



This document includes responses to questions asked during the **Webinar: Explaining the Hydrogen Tax Credit Rules: A First Look With RMI, on January 10**. The event recording can be found here: <https://rmi.org/event/webinar-explaining-the-hydrogen-tax-credit-rules-a-first-look-with-rmi/>

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## General questions on 45V

### **Are there clean hydrogen end uses that are more or less favored by the proposed rules?**

The proposed rules only pertain to the production of clean hydrogen. There are no advantages or disadvantages given to the end use of that hydrogen. The rule *does include* anti-abuse rules that prevent the collection of the tax credit “if the primary purpose of the production and sale or use of qualified clean hydrogen is to obtain the benefit of the section 45V credit in a manner that is wasteful, such as the production of qualified clean hydrogen that the taxpayer knows or has reason to know will be vented, flared, or used to produce hydrogen.”

### **Who/how does one present a planned hydrogen-based microgrid project so that it is compliant with 45V? Also, is the credit for the volume of hydrogen generation calculated annually or over the life of the project?**

To claim the 45V tax credit, a taxpayer must submit Form 7210, *Clean Hydrogen Production Tax Credit*, a [verification report](#) for the sale or use of hydrogen, and the taxpayer’s tax return or information return for each facility and for each taxable year in which the taxpayer claims the 45V credit.

The credit is evaluated on a yearly basis. Projects can qualify for the tax credit for up to 10 years following their placed-in-service date.

### **Can you comment on the definition of a facility, and if the guidance allows a developer to split H2 production into a 45V-qualified and non-qualified facility, or two production lines in different emission rates credit brackets?**

The proposed rule offers a definition of a facility [here](#) and [here](#). It seems possible, based on the proposed rule, that a facility could be split into qualified and non-qualified production lines. The definition says a qualified clean hydrogen production facility is “a facility ... that produces qualified clean hydrogen,” which indicates that if a facility produces any qualified clean hydrogen the entire volume of production within that facility would need to be considered for the emissions rate. Simultaneously, the term “facility” is defined as a “single production line that is used to produce qualified clean hydrogen.” Further clarification is likely needed from Treasury to ensure projects understand the definition of a facility and where the boundaries are drawn.

## **What is the co-product emission allocation mechanism specified in the guidance?**

The [45VH2-GREET model](#) that is required to evaluate the emissions rate of qualified clean hydrogen allows users to input the quantity of valorized co-products and allocates emissions to those co-products.

According to the [DOE 45VH2-GREET Manual](#) (page 18), only co-products valorized in a process downstream of the hydrogen production facility may be accounted for.

Treasury is [seeking feedback](#) on their approach, “including whether alternative co-product accounting methods, such as physical allocation (for example, energy allocation or mass allocation) or allocation based on other characteristics, would better ensure well-to-gate carbon intensity of hydrogen production is accurately represented.”

## **How will "proof of use" requirements be regulated? How will this hinder the ability to trade the product?**

The Inflation Reduction Act states that hydrogen is not qualified as clean hydrogen “unless ‘the production and sale or use of such hydrogen is verified by an unrelated party.’” The proposed rule lays out [procedures for verification](#) of sale and use of qualified clean hydrogen production. It must include a production attestation, a sale or use attestation, a conflict attestation, a qualified verifier statement, general information on the facility, and any documentation necessary to substantiate the verification process.

## **For projects that have directly connected renewables, but also intend to get power from the grid to maximize the utilization factor, is the carbon intensity of the hydrogen calculated on an annual basis? Or would it receive credits for the portion that is directly connected independently of how much is bought from the grid?**

As RMI understands the guidance, the carbon intensity of qualified clean hydrogen produced at qualified clean hydrogen production facilities is calculated on an annual basis. Further clarity from the Department of Treasury on this question is requested.

All electricity used to power hydrogen production will need to be evaluated on a life-cycle GHG emissions basis and used to determine the emissions rate for the hydrogen to determine the credit value. Grid power would not be exempted from this life-cycle analysis just because the facility has a direct connection with clean power. The project would need to contract with clean power producers or otherwise secure Energy Attribute Certificates (EACs) to retire and ensure that clean electricity is qualified under the rules.

## **Are 45V tax credits refundable for taxable entities?**

45V is eligible for direct pay for up to five years of the 10-year credit lifetime for any type of taxpayer. For entities such as state, local, and Tribal governments and other tax-exempt entities, the credit is eligible for direct pay for the entire 10-year period. The 45V credit is also eligible for transferability.

## On incrementality

**How would renewable energy that is being curtailed (even if it is not “new”) be treated under the proposed rules — and how would the fact that the renewable energy would have been curtailed be demonstrated? Can “curtailed” power count as additional power? Can curtailed electrons generate EACs?**

The proposed rule includes ideas on how to qualify non-incremental clean power as incremental under certain circumstances in which the use of that power would not result in significant induced greenhouse gas emissions. One of those scenarios is in the case of clean power being curtailed. One of the [proposed ways](#) to demonstrate when renewable energy is being curtailed is to use wholesale electricity prices — when those fall to zero or negative prices, it is common that clean energy then gets curtailed as low-price renewables are overproducing during that time.

Treasury has also [proposed](#) that 5 percent of hourly generation from already existing clean electricity producers could be qualified as incremental. This is in some ways an attempt to proxy the rate at which renewables get curtailed without requiring further evidence that the power was actually curtailed.

This indicates that the final rule will likely seek to qualify curtailed power as “incremental” and able to generate EACs, although the mechanism for proving that curtailment is still open for comment.

**Could you please expound on the 5 percent additionality decision that Treasury is weighing?**

Treasury has [proposed](#) that 5 percent of hourly generation from minimal-emitting electricity generators placed in service before January 1, 2023, could satisfy the incrementality requirement. The [justification](#) for this pathway is that there are times in which the use of pre-existing clean electricity generators does not induce significant emissions. Five percent [was chosen](#) as a proxy for the estimated amount of clean electricity that is curtailed each year and because it roughly represents the volume of the existing nuclear facilities with the potential to retire through 2032.

Treasury is [seeking comment](#) on “(i) how a five-percent allowance should be tracked, allocated, and administered and how feasible it is for EAC tracking systems to incorporate data on such an allowance; (ii) whether the five percent should apply to all existing minimal-emitting electricity generators in all locations or a subset and for what reasons; (iii) whether such an allowance should be assessed at the individual plant level or across an operator's fleet within the same deliverability region; and (iv) any other administrability considerations.” Further, Treasury seeks comment on “whether and how the “averaging” approach of a proxy appropriately captures the circumstances in which generation is incremental or does not generate induced grid emissions.”

**Won't the pillars lead to the slow growth pathway, given that those announcements probably assumed little in the way of incrementality?**

[RMI analysis](#) indicates that proposed rules of this type will *not* significantly hinder the growth of low-carbon, electrolytic hydrogen production. With these proposed rules, which provide some early

flexibilities without sacrificing legal emissions thresholds, adoption rates could push electrolyzer costs down at a rate in which clean hydrogen production scales significantly in the coming decade.

While incrementality will require continuous buildout of clean electricity to match hydrogen production, this is necessary to avoid overshooting emissions thresholds required by law. Dynamics between emissions impacts of the incrementality rule and the factors that projects will need to consider given these rules are elaborated more fully in the recording of [our webinar](#) and in the downloadable slide deck.

## On deliverability

**Do you interpret deliverability of EACs as solely being generated within the region as defined by the DOE transmission study, or to be paired with power delivery between balancing authorities within a region? Will the generation have to be delivered into the same region as the clean hydrogen facility claiming the credit, or will the clean electricity generation installation also have to be located in that region (as the European Union "geographical correlation" rule requires)?**

The proposed rule [states](#) that an EAC meets deliverability requirements if the clean electricity generator is located in the same region as the associated hydrogen production facility. The location of the generator and the hydrogen production facility will be based on the balancing authority to which it is electronically interconnected, and not its geographic location.

Treasury is [requesting comments](#) as to whether there are additional ways to establish deliverability, “such as circumstances indicating that electricity is actually deliverable from an electricity generating facility to a hydrogen production facility, even if the two are not located in the same region or if the clean electricity generator is located outside of the United States.”

**How will deliverability requirements affect hydrogen hubs that cross congestion regions?**

Demonstrating deliverability for projects that exist across congestion zones is one area Treasury will be seeking comment (see above question and answer). Until other pathways demonstrating deliverability are put in place, projects will need to source their EACs from within the same congestion zone as the hydrogen project to qualify for 45V.

## On temporal matching

**Does the guidance have any constraints on use of 45X for storage that is ultimately deployed to help green H2 projects to meet 45V hourly matching requirements?**

There are no restrictions on the use of 45X to produce technologies that are then deployed to support green hydrogen projects that seek to qualify for 45V. One unanswered question in the proposed rule is how electricity storage and the use of that generation to produce hydrogen will be considered by Treasury.

**Can (or should) the hourly matching requirement be met by combining one project a hydrogen production technology that uses electricity with a heat storage project that time-shifts a similar amount of electricity consumption from times of low renewable energy supply to periods when there is excess renewable energy supply?**

Whether and how storage technologies can be enabled to meet the temporal matching criteria under the proposed rule is an open question. Treasury requested comment on how precisely to account for temporal shifts, and they seem to have interest in including this pathway. The precise mechanics of storage in the EAC market require additional detail, but there are some early movers including the Center for Resource Solutions and the EnergyTag framework that have developed a number of options.

**How are missed hours accounted for in the guidance? Does hydrogen produced during those hours simply fail to qualify for 45V or does the hydrogen produced with higher emissions impact the facility's total emissions rate for the taxable year and therefore their potential credit value?**

As RMI currently understands the guidance, the carbon intensity of qualified clean hydrogen produced at qualified clean hydrogen production facilities is calculated on an annual basis. In this sense, all hydrogen produced at a qualifying facility would need to be evaluated for its GHG emissions intensity and combined throughout the course of the year, the facility would be scored for one emissions intensity level and that would determine the final tax credit incentive provided to all qualifying clean hydrogen production. Further clarity from the Department of Treasury on this question is requested.

From the proposed rule:

“In general. 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.” (emphasis added)

“Proposed § 1.45V-4(b) would provide that for each taxable year during the period described in section 45V(a)(1), a taxpayer claiming the section 45V credit determines the lifecycle GHG emissions rate of hydrogen produced at a hydrogen production facility using the most recent GREET model. Such a determination is made separately for each hydrogen production facility the taxpayer owns and as of the close of each respective taxable year in which such production occurs (that is, such a determination is made for that taxable year's total hydrogen production at a hydrogen production facility).”

## **On Provisional Emissions Rates (PER)**

**Could you expand on how developers can propose new production pathways?**

Under the circumstance in which a hydrogen producer seeks to qualify for 45V but their specific hydrogen production pathway is not included in the most recent GREET model, they may file

for a provisional emissions rate. This could mean that the most recent GREET model either does not include the feedstock used by such facility or the production pathway technology.

To receive a PER, a taxpayer would need to request a specific emissions value from the Department of Energy for their pathway. The [process outlined](#) in the proposed rule requires a taxpayer to attach a PER petition to their income tax return for the first taxable year of hydrogen production. This petition must contain “(i) an emissions value obtained from the DOE setting forth the DOE's analytical assessment of the lifecycle GHG emissions rate associated with the facility's hydrogen production pathway, and (ii) a copy of the taxpayer's request to the DOE for an emissions value, including any information that the taxpayer provided to the DOE pursuant to the emissions value request process specified in proposed § 1.45V-4(c)(5).”

The process by which a taxpayer receives an emissions value from the DOE will open on April 1, 2024. A taxpayer may only request an emissions value from DOE after a front-end engineering and design (FEED) study or similar indication of project maturity has been completed. Treasury is [seeking further](#) comment on appropriate indicators of project readiness that should be in place before requesting an emissions value from DOE.

## **On gas-based (blue) production pathways**

### **Does RMI think there is a large incentive for blue hydrogen producers to attempt to qualify for 45V, over 45Q?**

Existing policy frameworks don't stimulate gas-based hydrogen producers to drive carbon emissions to net zero. Gas-based hydrogen producers can qualify for either 45V PTC or 45Q, a tax credit for carbon capture and sequestration. Regardless of which credit they choose to take, given the structure of the 45V credit and the cost tradeoff with reaching higher capture rates, projects may be incentivized to reduce emissions only up to the point where they qualify for the credit — 4 kg CO<sub>2</sub>e/kg H<sub>2</sub> — and no further so that hydrogen can be classified as “clean.” Furthermore, the increased 45Q tax credit doesn't incentivize life-cycle emissions reduction as it is calculated in absolute terms providing \$85 credit per each ton of sequestered CO<sub>2</sub> rather than linked to an emissions threshold. In the early phase of market development many project developers [may opt](#) for the 45Q credit to minimize risks associated with achieving the high capture rates and low upstream methane emissions needed to access higher levels of PTC funding.

### **Can you comment on potential emissions rate determinations for hydrogen production pathways that may use renewable natural gas (RNG)?**

While the proposed rule does not outline the emissions intensity of projects using renewable natural gas, Treasury [has clarified](#) that they “intend to provide rules addressing hydrogen production pathways that use renewable natural gas (RNG) or other fugitive sources of methane (for example, from coal mine operations) for purposes of the section 45V credit.”

Treasury clarifies that rules for this pathway should be logically consistent but not identical to the requirements for electrolytic hydrogen production: incrementality, temporal matching, and

deliverability. Ideally, rules “would be designed to reflect the ways in which additional RNG or demand for fugitive methane can impact lifecycle GHG emissions and also to address the differences between electricity and methane, including but not limited to the different sources of emissions, markets, available tracking and verification methods, and potential for perverse incentives.”

### **Would a gas pathway be able to buy "extra" EACs to offset their gas emissions – effectively incenting more renewables penetration?**

As RMI understands the rule, an EAC can be retired to demonstrate compliance with electrolytic hydrogen production pathways. It does not seem as though a gas-based hydrogen production pathway would be allowed to purchase EACs and retire them and claim a 45V credit, and there are no options to explicitly buy offsets.

## **On registries and EAC retirement**

### **For a project in Texas, does ERCOT have to serve as the 'qualified EAC registry' or is it foreseeable that private EAC registries could also be used for hourly matching?**

It is possible that private EAC registries could be used to do the hourly EAC accreditation, tracking, retirement, and verification. However, those registries will need to work closely with the ISO/RTOs and utilities supplying the power to projects. ERCOT is a qualified EAC registry so it could serve as the registry for the tax credit or let another private EAC registry do this for projects on their grid.

### **How likely is it that RTOs/ISOs will have hourly matching by 2028? What guarantees are there that these systems will be ready in 2028? Does the US government have any forcing mechanisms over EAC registries to ensure they implement hourly matching EACs?**

RMI is confident these systems can be established well before 2028. Treasury has come to a similar conclusion and [states clearly](#) that the transition time is intended to allow the tracking systems and contractual structures needed for hourly matching to develop.

There are currently no ways to enforce that the registries be available for hourly matching by 2028. However, the incentive to participate in this hourly EAC market is significant because it will enable project siting in geographies with these systems in place. Without registries able to do the tracking, projects will likely have other avenues of proving the requirements of the proposed rule but it will be more burdensome. It is likely that the policy certainty for this rule accelerates the development of the hourly matching systems given the demand for its services in the context of qualifying for this valuable tax credit.

### **These regulations seem to assume technological leaps forward in both EAC tracking and electrolyzer operations. How do you expect the first movers to reach final investment decision (FID) with such regulations?**

The EAC guidance enables grid-connected projects to qualify under certain conditions, driving a market for hourly attributes. The tightness and liquidity of that market is the primary forecast that

first movers will need to navigate. The diligence required is like financial projections for renewable energy projects. Given the guidance includes a three-year grace period (the incrementality rule), most projects that come online prior to 2028 are currently in the queue and shovel-ready. The cost of these attributes will vary, but the large geographical boundaries combined with an inclusive incrementality definition suggest that EAC prices will be relatively low for first movers and will ramp up as competition increases (which should then drive new clean electricity capacity buildout).

There are companies already making project announcements that align with these rules—optimizing electricity procurement, electrolyzer size and type, and hydrogen storage. While electrolyzer production timelines mean projects may not be coming online in the next couple of years, the policy certainty of these rules for projects hoping to qualify for the tax credit will enable financial institutions to evaluate risk, projects to optimize for hourly matching and deliverability, and contractual structures and data infrastructure to develop.

The technological needs for EAC tracking are a bookkeeping and data availability challenge rather than a substantial technological shift. For early projects, we expect bilateral contracts between EAC providers and hydrogen producers. Electrolyzer operations will likely be informed by day-ahead and hour-ahead forecasting. Most existing electrolyzers (alkaline and PEM technologies) can ramp up and down within 15-minute intervals. RMI is tracking how the Treasury will treat “missed” hours when calculating the credit — this will also have an impact on risk mitigation, financial investment, and project optimization.

For early virtual power purchase agreements (vPPA) or sleeved PPA contracts, RMI expects a bilateral contract for attributes that are demonstrated to Treasury via meter data for both the electrolyzer and the qualifying clean electricity capacity. While registries may take 1-2 years to pull together comprehensive packages that enable a low-friction hourly EAC market, it seems immediately possible for existing registry systems to do hourly matching by manually correlating EAC data and facility usage data to demonstrate hourly compliance.

## **On emissions accounting**

### **Are water purification and distribution emissions included in the 45V carbon intensity calculation?**

All emissions beyond the gate are not included. Emissions as a result of water purification may be included if it is part of the facility but is a marginal part of the overall energy consumption of a hydrogen project.

### **Could voluntary carbon offsets be used in final guidance to meet 45V rather than just EACs?**

It is unlikely and not recommended that carbon offsets be used in final guidance to meet 45V. This practice would be misaligned with statute and Congressional intent, and it would be incredibly difficult to attempt to administer a system of clean hydrogen crediting that involves verifying, tracking, and retiring carbon offsets.



## On hydrogen hubs

### How important are the hydrogen hubs to the Treasury's guidance?

The success of the hydrogen hubs, and their ability to demonstrate different production pathways and offtake agreements, is important. RMI has done analysis suggesting there will be sufficient EACs available for projects in hydrogen hubs to access and comply with the proposed 45V rules. That analysis will be publicly available in the coming weeks. RMI expects the Treasury guidance takes into account the potential success of the hubs as a result of the proposed rules.

### Did RMI say the hubs will have ample H2 production under the current 45V proposal to meet the Hub commitments?

RMI analysis shows that this guidance does allow for sufficient EACs to be available to every hydrogen hub's anticipated projects by region. The guidance allows for all projects currently in the queue and retrospectively (over three years) to qualify. The projected capacity buildout in the post-IRA world is projected to be significantly higher than total hydrogen demand by 2030. This means if hydrogen hub projects want to qualify for 45V *and* purchase power from existing (non-incremental) clean power or the grid, they can purchase attributes from new clean power entering the grid to qualify for the credit.

Some hubs will have more attributes available in the coming years than others due to more regional clean energy and grid development, while other hubs have access to unique natural resources that support a diverse profile of clean power to support higher electrolyzer capacity factors. Rules regarding how storage of electricity to later produce hydrogen will qualify under 45V are not yet clear, but depending on how those are finalized more geographies could be advantaged under these rules.

## Miscellaneous hydrogen policy

### When do we expect demand-side policy to assist in creating offtake to match all the supply-side investments via the hydrogen hubs and BIL/IRA legislation?

On January 17, 2024, the Department of Energy announced the selection of [a consortium](#) to accelerate commercial liftoff of clean hydrogen using demand-side support measures.

Additionally, some states have begun implementing their own demand-side policies to support the offtake of clean hydrogen into certain end uses such as sustainable aviation fuel and fertilizer.

### Does the 45V guidance have any requirements for open-access H2 pipelines?

No.

**Are the proposed 45V standards designed to also open the United States to markets outside the European Union, for instance, in Southeast Asia?**

The standards proposed are aligned with Europe's and send a clear message to the international community that standards alignment will be best for mitigating emissions and encouraging global trade and competitiveness in the hydrogen and industrial sectors.

Markets in Southeast Asia, including Japan and South Korea, have adopted emissions intensity standards for clean hydrogen in line with the US's (3.2-4 kg CO<sub>2</sub>/kg H<sub>2</sub>), but have not yet set rules governing how hydrogen products can be classified as "renewable."

**More specifically about end uses, do we see these rules helping us to displace current dirty hydrogen production with clean hydrogen production for those same end uses?**

The 45V tax credit will provide a significant incentive for low-emissions hydrogen and reduce the green premium for purchasing and using that hydrogen. This will help make green hydrogen, which is currently more expensive than the carbon-intensive hydrogen produced and used at scale today.

Importantly, these rules will ensure that the hydrogen receiving the 45V incentive is truly low carbon. Replacing the carbon-intensive hydrogen used today with hydrogen that is labeled "clean" but induces significant carbon emissions, as would be the case without rules proposed by Treasury, would not be a true decarbonization solution.

**Where do you see the dividing line between 45V and Section 48 on co-located storage and liquefaction? It appears that storage is not included in the 45V support for gaseous hydrogen. Do you believe that storage tanks fall under 45V or 48? What about liquefaction and ammonia?**

The 45V guidance ends after the production of hydrogen, and any use outside of production is beyond the scope of the legislation and the proposed Treasury guidance. Treasury released guidance on the section 48 storage investment tax credit which does include some additional information about the boundaries for hydrogen storage. That guidance enables hydrogen storage that is solely used for energy purposes.