *King v. Burwell*, 576 U.S. 473, 494 (2015).

[75] *Id.*

can receive the tax credit immediately if they meet the specified thresholds. This reading is confirmed by the Joint Committee on Taxation's (JCT's) estimate of the potential impact of a bill the House of Representatives passed in April 2023 to repeal § 45V and other tax credits enacted by the IRA. JCT estimated that $127 million in clean hydrogen tax credits would be claimed in 2023.[76] If Congress intended the § 45V production tax credit to instead be available only for hydrogen projects powered by newly constructed carbon-free generation, JCT's estimate should have been zero.

Last, the incrementality would have the practical effect of preventing hydrogen producers from using nuclear energy, and as a result, would run afoul the IRA's broader statutory scheme. Section 45V may not be read in a vacuum; it is part of a comprehensive statutory scheme designed to facilitate a host of clean energy goals, including nuclear power.[77] When Congress enacted the Section 45V credit, it simultaneously enacted a nuclear power production credit under Section 45U. This companion credit applies only to nuclear facilities placed in service prior to the IRA's enactment.[78] Nonetheless, Congress made clear that the electricity produced by these facilities could also be used to receive a Section 45V credit if used to produce clean hydrogen. Section 45U(c)(2) expressly applies the special rule set forth in Section 45(e)(13), which states that electricity may be used to produce qualified clean hydrogen for purposes of Section 45V. Congress thus clearly intended that existing nuclear sources would qualify for the Section 45V credit. But while Treasury's proposed rule contemplates that a taxpayer might claim a credit under both Section 45V and 45U,[79] as discussed above, its proposed incrementality requirement would prevent essentially *all* nuclear facilities from qualifying for the Section 45V credit because they were placed into service more than 36 months before any clean hydrogen production facilities came online.

The Secretary may believe that incrementality is good policy, but Congress did not make that judgment. When Congress wanted the Secretary to issue regulations to advance policy objectives beyond incentivizing the production of clean hydrogen, it spoke to those issues directly.[80] Congress also made other carefully calibrated policy decisions concerning eligibility for the Section 45V credit. For example, while Congress opted not to require clean hydrogen producers to rely on new sources of clean electricity, it incentivized them to do so by allowing them to obtain "the sum of" credits under both § 45V and § 45(a) simultaneously.[81] But at the same time, Congress expressly disallowed producers from claiming both § 45V and § 45Q credits based on carbon capture equipment.[82]

b. The proposed deliverability requirement, § 1.45V-4(d)(3)(iii), is also unauthorized.

Under the proposed deliverability requirement, a taxpayer using EACs is eligible for the Section 45V credit only if, among other requirements, the electricity associated with the EAC is generated by a

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[76] HR 2811 CBO score, JCX-7-23, at line 6 (Apr. 26, 2023), *available at* https://www.jct.gov/getattachment/1bd2fab7-1a0f-4c30-9a8f-94b98f3b2888/x-7-23.pdf.

[77] *See, e.g.*, *Winkelman ex rel. Winkelman v. Parma City Sch. Dist.*, 550 U.S. 516, 523 (2007) ("[A] proper interpretation of the Act requires a consideration of the entire statutory scheme"); *Hibbs v. Winn*, 542 U.S. 88, 101 (2004) (statutes must be "construed so that effect is given to all its provisions, so that not part will be inoperative or superfluous, void or insignificant.")

[78] *See* 26 U.S.C. § 45U(b)(1)(c).

[79] *See* Proposed Treas. Reg. § 1.45V-5(j).

[80] *See supra* at Section II(a)(i) (discussing prevailing wages and apprenticeship requirements under Section 45V(e)).

[81] § 38(b).

[82] § 45V(d)(2).

facility that is in the same "region" as the taxpayer's hydrogen production facility.[83] The proposed rules divide the country into 15 regions based on an October 2023 DOE study.[84]

Congress, however, has already spoken to the permissible locations of qualifying hydrogen facilities. The sole limitation in Section 45V is that any qualifying facility producing "hydrogen" be "located in the United States or a possession thereof."[85] This policy choice has significant consequences because renewable resources are not available in every state with cost-effective access and scale. Any attempt by Treasury to engraft an additional deliverability requirement on Section 45V would run headlong into Congress' decision to avoid regional favoritism in favor of a national location requirement.

Deliverability is also inconsistent with the general-purpose GREET model that Congress adopted. Before Treasury's and the Argonne National Laboratory's attempt to substitute a novel and custom-built GREET model to support the NPRM, the existing GREET model that Congress adopted in Section 45V provided only broad regional differentiation for electricity from 11 grid networks; it did not permit calculations based on more precise geographic proximities between a specific hydrogen producer and its electricity source. Nor did it contemplate trying to trace particular electrons to particular sources on a state-by-state basis. To the contrary, GREET's use of annualized averages at the broad, regional grid level reflects a conscious decision *against* the kind of granular, proxy-driven analysis that "deliverability" would require.

Finally, like incrementality, a deliverability requirement would undermine—rather than—advance the purposes of Section 45V (other federal hydrogen policies, such as the DOE Regional Clean Hydrogen Hub program). This mandate would also promote a patchwork of regional "winners and losers" with disproportionate incentives for hydrogen production facilities to locate in a select few locations, contradicting Congress's goal of scaling a *national* network of clean hydrogen production facilities.

c. The proposed temporal-matching requirement, § 1.45V-4(d)(3)(ii), is unauthorized.

Like deliverability, hourly temporal matching seeks to establish a proxy—here, time—to increase the likelihood that clean energy used to produce clean hydrogen came from a particular nearby source.

Congress, however, did not adopt such a proxy in enacting Section 45V. Instead, Congress specified use of the general-purpose GREET model to calculate emissions, and that model uses annualized averages for different electricity sources and grids. This is significant because all electrical grids fluctuate in their carbon emissions based on weather, season, time of day, and congestion.

Narrow time-matching requirements would also undermine the purpose of Section 45V by disfavoring particular technologies and geographic locations. Due to variations in solar and wind, hourly temporal matching would limit hydrogen production to hydroelectric and nuclear energy sources, which are only available in certain locations (and precluded in most instances under the proposed incrementality requirement).

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[83] *See* Prop. Treas. Reg. § 1.45V–4(d)(3)(iii).

[84] *See* Prop. Treas. Reg. § 1.45V–4(d)(2)(vi) (adopting definition of "region[s]" as set forth in a DOE October 30, 2023 study).

[85] § 45V(c)(2)(B); *see also Request for Comments on Credits for Clean Hydrogen & Clean Fuel Prod.*, IRS Request for Comment, 2022-47 I.R.B. 483 (2022) (acknowledging same, broad geographic eligibility criterion).

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In sum, by introducing novel incrementality, deliverability, and time-matching requirements that are unmoored from the statutory text and legislative history, the proposed rules would amount to an impermissible agency override of Congress's decision to rely on these differentiated incentives. Regardless of its policy preferences, Treasury "has no power to correct flaws that it perceives in the statute it is empowered to administer. Its rulemaking power is limited to adopting regulations to carry into effect the will of Congress *as expressed in the statute*. If the [statute] falls short of providing safeguards desirable or necessary to protect the public interest, that is a problem for Congress, not that [agency] or the courts, to address." [86]

IV. Proposed § 1.45V-4(a)—Calling for The Inclusion of "All Hydrogen" in Section 45V Calculations—Also Contravenes The Statutory Text, Structure, and Purpose.

Proposed § 1.45V-4(a) provides that the "amount of the section 45V credit is determined under section 45V(a) of the Code and §1.45V-1(b) according to the lifecycle GHG emissions rate *of all hydrogen produced at a hydrogen production facility during the taxable year*.[87]

Requiring the inclusion of "all hydrogen" in this way cannot be reconciled with the text of Section 45V. Under the statute, the tax credit calculation is premised on "kilograms of *qualified clean hydrogen* produced … during [the] taxable year at qualified clean hydrogen production facility"—i.e., a taxpayer-owned facility that "produces *qualified clean hydrogen*."[88] Congress defined "qualified clean hydrogen" as hydrogen produced through a qualifying "*process*"—that is, "hydrogen which is produced through a process that results in a lifecycle greenhouse gas emissions rate of not greater than 4 kilograms of CO2e per kilogram of hydrogen."[89] The tiered formula for calculating the tax credit is based on "applicable percentage[s]" tied to "qualified clean hydrogen which is produced through a *process* that results in" specified levels of emissions rates.[90] Taken together, Section 45V calls for: (1) identifying the kilograms of hydrogen produced through "a process" with a qualifying emissions rate (*i.e.*, qualified clean hydrogen), and (2) multiplying that quantity by the "applicable amount" that reflects the emissions rate associated with the production of "such hydrogen."[91]

The resulting credit amount thus reflects kilograms of qualified clean hydrogen produced at the facility via one or more processes that produce such hydrogen (e.g., electrolysis using solar-generated electricity); the credit does not reflect "all hydrogen" produced there regardless of the production process. The statute recognizes this—defining a "qualified clean hydrogen facility," in relevant part, as simply one "which produces qualified clean hydrogen." Congress did *not* define the eligible facility as one that

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[86] *Brd. of Governors of the Fed. Reserve Sys. v. Dimension Fin. Corp.*, 474 U.S. 361, 368 (1986) (emphasis added); *see also Bostock v. Clayton Cnty.*, 140 S. Ct. 1731, 1753 (2020) ("The place to make new legislation, or address unwanted consequences of old legislation, lies in Congress.").

[87] NPRM, 88 Fed. Reg. at 89247 (emphasis added).

[88] § 45V(a), (c)(3) (emphasis added).

[89] § 45V(c)(2)(A) (emphasis added).

[90] § 45(v)(b)(2) (emphasis added).

[91] § 45V(a), (b).

produces *only* or *exclusively* qualified clean hydrogen. Congress understood that a "qualified clean hydrogen facility" might produce quantities of qualified clean hydrogen, as well as hydrogen that does not qualify for any tax-credit calculation ("non-qualified hydrogen"). And it in no way suggested that the production of non-qualified hydrogen should diminish or preclude the facility's ability to obtain a Section 45V tax credit.

Accordingly, consistent with the statute, kilograms of hydrogen produced by a non-qualifying process should neither contribute to, nor detract from, the calculation of any tax credit. This approach—in contrast with Treasury's all-or-nothing approach—advances Congress's intent to promote increased clean hydrogen capacity. The proposed rule's inclusion of "all hydrogen" is unjustified and threatens unintended consequences: For example, a hydrogen producer that might rely on solar energy for 12 hours and grid energy (without EACs associated with renewable sources) for the remaining 12 hours of each day would be better off (tax-credit-wise) simply allowing its facility to remain idle for the 50% of the time when solar energy is unavailable. Nothing in the text or statutory history suggests that Congress intended such a restraint on productivity.

V. The Proposed Rules Would Be Arbitrary and Capricious in Violation of the APA.

The proposed rules are not only highly vulnerable to legal challenge on the ground that they exceed Treasury's statutory authority, they would also be arbitrary and capricious in violation of the APA.[92]

An agency rule may be arbitrary and capricious for a variety of reasons, including "if the agency has relied on factors which Congress has not intended it to consider, entirely failed to consider an important aspect of the problem, offered an explanation for its decision that runs counter to the evidence before the agency, or is so implausible that it could not be ascribed to a difference in view or the product of agency expertise."[93]

a. The Proposed Rules—and the Incrementality Requirement, in Particular—Rest on an Arbitrary and Deeply Flawed "Induced Grid Emissions" Theory.

Treasury's proposed adoption of the three pillars—and the incrementality requirement in particular—is predicated on a speculative "induced grid emissions" theory that is unsupported by the evidence and, even assuming that the theory might apply in some situations, it does not justify the adoption of an across-the-board incrementality requirement (or the time-matching and deliverability mandates) in all cases. As a result, it would be arbitrary and capricious for Treasury to adopt the three pillars—and especially the incrementality requirement—because it has not (and cannot) rationally connect either its theory or the actual evidence to the rules proposed in the NPRM.

Without any evidence, much less cogent analysis, the NPRM invokes an induced grid emissions theory that relies on a daisy chain of hypotheses: namely, that (i) when a hydrogen producer uses EACs associated with clean energy that is not "new," in *some situations*, (ii) an indirect effect of that usage *may be* increased load on the electric grid and, (iii) as a further indirect consequence, overall greenhouse gas emissions may increase due to increased use by third parties of grid energy that *may* ultimately derive from

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[92] *See* 5 U.S.C. § 706(2)(A) (arbitrary and capricious rule must be "set aside" by court).

[93] *Motor Vehicle Mfrs. Ass'n v. State Farm Mut. Auto. Ins. Co.*, 463 U.S. 29, 43 (1983); *see also Clean Wisconsin v. EPA*, 964 F.3d 1145, 1161 (D.C. Cir. (2020) (agency must "articulate[] a rational connection between the facts found and the choice made").

fossil fuel production. This theory forms the foundation for Treasury's proposal to codify the three pillars and, in particular, its premise that a strict incrementality requirement should apply in all cases when a hydrogen producer seeks the Section 45V credit and wishes to use EACs associated with renewable energy such as solar or wind.

The NPRM relies on two documents to support this logical leap: (i) a "white paper" that DOE (not coincidentally) released in conjunction with Treasury's NPRM; and (ii) the December 20, 2023 letter (discussed above) that Treasury solicited from the EPA in an effort to shore up the NPRM.[94] Neither source, however, provides a sound basis for the induced emissions theory, and both merely highlight the lack of a logical connection between the evidence and the rules proposed in the NPRM.

First, the DOE white paper includes only conclusory assertions concerning the induced grid emissions theory, and even those assertions are carefully hedged in a way that makes it apparent that the theory does not apply in all—or even most—cases. DOE asserts, for example, that there is a "strong *likelihood* that the hydrogen production would *in many cases* significantly increase induced grid GHG emissions beyond the allowable levels required to qualify for § 45V" without the three pillars; that "new electricity load (such as from new hydrogen production) *can cause* an increase in GHG emissions from the broader power grid"; and "[t]here is a *risk* that the buyer's load" using EACs not cabined by time-matching and deliverability "would induce significant GHG emissions from other sources of generation."[95] Nowhere does the DOE white paper cogently explain why incrementality is needed—much less needed in all cases—nor does DOE seek to square its speculative theory with the three pillars.

Second, as discussed above, the EPA letter fares no better. Like DOE's equivocal white paper, EPA asserts that "[i]ncreased demand for electricity from electrolyzers for hydrogen production *can result in* indirect greenhouse-gas emissions" and that "[e]lectricity users, including hydrogen producers, *can cause or induce* emissions by adding new load and consuming electricity."[96] Notably, the letter does not assert (and Treasury could not assert based on the evidence) that this theoretical result would occur in all (or even most) cases. EPA further acknowledges that use of the three pillars—which the agency describes a "***methodological proxy*** in lieu of calculating [actual] induced grid emissions as part of a lifecycle greenhouse-gas analysis" —"***does not constitute a quantification of induced grid emissions***."[97] Moreover,

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[94] *See, e.g.*, NPRM, 88 Fed. Reg. at 89229 ("DOE has published a technical paper, *Assessing Lifecycle Greenhouse Gas Emissions Associated with Electricity Use for the Section 45V Clean Hydrogen Production Tax Credit,* which the Treasury Department and the IRS have reviewed, and which has informed the development of the proposed regulations. As discussed therein, incrementality, temporal matching, and deliverability requirements are important guardrails to ensure that hydrogen producers' electricity use can be reasonably deemed to reflect the emissions associated with the specific generators from which the EACs were purchased and retired. If hydrogen producers rely on EACs without attributes that meet these three criteria there is a significant risk that hydrogen production would significantly increase induced grid GHG emissions beyond the allowable levels required to qualify for the section 45V credit."); *id.* ("[T]he EPA has advised that it believes it would be reasonable for the Treasury Department and the IRS to use EACs that possess specific attributes that meet certain criteria as a means of reducing the risk of induced grid emissions resulting from new load from electrolytic hydrogen production being added to an existing grid.").

[95] DOE White Paper, *Assessing Lifecycle Greenhouse Gas Emissions Associated with Electricity Use for the Section 45V Clean Hydrogen Production Tax Credit* (Dec. 19, 2023) ("DOE White Paper") at 5, 9, 13.

[96] EPA Letter to Treasury (Dec. 20, 2023) at 4 ("[A]dding new incremental electricity demand to the electric grid *will often result in* either increased generation from existing generators, with associated emissions, or new incremental capacity coming online.") (emphasis added).

[97] *Id.* at 6 (emphasis added).

EPA conceded that "it has not analyzed the lifecycle greenhouse-gas emissions associated with or conducted a lifecycle analysis for electrolytic hydrogen production."[98] And the agency stressed that it "has *not* considered the use of three-pillar EACs in conjunction with its lifecycle analyses for fuels that involve the use of grid electricity under the [EPA's] RFS program."[99]

The upshot is that neither of the sources cited by the NPRM for the speculative induced grid emissions theory that undergirds the proposed rules actually supports a sweeping, across-the-board application of the three pillars—in particular, the incrementality requirement. One need look no further than the NPRM to see this. The NPRM itself acknowledges that there are cases where there may well be no adverse effect on induced grid emissions:

> The DOE has advised that ***there are circumstances during which diversion of existing minimal (that is, zero or near-zero) emissions power generation to hydrogen production is unlikely to result in significant induced GHG emissions***… Periods of curtailment or zero or negative pricing is one such circumstance. Hydropower plants sometimes "spill" water, a form of curtailment. Curtailment of minimal-emitting electricity generation tends to occur during times when wholesale electricity prices are zero or negative on a system-wide basis. Purchasing EACs from existing minimal-emitting electricity generators under these conditions would have limited or no induced grid emissions as these are times during which increased load would tend to be met by the otherwise curtailed minimal-emitting electricity generators rather than inducing increased generation from emitting electricity generators, and so is unlikely to significantly increase induced grid emissions. Similarly, if in a particular region, all generation—including imported generation—comes from minimal-emitting electricity generators, then increased load is unlikely to significantly increase induced grid emissions. The same may be true if a region is subject to a state or local policy that ensures that new load is met with minimal-emitting electricity generation.[100]

This is not surprising given the practical reality that, as a matter of basic physics, electricity is fungible and untraceable—electrons are still electrons, regardless of how they were produced, and unless the hydrogen process functions on a closed system, electrons received via an electrical grid cannot be definitively traced to any particular source.[101] Thus, for any given use case, it is impossible for Treasury to assert that the flexible use of EACs unrestricted by the three pillars (in particular, incrementality) will result in increased load on the grid that will, in turn, increase overall greenhouse gas emissions.

The NPRM is thus internally inconsistent and adopting the blunt instrument of the three pillars in all cases would be a quintessential example of arbitrary and capricious agency action: Not only is the induced grid emissions theory undergirding the three pillars highly speculative and contingent on certain assumptions and particular cases, Treasury concedes that there are situations in which the theory simply

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[98] *Id.* at 2.

[99] *Id.* at 5 (emphasis added).

[100] NPRM, 88 Fed. Reg. at 89230 (emphasis added).

[101] *See* DOE White Paper at 7 ("tracking of claims of physical electricity use is not feasible").

does not apply. Adopting the proposed rules, as currently, drafted, would be arbitrary and capricious and a violation of the APA.[102]

b. The Proposed Rules Are Arbitrary and Capricious On Other Grounds.

i. *The proposed rules are based on impermissible factors that Congress did not contemplate.*

Finally, the proposed rules would be based on "factors which Congress has not intended [the Secretary] to consider."[103] The proposals reflect policy judgments about who should bear the burden for decarbonizing the electrical grid and attempt to incorporate those judgments into the methodology for calculating emissions or as independent threshold eligibility criteria. But, in Section 45V, Congress conditioned the clean hydrogen credit on a small set of explicit criteria—namely, the amount of carbon emitted via a process that results in the production of qualified clean hydrogen, as determined by the existing GREET model.

Congress did not direct Treasury to consider whether that process employed new or existing technology (incrementality), or whether otherwise qualifying clean electricity was produced within a certain physical proximity (deliverability) or strict temporal proximity (temporal-matching). At bottom, the proposed rules *all* seek to leverage the clean hydrogen credit to transform the electric grid by requiring clean hydrogen producers to also be a source of new, clean electricity. Given the statute, it is unreasonable to conclude that this qualifies a reasonable exercise of the limited rulemaking authority delegated to the Secretary under Section 45(f)—especially where, as discussed above, the proposed rules will undermine Congress's overarching objectives in enacting Section 45V.

ii. *The proposed rules raise serious administrability concerns and impose costs that vastly outweigh any theoretical benefits.*

Worse still, the proposed requirements raise serious administrability problems. Whereas GREET is a straightforward model that allows any hydrogen producer to quickly ascertain their carbon emissions and eligibility for the clean hydrogen credit, the new rules would call for three separate and complicated new analyses—a highly technical analysis involving environmental and energy considerations that are well outside the expertise of IRS staff tasked with monitoring compliance with the tax laws. Moreover, the novel 45VH2-GREET model is plagued by technical problems (including repeatedly crashing on computers that previously could easily run the most recent GREET model that Congress adopted).

Treasury has also failed to consider important aspects of the problem before it—namely, the serious adverse implications of the proposed requirements for the growth and development of the clean hydrogen

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[102] *See, e.g.*, *Exxon Co., U.S.A. v. FERC*, 182 F.3d 30, 41-42 (D.C. Cir. 1999) (agency's use of a price "proxy" in lieu of valuing a particular "feedstock" was "arbitrary," as there was "no demonstrated relationship between the value of [the proxy] ... and coker feedstock other than an observed rough correlation in price, and even the data relied on by [the agency] show[ed] inconsistent relationships in the price [proxy] ... and the coker feedstock values."); *Ne. Maryland Waste Disposal Auth. v. EPA*, 358 F.3d 936, 954 (D.C. Cir. 2004) (rejecting as arbitrary and capricious EPA's adoption of "permit levels" given "the absence of evidence that the permit levels reflect[ed]" relevant "emission levels" and "affirmative evidence that they d[id] not").

[103] *Motor Vehicle Mfrs. Ass'n*, 463 U.S. at 43.

industry.[104] As shown above (Section I, *supra*), the proposed rules would impose massive costs that undercut the intended benefits of the Section 45V credit. Relatedly, the evidence before the Secretary does not support the proposed rules, which rely on unsupported assumptions and conjecture. Overall, far from promoting the production of clean hydrogen, the new requirements promise to raise costs and uncertainty, effectively shackling a nascent industry that Congress has sought to bolster.

The proposed rules are deeply flawed, and adopting them as currently drafted would be arbitrary and capricious on multiple grounds.

VI. If Treasury Adopts the Three Pillars in Some Form, It Must, At a Minimum, Make Several Modifications to the Proposed Rules.

For the reasons discussed above, Plug respectfully submits that Treasury lacks the legal authority to adopt the proposed rules (or any rules codifying the three pillars), and the rules in their current form would be arbitrary and capricious. Nevertheless, if Treasury is inclined to adopt rules codifying some or all of the three pillars, at a bare minimum, it should make the following modifications before adopting final rules.

a. Grandfathering/First-Mover Protections are Fundamental to U.S. Clean Energy Leadership.

Absent grandfathering protections, the proposed rules would constitute arbitrary and capricious agency action (in addition to their other legal flaws). Accordingly, the final rules should include grandfathering provisions that (i) exempt from the incrementality, time-matching, and deliverability requirements clean hydrogen projects that began construction prior to the publication of the final regulations in the Federal Register; and (ii) allow hydrogen producers to rely on the regulatory framework in place at the time of the facility's "beginning of construction" date for the entirety of the producer's ten-year Section 45V credit.

A Section 45V framework without grandfathering would not only jeopardize the trajectory of the clean hydrogen economy and our ability to decarbonize heavy industry – it also would be bad precedent for clean energy policy. Our federal clean energy policy is firmly rooted in sparking first-mover innovation. A Section 45V framework without grandfathering runs counter to that principle and would have a profound chilling effect for future first movers in the domestic clean energy space.

Since the IRA's passage in August 2022, Plug and other first-movers have made millions of dollars of investments in clean hydrogen production projects based on the reasonable understanding (given Section 45V's explicit adoption of GREET) that they would benefit from the Section 45V credit without the

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[104] Consider deliverability, for example. Requiring a clean hydrogen power operator to locate its facilities in a region with clean power available at certain levels (e.g., states with abundant solar or wind power generators) is no guarantee that the facility would actually use—or be able to use—that power. That is the essence of an arbitrary requirement, because the restriction to certain preferred states does not rationally advance even the stated objective of proponents of the restriction. Worse still, the requirement would be guaranteed to significantly increase the cost of doing business. As discussed above, both individually and collectively, the proposed rules would—as a practical matter—make it impossible for companies such as Plug Power (the intended beneficiaries of the credit) to expand nationwide production of qualifying clean hydrogen, thereby defeating the overarching goal of Section 45V.

artificial limitations of the three pillars that are nowhere in the statutory text or GREET. These first-mover projects will be vital to the trajectory of the domestic clean hydrogen economy, to U.S. clean energy leadership, and to domestic job creation. In just the past two years, Plug Power has begun construction of multiple electrolytic hydrogen generation facilities, a gigafactory for electrolyzer manufacturing, and a 500,000 square foot manufacturing facility in Albany County, New York. These investments have created thousands of jobs and solidified U.S. leadership in clean hydrogen technologies. Clean energy policy should not penalize first-movers. Projects which have begun construction should not be subject to the nascent and unprecedented three-pillars requirements.

To take proper account of these reliance interests,[105] and to further the overarching goals of Section 45V, Treasury should therefore ***exempt clean hydrogen projects that began construction prior to the publication of the final regulation in the Federal Register.***

Similarly, current and prospective producers of clean hydrogen need some measure of regulatory certainty and predictability before investing enormous sums of money in long-term projects—projects that Section 45V explicitly envisages may have a decade-long lifespan (if not more). The absence of a "beginning of construction" standard for the three-pillars requirements will have a profound chilling effect on project finance. In particular, the uncertain future availability of hourly EACs demonstrates the importance of a "beginning of construction" standard. The existing EAC market is predominantly driven by annual Renewable Portfolio Standards (RPS), Clean Energy Standards (CES), and to a much lesser extent, voluntary markets. These existing markets do not impose an hourly-matching requirement. The imposition of such a requirement on one niche industry is insufficient to create a liquid EAC market. Furthermore, only three of the 10 EAC tracking systems have hourly accounting. Existing hourly EACs are limited and used for corporate voluntary goals. As a result, existing hourly EAC tracking has limited functionality for transferring and retiring hourly EACs. Hourly EACs are not a tradeable product at this time.

To account for this need for predictability and certainty, ***any application of the three pillars (together or individually) should be limited by a "beginning of construction" standard***—specifically, a "qualified clean hydrogen production facility" should be subject to the same Treasury requirements for the entirety of its ten-year Section 45V credit. For example, projects that begin construction prior to 2028 should only be subject to annual temporal matching for the entire duration of its ten-year credit. Similarly, if Treasury adjusts the date of an incrementality requirement (as recommended herein), such requirement should be based upon a "beginning of construction" standard. Furthermore, we strongly recommend that Treasury adopt a "begin construction" exception to incrementality that would allow all hydrogen projects that are under construction by Dec. 31, 2026, to use existing resources to produce clean hydrogen through the term of the Section 45V tax credit. This phase-in date for incrementality is more in-line with the realities of existing interconnection queues and the goals of the DOE's Regional Clean Hydrogen Hub program.

Grandfathering principles are also relevant to which "version" of the GREET model may be used by a taxpayer. Hydrogen producers should be able to rely upon the GREET 2021 model for the reasons discussed above.[106] But if Treasury does it adopt that approach, at a minimum, these producers should be

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[105] This is a basic requirement to comport with the APA. Courts have held that agencies must consider—and give proper weight to—industry participants' reliance interests. *See, e.g., Dep't of Homeland Sec. v. Regents of the Univ. of California*, 140 S. Ct. 1891, 1913 (2020); *R.J. Reynolds Vapor Co. v. Food & Drug Admin.*, 65 F.4th 182, 189 (5th Cir. 2023).

[106] *See supra* Section II(b).

entitled to rely on the version of the all-purpose GREET model (currently, R&D GREET 2023) in effect at the time such qualified clean hydrogen production facility begins construction. Under the proposed regulations, the amount of the Section 45V credit is determined based upon the lifecycle GHG emissions rate of the facility's total hydrogen production using "the most recent GREET model," defined, in part, as the "latest version of 45VH2–GREET developed by Argonne National Laboratory that is publicly available, as provided in the instructions to the latest version of Form 7210, *Clean Hydrogen Production Credit,* or any successor form(s), on the first day of the taxable year during which the qualified clean hydrogen for which the taxpayer is claiming the Section 45V credit was produced." In addition to running afoul of the statutory text, as discussed above, this definition and practice would create uncertainty for the Section 45V credit and would discourage project financing. Taxpayers may not invest in the development of hydrogen facilities unless they are confident that future versions of the GREET model will not limit or prevent a hydrogen facility from qualifying for tax credits under Section 45V. At the very least, then, we recommend that taxpayers have the option of using the GREET model in place at the time such qualified clean hydrogen production facility begins construction. Furthermore, taxpayers should be permitted to use the most recent GREET model at the time hydrogen is being produced – but should not be required to do so.

For all these reasons, it is imperative that any final rules adopting some or all of the three pillars at the very least contain the grandfathering protections discussed above.

b. The Final Rules Should Afford Meaningful Access To Key Baseload Power.

The proposed rules also should be modified to afford several pathways for hydrogen producers to access hydroelectric, nuclear, and other clean baseload power resources. The NPRM seeks comments on alternative frameworks to its proposed "incrementality" requirement.[107] At a minimum, we strongly recommend that any incrementality framework should afford several pathways for hydrogen producers to access hydroelectric, nuclear, and other clean baseload power resources, including (i) a carveout for facilities located in jurisdictions with renewable portfolio standards, clean power mandates, or other similar policies; (ii) an allowance of 10% of a power producer's (at the owner-level) minimal-emitting generation (e.g., nuclear and hydroelectric); (iii) risk of relicensing and curtailment exceptions; and (iv) optionality to submit grid emissions data showing zero or de minimis induced emissions on a case-by-case basis. We respectfully suggest that the full suite of options to meet the incrementality requirement must be included.

i. Grid Decarbonization is Already Happening and Incrementality is Ineffectual and Unnecessary.

Treasury's proposed incrementality requirement ignores the national trend towards grid decarbonization. Between 1990 and 2010, the percentage of net generation of non-emitting resources was flat at about 30%.[108] During the most recent twelve year, the figure increased by *one-third* to 40 percent. As the Energy Information Administration reported, in the *one year* "[b]etween 2021 and 2022, utility-

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[107] *See* NPRM, 88 Fed. Reg. at 89228–32.

[108] Energy Information Administration, U.S. Energy-Related Carbon Dioxide Emissions, 2022 at 5 (Nov. 2023), https://www.eia.gov/environment/emissions/carbon/pdf/2022_Emissions_Report.pdf.

scale solar generation grew by 26 percent and wind generation by 15 percent," helping to "contribute[] to the decrease in the carbon intensity of electricity."[109]

The trend toward zero-emitting generation is expected not only to continue but accelerate. First, the cost of constructing new non-emitting generators is decreasing rapidly. The International Renewable Energy Agency, for example, reported that between 2010 and 2021, the cost of new utility-scale solar, onshore wind, and offshore wind units dropped by 89 percent, 69 percent, and 59 percent, respectively.[110] Second, the federal government, through various policies including within the IRA, has provided subsidies to support non-emitting resources.[111] In FY 2022, the federal government provided $15.3 billion in renewable-related tax expenditures, nearly three times the level in FY 2016.[112] The IRA will dramatically expand this investment, including an estimated $1.2 trillion in incentives by 2032 which could support $11 trillion in total infrastructure investments by 2050.[113] Third, twenty-three states, the District of Columbia, and Puerto Rico have adopted 100% clean-energy goals by 2050. [114] Thirty-six states have implemented renewable portfolio standards or other measures requiring utilities to procure various amounts of zero-carbon resources.[115]

The Energy Information Administration ("EIA") assessed in its long-term outlook that "renewable power capacity will increase in all regions of the United States…."[116] According to EIA, by the end of the decade, 424 GW of new non-emitting capacity will come online, more than doubling the existing 403 GW of non-emitting capacity.[117] Notably, "[o]nce built and when the resource is available, wind and solar generation outcompete other technologies for system dispatch because they have zero fuel costs."[118] As a result, EIA expects that "U.S. coal-fired generation capacity will decline sharply by 2030 to about 50% of current levels," and there will be decreased "reliance on natural gas in favor of renewables."[119]

This historical trend and projections for a cleaner grid demonstrate that Treasury's proposed rule is arbitrary and capricious in two ways. First, there is no need for incrementality. The grid is becoming cleaner following technological advances and governmental policies. In its recent proposed rule to control

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[109] *Id.*

[110] Int'l Renewable Energy Agency, Renewal Power Generation Costs in 2022 at 9-10 (2023), https://mc-cd8320d4-36a1-40ac-83cc-3389-cdn-endpoint.azureedge.net/-/media/Files/IRENA/Agency/Publication/2023/Aug/IRENA_Renewable_power_generation_costs_in_2022_SUMMARY.pdf?rev=a008fb3ef20d4f05b1160b37f837c6dd.

[111] Envt'l Protection Agency, Summary of Inflation Reduction Act Provisions Related to Renewable Energy https://www.epa.gov/green-power-markets/summary-inflation-reduction-act-provisions-related-renewable-energy (accessed Feb. 4, 2024).

[112] Energy Information Administration, Federal Financial Interventions and Subsidies in Energy in Fiscal Years 2016–2022 at 7 (Aug. 2023), https://www.eia.gov/analysis/requests/subsidy/pdf/subsidy.pdf.

[113] Goldman Sachs, The US is Poised for an Energy Revolution (Apr. 17, 2023), https://www.goldmansachs.com/intelligence/pages/the-us-is-poised-for-an-energy-revolution.html.

[114] Clean Energy States Alliance, Table of 100% Clean Energy States, https://www.cesa.org/projects/100-clean-energy-collaborative/guide/table-of-100-clean-energy-states/ (accessed Feb. 4, 2024).

[115] Energy Information Administration, Renewable Energy Explained, Portfolio Standards (updated Nov. 30, 2022), https://www.eia.gov/energyexplained/renewable-sources/portfolio-standards.php.

[116] EIA Outlook at 10, https://www.eia.gov/outlooks/aeo/pdf/AEO2023_Narrative.pdf

[117] Ref Case Table 56.

[118] *Id.* at 11.

[119] *Id.* at 13.

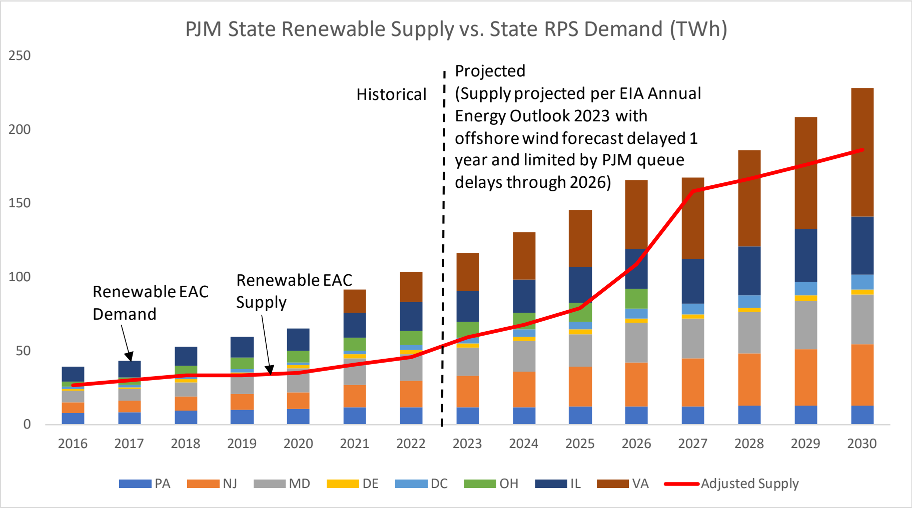
greenhouse gas emissions from power plants under the Clean Air Act, EPA itself indicated that the concerns from some NGOs that "existing non-emitting assets will channel electricity from the grid toward electrolyzers" "should mitigate over time as the carbon intensity of the grid is projected to decline."[120] Treasury does not acknowledge the clear trend and EPA's own projections, let alone adapt its proposed rule to them.

Second, there is no basis to conclude that restricting EACs for Section 45V to "new" resources will encourage production of new renewable entry. Consider, for example, EIA's projection that 424 GW of non-emitting capacity will enter service by 2030. This estimate does not consider the Section 45V hydrogen tax credit. If a new renewable resource would enter the market regardless of the hydrogen production tax credit, then from the standpoint of the grid, the new resource is no more "incremental" than an existing resource. But for the opportunity to serve a hydrogen producer, either one would be serving other load on the grid. Distinguishing between the two is arbitrary and capricious.[121]

ii. *Regional Analysis Confirms There Is No Basis to Distinguish Between "New" Generators and Existing Resources.*

Hydrogen producers will use new renewable generation that will enter the grid, regardless of whether the generators are "new" or "existing." Incrementality does not benefit grid emissions.

In the mid-Atlantic, parts of the Midwest, and New England, existing demand for renewable EACs exceeds available supply, and new entry is constrained. Because many new non-emitting units will enter the market, and there is no ability to expand new renewable entry further in response to the additional load caused by hydrogen production, it makes no difference whether hydrogen production facilities obtain EACs from new or existing clean resources. Either way, the clean resources would otherwise be serving load.



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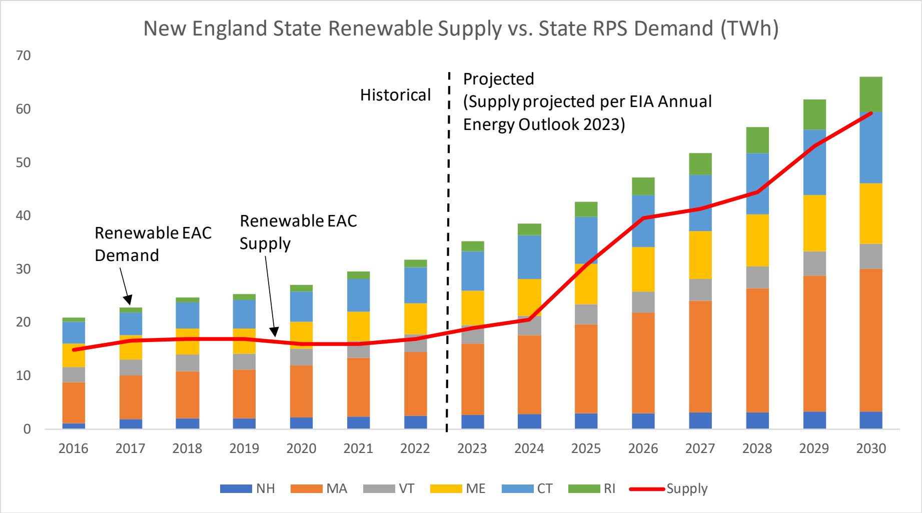
[120] *New Source Performance Standards for Greenhouse Gas Emissions From New, Modified, and Reconstructed Fossil Fuel-Fired Electric Generating Units*, 88 Fed. Reg. 33,240, 33,409 (May 23, 2023).

[121] *See, e.g.*, Constellation Energy Corp., *American Manufacturers Need Equal Access to Clean Hydrogen to Decarbonize their Operations* at 4, https://www.constellationenergy.com/our-work/what-we-do/generation/ensuring-equal-access-to-clean-hydrogen.html (accessed Feb. 5, 2024).

Source: EIA Electric Power Annual (state level load and renewable generation). EIA Annual Energy Outlook 2023. Database on State Incentives for Renewables (DSIRE) from the NC Clean Energy Technology Center at North Carolina State University. Totals do not include states with only a small fraction of load within the PJM region (IN, MI, KY, NC) and assume that 70 percent of Illinois demand and renewable production is located within PJM.



Source: EIA Electric Power Annual (state level load and renewable generation). EIA Annual Energy Outlook 2023. Database on State Incentives for Renewables (DSIRE) from the NC Clean Energy Technology Center at North Carolina State University.

In single-*market states with enforceable net-zero goals*, such as New York and California, any new entry to support expanded grid demand—including for hydrogen production—will be from non-emitting resources. If hydrogen production is served by existing resources, it will be backfilled by new renewable resources. There is no distinction between EACs from new or existing resources. Other states requiring 100% zero-emitting power—including Connecticut, Illinois, Michigan, Minnesota, New Jersey, Virginia, and Washington—are similarly situated.

State	Goal
Connecticut	100% carbon-free electricity by 2040[122]
Hawaii	100% renewable energy by 2045
Illinois	100% clean energy by 2050[123]
Michigan	100% clean energy by 2040[124]
Minnesota	100% carbon-free energy by 2040[125]
New Jersey	100% clean energy by 2035[126]

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[122] Ct. Gen. Stats. § 22a-220(a)(3).

[123] 20 ILCS § 3855/1-5(1.5).

[124] Mich. Code § 460.1051(1)(b) (eff. Feb. 27, 2024).

[125] Minn. Stats. § 216B.1691(2g).

[126] N.J. Exec. Order 315 (Feb. 15, 2023) (requiring the New Jersey Board of Public Utilities to adopt enforceable standards during 2024).

Rhode Island	100% renewable energy by 2030
Virginia	100% zero-carbon energy by 2045 or 2050[127]
Washington	100% carbon neutral by 2030; 100% carbon free by 2045[128]

In states with competitive markets where renewable units are economic, such as Texas, renewable deployment is robust. It is reasonable to expect increased grid demand to be met with new renewable entry, regardless of any incrementality requirement. Lastly, in states with vertically integrated utilities not incentivized to sell EACs, renewable entry is fixed by factors exogenous to the hydrogen production tax credit. An incrementality requirement will not incentivize any incremental new clean generation, but instead will simply result in generation that otherwise would have served load being used for hydrogen production—just like existing clean resources.

In sum, the proposed incrementality requirement will not drive new incremental clean generation. In fact, recent modeling from EPRI showed that total emissions increase even with the three pillars in place.[129] This stands in contrast to the bare assertions (unsupported by modeling or analytics) from DOE's and EPA's supporting materials that "when EACs from low-GHG generators have attributes that meet these three criteria, it would be reasonable to treat induced grid emissions as zero."[130]

iii. ***The final rules should include a carve-out for facilities located in jurisdictions with clean energy, renewable portfolio, or emissions reduction standards.***

Treasury's "induced grid emissions" theory for the proposed rules is even more tenuous for hydrogen generation projects in states with policies driving grid decarbonization and greenhouse gas emissions reductions. Even if there were any basis to the theory in limited situations and regions, it clearly has no application in regions subject to state decarbonization rules and standards. As a result, hydrogen generation facilities in locations with greenhouse gas emissions caps or renewable portfolio standards (or similar policies) should be deemed automatically compliant with any proposed incrementality framework. Several state stakeholders have supported this position.[131] For example, the State of California (through Go-Biz and ARCHES) explained in its August 23, 2023 letter to Treasury:

> The argument for requiring additionality [i.e., incrementality], in the context of a state with an RPS and carbon neutral requirement, sets up an "either-or" at the project level when we need "both-and" at the system level to enable deep system wide decarbonization. For context, in California, to provide 100% clean electricity our state will need to build 148,000 MW of clean energy resources by 2045 – increasing our already robust clean electricity capacity by 400% over the next two decades. We believe these targets are achievable, but if hydrogen projects require additionality

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[127] Va. Code § 56-585.5(C).

[128] RCW §§ 19.405.040(1), 19.405.050(1).

[129] EPRI, *IRA's 45V Clean Hydrogen Production Tax Credit* (Nov. 3, 2023), *available at* https://www.epri.com/research/products/000000003002028407.

[130] *DOE Guidelines* at 12; EPA Letter at 6 ("it would be reasonable to expect that the purchase and use of zero-emitting electricity represented by three-pillar EACs does not result in induced grid emissions.").

[131] Letters attached hereto as Exhibit C.

> above and beyond our 100% RPS requirements, it will be impossible to interconnect them in a timely and cost-effect manner without disrupting our carefully calibrated energy system.[132]

Similarly, a consortium of states in the northeast, led by the New York State Energy & Research Development Authority, explained:

> [We] do not support a strict requirement of "Additionality". As an initial point, in states with renewable portfolio standards (RPS) based on a percentage of load, by definition if an electrolyzer load is added to that grid, new renewables must be built to cover the percentage of obligation in place. An RPS enables the clean electricity sector to automatically adjust its renewables requirements for new clean load without putting this obligation onto the new electrolyzer load. Under current RPS implementation policies, no RPS requires additionality tied to individual heat pumps installed, electric vehicles connected to the grid, lithium-ion energy storage, nor any other decarbonization solution being deployed at scale to meet local, state or national climate and energy goals. It is unclear why a different approach should be applied to hydrogen. [133]

The State of Washington also provided a compelling justification that incrementality is unwarranted—at least on an undifferentiated, nationwide basis:

> The suggested additionality restrictions are not only unnecessary in a statutory clean energy state such as Washington, they would also complicate the development of electrolytic hydrogen production in such states. An additionality requirement would prevent the use of electricity from existing hydroelectric, wind, solar, or nuclear generating facilities even if those facilities are most suitable to serve a particular hydrogen production facility and even if state law ensures this use would not result in any increase in GHG emissions. . . Proponents of the additionality restriction argue that, if existing generating resources are shifted to hydrogen production, utilities will increase electric generation at existing fossil fuel power plants. There may be a reasonable concern in states without clean electricity and GHG cap laws, and if this occurred it would greatly reduce the climate benefits that Congress anticipated in enacting the § 45V PTC. However, that scenario is not credible in Washington and other states with clean electricity or GHG emission laws. Washington's clean electricity law would prevent utilities from back-filling their generating portfolio with fossil fuel generation. These factors are acknowledged in the analysis cited by advocates for the strict additionality requirement. ***We believe that any additionality-based restriction of the § 45V tax credit should distinguish between states with these laws and states with no safeguards on increased generation from fossil fuel plants.***[134]

The NPRM inquires about the use of existing minimal-emitting generation "in locations where grid electricity is 100 percent generated by minimal-emitting generators or where increases in load do not increase grid emissions, for example, due to State policy capping total GHG emissions such that new load must be met with minimal-emitting generators."[135] Plug respectfully suggests that, in addition to GHG emissions caps, clean energy deployment targets (such as renewable portfolio standards) are equally relevant. The NYSERDA website for New York State's Clean Energy Standard (CES) provides a compelling narrative about the degree to which state-policy is addressing grid emissions:

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[132] *Id.*

[133] *Id.*

[134] *Id.*

[135] NPRM, 88 Fed. Reg. at 89230

> New York's Clean Energy Standard (CES) is designed to fight climate change, reduce harmful air pollution, and ensure a diverse and reliable low-carbon energy supply. Following its adoption in 2016, the CES was expanded in 2020 to meet the requirements of the Climate Act Link opens in new window, which sets goals for achieving 70% renewably sourced electricity by 2030 and a zero-emission electric grid by 2040. By focusing on low-carbon energy sources, such as solar, wind, and hydropower, the CES will bring investment, economic development, and jobs to New York State. The CES features two mechanisms – the renewable energy standard (RES) and zero-emissions credit (ZEC) requirement – that require every load serving entity to procure renewable energy certificates (RECs) and ZECs.[136]

It would be arbitrary and capricious—not to mention onerous and completely unnecessary—to impose incrementality requirements in states that are proactively addressing grid decarbonization. Furthermore, this provision would encourage hydrogen developments to focus on jurisdictions that are most thoughtfully pursuing the renewable deployment, grid decarbonization, and climate change. An exemption should therefore be granted for facilities located in jurisdictions with renewable portfolio standards, clean power mandates, or other similar policies.

iv. The final rules should afford producers options for demonstrating compliance, including their use of existing generators with minimal emissions.

The NPRM seeks comment on whether a percentage of existing minimal-emitting generation should be considered as an alternative approach within a proposed incrementality framework. One such approach would deem a percentage of:

> the hourly generation from minimal-emitting electricity generators (for example, wind, solar, nuclear, and hydropower facilities) placed in service before January 1, 2023, as satisfying the incrementality requirement. This pathway may be appropriate because some circumstances . . . may make the resulting incremental generation difficult to anticipate or identify, or because the process for identifying the circumstances (such as avoided retirement risk or modeling of minimal-emissions) may be overly burdensome to evaluate for specific electricity generators or require data that is not available.[137]

A percentage inclusion of minimal-emitting generators is crucial to ensuring the viability of the proposed regulatory framework. Furthermore, inclusion of clean baseload assets is paramount to the viability of clean hydrogen generation projects. Given the critical need to afford producers viable and realistic production options, we respectfully request that Treasury allow 10% of existing minimal or zero emitting resource production EACs be used for qualifying hydrogen production. These EACs will have eligibility tracked in an approved tracking system. Until tracking systems implement this functionality, we request that hydrogen producers are allowed use EACs from existing minimal or zero emitting resources for up to 30% of their consumption. A higher percentage threshold inclusion is warranted, due to the highly speculative induced grid emissions theory and the project-chilling effect of incrementality, more generally.

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[136] https://www.nyserda.ny.gov/All-Programs/Clean-Energy-Standard

[137] NPRM, 88 Fed. Reg. at 89231.

The NPRM proposes a much lower figure of only 5%, but this amount is underinclusive. Treasury arrived at that figure via two avenues. First, the NPRM notes that roughly 5% of nuclear facilities and between 6 and 10% of wind and solar facilities are at risk of retirement in the coming years. Second, the NPRM notes that periods of negative wholesale electricity prices (during which any increased load is unlikely to increase any induced emissions) occurred during roughly 5% of hours. From these premises, the NPRM extrapolates that a bare 5% allowance should serve as a proxy for all non-inducing electricity production. To the contrary, these two figures—avoided retirements and negative wholesale electricity periods—are independent and additive. Periods of negative wholesale electricity pricing affect *all* minimal-emitting producers, regardless of retirement risk.[138] Separately, for those facilities that would retire but for a relationship with a hydrogen producer—roughly 5%, though likely to increase—*all* additional electricity generated to avoid retirement would also be non-inducing. By NPRM's own logic, any allowance must be large enough to account for both proxies.

In finding a risk that 5% of the nuclear fleet may retire through 2032, Treasury ignores that the nuclear production tax credit will expire after 2032. In the decade prior to the passage of the IRA, 13 reactors representing 10.2 GW of nuclear capacity retired, with most retirements driven by economic factors. At the same time 20 reactors representing 20.3 GW of capacity sought and obtained state-based support to avoid retiring. Collectively, these reactors represented 30% of the total nuclear capacity and more than half of the non-regulated merchant nuclear capacity operating as of 2012.[139] These units have remained in service because of federal and state programs to support their operation. Much of the state support—including in Illinois, New York, and Connecticut—however, will terminate in the next few years, well before 2033. Thus, nuclear plants face a revenue cliff beginning in 2033, when the § 45U nuclear production tax credit sunsets.

Critically, Treasury also overlooks that the timing for greatest retirement risk aligns with the timing for the greatest needed increase in hydrogen production volumes. As discussed above, under DOE's hydrogen pathways, clean hydrogen production will rise from near-zero now to 10 million metric tons by 2030, and then quintuple between 2030 and 2050.[140] With this trajectory, about 75 percent of the hydrogen production volumes eligible to claim the 45V credit will fall in the 2033-45 period. Failing to consider EIA's projection of retirements after 2032 ignores the period when EACs will be in the greatest demand, and when EAC purchases may avoid the greatest number of retirements.

Second, the 5 percent limit will not be sufficient to satisfy hydrogen producers' demand for EACs. In the aggregate, the proposed 5 percent level is a ceiling—it can only be met if every eligible facility sells its full 5 percent allotment to hydrogen production facilities. But that is unlikely because over 60 percent of non-emitting capacity is owned by vertically integrated utilities focused on serving native load rather

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[138] In 2022, negative wholesale electricity price periods accounted for roughly 6.3 percent of hours, part of a consistent upward trend since 2012. Berkeley Lab, Electricity Markets & Policy, *The Renewables and Wholesale Electricity Prices (ReWEP) Tool, available at https://emp.lbl.gov/renewables-and-wholesale-electricity-prices-rewep.*

[139] Retired reactors include Crystal River 3 (Regulated, 2013), Kewaunee (2013), San Onofre 2&3 (Regulated, 2013), Vermont Yankee (2014), Ft. Calhoun (Regulated, 2016), Oyster Creek (2018), Pilgrim (2019), Three Mile Island 1 (2019), Indian Point 2&3 (2020/21), Duane Arnold (2020), and Palisades (2022). Merchant reactors obtaining state support have included Quad Cities 1&2, Clinton, Dresden 2&3, Byron 1&2, Braidwood 1&2, Ginna, Fitzpatrick, Nine Mile Point 1&2, Salem 1&2, Hope Creek, Millstone 2&3, Davis-Besse, and Perry (state support legislation passed but later repealed for the final two).

[140] Pathways Report at 6, 68.

than hydrogen production. It is also unreasonable to assume that every other eligible facility will use its full 5 percent allotment for hydrogen producers rather than other EAC purchasers. Thus, in practice, EACs representing far less than 5 percent of the existing non-emitting capacity will be available to hydrogen producers under the contemplated 5 percent allowance.

Access to a large volume of EACs to support the § 45V credit is essential for hydrogen production to be economic. Producers must run electrolyzers near capacity to offset the high capital costs of entry and require an adequate supply of EACs to support that operation. Without an adequate supply of EACs, prospective entrants may decide that hydrogen production is not likely to be viable. Allowing 10 percent of existing clean capacity to be treated as incremental would ensure that EACs can be allocated efficiently, particularly by enabling owners of uncommitted clean generators to benefit from the economics of scale in selling to large hydrogen producers, and by ensuring that those producers have access to an adequate supply of credits.

To further address these issues, Treasury should measure the 10% threshold at the owner level rather than the facility level. As explained, not every nuclear plant will power hydrogen production, and hydrogen production projects need to be relatively large to achieve economies of scale. Requiring hydrogen production to be tied to, and limited by, available supply from a particular generator would require hydrogen projects to be configured on a small scale, undermining economics and preventing technology deployment and scaling. Measuring the 10 percent at the fleet level for each company would provide flexibility to tailor the size of hydrogen projects to the total pool of available generation that otherwise complies with applicable requirements, *i.e.*, no more than 10 percent of the company's total carbon-free generation being used for hydrogen production and subject to any applicable temporal or geographic limitations adopted in the final regulations.

A 10% figure on the generation resource level better accounts for the factors Treasury has identified to account for non-inducing production. Inclusion of 10% of minimal or zero-emitting generation assets would rightfully acknowledge the economic benefit of using already-built generation sources to facilitate the scaling of clean hydrogen to bring down its cost as quickly as possible. The exception also would be self-limiting given that almost all regulated and much of the deregulated clean generation already has committed its output to customers or state programs and would not be available for hydrogen production. The primary impact of this change would be to allow owners of uncommitted clean generation (primarily deregulated clean resources that are not participating in state programs) to take advantage of the economies of scale that are present at a larger electrolyzer given the cost of the equipment and supporting infrastructure. Since only a portion of owners will be able to utilize this exception, this modification would effectively cap the amount of existing national clean energy that is used for hydrogen at a few percent. Furthermore, this change is essential to ensuring that recently awardees can proceed under DOE's Regional Clean Hydrogen Hub program, which demands, among other things, production of nuclear-based clean hydrogen.

Treasury should not credit recent analytics suggesting that even a 5 percent allowance could raise greenhouse gas emissions significantly. In its paper *How Clean Will US Hydrogen Get*, the Rhodium Group attempts to evaluate the effect of Treasury's proposed 5% allowance, but in doing so, it assumes a baseline where *no* nuclear units retire, and all licenses are renewed.[141] Rhodium's own research has shown that over half of the nation's merchant nuclear fleet is at risk of retirement without policy support.[142] Moreover, Rhodium's estimates appear to assume full utilization of the 5% allowance by all resources, which likewise is not reasonable. The same reasons why these assumptions are wrong explain why an allowance of at least 10 percent is appropriate.

Finally, Treasury must acknowledge that the revenue from EAC sales to nuclear generators could be a key factor in owners' decisions not to retire. When combined with market revenues, the § 45U nuclear production tax credit is a reasonable proxy for the ongoing costs and risks of operating a nuclear plant, and is equivalent to all-in revenue ranging from $43.75/MWh in 2024 to about $55/MWh in 2033, with expected inflation. This suggests that, without additional revenue streams such as sales of EACs to hydrogen producers, nuclear operators may view it more economic to stop operating once the § 45U nuclear production tax credit sunsets. But nuclear facilities offer a host of benefits, including stable, reliable, and carbon-free operations during all hours. To the extent Treasury adopts an incrementality requirement, it should do so in a way that is tailored to avoiding unnecessary nuclear retirements.

v. When a producer has filed for a license renewal or extension, minimal or zero-emitting resources should be deemed incremental for such period.

Any formulaic incrementality framework should also include nuclear and hydroelectric assets at risk of retirement. The NPRM inquires about "particular characteristics of hydrogen production facilities associated with existing generators at risk of retirement that should be considered (i) to demonstrate that the hydrogen production reduces retirement risk, such as co-location of hydrogen production with an existing generator and (ii) to assess the minimum hydrogen production necessary to reduce retirement risk, such as limitations on project size, electrolyzer capacity, or percent of generation used by the hydrogen production."[143]

We respectfully submit that a nuclear or hydroelectric generation facility unit extending its operating license should be deemed "incremental" (i.e., deemed to meet the incrementality requirement or otherwise a permissible alternative that allows the producer to remain eligible for the Section 45V credit using EACs). To qualify for a license extension, these facilities must make significant investments in plant equipment to demonstrate that they can operate safely through the renewed license period. These investments involve replacing and upgrading major components of the nuclear unit such as generators, turbines, heat exchangers, piping, pressure systems, and control systems, as well as expenditures necessary to satisfy commitments undertaken during the extended 20-year operating life. Facility owners will not

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[141] Rhodium Group, *How Clean Will US Hydrogen Get? Unpacking Treasury's Proposed 45V Tax Credit Guidance* (Jan. 4, 2024), https://rhg.com/research/clean-hydrogen-45v-tax-guidance/.

[142] Rhodium Group, *Nukes in the Crosshairs Revisited: The Market and Emissions Impacts of Retirements* (Nov. 4, 2016), https://rhg.com/research/nukes-in-the-crosshairs-revisited-the-market-and-emissions-impacts-of-retirements/ ("Nation-wide we estimate that roughly one-half of the nation's nuclear plants located in competitive markets are at risk of early retirement. The economics of nuclear plants in regulated regions are also being drawn into question as well. In total, we estimate an additional 24 GW of nuclear generating capacity could close across the country between now and 2030 unless additional policy steps are taken."); *see also* Rhodium Group, *Pathways to Build Back Better: Investing in 100% Clean Electricity* (Mar. 23, 2021), https://rhg.com/research/build-back-better-clean-electricity ("Under current policy more than half of the nuclear fleet will retire by 2030, leaving a huge gap.").

[143] NPRM, 88 Fed. Reg. at 89232

undertake this investment unless they have a reasonable expectation of being able to earn sufficient revenues to cover the costs and risks of operating the unit.

For example, a June 2017 review by Idaho National Lab found that two-thirds of the nation's nuclear fleet was unprofitable and one-fifth were likely to retire early. Between 2012 and 2022, 13 nuclear units prematurely retired and over a dozen more announced plans to retire. These closures have temporarily ceased given the passage of supportive state policy and the federal nuclear production tax credit, all of which expire by 2032. Precisely at the time when the nation will be struggling to meet midcentury carbon reduction goals, there will be no mechanism in federal law to support existing nuclear. By contrast, a nuclear unit that commits to a hydrogen production facility due to the availability of the Section 45V credit has an incentive to take steps necessary to seek license extension and operate post-2032 to satisfy that commitment. Treasury should conclude that all electricity produced by an existing minimal-emitting generator is incremental for purposes of Section 45V, once the such facility has filed to extend its operating license. No additional showing of financial need should be required given the monetary investments already being made by the unit's owner to extend the operating license.

vi. Hydrogen producers should be allowed to submit data to demonstrate zero or minimal induced grid emissions on a case-by-case basis.

Finally, Plug respectfully requests that all hydrogen producers should have the option to submit data demonstrating zero or minimal induced grid emissions in any given case (or category of cases) through modelling or other evidence. It is imperative to provide flexibility to avoid unintended consequences of stifling hydrogen generation project development. And, as explained above, the NPRM itself acknowledges that the induced grid emissions theory does not apply in many situations. Furthermore, any such framework should afford flexibility to submit any data well in anticipation of future project developments. As is relevant for all of the proposed three-pillars requirements, a lack of predictability and project certainty will create an insurmountable hurdle for hydrogen project financing and development. For all these reasons, any incrementality mandate should allow producers to submit data to rebut application of the induced grid emissions theory in any given case or category of cases.

vii. Incrementality is immaterial to hydrogen facilities co-located with clean energy resources. Three-pillars requirements should not be imposed at these facilities.

Incrementality is not relevant to a behind-the-meter electrolyzer using dedicated clean power resources. The emissions profile of hydrogen produced using electricity from a specific generation source that supplies electricity via direct connection to the electrolyzer without flowing through the grid is clear: it reflects the emissions of the generator powering the electrolyzer.

Further, the proposed regulations do not provide any accommodation for co-located facilities. Specifically, Prop. Treas. Reg. § 1.45V–4(d)(1) provides that certain requirements must be met regardless of whether the electricity generating facility giving rise to the qualifying EAC is grid connected, directly connected, or co-located with the hydrogen production facility. However, the three-pillar restrictions should not apply to a hydrogen facility's reliance on behind-the-meter clean power resources. Prop. Treas. Reg. § 1.45V–4(d)(1) adds substantial administrative burdens without benefits. Treasury should advance a policy that incentivizes co-located projects. We respectfully request that Treasury affirm that the three pillars' requirements only apply to "purchased" EACs in the final regulations.

c. Rather Than Aggregating All Hydrogen Produced During a Taxable Year, the Final Rules Must Rely On Only Qualified Clean Hydrogen.

Proposed § 1.45V-4(a) must be modified to allow a qualified clean hydrogen production facility to claim the Section 45V credit for any amount of qualified clean hydrogen produced via any process that makes the hydrogen eligible for the credit within a given year. As discussed above, the proposed rules in their current form contravene the plain text of Section 45V because they would require a taxpayer to lump together all hydrogen produced via different processes (e.g., hydrogen produced using solar energy and hydrogen produced using wind energy or energy from the electric grid) in a given year. In addition to being inconsistent with the statutory text, the proposed rule would create perverse incentives that run counter to Section 45V's objectives of incentivizing and rapidly scaling up hydrogen production. The effect of the regulation would be particularly onerous if combined with the proposed requirement of hourly temporal matching.

d. If Treasury Advances Hourly Temporal Matching, the Phase-in Should Not Predate Sufficient Commercial Availability of Hourly EACs.

Though Plug contests the permissibility of hourly temporal matching, we suggest that any implementation thereof must be cognizant of the commercial realities of existing EAC markets. Premature or poorly devised implementation of hourly temporal matching would make electrolytic hydrogen projects un-financeable. Plug has conducted extensive empirical analyses on the adverse economic consequences and administrative impracticalities of imposing hourly temporal matching under the Proposed Rule, § 1.45V-4(d)(3)(ii). (Plug's analyses can be found at The Road to Clean Hydrogen: Getting the Rules Right and are attached hereto as Appendix B). These analyses demonstrate, among other things, that hourly temporal matching is adversely impactful to clean hydrogen deployments and cost reduction – in large part driven by the non-existent and highly speculative availability of hourly EACs in the foreseeable future.

As a necessary prerequisite to hourly matching, all tracking systems should demonstrate (i) full functionality, (ii) compliance reporting and informational tags, and (iii) hourly EAC market liquidity. In light of these prerequisites, we strongly recommend that 2028 is too ambitious for hourly matching. We recommend that Treasury should forego its proposed hourly temporal requirement, in lieu of a comprehensive feasibility assessment of nation-wide hourly temporal matching. The transition to hourly matching should not be implemented until all tracking systems demonstrate the following:

Full Functionality. Hourly EAC tracking must be fully functional – meaning an account holder can see and perform retirements, transfers, imports, and exports of a single EAC (and not only on an entire "batch" of EACs) in a given hour. For example, if a wind resource generated 100 MW in one hour, the EAC tracking system would mint 100 EACs for that hour. Full functionality would allow the account holder of those 100 EACs for that one hour to transfer, retire, or import/export 1 EAC for that hour. Currently, the few tracking systems with hourly capabilities have limited functionality requiring the account holder to transfer or retire the entire 100 EACs, rather than individual EACs. Individual EAC capabilities are essential to a load following EAC or REC. Tracking systems must address this functional deficiency prior to an hourly EAC mandate.

Compliance Reporting and Informational Tags. Tracking systems' annual compliance reporting must be able to demonstrate that EACs were retired and matched to the qualified hydrogen producer's consumption on an hourly level. This compliance reporting capability, along with informational tags (COD, location, resource type, incrementality, etc.) are essential to a qualified hydrogen producer's abilities to demonstrate and verify compliance with Section 45V.

Hourly EAC Market Liquidity. Treasury should monitor and confirm hourly EAC market liquidity prior to any Section 45V mandate. All accounts – inclusive of generation owners, EAC buyers/sellers, RPS purchasers, and brokers – should have, and be using, fully functional hourly tracking systems. Furthermore, market liquidity can only be achieved via non-optional hourly EAC tracking. Without this mandate, users will opt for monthly-minted EACs and preclude the sale of hourly EACs to hydrogen producers. Requiring non-optional hourly tracking will bolster market liquidity by enabling the sale of hourly EACs to hydrogen producers, without the administrative burden of changing sellers' tracking system registrations. Hourly EACs markets must be liquid prior to any mandate; otherwise, Treasury will have imposed an unattainable standard upon hydrogen producers.

Upon evidencing full functionality, compliance reporting with informational tags, and market liquidity (which could be incentivized and expedited in numerous ways), Treasury could thereafter consider a "beginning of construction" implementation of hourly temporal matching requirement.

e. The Final Rules Should Afford Access to Energy from Other Regions to Satisfy Any Deliverability Requirement.

As with incrementality and temporal matching, there is no basis in Section 45V for the imposition of an additional deliverability requirement. But if such requirement is imposed, it certainly should allow hydrogen producers to procure power from other regions where deliverability can be demonstrated. If a hydrogen producer can prove that power produced from a generator outside of the hydrogen facility's region is delivered into the same region as the facility, then the hydrogen producer should be allowed to utilize EACs from that generator outside of the region.

The proposed rule, White Paper, and EPA Letter falsely portray that generation from one state cannot meet load in another state that could be a significant distance away.[144] Though each balancing authority ("BA") is required to carry a certain amount of generation within its boundaries to maintain system frequency and control due to NERC requirements,[145] it is incorrect that a generator in a neighboring or distant BA ("source") cannot serve load in another BA ("sink"). These transfers are overseen by Reliability Coordinators ("RCs"). Following the Energy Policy Act of 1992[146] and FERC Orders 888

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[144] DOE White Paper at 5 ("an electricity generator located in Florida is not able to meet load in Montana.").

[145] NERC Standard BAL-001 and BAL-005.

[146] Public Law 102-486. October 24, 1992.

and 889,[147] a software system called Open Access Same-Time Information System ("OASIS") was created. OASIS allows for sources to reserve transmission across seams between BAs (called E-Tags or "Tags") such that the energy arrives to the sink. Tagging MWs is subject to federal requirements from NERC and overseen by RCs.[148] Therefore, if there's an extreme weather event that disrupts electricity generation in Florida, a generator in Montana could reserve transmission across BAs in the Eastern Interconnect to serve load in Florida (and vice versa). Tagging MWs between source and sinks is an everyday occurrence across the electric power sector.

In fact, because OASIS exists, some entities such as California's largest BA, the California Independent System Operator ("CAISO"), require imports into its BA to be tagged, with an associated emissions rate, otherwise those MWs will be assigned an emissions rate equivalent to a combined cycle power plant.[149] Similarly, the State of Washington has seven BAs, that are also utilities, nested within the multi-state Bonneville Power Administration ("BPA") BA. Washington's Clean Energy Transformation Act ("CETA")[150] requires utilities to eliminate coal-fired generation from serving its customers, to become greenhouse gas neutral by 2030, and by 2045 to generate 100% of their power from renewable or carbon-free resources. As it specifically relates to the CETA, the elimination of coal-fired generation is not only for generation internal to Washington, but also includes imports. Utilities must ensure that MWs imported into their service territories come from specific types of generation or else they will pay alternative compliance penalties.

As a result of the aforementioned considerations, Treasury's final rules should address deliverability across regions.

VII. Conclusion

For all the reasons discussed above, Plug respectfully submits that the proposed restrictions of incrementality, hourly time-matching, and deliverability are unlawful, undermine Congress's goals in enacting Section 45V, and create serious practical problems in the administration of the scheme. If Treasury is nevertheless determined to adopt the three pillars in some form, at a minimum, Plug urges the agency to make the following modifications to its proposals:

a. **Grandfathering/First-Mover Protections are Essential for U.S. Energy Leadership:** The final regulations should include grandfathering provisions that (i) allow hydrogen producers to rely on the regulatory framework in place at the time of the facility's "beginning of construction" date for the entirety of the producer's ten-year Section 45V credit; and (ii) exempt from the incrementality, time-matching, and deliverability requirements clean hydrogen projects that began construction prior to the publication of the final regulation in the Federal Register (and after passage of the IRA). Within these grandfathering protections, Treasury should also adopt a "beginning of construction"

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[147] Order 888: Promoting Wholesale Competition Through Open Access Non-Discriminatory Transmission Services by Public Utilities; Recovery of Stranded Costs by Public Utilities and Transmitting Utilities. 61 FR 21540 (May 10, 1996). Order 889: Open Access Same-Time Information System (formerly Real-Time Information Networks) and Standards of Conduct. 61 FR 21737 (issued May 10, 1996).

[148] NERC Standard INT-001 – Interchange Transaction Tagging.

[149] This is a result of Assembly Bill 32: Global Warming Solutions Act of 2006 which directs the California Air Resources Board to adopt regulations to reduce emissions.

[150] SB 5116 – Effective May 7, 2019.

exception to incrementality that would allow all hydrogen projects under construction by Dec. 31, 2026, to use existing clean power resources to produce clean hydrogen through the term of the Section 45V tax credit.

b. **Section 45V Should Afford Meaningful Access to Clean Baseload Power:** Plug respectfully maintains that the proposed incrementality requirement would exceed Congress' delegation of authority to Treasury in Section 45V and violate the APA. However, if the final rules impose any incrementality requirement, at the very least, such provisions should afford several pathways for hydrogen producers to access hydroelectric, nuclear, and other clean baseload power resources. The NPRM seeks comments on several alternative frameworks.[151] Plug appreciates Treasury's willingness to consider these alternatives and submits that, at a minimum, any incrementality framework should include: (i) a carveout for facilities located in jurisdictions with renewable portfolio standards, clean power mandates, or other similar policies; (ii) an allowance of 10% of a power producer's minimal or zero-emitting resources, measured at the owner level; (iii) exceptions for facilities with renewed or relicensed operations; and (iv) an option for hydrogen producers to submit data demonstrating zero or minimal induced grid emissions in any given case (or category of cases). We respectfully suggest that the full suite of alternative incrementality metrics should be included. In addition to formulaic incrementality approaches, Treasury should also adopt a pre-December 31, 2026 "beginning of construction" exception to incrementality, to address multi-year interconnection queues and better align with the goals of the DOE's Regional Clean Hydrogen Hub program.

c. **Any Amount and Duration of Qualified Clean Hydrogen Production Should Be Eligible**: Proposed §1.45V-4(a) should be modified to allow a qualified clean hydrogen production facility to claim the Section 45V credit for any amount of qualified clean hydrogen produced via any process that makes the hydrogen eligible for the credit within a given year. As currently drafted, the proposed provision would require a taxpayer to lump together all hydrogen produced via different processes (e.g., hydrogen produced using grid energy without applying EACs and hydrogen produced using wind energy) in a given year. This proposed requirement is inconsistent with the plain statutory language of Section 45V and would create perverse incentives counter to Section 45V's objectives of incentivizing clean hydrogen projects. This draft provision's detrimental impact is compounded by the proposed hourly temporal matching requirement.

d. **Hourly Temporal Matching Should Not Be Imposed Until Commercially Appropriate**: The final regulations should not impose hourly temporal matching until hourly EAC tracking products are broadly available on the market. EAC tracking would need to be commercially available within the next 12 months to comply with the draft regulation's proposed January 1, 2028 phase-in. Treasury should only apply an hourly matching requirement if the hourly EAC market is appropriately developed and commercially available at a reasonable rate for clean hydrogen production. To verify this market

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[151] *See* NPRM, 88 Fed. Reg. at 89228-32.

development, the DOE should conduct a study to ensure the market is viable for clean hydrogen producers. Treasury could also consider a potential good faith exemption for clean hydrogen projects that operate where no such market is available.

Appendix A

As expressed in an earlier email dated February 14, 2024, Don Boyajian, Director, Government Affairs & Counsel requests to testify in-person at the March 25, 2024 public hearing for proposed REG-117631-23 on the Section 45V Credit for the Production of Clean Hydrogen.

As requested, a proposed outline of the in-person testimony is below. Please let us know if we can provide any further information in the interim. Thank you.

Proposed In-Person Testimony Outline

1. Introduction and background on Plug Power (1 minute)
2. Overview of requested modifications to the proposed regulations for Section 45V (1 minute)
3. Discussion of the economic implications of the proposed three-pillars (2 minutes)
4. Discussion of administratively problematic provisions in the proposed Section 45V regulations (1 minute)
5. Discussion of the requested modifications to the proposed regulations (4 minutes)
6. Conclusion (1 minute)

Appendix B

ECONOMIC ANALYSIS OF THREE PILLARS (AFFIXED HERETO)

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The Road to Clean Hydrogen: Getting the Rules Right

July 2023

The “three pillars” being considered for implementation could potentially impact the rate at which PTC ramps-up the green hydrogen economy

PTC pillars	Definition	Implication (based on analysis by Plug)
Additionality	Green hydrogen to be produced using **newly-built clean energy assets** constructed primarily for this purpose	• **Makes renewable power a value chain control point and limits business models** • **Reduces the benefits of green hydrogen** • **Delays green hydrogen projects by 5+ years** • **Prevents ~200,000 jobs from being created and reduce carbon abatement by ~50%**
Hourly time-matching	Clean power used for electrolyzer operation to be **produced in the same hour it was consumed**	• **Increases green hydrogen production costs by ~\$1.3/kg (~50% of PTC)** • **Not yet widely available** creating delays of several years in green hydrogen projects • **Reduces green hydrogen investments of ~65% by 2032, ~90% of gross jobs through 2035, green hydrogen demand of ~75% in 2040, and emissions by ~540Mn tCO2eq of GHG and ~4.2 micrograms/m3 PM2.5 by 2040**
Strict local geographic matching	Green hydrogen production to be at **minimum geographic proximity and grid connectivity** from the source of clean power (e.g., direct connection)	• **Increases green hydrogen production costs by ~\$1/kg (~35% of PTC)** • **Creates regional winners and losers** • **Counterproductive to other federal programs (i.e., DOE Hydrogen Hubs)** • **Inflates hydrogen logistics and distribution costs**

Implementing both strict local matching and 100% hourly time-matching **in 2025 could increase Levelized Cost of Hydrogen (LCOH) to the extent that green hydrogen producers would opt out of the PTC.**

Additionality, Time Matching, and Regionality are not included in the legislative language, any legislative intent or colloquies associated with 45V PTC.

The intent of the PTC in the Inflation Reduction Act (IRA) is to rapidly scale clean hydrogen production, not overly regulate it. **The three pillars are not within the legislative intent.**

Source: Inflation Reduction Act, Plug analysis

Overview of context and objectives for this study

Context

- The Clean Hydrogen Production Tax Credit (PTC) in the Inflation Reduction Act (IRA) is likely to be one of the largest drivers for decarbonization, job creation, and US clean tech competitiveness in the next decade
- In the next several months, the implementation guidance for the PTC are being finalized; one primary uncertainty is around the "three pillars" for clean power time-matching, additionality, and regionality/ proximity to the electrolysis source (e.g., same balancing zone)

Objectives

Test out the potential implementation of the PTC under the "three pillars" and their impacts on gross[1] socioeconomic and decarbonization factors, we run the study detailed herein with the following objectives:

- **Develop scenarios for implementation of the hydrogen PTC** with a focus on additionality, time-matching, and regionality
- **Understand the implications** on levelized cost of hydrogen (for 2025 and 2030), for a variety of project archetypes
- **Estimate the deployment implications** for green hydrogen economy in the US for each of the scenarios
- **Determine the gross impacts on the following metrics:**
  - Gross investment impact, i.e., investments into green hydrogen production – there are investments in upstream and downstream steps of the value chain (e.g., renewables); those are not quantified
  - Gross job implications (direct and indirect)
  - Gross societal emissions impacts (GHG and particulate matter)

Plug was responsible for the analysis of the legislation and development of the scenarios

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[1] *Gross impact considers the impact on the green hydrogen economy only, without considering other clean technologies that could potentially replace green hydrogen to back-fill decarbonization needs.*

Overview of sources of insight

Analyses leverage public market data, and Plug's industry knowledge and previous studies

Industry reports and data

Market report sources

- U.S. National Hydrogen Strategy & Roadmap
- Department of Energy's (DOE) Pathways to Commercial Liftoff report
- Hydrogen Council Global Hydrogen Flow report
- Long Duration Energy Storage (LDES) Council – A path towards full grid decarbonization with 24/7 clean power purchase agreements

Public data review

- Argonne National Laboratory Greenhouse gases, Regulated Emissions, and Energy use in Technologies (GREET) model for fuel carbon intensity
- California Air Resources Board's Low Carbon Fuel Standard (LCFS) Fuel Pathways for fuel carbon intensity
- US Environmental Protection Agency Compilation of Air Emissions Factors
- LevelTen data on Power Purchase Agreement (PPA) prices
- Energy Acuity data on Renewable Energy Credit (REC) prices
- U.S. Energy Information Administration (EIA data) on grid prices for industrial consumers
- National Renewable Energy Laboratory (NREL) solar and wind capital cost
- Lawrence Berkeley National Laboratory analysis on interconnection queues
- Air Products public announcements on new facility costs

Plug industry knowledge

- Plug Power's near term clean hydrogen deployment projects
- Plug Power's Socioeconomic Impact of hydrogen effort, May 2022
- Hydrogen jobs model

Additionality impacts go beyond project-level economics

1

Delays the green hydrogen value chain development

At least **5 years of delays** in the interconnection queues for new RES capacity would translate into **delays for green hydrogen projects**

2

Poses difficulties in tracking what is truly additional

It could be **challenging to identify resources that would not otherwise have been present** without the demand for green hydrogen

3

Makes renewable power a value chain control point

Limiting the available supply of qualifying RES projects could create a supply shortage and **increase power costs on green hydrogen developers**

4

Limits business models that reduce decarb. cost

Leveraging financially distressed RES projects would not be possible with additionality, **limiting potential system cost savings**

5

Reduces system benefits of green hydrogen as a source of power flexibility

Green hydrogen provides system flexibility by taking renewables that would have been otherwise curtailed or when low/negative power prices exist; hence potentially **reducing overall system costs and improving grid reliability and performance.**

Other considerations

New RES could be driven by market forces regardless

With new demand and incentives at the state and federal (i.e., IRA) level for solar and wind generation, **significant new capacity is expected to come to the market regardless** of additionality

Required energy capacity is small compared to RES pipeline

1,300GW of solar and wind capacity is currently seeking connection to the grid, vs ~30GW electrolyzer deployment by 2030, **which amounts to <3% of potential capacity RES capacity**

Many policies driving new clean energy demand do not require additionality

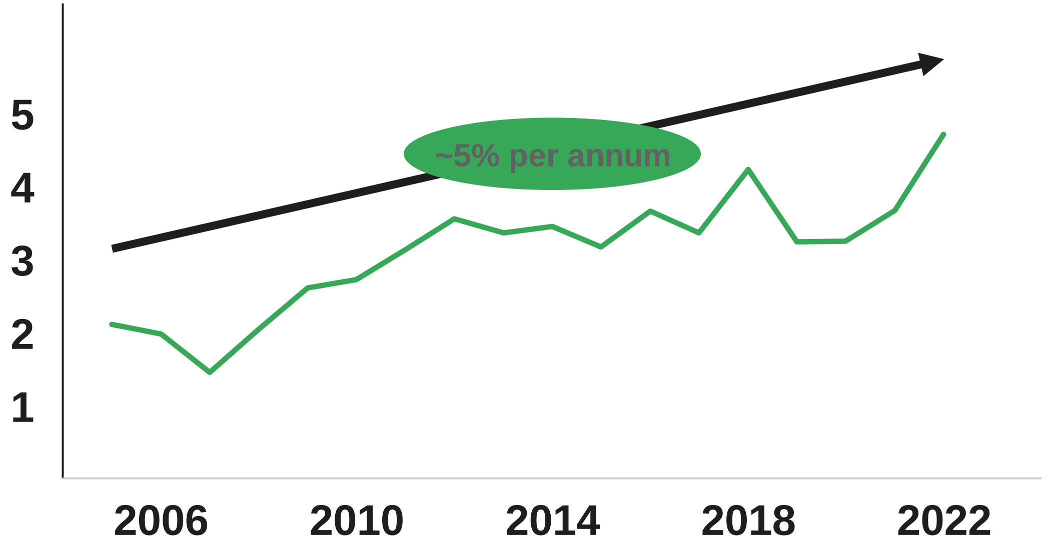
For example, EPA EO 14057 requires 100% renewable power by 2030, with 50% hourly time matching for Federal Government electricity demand, **without requiring clean energy to be additional**

Source: Plug Power analysis

Renewable projects today face 5+ year waiting times in the interconnection queue, which would push out green hydrogen scale up and supply

The increase in number of interconnection requests has caused increasing wait times for new capacity to be interconnected to the grid; projects interconnected in 2022 took on average **5+ years to progress from interconnection request to commercial operations**[1]

Interconnection queue, *years to get interconnected*



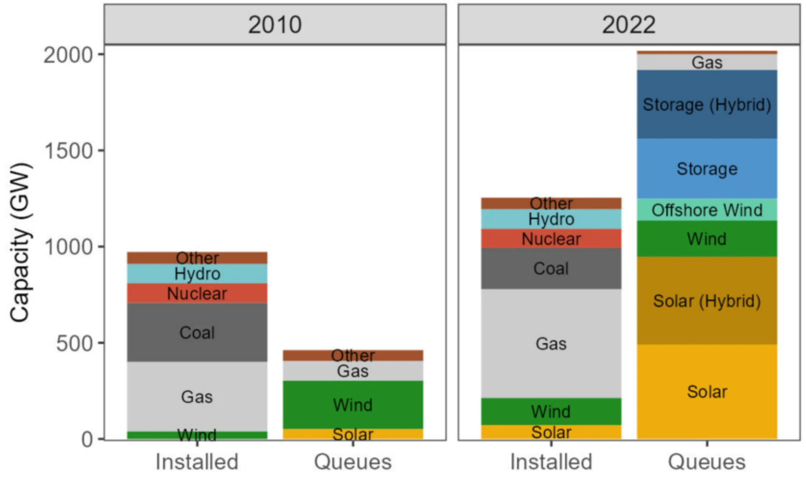


Image courtesy of Joseph Rand at Lawrence Berkeley National Laboratory

- An additionality requirement would **directly tie clean hydrogen production to the interconnection challenges of the electric grid.**
  - This would **impose the current delays (5+ years)** and timelines for renewable development upon the hydrogen economy as well.
- There is **significant renewable resources already in the queue** with the rate of deployment expected to increase significantly with the IRA.
  - Projections for hydrogen deployment over the rest of the decade indicate a maximum of 30 GWs of electrolyzers deployed by 2030.
  - **Clean hydrogen would represent <1% of the renewable supply projected to be available in 2030.**

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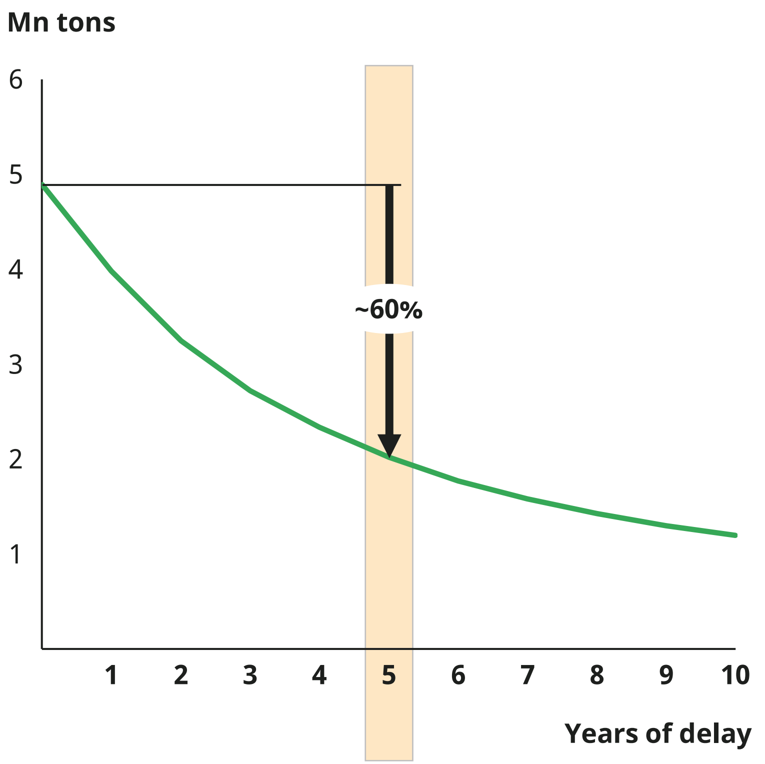
1. Includes only 58% of all operational projects due to the availability of in-service date.

Source: Lawrence Berkeley National Laboratory, Plug Power analysis

Delay in scale up would prevent ~250,000 jobs from being created and reduce carbon abatement by ~50%

🟧 Expected delay in COD based on current interconnection queues

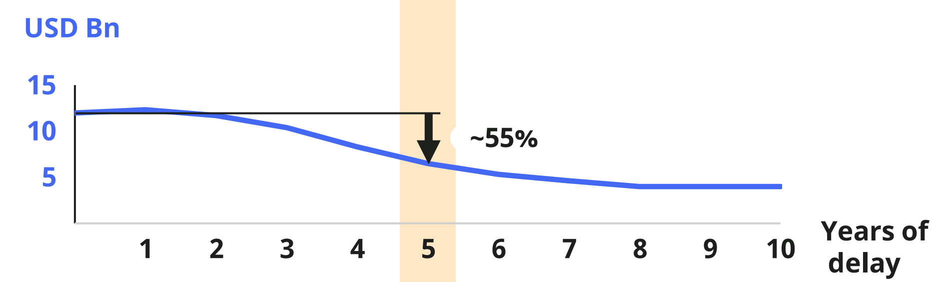
Gross green hydrogen demand[1] in 2030:



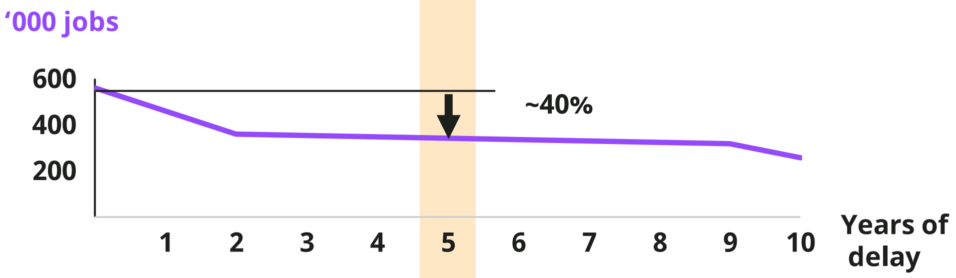
Gross[2] impact on investments, GHG abatement, and PM2.5 concentration

Considering additionality requirement only (excl. impact of local geographic matching and hourly time-matching)

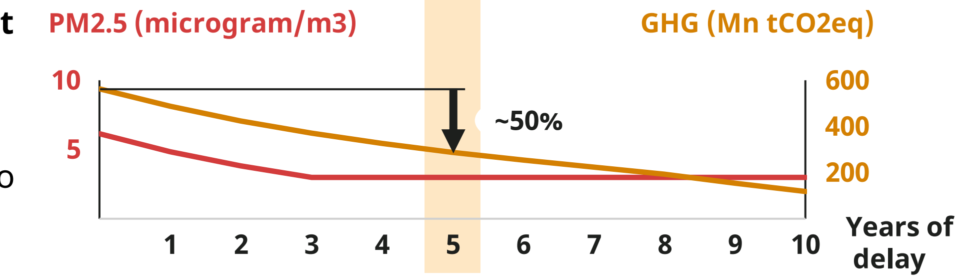
Gross investment in 2030: based on current interconnection queues, additionality could delay required investment volume to ~55% of baseline volume



Gross jobs[3] in 2030: gross job volume would likely drop by ~40%, if additionality causes delay in direct and indirect employment associated with hydrogen production



Gross environmental impact in 2030: both PM2.5 and GHG abatement potential could drop by ~50% by 2030, with PM2.5 abatement projected to drop faster due to the high sensitivity of transportation demand to delays



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1. Petroleum refining is excluded to eliminate confounding effect of demand increase.
2. Gross impact considers the impact on the green hydrogen economy only, without considering other clean energies that could potentially replace green hydrogen to back-fill decarbonization needs.
3. Only direct and indirect jobs are considered.

Source: Lawrence Berkeley National Laboratory, Plug Power analysis

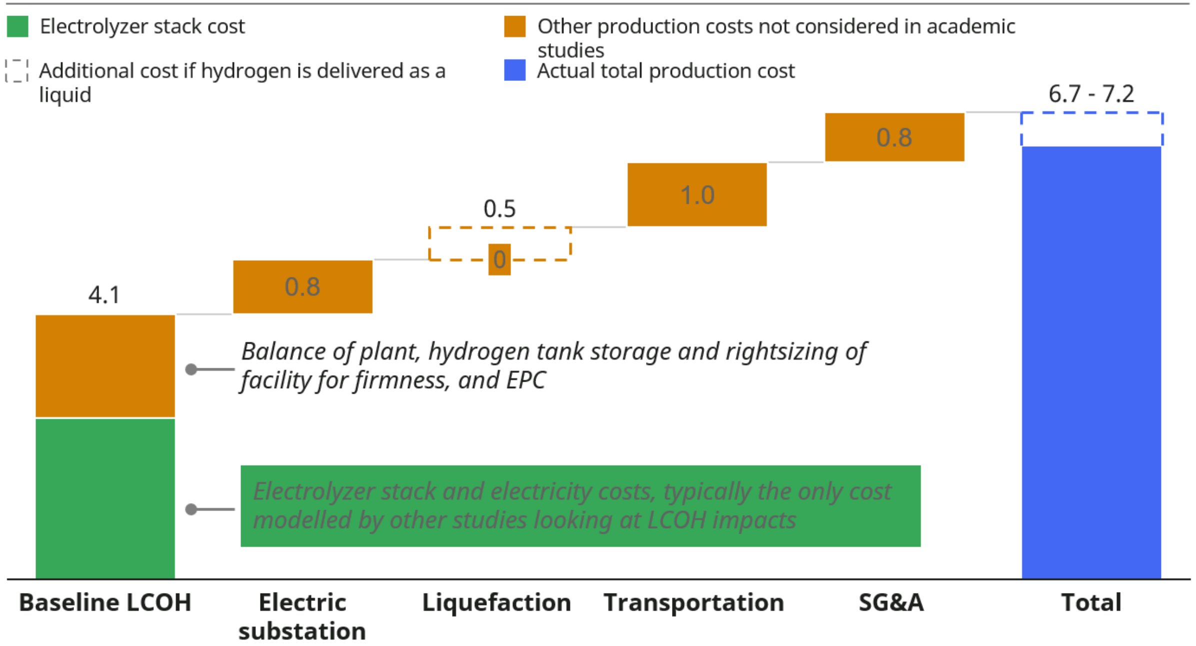
Other analyses cite lower impacts of the three pillars on LCOH; this seems to be driven by 4 key differences in underlying assumptions

1	**No hydrogen production plant operational requirements**	Other studies model **low or no firmness requirements for the hydrogen system and its downstream application** (e.g., liquefaction) – they assume a system that meets an overall annual target with no production requirements on an hourly or daily basis (e.g., a 50% utilization is assumed to be achievable by operating only certain days or months) Several downstream operations (e.g., chemical production) require **consistent hydrogen availability on an hourly or daily basis;** higher firmness requirements usually lead to higher LCOH due to larger storage requirements and optimal sizing of the renewables and electrolyzer
2	**Missing components in assumed capex and opex for hydrogen projects**	Studies tend to consider **only the capital costs associated with the electrolyzer stack**, overlooking **additional costs** of the balance of plant, hydrogen storage, and EPC, as well as other post-gate downstream costs such as liquefaction and distribution. This results in cost assumptions being far too aggressive and LCOH results not representing the actual cost of production
3	**Cost and risk of shaping clean power not fully incorporated**	With hourly time-matching requirements, associated power prices will further increase due to the **additional cost (e.g., energy storage or RES project oversize) and risks (e.g., financial) of shaping power into the profile required** for electrolyzer operations. System models that use top-down approaches smooth out project-level variability impact overlooking the extra cost implications; these increased power prices constitute only a portion of LCOH cost, which does not increase proportionally to the increase LCOE cost
4	**Only "winning" archetypes seem to be modelled**	**Usually, only regions with optimal complementary solar and wind resources are modelled**; these regions represent an archetype that would not be as strongly affected by hourly time-matching and strict local geographic matching requirements; in **reality, hydrogen producers could set up operations elsewhere** (e.g., Camden GA, Fresno CA) which may be less endowed with naturally high quality and complementary resources

Source: Ricks, Wilson, & Jenkins, Jesse. (2023), The Cost of Clean Hydrogen with Robust Emissions Standards: A Comparison Across Studies

Two critical aspects overlooked by other studies include *realistic* all-in hydrogen costs and the anticipated demand curves

Breakdown of additional costs comprising the total production-to-delivery cost, for plant in GA in 2025, $/kgH2

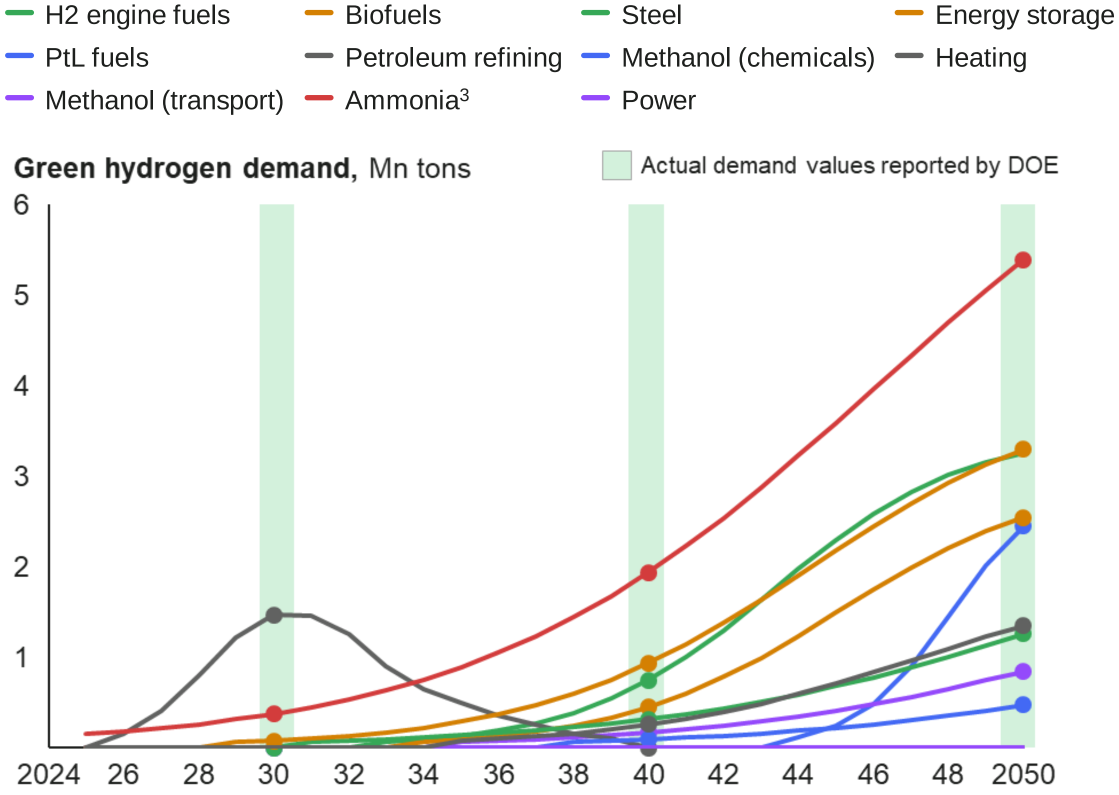


Balance of plant, hydrogen tank storage and rightsizing of facility for firmness, and EPC

Electrolyzer stack and electricity costs, typically the only cost modelled by other studies looking at LCOH impacts

- **Baseline LCOH often would not reflect the full costs on hydrogen project developers**
- In some cases, even the baseline LCOH reported in public studies excludes additional costs that should be included in the optimization.

Interpolated baseline demand curves by end-use sector

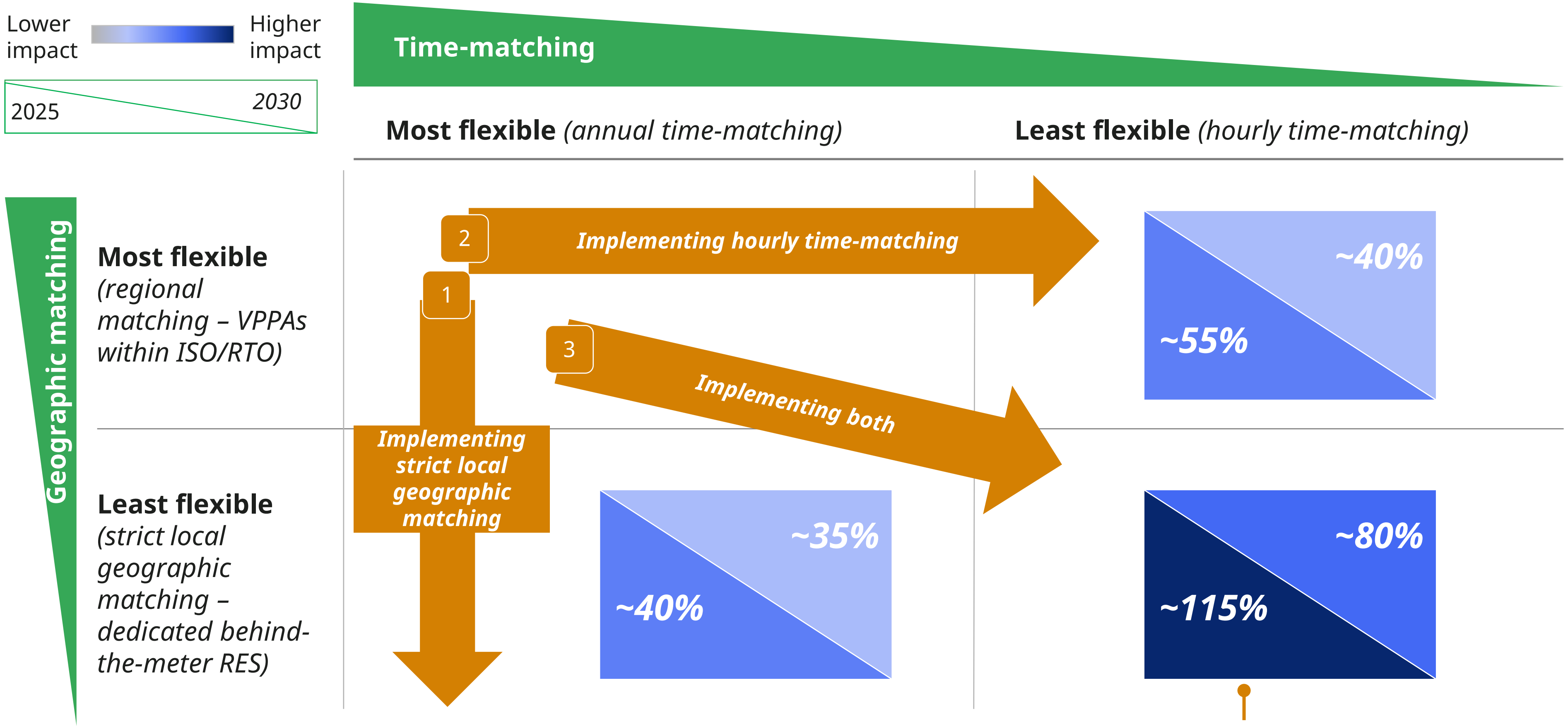


- **2030, 2040, and 2050 base case demand** interpolated from DOE's National Hydrogen Strategy and Roadmap.
- **Immediate scale up is needed** to meet projected levels of demand in 2030+.

Source: Hydrogen cost optimization model, Plug Power inputs on plant costs for first generation plant
For grid electricity, a flat price profile is modelled, and grid prices are taken as they are **(i.e., excluding any cost optimization or negotiations that individual project developers might have)**

Analysis suggests that introducing hourly time-matching and strict local geographic matching immediately could potentially counter the benefits of PTC

Impact of PTC requirements on LCOH, *average across different US regions[1], % of PTC value of $3/kgH2*



When complying to the pillars causes >$3/kg increase in LCOH, hydrogen producers would likely opt out of the PTC

- **Hourly time-matching potentially has higher impact on LCOH than strict local geographic matching**, increasing production costs by up to 55% of PTC value if implemented in 2025
- **Implementing both requirements by 2025** could increase LCOH by more than $3/kgH2, **countering the benefit of the PTC**

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1. Considering both regions with ample renewables resources (e.g., Texas, Georgia) and regions with ample solar but uncomplimentary wind resources (e.g., California).

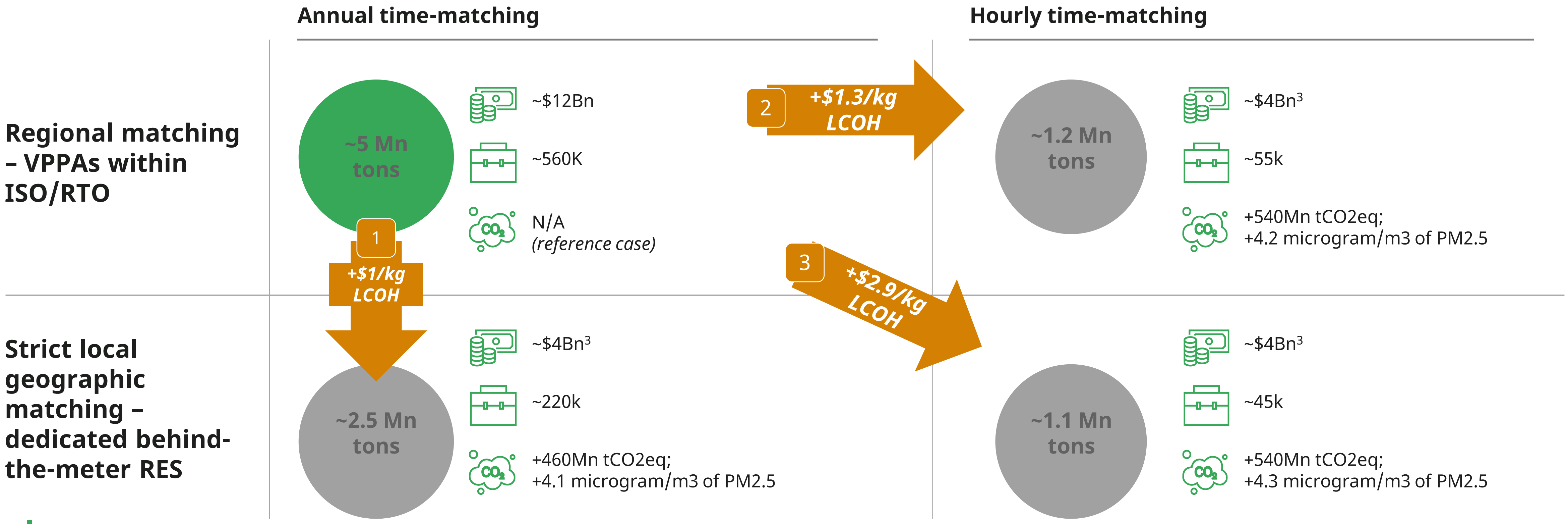
Source: Hydrogen cost optimization model.

Hourly time-matching and strict local geographic matching could potentially lead to reductions in gross investments, jobs, and emissions

Gross[1] impact on economic and environmental factors, taking average of LCOH changes across different US regions

Values correspond to 2032 for investments made (final year for PTC eligibility), 2035 for jobs[2], 2040 for green hydrogen demand and emissions abatement loss

- ● Green hydrogen demand
- Investments made
- Direct and indirect jobs created
- Cumulative additional emissions from lost abatement



	Annual time-matching	Hourly time-matching
Regional matching – VPPAs within ISO/RTO	~5 Mn tons ~$12Bn ~560K N/A *(reference case)*	~1.2 Mn tons ~$4Bn[3] ~55k +540Mn tCO2eq; +4.2 microgram/m3 of PM2.5
Strict local geographic matching – dedicated behind-the-meter RES	~2.5 Mn tons ~$4Bn[3] ~220k +460Mn tCO2eq; +4.1 microgram/m3 of PM2.5	~1.1 Mn tons ~$4Bn[3] ~45k +540Mn tCO2eq; +4.3 microgram/m3 of PM2.5

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1. Gross impact considers the impact on the green hydrogen economy only, without considering other clean energies that could potentially replace green hydrogen to back-fill decarbonization needs.
2. Only direct and indirect jobs.
3. Corresponds to the historically announced investments into green hydrogen production in the US, for projects with Commercial Operation Date by 2026.

Source: Plug Power analysis

Impact of hourly time-matching and strict local geographic matching on LCOH

Introducing both requirements in the near-term would drive up the LCOH by >100% of PTC value and thereby impacting incentive value

Cost increase in LCOH, driven by introducing both strict local geographic matching and hourly time-matching requirements

Lower impact ▭ Higher impact

⬜ Detailed next

Impact of strict local geographic matching and hourly time-matching on LCOH

		2023	2025	2030
Average across all archetypes		+5.47	+3.33	+2.37
Archetype A Georgia	Areas with scarce RES assets today	+4.40	+2.70	+1.70
Archetype B Texas	Areas with ample RES assets	+4.20	+2.80	+2.10
Archetype C California	Areas with uncomplemented solar resources	+7.80	+4.60	+3.30

Introducing both hourly time-matching and strict local geographic matching requirements **could increase LCOH by more than the value of the PTC** in the near term (2025-28)

PTC As-Written

~5 Mn tons

~$12Bn

~560K

N/A
(reference case)

PTC with 100% hourly matching + regionality

~1.1 Mn tons

~$4Bn[3]

~45k

+540Mn tCO2eq;
+4.3 microgram/m3 of PM2.5

● Green hydrogen demand

Direct and indirect jobs created

Investments made

Cumulative emissions not abated

Source: Hydrogen cost optimization model

Compounding hourly time-matching with strict local geographic matching could potentially lower the impact of the PTC, if implemented in 2035

Impact of PTC on helping green hydrogen become competitive with conventional fuels

📅 Hourly time-matching

🌍 Strict local geographic matching

🟢 Green hydrogen becomes competitive as a result of the PTC

⚪ Green hydrogen does not become competitive as a result of the PTC

Year of implementing pillars		A **2025**			**2030**			**2035**		
Pillars implemented		**None**	📅	📅 + 🌍	**None**	B 📅	📅 + 🌍	**None**	📅	C 📅 + 🌍
Increase in LCOH[1], % of PTC		-	*40%*	*90%*	-	*30%*	*50%*	-	*28%*	*42%*
Transport	**H2 engine fuel**	🟢	⚪	⚪	🟢	🟢	⚪	🟢	🟢	⚪
	PtL fuels	🟢	⚪	⚪	🟢	⚪	⚪	🟢	⚪	⚪
Depends on vehicle type	**Biofuels**	🟢	⚪	⚪	🟢	🟢	🟢	🟢	🟢	🟢
	Methanol	🟢	⚪	⚪	🟢	⚪	⚪	🟢	⚪	⚪
Industry	**Petroleum refining**	🟢	⚪	⚪	🟢	🟢	⚪	🟢	🟢	⚪
	Ammonia	🟢	⚪	⚪	🟢	🟢	⚪	🟢	🟢	🟢
	Steel	🟢	⚪	⚪	🟢	🟢	⚪	🟢	🟢	⚪
	Methanol	🟢	⚪	⚪	🟢	⚪	⚪	🟢	⚪	⚪
Power & utilities	**Power (H2 turbines)**	⚪	⚪	⚪	⚪	⚪	⚪	⚪	⚪	⚪
	Energy storage	🟢	⚪	⚪	🟢	🟢	⚪	🟢	🟢	⚪
	Heating	🟢	⚪	⚪	🟢	⚪	⚪	🟢	⚪	⚪

A Implementing any of the pillars **in 2025** could potentially increase LCOH to the extent that **green hydrogen producers would opt out of the PTC**

B If hourly time-matching is implemented around **2030-2035, the PTC would still not benefit many end-use sectors**

C **If hourly time-matching and strict local geographic matching are both implemented**, the compounded effect would **negate the benefit of the PTC across almost all sectors**, even if they are implemented in 2035

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1. Compared to scenario if pillars are not implemented.

Source: Plug Power analysis

The “three pillars” being considered for implementation would severely impact the rate at which PTC ramps-up the green hydrogen economy

PTC pillars	**Definition,** *and impact driver*	**Implication (based on analysis by Plug)**
Additionality	Green hydrogen to be produced using **newly-built clean energy assets** constructed primarily for this purpose ***Reduces the pool of potential sources of clean power*** *to deploy green hydrogen projects*	Additionality makes **renewable power a value chain control point**, **limits business models** that would reduce decarbonization costs, and **reduces benefits of green hydrogen** as a source of power flexibility; given long interconnection queues for renewables, it will likely **delay green hydrogen projects by +5 years** as projects wait for new power sources to materialize This delay from additionality **alone** could impact **~50% of expected new jobs and emission reduction impacts**
Hourly time-matching	Clean power used for electrolyzer operation to be **produced in the same hour it was consumed** ***Increases cost of clean power supply,*** *given the variable nature of most clean power sources (e.g., solar) and the risk and cost of “shaping” it*	Implementing 100% hourly time-matching **alone** in the near-term could **increase green hydrogen production costs by ~$1.3/kg** (roughly ~50% of the value of the PTC); this impact can be reduced over time due to tech cost reductions but still has a significant impact by 2035 Impacts would **decrease green hydrogen investments ~65%** in 2032, create a **~90% loss of gross[1] jobs** in 2035, **reduce green hydrogen demand 75%** in 2040, and push additional gross emission by ~**540Mn tCO2eq of GHG** (~8% of US in 2021) and ~**4.2 micrograms/m3 PM2.5** (~80% of WHO targets) by 2040
Strict local geographic matching	Green hydrogen production to be at **minimum geographic proximity and grid connectivity** from the source of clean power (e.g., direct connection) ***Limits the available sources of power*** *that can be leveraged, driving up cost*	Implementing strict local geographic matching **alone** could **increase green hydrogen production costs by ~$1/kg** (roughly ~35% of the value of the PTC); this impact can be reduced over time due to tech cost reductions, but still has a significant impact by 2035 Implementing both strict local matching and 100% hourly time-matching **in 2025 could increase LCOH to the extent that green hydrogen producers would opt out of the PTC;** compounded impact continues to fully offset PTC beyond 2035

Implementing the three pillars would only serve to delay green hydrogen production scale up and encourage producers to not pursue the PTC at all.

Source: Inflation Reduction Act, Plug analysis

FAQs

FAQs (1/11)

LCOH modelling	**Methodology**	1	How does the model calculate LCOH (levelized cost of hydrogen)?	• We use a linear optimization model at hourly resolution where the objective function is total levelized costs for investment and operations over the plant lifetime, with constraints on target production, firmness of output H2, time matching requirements (hourly vs annual) etc. • In addition to the constraints, inputs include hourly renewables capacity factor profiles (across 8760 hours), grid prices, and financial assumptions (capex, opex, and WACC[1]) for the electrolyzer, H2 storage, RES, etc. • The model then solves for the sizes of all plant components (i.e., power mix supply of solar vs wind vs grid, sizing of electrolyzer, tank, etc.) that delivers the H2 required at lowest cost while compliant to operational constraints
	System setup	2	What is "firmness" target?	• Firmness target refers to the consistency of the profile of produced hydrogen • Each type of hydrogen end-use requires a different level of “firmness”, for example: – If the produced hydrogen is injected into the pipeline or stored in a tank, hydrogen production could be intermittent, hence “firmness” is low – On the other hand, if the produced hydrogen is sent to a liquefaction plant or used for ammonia production, a more consistent flow of hydrogen is needed since those facilities cannot ramp up and down, hence high “firmness” would be required
		3	What specific hydrogen production target is considered in the analysis? Would LCOH decrease with economies of scale?	• We used a sample production of 30 tons/day to model real plant sizes • Economies of scale associated with solar cells, wind turbines, and electrolyzer are embedded into their capex assumptions, hence varying the production target does not impact our results of the optimized production LCOHs

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1. Weighted averae cost of capital

FAQs (2/11)

LCOH modelling	**System setup**	4	What is assumed is done with excess electricity?	• It depends on the time-matching requirement: – For annual time-matching, the excess electricity is either curtailed or sold back to the corresponding grid that the plant is interconnected with – For hourly time-matching, the excess electricity is curtailed • In our modelling setup, we assume that excess electricity cannot be sold back to the grid in hourly time-matching scenarios in order to remove the impact of additionality on LCOH results, since interconnection queue would delay COD (commercial operating date) of an asset by 5+ years
		5	How are the locations (i.e., load profiles) from which VPPAs[1]/ PPAs are sourced selected?	• A geospatial model is used to determine the location(s) with the highest average capacity factors and the most complementary profiles, leveraging public solar and wind weather data • For VPPAs, the location(s) are searched for within the ISO/RTO[2] the hydrogen plant is located in; for PPAs, the location(s) are searched for within the county the hydrogen plant is in
	Cost assump-tions	6	Why are flat grid prices used?	• The same market participant assumed grid pricing from publicly available EIA data is used when modelling 2025 and 2030 to isolate the impact of the three pillars on LCOH, without the potential additional impacts of other variables such as grid price
		7	How are VPPA/ PPA prices calculated?	• Using the geospatial model mentioned in the response to Q5 and solar/ wind cost assumptions from NREL[3], solar/ wind LCOEs are calculated and input into the LCOH optimization model as VPPA/ PPA prices

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1. Virtual power purchase agreement; 2. Independent System Operator/Regional Transmission Organization; 3. National Renewable Energy Laboratory

FAQs (3/11)

LCOH modelling	**Cost assumptions**	8	What is included in the green hydrogen plant cost assumptions? Why are the costs higher than those cited in other public studies?	- Our green hydrogen plant cost assumptions include system capex (electrolyzer, balance of plant, hydrogen tank storage), as well as EPC - Most of the other public studies tend to use only electrolyzer cost; we include balance of plant, hydrogen tank storage, and EPC[1] costs derived from Plug Power's industrial expertise
		9	What is driving the reduction in electrolyzer and renewables capex over time?	- Technology cost reduction follows the learning curves published by the DOE in their "National Hydrogen Strategy & Roadmap" and "Pathways to Commercial Liftoff" reports; cost reduction is driven by R&D as well as economies of scale across the supply chain associated with building larger plants
	LCOH results	10	How are the results of the modelling higher than those cited in other public studies?	- Four key parameters drive the difference between our analysis and other public studies: – Other studies assume no electrolyzer operational requirement (i.e., zero "firmness"), when in fact several major downstream uses of hydrogen today require consistent hydrogen availability on an hourly basis – Studies tend to consider only the capital cost of the electrolyzer, overlooking costs of balance of plant, hydrogen storage, EPC, etc. – The cost of shaping power into the profile required for electrolyzer operation is not incorporated in other studies; our modelling implicitly incorporates this cost by assuming that consistent hydrogen availability on an hourly basis results in the buildout of storage, larger renewables, and/or electrolyzer capacities, and more realistic electrolyzer utilization – Other studies tend to run LCOH modelling for locations with optimal solar and wind resources; in reality, projects could be located close to hydrogen demand centers, where renewables resources might not be optimal

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[1] Engineering, procurement, and construction

FAQs (4/11)

LCOH modelling

LCOH results

11 What are the specific impacts to the optimization and modeling from hourly time matching that then resulted in the increase in LCOH?

- For annual to hourly comparison, the key factors that increase the LCOH are:
  - ~30% average increase in electrolyzer capacity and hence costs, given electrolyzer will not be functioning all hours and hence need for higher outputs in the hours the electrolyzer functions and
  - ~10-40+ tons of extra storage tank capacity installation, in order to account for hydrogen firmness to ensure reliable outputs for hydrogen end uses
- Please note, the above numbers would vary by region. For example, in TX, the LCOH increase will not be as high as a plant in Georgia or California, where the increases are expected to be much higher

12 What are the specific impacts to the optimization and modeling from regionality/geographic matching that then resulted in the increase in LCOH?

- Key factor that increases the LCOH is that grid prices are higher, given optimizing for renewables power in a smaller region v/s more broadly, say within the ISO/ RTO. The impact of this varies by region.
  - For regions with more complementary RES resources, the impact on LCOH is lower than other archetypes, but could potentially still erode ~15% of PTC value
  - For regions with mostly solar resources and low complementary wind, the impact on LCOH could be large enough to nullify >50% of PTC benefit

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1. Engineering, procurement, and construction

FAQs (5/11)

Green hydrogen demand and supply

13	Where do the clean and green hydrogen demand numbers come from?	- The clean hydrogen demand numbers are from the base case scenario in the DOE's "National Hydrogen Strategy & Roadmap" - To isolate the green hydrogen demand specifically, the hydrogen demand split by color is used from the Hydrogen Council's "Global Hydrogen Flows" report - Combining the overall clean hydrogen with the green hydrogen %, green hydrogen demand is then calculated for 2030, 2040, and 2050
14	Where do the annual green hydrogen demand numbers come from, if the DOE only reports demand in 2030, 2040, and 2050?	- Green hydrogen demand is assumed to follow an S-curved shape - Hence, yearly green hydrogen demand for each end use is interpolated using a logistic function "A+[(A+B)/(1+(C/x)^n)]", where A=demand starting point, B=demand ending point, x=individual year, n=curvature number; excel solver is used to optimize the curve parameters
15	How is each sector's sensitivity to LCOH calculated?	- For each end use sector, green Hydrogen breakeven year before and after the rollout of Inflation Reduction Act (from the DOE's "Pathways to Commercial Liftoff" report) and the corresponding $3/kg PTC are combined to calculate the sector's breakeven sensitivity to a $/kg chance in LCOH - For end uses that are not mentioned in the report, academic research and team analysis are combined to estimate the sector's breakeven sensitivity based on how much the total ownership cost is dependent on hydrogen production costs vs infrastructure costs

FAQs (6/11)

Green hydrogen demand and supply	16	Why does the green hydrogen demand from oil refineries occur in earlier years but disappear over time?	• According to the clean hydrogen demand projections published publicly, the economy is expected to move away from diesel as clean alternatives emerge, and hence conventional refineries are expected to phase out by 2040, and the corresponding demand they drive to diminish as well
	17	Why would interconnection queues cause delays in green hydrogen supply? Couldn't behind-the-meter assets compensate for that?	• Even for green hydrogen production plants with dedicated behind-the-meter renewables, connection to the grid would be important to provide a backup power source to ensure system reliability • Furthermore, behind-the-meter renewables assets could be appropriate for small-scale hydrogen production applications; the full scale-up of the green hydrogen economy might be challenged by pure behind-the-meter resources
Investments	18	Does the investment value include investments across the full hydrogen value chain (i.e., required energy, refueling infrastructure, etc.)?	• No, the investment value only includes the investment needed to build up new green hydrogen facilities, i.e., electrolyzer and hydrogen storage capex and EPC • There would be additional investments lost associated with upstream steps of the value chain (e.g., renewables) and downstream steps (e.g., end use applications); those are not quantified in this study
Jobs	19	What is the methodology behind job calculation?	• Direct jobs are calculated based on cost assumptions and job multipliers that Plug Power has modelled out • Indirect jobs are then estimated using their corresponding job multipliers, adjusted for double-counting effects • Finally, induced jobs are calculated by estimating direct and indirect employee spending

FAQs (7/11)

Jobs

20	Where do the job multipliers come from?	• Common job multipliers are from the Economic Policy Institute (2019) • Net multiplier calculation methodology comes from the University of Groningen's "On the Dynamics of Net versus Gross Multipliers" (2002) • Total requirements matrix (to eliminate double counting) is from the U.S. Bureau of Labor Statistics
21	Does the calculated job impact correspond to direct, indirect, or induced jobs?	• The total job impact communicated includes direct and indirect jobs only • Induced jobs are excluded to reflect the gross impact of reduced green hydrogen demand; induced jobs would be considered within net job impact
22	Are the jobs attributed to specific region or hydrogen project?	• The jobs considered reflect the impact on the entirety of the US, since our impact modelling is based on total US demand for green hydrogen

23	Are the calculated jobs associated with only the build-out of the production facilities, or are end-use applications considered as well?	• The jobs considered are across the entirety of the green hydrogen value chain:
		  • Upstream: renewable energy, hydrogen equipment manufacturing, hydrogen production
		  • Midstream: hydrogen distribution and storage
		  • Downstream: end-use applications (e.g., hydrogen engine OEMs, steel plant operators, power plant operators

FAQs (8/11)

Emissions	24	How is emission abatement calculated?	• The net emission impact is calculated by assuming that the lost green hydrogen demand would then lead to conventional fuels to be used for a longer period of time; then the carbon intensity of this conventional fuel is multiplied by the additional conventional fuel consumption to calculated associated emissions • The carbon intensity scores come from a variety of public sources, such as the GREET model, the LCFS Fuel Pathways database, and the US Environmental Protection Agency • This is applied to each end use sector separately, as each sector is characterized by a different conventional fuel and different carbon intensities
	25	Are these emissions only from the production of hydrogen, or do they consider the full value chain?	• The net emission impact corresponds to the full value chain, from hydrogen production to its consumption (and hence the replacement of conventional fuels at the point of end use)
	26	How does this emissions assessment vary from those conducted in other reports?	• Other studies tend to consider the emissions from hydrogen production only, while we also consider the net benefits of using hydrogen to decarbonize end-use applications, as the legislation intended
	27	How are emissions considered for other industries where hydrogen is not used as a fuel, e.g., steelmaking or ammonia?	• For these industries, the emissions abated through the use of green hydrogen correspond to those emitted during the production of hydrogen, i.e., by using green hydrogen vs gray hydrogen for ammonia production, the abated emissions are those from the extraction and reforming of natural gas

FAQs (9/11)

Emissions

28	What is PM2.5?	• According to the US Environmental Protection Agency:
		  • PM stands for particulate matter; and PM2.5 are fine inhalable particles, with diameters that are generally 2.5 micrometers and smaller
		  • Most particles form in the atmosphere as a result of complex reactions of chemicals such as sulfur dioxide and nitrogen oxides, which are pollutants emitted from power plants, industries and automobiles
		  • PM can be inhaled and cause serious health problems. Some particles less than 10 micrometers in diameter can get deep into your lungs and some may even get into your bloodstream. Of these, particles less than 2.5 micrometers in diameter, also known as fine particles or PM2.5, pose the greatest risk to health

29	How is the increase in PM2.5 air pollution concentration calculated?	• First, baseline PM2.5 emissions are calculated by combining the emission factor of a fuel across the value chain (e.g., for diesel: crude oil extraction, refining, transportation, then finally diesel combustion) with the corresponding fuel consumption associated with green hydrogen
		• The lost volume of abated PM2.5 is then calculated by subtracting emissions associated with hydrogen use or hydrogen-based fuels (e.g., synthetic diesel) from the baseline pollution level
		• To convert lost volume of abated PM2.5 (in tons) into increase in air pollution concentration (microgram/m3):
		  – The US atmospheric volume is estimated by dividing total earth atmosphere with US surface % of the Earth
		  – Finally, the lost volume of abated PM2.5 is multiplied by an average settling factor of 50-60%, then divided by the US atmospheric volume

FAQs (10/11)

Emissions

30 What is your response to studies which claim that the PTC will result in significant increases in grid emissions?

- The studies claiming that the PTC will drive significant increases in grid emissions are compounding several poor assumptions and limitations of their models.
- These studies assume the following:
    - The grid is uniformly dirty everywhere (using the highest emissions intensity available)
    - They are looking at a static point in time and fail to consider that the grid emissions intensity will improve as more renewables are deployed, fossil assets retired, and existing fossil assets cleaned up.
    - They assume that all other (non-IRA) state and federal climate policies are ineffective.
    - They assume that electrolyzer plants will not be able to get any access to RECs or other green electrons, requiring them to run on grid power 100% of the time.
- Under all of these assumptions, yes, the models showing grid emissions increasing due to increased electrolytic hydrogen load are not incorrect. **However, this is a model of a highly unrealistic scenario.**
- The grid has been getting cleaner for the last 15 years and will continue to do so.
- Significant renewable assets are in the interconnect queue, in addition to those already available.
- State and Federal policies (i.e., IRA) are projected to rapidly accelerate renewable deployment, resulting in the grid emissions to further decrease.
- Green hydrogen producers will not be using 100% grid power; rather, it would only be considered at discrete moments in time to firm an operation.
- The emission numbers arrived at in some of those studies also fail to consider the potential abatement. The hydrogen would actually be used to decarbonize an application, resulting in an emissions benefit.
- These studies are not wrong, they are just being poorly applied and interpreted.

FAQs (11/11)

Emissions

31 If additionality is not imposed what would be the emissions associated with production if electrolytic load is added to the grid?	• At present, 100% grid powered electrolysis (not what is being proposed by Plug) does have more emissions than SMR produced (grey) hydrogen by ~2x. • However, as the grid gets cleaner this dynamic will change. Depending upon the application, grid produced hydrogen would be “cleaner” than SMR by ~2030. RMI has an excellent calculator projecting this based upon various scenarios. • This aligns with when the large green hydrogen demand is projected to be required.

plug™

Green Hydrogen at Work™

Appendix C

COMMENT LETTERS (AFFIXED HERETO)

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NEW YORK STATE | NYSERDA

KATHY HOCHUL
Governor

RICHARD L. KAUFFMAN
Chair

DOREEN M. HARRIS
President and CEO

August 3, 2023

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

Re: Notice 2022-58

Response to Request for Comments on
Credits for Clean Hydrogen and Clean Fuel Production:
Northeast Regional Clean Hydrogen Hub States

We, the undersigned Northeast state representatives, appreciate the opportunity to submit these comments in response to Notice 2022-58. We write with great enthusiasm for all the work that this administration has achieved in support of our mutual climate and energy goals. In particular, we write to express how important we believe that the support provided by this administration to the development of a robust clean hydrogen industry continues to be for our collective goals. We are applicants to the U.S. Department of Energy's Regional Clean Hydrogen Hubs program and otherwise have strong interest in other hydrogen offerings provided by this administration. It is regarding the hydrogen production tax credit that we write you today.

Like any nascent industry, the clean hydrogen industry will need many years and a variety of strong mechanisms to catalyze its potential to decarbonize hard to electrify sectors of the economy. The clean hydrogen industry, like others, must go through a multi-year process of building trust with counterparts, including investors, insurers, consumers, transporters, host communities, and others. It must take incremental risks to grow when its policy and economic paths are not yet defined. And it must continue to develop a constituency that embraces its value to decarbonization, resilience, air pollution mitigation, and other positive attributes (benefits). These processes take time. For a new industry to compete successfully against incumbent technologies such as coal and natural gas it must be supported, much like the country has supported other sources of energy, with tax credits, favorable market rates, initiatives to reduce soft costs, and so many other mechanisms.

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Just as solar and wind has grown in their respective shares of the national energy market and have been supported for decades to meet the nation's growing needs for clean resources, the market is ready to take the next steps with clean hydrogen. State policies, like renewable portfolio standards and net metering with annual matching requirements, have resulted in once unthinkable growth in renewable technologies. This success in policy support for renewable energy should serve as the template for clean hydrogen. Clean hydrogen could play a pivotal role in the decarbonization of hard to decarbonize sectors in the United States. There is also an opportunity for our states, and the nation, to capture and maintain the lead in the hydrogen industry and reap the related jobs, economic growth, and pollution mitigation benefits alongside those of decarbonization.

The Inflation Reduction Act, including the Act's creation of the hydrogen production tax credit (45V), has the promise to significantly advance the decarbonization of the economy. If, however, proper policy is not implemented, that promise is unlikely to be fully achieved. The undersigned have concerns with attaching overly burdensome obligations, known as "Additionality," "Time Matching," and "Geographic Matching" to the hydrogen production tax credit provisions. The undersigned respectfully raise the following suggestions regarding these draft requirements of the new tax benefit.

Additionality

Although we share the concern that rapid additions of electrolyzers could potentially lead to greater emissions because of the increase in electricity demand, we do not support a strict requirement of "Additionality". As an initial point, in states with renewable portfolio standards (RPS) based on a percentage of load, by definition if an electrolyzer load is added to that grid, new renewables must be built to cover the percentage of obligation in place. An RPS enables the clean electricity sector to automatically adjust its renewables requirements for new clean load without putting this obligation onto the new electrolyzer load.

Under current RPS implementation policies, no RPS requires additionality tied to individual heat pumps installed, electric vehicles connected to the grid, lithium-ion energy storage, nor any other decarbonization solution being deployed at scale to meet local, state or national climate and energy goals. It is unclear why a different approach should be applied to hydrogen.

One of the purposes of the tax credits is to accelerate the growth of a scaled clean hydrogen industry. We do not see a strict "Additionality" obligation as consistent with achieving that goal in the long run as it could stifle the development of clean hydrogen and ultimately block the progress in hard to decarbonize sectors. Clean hydrogen is a nascent technology, and the policies to advance it must recognize the market barriers it faces coming to scale. Many existing clean resources in need of new markets and many projects in our states are at various stages of development and they are excited to play a role in clean hydrogen development. For the success of our power markets and decarbonization goals, a broad interpretation of "Additionality" would be critical to our success.

Geographic Matching / Deliverability

One of the goals for further development of the clean hydrogen industry as expressed by the Department of Energy, notably in its regional clean hydrogen hub solicitation, is to develop a nationwide industry for the fuel. We share this goal. Only a national industry is likely to be able to adequately create a flexible, reliable, cost-effective market that can meet the needs of so many hard-to-electrify sectors and be capable of matching the scale and scope of its potential customers.

The greater the obligation to match the location of the renewable power generation resource with the hydrogen production asset, the less likely it will be that either can reduce its respective costs and take advantage of the unique resources that each needs to be successful. Some proposals call for electrolyzers to be physically attached to the renewable power generator that it would use to produce hydrogen. In this instance, instead of both renewable developer and hydrogen developer selecting site characteristics that improve their ability to provide a low-cost energy resource, whether electron or molecule, they may both be forced to choose suboptimal areas and resources to ensure their physical connectivity, leading to higher energy prices and substantially fewer feasible projects. Renewables siting has long been, and continues to be, a challenge for the industry. Adding the renewable siting challenges to those of siting new hydrogen projects will compound costs, delays, and potentially lead to an increased risk of failed projects. Any increase in project failures or downsizing of projects will mean a sacrifice of good paying jobs and clean energy production. In other cases, costs may be higher and outputs suboptimal for long-term industry growth and affordability. Further, co-location has the potential to lead to suboptimal solutions, such as prioritizing the generation, which may prevent locating the hydrogen production in the best location for offtake, resulting in higher need for expensive and emission intensive transportation of hydrogen to the end use.

To ensure the tax credits help reduce production costs and ensure maximum supply to consumers, hydrogen producers must be able to guarantee certain quantities of production. If hydrogen production must have a physical interconnection with an intermittent renewable asset, then it will only produce hydrogen when that specific renewable asset produces power. While wind and solar forecasting are improving, wind and solar remain intermittent resources that do not produce uniform amounts of electricity over a given period. Electrolyzers are better operated continuously, rather than intermittently. By requiring a physical connection to a renewable asset, the inherent supply risk from intermittent resources would be added unnecessarily to electrolyzer projects at a time when the industry needs to reduce risks.

Time Matching

Time Matching is an important part of how many RPS programs have been developed, mostly using annual matching, which is the industry standard. We are not aware of a tracking system in North America that has the ability to fully implement hourly tracking for all renewable sources. Many RPS programs and behind the meter programs were instituted for much the same reason as the hydrogen production tax credit - to support the scale up of new industries that could not otherwise compete on their own. These programs have been highly successful. Requiring hourly matching would significantly impact the economics of clean hydrogen projects. A preliminary look at work being performed on hydrogen for Connecticut indicates that hourly matching would approximately double the cost of clean hydrogen as compared to annual matching. Hydrogen would benefit from the same support pathway provided to other clean energy sectors.

We appreciate this opportunity provide these comments and express our continuing support of this important initiative.

Respectfully Yours,

Doreen Harris
President & CEO, New York State Energy Research and Development Authority

Elizabeth Mahony, Commissioner
Massachusetts Department of Energy Resources

Dan Burgess
Director, Governor's Energy Office Maine

Katie Dykes
Commissioner, Connecticut Department of Energy & Environmental Protection

Chris Kearns
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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

July 14, 2023

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

The Washington State Department of Commerce appreciates the work that the US Internal Revenue Service is conducting to determine the best guidelines for the forthcoming § 45V clean hydrogen production tax credit (PTC). We are grateful for the consideration both of the critical need to contribute to reducing the cost of clean hydrogen, and to the need to consider the lifecycle greenhouse gas (GHG) impacts of hydrogen production and focus incentives on hydrogen produced with the lowest GHG emissions.

The Washington State Department of Commerce submitted comments to the US IRS in December 2022 regarding the § 45V PTC in repose to an RFI. These comments were largely focused on complementarity with the Clean Fuel Standard in Washington State to ensure that they ways in which hydrogen producers generate and account for the lifecycle GHG impacts of hydrogen production are aligned.

Since these comments were submitted, there have been increasing discussions about the “three pillars” of hydrogen production via electrolysis, which is the production method of the greatest focus in Washington state. We have determined that additional clarification will be helpful regarding these policies and would like to submit additional comments at this time.

Additionality in states with clean electricity laws and binding greenhouse gas limits
Our agency agrees that it is extremely important that the PTC rules avoid the unintended consequence of incentivizing the production of electrolytic hydrogen in a way that causes increased emissions of GHGs. The discussions and analysis around the “three pillars” of additionality, deliverability, and hourly matching have provided a valuable context in which to identify the circumstances in which the tax credit could lead to an inadvertent increase in emissions.

However, the advocates for three pillars consistently assume, explicitly or implicitly, a single national policy landscape with no effective requirement to limit use of fossil fuels in electric power generation and no binding limit on the emissions of greenhouse gases. While this assumption may be accurate with respect to many jurisdictions, it fails to reflect important differences in law among states. The case for an additionality requirement is unfounded in Washington state because of its statutory 100% clean electricity standard and its statutory GHG cap-and-invest regulation.

The suggested additionality restrictions are not only unnecessary in a statutory clean energy state such as Washington, they would also complicate the development of electrolytic hydrogen production in such states. An additionality requirement would prevent the use of electricity from existing hydroelectric, wind, solar, or nuclear generating facilities even if those facilities are most suitable to serve a particular hydrogen production facility and even if state law ensures this use would not result in any increase in GHG emissions.

Proponents of the additionality restriction argue that, if existing generating resources are shifted to hydrogen production, utilities will increase electric generation at existing fossil fuel power plants. There may be a reasonable concern in states without clean electricity and GHG cap laws, and if this occurred it would greatly reduce the climate benefits that Congress anticipated in enacting the § 45V PTC. However, that scenario is not credible in Washington and other states with clean electricity or GHG emission laws. Washington's clean electricity law would prevent utilities from back-filling their generating portfolio with fossil fuel generation.

Washington's clean electricity law, the Clean Energy Transformation Act (Chapter 19.405 RCW) requires that electricity consumed in Washington be greenhouse gas neutral by 2030. This law applies to electricity used in Washington to produce hydrogen, including electricity imported from other states. Further protection exists in the Washington cap-and-invest law (the Climate Commitment Act, Chapter 70A.65 RCW), which applies to electricity generation and imports of electricity. With the number of GHG allowances fixed under that law, any increase in emissions from electricity would require a reduction in emissions from some other source in Washington. Moreover, the cost of purchasing allowances under this program makes fossil fuel power generation more expensive than renewable generation, especially with the increased federal tax credits for renewable energy generation. The combined impact of these regulations and market incentives for renewables provide a high degree of confidence that hydrogen used in Washington State will be made using renewable power.

These factors are acknowledged in the analysis cited by advocates for the strict additionality requirement. **We believe that any additionality-based restriction of the § 45V tax credit should distinguish between states with these laws and states with no safeguards on increased generation from fossil fuel plants.** Making this kind of distinction will help ensure states such as Washington which already have strong regulations on the books can get to work producing green hydrogen at a low cost and with very low carbon footprint quickly, and could serve to motivate other states interested in hydrogen production to consider passing similar policies. This can support additionality goals and renewable electricity production broadly across the country, for all sectors of the economy including but not limited to hydrogen. This approach would be similar to the European Commission's Delegated Regulation which also distinguishes approaches additionality differently for zones with grids dominantly served by renewable electricity.

Thank you for your consideration of these comments so that we can ensure this valuable tax credit achieves its goals to help drive private sector investments in clean hydrogen production to reduce costs, while ensuring the associated GHGs are low, with the appropriate differentiations made to respond to local regulatory context.

Please feel free to reach out with any questions regarding this topic. We appreciate the opportunity to provide additional comments on this important issue.

Sincerely,

Michael Furze
Assistant Director, Energy Division
Washington State Department of Commerce

August 23, 2023

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

Re: Notice 2022-58-- Response to Request for Comments on Credits for Clean Hydrogen (H2) and Clean Fuel Production

Thank you for the opportunity to submit comments in response to **Notice 2022-58.** We are deeply appreciative of this Administration's prioritization and commitment to a clean energy future and efforts to ensure states have the resources needed to deploy effective programs and strategies. We enthusiastically support the Administration's Regional Clean Hydrogen Hubs program–or H2Hubs–that will catalyze the development of domestic carbon-free energy and fuels across America. These hubs will accelerate the decarbonization of hard-to-reach sectors, improve our energy security, establish good-paying green jobs, and help communities benefit from clean energy investments.

California has long been a leader in cleaning the air and fighting against climate change. The state has committed to a clean, renewable future with ambitious goals that the state plans to meet through a number of initiatives aimed at achieving carbon neutrality by 2045. Renewable clean hydrogen must be an integral part of California's clean energy portfolio to achieve that goal. To organize and accelerate the hydrogen market, California launched the Alliance for Renewable Clean Hydrogen Energy Systems (ARCHES), a public private partnership founded by the Governor's Office of Business and Economic Development (GO-Biz), the University of California Office of the President, The State Building and Construction Trades Council, and Renewables 100 Policy Institute. ARCHES is tasked with establishing a hydrogen ecosystem that drives down the cost of renewable hydrogen, while increasing renewable energy penetration and achieving our net zero and carbon goals on an accelerated schedule.

Based on California's extensive experience to successfully bring clean technologies to market, we know that success hinges on getting market signals right, enabling a level playing field among low- and zero-carbon technologies and working from the perspective of operating a multi-level, multi-sectoral energy system, not just individual projects.

Therefore, launching "new" technologies requires thoughtful collaboration and discussion on all levels to ensure a positive outcome. A viable and successful demand-side support mechanism for clean hydrogen and ultimately a regional and national network of H2 hubs requires a comprehensive, systems-level policy framework that ensures three objectives: 1) timely and consistent clean H2 production; 2) competitive pricing; and 3) suitable point of delivery. To achieve these three objectives, policy mechanisms must provide Transparency, Long-term objectives, and Consistency (TLC) throughout all phases of design and implementation. These are necessary to ensure clear, long term demand-side support resulting in steady offtake and corresponding H2 price reductions, which are stated objectives for the U.S Department of Energy (DOE) Hydrogen programs.

We write today in support of the new § 45V clean hydrogen production credit as it is central to our efforts to decarbonize California and key to our national goals for H2. But most importantly, we write to urge that policies and regulations ensure a level playing field for hydrogen to other energy technologies. **It is critical that pathways for market liftoff not single out and overburden one technology or resource with onerous geographic, time matching, and "additionality" requirements.**

Strict geographic and deliverability requirements will stifle the system.

- Requiring an obligation to match the location of the renewable power generation resource to the hydrogen production asset will add additional costs in many cases and inhibit placing renewable energy generation and hydrogen production in the best locations.

Time Matching needs to align with similarly situated technologies.

- Like other renewable portfolio standards, hydrogen should be allowed to use annual matching—the industry standard—vs. hourly tracking. In addition, such requirements should be carefully calibrated to have similar applicability for like technologies/or resources, such as batteries (stationary and mobile), pumped hydro, or compressed air, etc.

Additionality should not be required for jurisdictions with Renewable Portfolio Standards and clear commitments to decarbonize all sectors of the economy.

- Current implementation policies for renewable portfolio standards do not require additionality be tied to electric vehicles connected to the grid, battery energy storage, or any other decarbonization solution being deployed to meet climate and energy goals. Hydrogen should not have to follow a different approach. Requiring additionality for hydrogen alone would significantly impact the technology's ability to reach its full potential and prevent California (and the U.S.) from building a system that can be optimized to decarbonize all sectors of the economy.

The argument for requiring additionality, in the context of a state with an RPS and carbon neutral requirement, sets up an "either-or" at the project level when we need "both-and" at the system level to enable deep system wide decarbonization. For context, in California, to provide 100% clean electricity our state will need to build 148,000 MW of clean energy resources by 2045 – increasing our already robust clean electricity capacity by 400% over the next two decades. We believe these targets are achievable, but if hydrogen projects require additionality above and beyond our 100% RPS requirements, it will be impossible to interconnect them in a timely and cost-effect manner without disrupting our carefully calibrated energy system.

In other words, additionality, time matching and geographic co-location requirements for H2 would not allow California to optimize its system to accelerate deep decarbonization in all sectors. Similar to electrifying other sectors like transportation, buildings, and industry, which we account for, hydrogen is already part of our comprehensive energy system planning process. Taking hydrogen outside of this process–with additional burdensome requirements–will have an unnecessary negative impact system wide.

As we work to increase support for hydrogen among consumers and motivate the market towards investment and inspire manufacturers to build hydrogen production facilities, the hydrogen ecosystem should not be unfairly burdened by its own set of unique rules and regulations. Instead, policies should be structured so that hydrogen follows similar requirements as other similarly situated technologies. This will attract private investment and amplify any incentives put forth by the government at all levels.

Thank you for the opportunity to share our thoughts. ARCHES is fully committed to accelerating California's transition to a carbon-free economy, and we look forward to working together to implement a clean hydrogen future for our country.

Sincerely,

Angelina Galiteva

CEO, ARCHES; Founder and Board Chair, Renewables100 Policy Institute

Tyson Eckerle

Senior Advisor for Clean Infrastructure and Mobility, California Gov's Office of Business & Economic Development (GO-Biz)

Scott Brandt

Scott Brandt

COO, ARCHES; Associate Vice President for Research & Innovation, University of California Office of the President

Chris Hannan

President, State Building and Construction Trades Council of California (SBCTC)