



WESTERN GREEN HYDROGEN INITIATIVE

Understanding
45V and the Three
Pillars

A Convening Brief

INTRODUCTION

Clean hydrogen has gained traction as a valuable tool in nationwide decarbonization efforts, prompting federal and state actors to take steps to ensure its safe and equitable deployment. Specifically, the Inflation Reduction Act (IRA) of 2022 marked the largest investment in climate and energy in American history with a multitude of grant funding opportunities and tax credits. One of these is the 45V Clean Hydrogen Production Tax Credit, which provides a tax credit of up to \$3 per kilogram (kg) of hydrogen for projects with less than 4 kg of carbon dioxide (CO₂) produced per kg of hydrogen on a lifecycle basis. This tax credit complements other federal investments in the clean hydrogen economy, such as the Department of Energy's Regional Clean Hydrogen Hubs program, which provides \$7 billion across seven hydrogen hubs.

Table 1 | Tax Credits for Clean Hydrogen in the Inflation Reduction Act 45V Section

CO ₂ Emissions Per Kilogram of Hydrogen Produced (kg)	Equivalent Reduction in CO ₂ Emissions (%)*	Credit Qualification (\$)
< 0.45	95-100	\$0.60
0.45 to < 1.5	83-95	\$0.20
1.5 to < 2.5	72-83	\$0.15
2.5 to 4	56-72	\$0.12

*Compared to steam methane reforming, which emits about 9 kg of CO₂/kg of hydrogen produced, assuming no methane leaks. Estimates are rounded to the nearest percentage point. Calculations of credit qualifications above do not include the 5x multiplier from wage and apprenticeship programs.

Source: Alvin Lee and Peter Lawrence. "Section 45V Clean Hydrogen Production Credit Proposes Guidance on Determining Greenhouse Gas Lifecycles, Certification of Hydrogen Production, Generating Electricity from Renewable Resources, and Modifying and Retrofitting Old Facilities," Novogradac, 2024.

To understand the 45V tax credit and how it can help accelerate states' clean hydrogen progress, the Western Green Hydrogen Initiative (WGHI) hosted a virtual webinar in March 2024 that brought together public sector leaders from states with diverse resources, social and political attitudes, and energy needs. The webinar included an introduction from WGHI's Co-Vice Chair, Stephanie Celt, a Senior Energy Policy Specialist at the Washington State Department of Commerce, and a presentation from Elizabeth Crouse, a Partner at Perkins Coie LLP focused on renewable energy tax law. This brief summarizes the insights gained from the WGHI webinar and offers an overview of key takeaways and considerations for states as they navigate how to leverage the 45V tax credit most effectively.

BACKGROUND ON 45V

The U.S. Department of the Treasury and the Internal Revenue Service (IRS) were tasked with developing comprehensive guidance to enable clean hydrogen producers to claim the 45V tax credit. The draft guidance was released in December 2023. The Treasury received approximately 30,000 comments from stakeholders and a public hearing on the proposed regulations was held on March 25-27, 2024. The timeline for the release of the final regulations is still unknown.

As the proposed guidance currently stands, the Treasury and IRS opted to use the latest version of the Greenhouse Gases, Regulated Emissions, and Energy Use in Technologies (GREET) model developed by Argonne National Laboratory to determine emissions for various hydrogen production processes and assess tax credit eligibility.¹ The amount and carbon dioxide equivalency (CO₂e) emissions score of the hydrogen produced must also be validated by a third party. This scoring encompasses all emissions through the point of production, or well-to-gate, including emissions associated with feedstock growth, extraction, processing, and delivery to the facility. Furthermore, the proposed scoring also includes emissions associated with hydrogen production, such as electricity used by the production facility and any carbon capture and sequestration by the facility.²

The IRS and Treasury's proposed regulations to implement code section 45V are based on the three pillars: incrementality, deliverability, and time matching.

- **Incrementality** (or additionality) requires that electricity used for electrolytic hydrogen production is in addition to existing generation. This prevents existing clean electricity resources from being diverted from serving other electric loads.
- **Deliverability** ensures that only resources that can be physically delivered to the electrolyzer can qualify as part of the electrolyzer's resource portfolio, rather than solely relying on purchasable renewable energy credits. The clean electricity must also be located in the same grid region according to the Treasury and IRS December 22 Notice of Public Rulemaking (NPRM)³ and GREET documentation, based on the Department of Energy (DOE)'s 2023 National Transmission Needs Study.⁴
- Lastly, **time matching** (or hourly matching) requires that generation from new clean electricity is matched with the production of clean hydrogen on an hourly basis. Hourly matching allows for renewable resources to be grid-connected while also maintaining some geographic and technological diversity in the portfolio of clean electricity resources.

Based on the regulations outlined in the three pillars, the 45V credit is offered on an opt-in basis for taxpayers with qualified hydrogen produced after December 31, 2022, for a 10-year period following the facility's in-service date, given that facility construction began before 2033.

The economic signals in the 45V tax credit are expected to encourage large-scale clean hydrogen production even if the Treasury Department implements stricter accounting of lifecycle emissions under the three pillars.⁵

¹ The GREET model was developed to assess lifecycle energy, emissions, and environmental impacts of fuels and their production processes. A key use of the GREET model has been to quantify greenhouse gas emissions associated with transportation fuels for the California Low Carbon Fuel Standard.

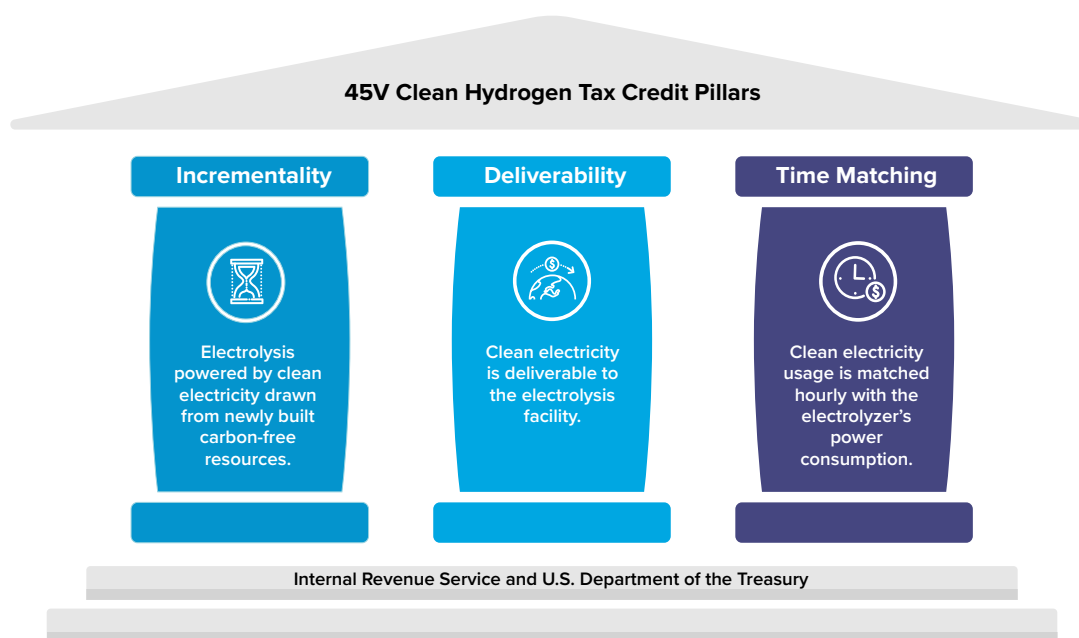
² Federal Register, "Section 45V Credit for Production of Clean Hydrogen; Section 48(a)(15) Election to Treat Clean Hydrogen Production Facilities as Energy Property," National Archives, 2023, <https://www.federalregister.gov/documents/2023/12/26/2023-28359/section-45v-credit-for-production-of-clean-hydrogen-section-48a15-election-to-treat-clean-hydrogen>.

³ "Treasury Sets Out Proposed Rules for Transformative Clean Hydrogen Incentives," White House, 2023, <https://www.whitehouse.gov/cleanenergy/clean-energy-updates/2023/12/22/treasury-sets-out-proposed-rules-for-transformative-clean-hydrogen-incentives>.

⁴ "DOE National Transmission Needs Study, October 2023," United States Department of Energy, 2023, https://energy.gov/sites/default/files/2023-12/National%20Transmission%20Needs%20Study%20-%20Final_2023.12.1.pdf.

⁵ Haley, Ben, "45V Tax Credit: Three-Pillars Impact Analysis," Evolved Energy Research, 2023, <https://www.evolved.energy/post/45v-three-pillars-impact-analysis>.

Figure 1 | Three Accounting Pillars of 45V Clean Hydrogen Production Tax Credit



Source: [Strategen Consulting Inc.](#)

KEY TAKEAWAYS FROM THE WEBINAR

TOPICS COVERED BY STAKEHOLDER COMMENTS TO THE TREASURY

In Elizabeth Crouse's webinar presentation, she explained that comments from stakeholders to the Treasury focused on several key concerns, including how to best demonstrate incrementality, hourly matching, natural gas usage, and appropriate geography for deliverability. Specifically, stakeholders noted the need for the following clarifications or modifications:

1. Simplify the incrementality requirement through a 5% rule, which would allow 5% of existing clean generation to qualify as incremental. Furthermore, this entails removing the burden of proof to provide a proxy for curtailment and the avoided retirement of emitting facilities.
2. Establish a way of measuring hourly matching, including the next steps for the Energy Attribute Certificate market to develop hourly tracking capabilities to verify compliance, as well as plans for a transitional phase to enable annual matching until December 2027.
3. Confirm methods of accounting for renewable natural gas (RNG) usage, given the limited hydrogen production pathways included in the existing GREET model, which excluded RNG. Explore the potential usage of book and claim⁶ and mass balance⁷ approaches, as well as changes in feedstock.⁸
4. Clarify geography for deliverability due to the proposed map from the Treasury not aligning with the map of balancing authorities.
5. Establish a methodology to represent annual average CO₂ emissions, given numerous uncontrollable values for the electric grid.

⁶ A practice in which clean electricity producers can enter or "book" the emissions savings of the electricity produced, and customers can claim the emissions benefit from the electricity to achieve climate regulations. See Blank, Thomas Blank O. et al. "Clean Energy 101: Book and Claim," Rocky Mountain Institute, 2023, <https://rmi.org/clean-energy-101-book-and-claim>.

⁷ The practice of mixing fossil and renewable resources in existing generation systems but tracking their respective quantities and allocating the resources to specific products. See Johansson, M. Berggren, A. "Mass balance – a necessary strategy towards renewables," Perstorp, 2019, https://www.perstorp.com/en/news_center/news/2017/20171115_mass_balance#:~:text=Mass%20balance%20is%20about%20mixing,the%20renewable%20content%20is%20verified.

⁸ Adam Schurle, Tori Roessler, and Kyle Hayes, "IRS Releases Proposed Regulations for Section 45V Hydrogen Production Credit," Foley & Lardner LLP, 2023, <https://www.foley.com/insights/publications/2023/12/irs-proposed-regulations-section-45v-hydrogen-production-credit>.

CONSIDERATIONS FOR STATE LEADERS IN DIFFERENT STATE CONTEXTS

The convening also surfaced various considerations around 45V for public sector leaders in different state contexts. All states were encouraged to create frameworks to support early clean hydrogen movers, create local market liftoff, and incorporate greenhouse gas emissions reduction considerations into state policy and program decisions. It was also recommended that all states ensure consistency between their new policies and federal programs.

Similarly, states with strong climate and clean energy laws are recommended to ensure consistency across state and federal programs, as well as understand tradeoffs between economy-wide and project-level additionality.

For states pursuing hydrogen hub development, it is recommended that public sector leaders balance the timing of 45V finalization in relation to DOE negotiations and final investment allocation decisions.

CONCLUSION

As highlighted in this brief and at the WGHI webinar, the 45V Clean Hydrogen Production Tax Credit has strong potential to encourage clean hydrogen market liftoff across the country, but much remains uncertain about its final design and effective implementation. Public sector leaders and stakeholders can benefit from additional transparency and clarity surrounding tax credit eligibility and geographic limitations. This clarity is especially urgent for regions with anticipated Regional Clean Hydrogen Hubs and other clean hydrogen production projects in development.

Furthermore, the webinar highlighted the necessity for more coordination between federal and state programs to minimize barriers to clean hydrogen production. The Treasury and IRS were also encouraged to consider the mechanisms needed to verify compliance with the three pillars, as well as specific regulations for clean hydrogen production using RNG. By addressing these concerns at the federal, state, and local levels, public sector leaders will be able to ensure the deployment of a robust, clean hydrogen economy in the United States.



The Western Green Hydrogen Initiative is a public-private partnership to advance and accelerate deployment of green hydrogen infrastructure in the Western region for the benefit of the region's economies and environment. It includes representatives from 11 western states and two Canadian provinces—all part of the Western Interconnection—as well as Florida, Ohio, and Louisiana. It is jointly hosted by the Green Hydrogen Coalition, the National Association of State Energy Officials (NASEO), and the Western Interstate Energy Board (WIEB). For more information, please visit wghydrogen.org.

© May 2024, Green Hydrogen Coalition. All rights reserved.