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Internal Revenue Service
CC:PA:LPD:PR (REG-117631-23)
Room 5203
P.O. Box 5203, Ben Franklin Station
Washington, D.C. 20044

The Honorable Lily L. Batchelder
Assistant Secretary for Tax Policy
Department of the Treasury
1500 Pennsylvania Avenue, N.W.
Washington, D.C. 20220

Mr. William M. Paul
Principal Deputy Chief Counsel and Deputy Chief
Counsel (Technical)
Internal Revenue Service
1111 Constitution Ave., NW
Washington, D.C. 20224

Re: Request for Comments on Temporal Matching Requirement in Notice of Proposed Rulemaking for Section 45V Credit for Production of Clean Hydrogen

Dear Assistant Secretary Batchelder and Mr. Paul,

I am writing on behalf of Apex Clean Energy ("Apex") in response to the Notice of Proposed Rulemaking (NPRM) for the Section 45V Credit for Production of Clean Hydrogen (45V Credit) regarding the Temporal Matching Requirement and 45VH2-GREET.

Founded in 2009, Apex Clean Energy has been dedicated to accelerating the shift to renewable energy sources across the continent. With a team of over 400 professionals, we focus on origination, construction, and operation of utility-scale wind, solar, and storage facilities, as well as distributed energy resources and green fuel technologies. One of our flagship initiatives, "Project Rio," in collaboration with Ares Management Corporation, EPIC Midstream, and the Port of Corpus Christi Authority, aims to establish a gigawatt-

scale green fuels hub on the Texas Gulf Coast.¹ This ambitious project will co-locate wind and solar facilities with electrolyzers to produce hundreds of thousands of metric tons of hydrogen annually.

Key Concerns and Recommendations

Apex appreciates the opportunity to comment on the regulations relating to 45V Credit and the energy credit election, as established and amended by the Inflation Reduction Act of 2022 (IRA). The 45V Credit warrants significant attention and will support the emerging domestic clean hydrogen and fuels industry, create jobs, and support domestic manufacturing. However, the production volumes necessary to unlock the long-term, deep decarbonization benefits of clean hydrogen may not be reached under the proposed temporal matching rules.

We are concerned that portions of the rule as proposed will hamstring the industry's ability to bring hydrogen to scale by increasing the cost and complexity of these projects. Apex's top priorities are born out of the need for certainty to move forward on large-scale, capital-intensive hydrogen initiatives.

Apex's comments are centered on the below recommendations:

Temporal Matching Requirement:

- Provide a safe harbor that allows certain early mover projects to grandfather annual temporal matching for the duration of the 10-year credit period if project construction begins before the transition date.
- Update the January 1, 2028 transition date to a date based on when the Treasury Secretary publishes guidance with respect to the availability of a suitable EAC tracking and verification mechanism nationwide.
- Permit a percentage of energy consumed to be annually matched for the life of the credit, a concept similar to the formulaic approach proposed to address incrementality from existing generation.

45VH2-GREET:

- Allow the use of 45VH2-GREET model available at the start of project construction for the duration of the 10-year credit period.
- Implement a notice and comment period requirement for new releases of 45VH2-GREET.
- Address issues with current 45VH2-GREET model (only contemplates annual inputs; regional grid emissions factors; 4.9% assumption for transmission and distribution loss of electricity).

¹ <https://www.apexcleanenergy.com/news/apex-clean-energy-ares-management-epic-midstream-and-port-of-corpus-christi-authority-sign-memorandum-of-understanding-for-gigawatt-scale-green-fuels-hub-on-texas-gulf-coast/>

Flexibility on Temporal Matching

The Proposed Rule² allows for the use of EACs generated within the same calendar year that the taxpayer's hydrogen production facility uses electricity to produce hydrogen until January 1, 2028; after that date, EACs must be generated in the same hour that the taxpayer's hydrogen production facility uses electricity to produce hydrogen. The proposed transition rule from annual to hourly temporal matching by January 1, 2028 does not give green hydrogen developers enough time to take advantage of annual temporal matching allowance and help them reach economies of scale. We expect the transition will not align with the deployment timelines of early mover projects or clean hydrogen hubs.

In the year leading up to Treasury's proposal, Apex supported the American Clean Power Association's (ACP) negotiated proposal, which calls for projects that begin construction before January 1, 2029 to be eligible for the full Hydrogen PTC with annual matching for the life of the tax credit. Apex continues to support the adoption of annual temporal matching for projects that start construction before January 1, 2029 or, at minimum, annual temporal matching for projects placed in service prior to that date. We feel this is especially helpful to ensure a robust clean hydrogen market materializes, as it will better bring the necessary components to scale in an economic, cost competitive fashion - and enable more producers, manufacturers, and buyers to support the nascent clean hydrogen industry.

Studies almost universally show that green hydrogen projects cannot currently be competitive³ with fossil-based fuels on a wide-scale basis under hourly-matching regimes like the one Treasury has proposed. Achieving cost competitiveness with incumbent fuels is crucial for the widespread adoption of clean hydrogen, enabling economies of scale in infrastructure and manufacturing. Rapidly transitioning to hourly matching without providing grandfathering for early projects would exacerbate existing cost challenges, potentially rendering clean hydrogen prohibitively expensive for many buyers. According to data from BloombergNEF, only around 9% of low-carbon hydrogen expected to be online by 2030 has an offtake agreement — of those agreements, only 23% are binding.⁴

Since the IRA was passed, green hydrogen production costs have increased significantly due to underlying inflation and associated interest rate increases. These trends have driven up the cost of capital for renewable energy and green hydrogen projects. Altogether, these additional challenges add to the levelized cost of hydrogen (LCOH) in an already difficult macroeconomic environment, endangering projects that would lay the foundation for the clean hydrogen industry. These higher production costs feed into the higher cost of

² Proposed Rule at § 1.45V-4(d)(3)(ii)(A)

³ Rhodium Group, Scaling Green Hydrogen in a post-IRA World, <https://rhg.com/research/scaling-clean-hydrogen-ira/> (detailing green hydrogen's cost competitiveness in the near term given potential ramifications from IRA subsidies).

⁴ <https://about.bnef.com/blog/hydrogen-offtake-is-tiny-but-growing/>

delivered hydrogen that offtakers pay, reducing its appeal as a feedstock among early users.

Prior ACP analysis has shown that only 1.5-2.5 million tons per annum (mtpa) (representing 10-16GW of electrolyzers) will be deployed by 2032 under *any* temporal matching regime, with most of those deployments between 2028-2032. While this is only a fraction of the administration's goals, ACP estimates the size of the green hydrogen market by 2032 under hourly matching to be less than 0.7 mtpa. Such a scenario would undermine the efficacy of clean hydrogen as a tool for achieving long-term deep decarbonization goals.

To bring the nascent clean hydrogen industry to scale and spur investment, we urge treasury to provide a safe harbor that allows certain early mover projects to grandfather annual temporal matching for the duration of the 10-year credit period if project construction begins before the transition date. Some degree of flexibility is necessary to grant investment certainty, allow verification systems to develop nationwide, and avoid burdensome operational complexity.

The Need for Investment Certainty

There is a critical need for financial certainty of the tax credit value over the 10-year credit period in order to attract investment in clean hydrogen projects. The shift from annual to hourly matching poses a credit qualification risk-that is expected to limit external financing from both tax equity providers and project financing banks. To mitigate this risk, the temporal matching requirements and qualification status that are in place during the initial claim of 45V credits should remain in place for the entire 10-year PTC period.

After a number of conversations with the financial community over the past twelve months (with leading US tax equity providers and project financing banks); the feedback received on 45V guidance, and more specifically the move from annual to hourly matching represents a key credit qualification risk for committing long-term capital. We understand that these banks also hold some level of skepticism on relatively new technology applications (at scale) of electrolyzers /hydrogen production and the proposed regulations introduce additional risk. Simply put, if a financing bank is unsure if the project will qualify for the full tax credit over an extended period of time (minimum of 7-10 years), they will take the most conservative approach and underwrite the project with limited tax credit qualification.

Verification System Availability

There is currently no nationwide accounting system capable of hourly matching, with regional disparities in readiness for such systems⁵. Clear guidelines are needed for projects in regions without hourly verification capabilities, particularly in areas like Texas with significant green hydrogen initiatives.

Hourly verification systems may be in place in some regions/regional transmission organizations (RTOs) by 2028, but not uniform across the country. For example, according to the Center for Resource Solutions study referenced in the Proposed Regulations, six out of nine regional tracking systems, including ERCOT, have no plans to set up an hourly accounting system. While some regions may be able to comply by 2028, an inconsistent and patchworked approach to verification across the country will stunt investment.

Additionally, the industry will need clarification on how projects will be treated in the event an hourly match system is not in place. It is our understanding that the Proposed Rule does not compel REC tracking systems to establish that capability. In the event that third party tracking systems are developed, clarity will be needed on whether the IRS has to approve them by name or if there is a standard approach to verification.

As an alternative path, Treasury could update the January 1, 2028 transition date to a date based on when the Treasury Secretary publishes guidance with respect to the availability of a suitable EAC tracking and verification mechanism nationwide.

Burdensome Operational Complexity

From a technical standpoint, an annual-matched hydrogen production facility must be designed differently from an hourly-matched production facility. The differences in design are so significant that switching from one regime to another during the life of a project is not possible; hydrogen production projects will have to be built for hourly matching from the beginning of commercial operations.

Some flexibility around temporal matching is imperative for safety of hydrogen production. With very low grid utilization, the electrolyzer systems significantly increase the amount of shutdown and startup hours. While electrolyzers are generally good at keeping oxygen and hydrogen separated from each other, under transitory process conditions such as startup, intermittent power turn down, and cell stack pressure imbalance, or toward the end of life for the electrolysis cell stack, these concentrations may increase significantly. In the worst case, flammable mixtures may be generated and transported downstream into electrolysis gas system and storage volumes, with hazardous outcomes.⁶The equipment is still

⁵ Regional Disparities in Verification Systems: Center for Resource Solutions, "Assessment of Regional Readiness for Hourly Verification Systems," 2023.

⁶ <https://h2tools.org/bestpractices/h2-o2-gas-cross-over-safe-practice>

relatively new and typically operated with more continuous power. As a result, wear will increase, and require quicker replacement, as increased wear will also move the system closer to unsafe operating conditions.

While Apex considers project grandfathering or a longer transition period before the adoption of hourly temporal matching to be the most impactful change available to Treasury, please see below for other alternatives that would provide some smaller, yet material, flexibility to renewable-based clean hydrogen projects.

Formulaic Approach to Temporal Matching

To the extent that Treasury does not adopt a grandfathering approach, we encourage Treasury to consider, at a minimum, exempting a percentage of hydrogen production from having to meet hourly requirements for the life of the tax credit. Consistent with the formulaic approach proposed for incrementality, a similar approach could be applied to first-mover projects with respect to temporal matching.

This would work similarly to the formulaic approach being considered by Treasury, which would deem “five percent 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.”⁷ Treasury could make the tax credit more pathway/technology agnostic by allowing these flexibilities to translate to temporal matching as well. Additionally, accounting for grid emissions impacts that would occur if a small percent of the hydrogen production could be annually matched for the life of the credit involves similar grid complexity as that used to justify the formulaic proposal for incrementality. In both instances, the generation that could likely ramp up or come online to account for hydrogen production being powered by existing clean energy generation, or some direct grid draw, can be difficult to predict.

In order to incentivize early movers and ensure that they can cost effectively meet an hourly requirement (in the early years when it is expected to be cost prohibitive), a certain percentage of annual matching should be permitted for the life of the tax credit for those projects. The percentage should be applied to the total amount of energy consumed by a facility in a year. For instance, the green hydrogen facility would be able to match, on an annual basis, 15% of electricity consumed but would have to meet 85% of its remaining capacity on an hourly basis. For a project pulling from the grid when co-located generation is not producing (under 5% of the year), even a 5% threshold for annually matched generation would simplify operations and drive down costs. This approach can also relieve administrative burden of implementing the tax credit, similar to the proposed rule for incrementality.

⁷ Proposed Rule at 89231

Some degree of flexibility and certainty on temporal matching is crucial to bring the nascent clean hydrogen industry to scale, and we urge Treasury to spur this investment, whether through grandfathering or a threshold/formulaic approach.

Utilize Legacy 45VH2-GREET Model

The Proposed Rule⁸ provides that lifecycle greenhouse gas emissions are calculated through the most recent version of 45H2-GREET that is publicly available on the first day of the taxpayer's taxable year in which the qualified clean hydrogen for which the taxpayer is claiming the section 45V credit was produced.

To provide certainty to investors and hydrogen providers, we urge the inclusion of a provision to allow the use of the 45VH2-GREET model available at the start of construction for the duration of the 10-year credit period. This would provide investors and hydrogen developers the necessary level of certainty to assess project economics and viability. Any change to the model would be a concern, as uncertainty arises with an unknown future model of 45VH2-GREET. The ability to “lock in” 45VH2-GREET minimizes the risk associated with potential changes to the model over time, allowing predictability for project stakeholders. This type of mechanism is preceded by Treasury's begin construction special rule provided in the Energy Community bonus credit guidance⁹, where Treasury provided needed certainty for projects that began construction in an energy community to continue to meet the energy community standard throughout the ten-year tax credit period. Similar need and considerations should be given to the use of the 45V-H2 GREET model in effect at the time of beginning construction. This would provide needed certainty for projects that begin construction under a current 45VH2-GREET model.

Some existing government programs that use GREET allow for grandfathering of a specific version of the model for certainty instead of being subject to changes on an annual basis. There is precedent for this approach through California's Low Carbon Fuel Standard program, which allows for a two-year use of a prior GREET model before entities are required to make a transition. If locking in the model for the life of the tax credit is not feasible, a minimum allowance for provide a two-year “grace period” before the released version of GREET must be used will be necessary to adapt operations with any future model updates that would put tax credit qualification in jeopardy. At a minimum, 45VH2-GREET should be open to notice and comment requirement. In the normal course of GREET model updates, Argonne provides the opportunity for interested stakeholders to review and provide comment on modifications to its draft models, including the standard H2 GREET model, and this review and comments process should be applied to the 45VH2-GREET model. While the lack of insight into potential changes is troublesome, there are a few changes that would be particularly difficult to adapt to.

⁸ Proposed Rule at 1.45V-1(a)(8)(ii)

⁹ Notice 2023-29

First, today's 45VH2-GREET model only contemplates annual inputs. As such, the model produces an annual average CI score using a weighted average of the annual inputs. Under the NOPR, it is unclear what this will look like in 2028. If this switches to hourly inputs (8760) this could result in a vastly different CI score. Apex retained ICF International, Inc., a third-party advisory firm, to perform a Life Cycle Analysis on one of our green hydrogen production sites in development. Changing from an annual weighted average CI score to a CI score calculated on an hourly basis led to a 4-6% decrease in annual tax credit revenue. Taken over the life of the tax credit, this could represent a loss of tens to hundreds of millions of dollars, leading to an increased cost to the ultimate hydrogen purchaser.

Second, to the extent a future 45VH2-GREET model switches the regional grid emissions factors, a project's regional emissions factor, and therefore, tax credit qualification can change.

Finally, 45VH2-GREET assumes a transmission and distribution loss assumption of 4.9%, which is not reflective of co-located projects. If the goal of the proposed regulations is to ensure clean generation is tied to H2 production, this stipulation runs counter to that goal by penalizing co-located with a false, higher emissions score. Treasury should require the 45VH2-GREET model to adopt differentiated transmission and distribution loss rates and have a category for hydrogen production facilities that are co-located with their source of clean electricity.

Conclusion

In conclusion, the Proposed Rule, particularly the temporal matching requirement, risks undermining the Department of Energy's hydrogen goals and deterring investment in the green hydrogen industry. Some aspects of the temporal matching requirements, as proposed, may result in increased costs for clean hydrogen production, impede much-needed investment in the supply chain, and introduce operational complexities. Ultimately, this has the potential to delay the realization of the administration's goals of achieving 10 million metric tons of domestic clean hydrogen production annually by 2030 and reducing the cost of clean hydrogen to \$1/kg within that timeframe.

Thank you for considering our comments. We look forward to continued collaboration on this important matter.

Sincerely,



Ken Young
CEO
Apex Clean Energy, Inc.