

February 26, 2024

The Honorable Janet Yellen Secretary U.S. Department of the Treasury 1500 Pennsylvania Avenue NW Washington, D.C. 20220

Ethan Zindler Climate Counselor U.S. Department of the Treasury 1500 Pennsylvania Avenue NW Washington, D.C. 20220

Dear Secretary Yellen and Climate Counselor Zindler:

The Green Hydrogen Coalition (GHC)¹ is an advocacy and educational 501(c)(3) non-profit organization. The GHC was formed in 2019 to recognize the game-changing potential of "green hydrogen"² to accelerate multi-sector decarbonization and combat climate change. GHC facilitates policies and practices that advance the production and use of green hydrogen in all sectors of the economy so that it can accelerate a carbon-free energy future. Our sponsors include foundations, renewable energy users and developers, utilities, and other supporters of a reliable, affordable green hydrogen fuel economy for all.

The GHC is writing to express the need for robust and climate-conscious guidance for implementing Section 45V of the Inflation Reduction Act's (IRA) Production Tax Credit (PTC) for clean hydrogen. We fully endorse the PTC for clean hydrogen and believe it will be integral to helping clean hydrogen become cost-competitive with fossil fuel alternatives.

We appreciate the U.S. Department of the Treasury's (the Treasury) Notice of Proposed Rulemaking (NPRM)³ which specifically highlights the need to meet the "energy attribute criteria" – incremental generation, temporal matching, and deliverability – to ensure that Energy Attribute Certificates (EACs) are an appropriate tool to qualify under the 45V-H2 GREET model for Section

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¹ Green Hydrogen Coalition. "Green Hydrogen Coalition," February 20, 2024. https://www.ghcoalition.org.

² The GHC defines "green hydrogen" as hydrogen that is produced from non-fossil fuel feedstocks and has climate integrity. The GHC supports a well-to-gate carbon intensity framework consistent with the U.S. Department of Energy.

³ Federal Register. "Section 45V Credit for Production of Clean Hydrogen; Section 48(a)(15) Election To Treat Clean Hydrogen Production Facilities as Energy Property," December 26, 2023. https://www.federalregister.gov/documents/2023/12/26/2023-28359/section-45v-credit-for-production-of-clean-



45V of the IRA and thereby prevent the generation of induced emissions. Our comments pertain to the EAC of electricity inputs in the GREET model for any hydrogen production pathway. Since green hydrogen production facilities can increase carbon emissions when connected to the grid, it is imperative that safeguards are in place to ensure that the pathway for production has climate integrity, meaning that it complies with important existing regulations. At the same time, the GHC recognizes that green hydrogen production is still in its infancy and that rapid scale up of production is key to realizing anticipated cost reductions. Therefore, overly strict requirements on qualifying electricity may inadvertently hamper this needed scale up and have the unintended consequence of reducing the cost-competitiveness of green hydrogen. As a result, this may unnecessarily prolong our dependence on fossil fuels where green hydrogen can serve as a commercially viable and scalable alternative, particularly for hard-to-abate sectors.

Ultimately, the GHC urges the Treasury to ensure that the implementation strategy for each of the energy attribute criteria strike the balance between two imperatives: ensuring climate integrity while simultaneously supporting rapid scalable near-term commercial progress. We support the advocacy of other non-governmental organizations (NGOs) and experts that stress the importance of these three criteria, but wish to emphasize that the key to the success of the energy attribute criteria is a phased strategy based on a reasonable timeframe that leverages proven market mechanisms, such as the use of Renewable Energy Certificates (RECs) and book-and-claim. The guiding principles that have led us to this approach are as follows:

• Create alignment for consistency and ease of use

- o Make the PTC administratively easy to roll out to minimize transaction costs
- o Send strong market signals that the U.S. is prepared to build a robust hydrogen economy and welcomes investors

• Level the playing field for hydrogen in the U.S.

- o Ensure that the market in the U.S. is level with existing renewable hydrogen markets abroad, namely the European Union
- O The GHC is supportive of the framework adopted by the European Commission in which a phased approach is implemented for incremental generation (referred to as "additionality"), temporal matching (referred to as "temporal correlation"), and deliverability (referred to as "geographic correlation"). While the European Union market differs from the U.S. market, the GHC nonetheless believes that adopting more stringent targets than the European Union could hamstring the U.S. market.

Reward early investors/first-movers

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⁴ European Commission, "Renewable Hydrogen Production: New Rules Formally Adopted." Accessed February 26, 2024. https://energy.ec.europa.eu/news/renewable-hydrogen-production-new-rules-formally-adopted-2023-06-20 en.



 Make certain that the rollout of the PTC does not punish first-movers, who are instrumental 'beachheads' in catalyzing market lift-off and de-risking follow-on investment

• Ensure the rules can be practically implemented

• Ensure that the requirements, upon rollout, are not ahead of the relevant EAC third party tracking entities' ability to execute

After extensive discussions and working groups with experts, academics, NGOs, and industry leaders, the GHC has arrived at the following phased implementation strategy for the Treasury's consideration:

- 1) **INCREMENTAL GENERATION:** Facility criteria serve as the foundation for the environmental credibility of green hydrogen production. Starting January 1, 2028, the GHC believes that the facility requirement be met through conformance with at least one of the following rules:
 - New Renewable Energy Projects: In line with the Treasury's guidance, green hydrogen projects should source electricity from renewable energy projects that were placed into service no more than 36 months prior to when the project is placed in service. This encourages the utilization of recently established renewable energy sources for green hydrogen production.
 - *Uprates:* Any increase in the nameplate capacity should be considered a new source of clean power, provided that the generation resulting from the clean power generator's newly added capacity achieves commercial operations no earlier than 36 months from, and within, the hydrogen production facility's placed-in-service date.
 - Repowered Renewable Energy Projects: The Treasury should consider renewable energy projects as "incremental" if they meet the 80/20 repowering rule⁵ within the 36-month framework outlined above. This promotes the modernization and upgrading of existing renewable energy infrastructure for green hydrogen production, which is an affordable and viable pathway that should be encouraged.
 - Renegotiated PPAs: In recognition of the dynamic nature of the renewable energy market, clean generation facilities that have undergone power purchase agreement (PPA) renegotiation should be eligible. Given the fact that there are existing assets that are rolling off contracts and are at risk of losing capacity, the decision to re-contract through a PPA should be considered "new" since these assets will be effectively incremental as they would have otherwise been expected to retire or sunset operations. The facility should provide

⁵ To re-qualify an existing asset, owners must invest 80% of the fair market value (FMV) of the asset, achieved through repowering or retrofitting.



documentation detailing the renegotiation process and the resultant improvements in environmental performance to demonstrate its continued commitment.

Certain price conditions should be proxy for incrementality and temporal matching: To incentivize hydrogen producers to capture otherwise curtailed renewable energy and to encourage market strategies that convert electrical energy to hydrogen during times of renewable energy abundance, the GHC believes that certain price conditions can serve as a proxy for incrementality and temporal matching. These conditions are currently identified by low or negative pricing and are expected to become increasingly abundant. Specifically, when renewable generators are the marginal resource based on a locational marginal pricing [LMP]) the price condition can serve as a proxy for incrementality to avoid the curtailment of renewable energy. Low LMPs are an excellent indicator of an abundance of renewable power, during which incremental load caused by hydrogen production will not induce additional grid emissions. Such circumstances may have seasonal and regional variability but can generally be calculated with relative ease based on available market data. The Treasury, in coordination with the Department of Energy, should develop and publish an applicable "Threshold Clean LMP" for a given region. Any consumption by a hydrogen production resource during those price conditions would be deemed to have satisfied the incrementality and temporal matching criteria. This approach creates a direct market incentive for hydrogen production resources to absorb renewable energy from the grid under these conditions. It would also create a transparent market strategy for electrolyzers to simply bid into markets at or below the Threshold Clean LMP. We therefore recommend the Treasury publish a Threshold Clean LMP in coordination with the Department of Energy, which are likely to vary by region, at the beginning of each year.

For example, Meta and WattTime find in Figure 2 of "Unlocking the Potential of Renewable Energy Through Curtailment Prediction" that the CAISO curtailment clearing price for most nodes is \$16.2 per megawatt hours.⁶ In this region, any megawatt hours used at LMPs by a hydrogen production resource during these price conditions would be a sufficient proxy for the incrementality and temporal matching criteria.

• *Clean grids:* The incrementality criteria should be waived for regions with high renewable energy penetration. For example, the European Commission's directive finds that "if hydrogen production located in a bidding zone with an average renewable electricity share exceeding 90 % in the previous calendar year, it may be counted as renewable if it does not

⁶ Acun, Bilge, Brent Morgan, Henry Richardson, Nat Steinsultz, and Carole-Jean Wu. "Unlocking the Potential of Renewable Energy Through Curtailment Prediction." In *Climate Change AI*. Climate Change AI, 2023. https://www.climatechange.ai/papers/neurips2023/123.



exceed the proportion of renewable electricity in the bidding zone." Additionally, the Commission notes that "if the 90 % share is reached in 1 calendar year, it is considered to be reached in the following 5 calendar years." Therefore, green hydrogen production projects that are located in regions with high renewable energy penetration should not have to acquire the same quantity of EACs per megawatt hour as those in GHG-intense regions. Treasury and the Department of Energy should excuse incrementality until such time as discrete regional grid mixes have been developed for use in the 45V-H2 GREET model. This approach will allow for grids with progressive renewable goals to be rewarded for those efforts and further align incentives for coordinated decarbonization.

Specific Exemptions:

• Legacy Requirement: To ensure a smooth transition, projects that were under construction prior to the issuance of the NPRM and placed in service prior to January 1, 2028, should be exempt from the incrementality and temporal matching rule. This allows ongoing projects to execute existing strategies and continue their green hydrogen production and minimize existing contractual disruptions.

The logic underpinning this exemption is that market first-movers, who already have projects under construction, may otherwise be at risk of material harm if they need to renegotiate existing contracts. Projects placed in service prior to January 1, 2028, will have already secured renewables contracts prior to the issuance of final Treasury guidance. Given that the NPRM is not yet finalized, the GHC is concerned that requiring these first-mover projects to reevaluate their resource stack may thereby jeopardize their success since it will add significant transaction costs to renegotiate these contracts on short notice. Since first-mover projects are key to de-risking the market and providing critical supply and demand, it is important to ensure that they are incentivized to continue participating in the market.

2) <u>TEMPORAL MATCHING:</u> As noted in the DOE's technical paper,⁹ temporal matching is one of the key criteria for assessing the lifecycle GHG emissions of grid-connected projects by aligning electricity consumption with renewable electricity production. We appreciate the Treasury's acknowledgment that a transitional period is needed to shift the market from annual to hourly time matching since hourly time matching in the near term is costly and not yet

⁷ Gregor, Erbach. "EU Rules for Renewable Hydrogen," n.d. https://www.europarl.europa.eu/RegData/etudes/BRIE/2023/747085/EPRS_BRI(2023)747085_EN.pdf Bibid.

⁹ U.S. Department of Energy, "Assessing Lifecycle Greenhouse Gas Emissions Associated with Electricity Use for the Section 45V Clean Hydrogen Production Tax Credit." https://www.energy.gov/sites/default/files/2023-12/Assessing Lifecycle Greenhouse Gas Emissions Associated with Electricity Use for the Section 45V Clean Hydrogen Production Tax Credit.pdf



widely feasible. While the Treasury's temporal matching requirement within the Proposed Regulations states that hourly matching would begin on January 1, 2028, the GHC maintains that this deadline should be pushed to January 1, 2030, provided that the time matching registries can meet this deadline. We also advocate for the implementation of an operational optionality approach, which would allow a hydrogen producer to select the volume of hydrogen for which it is requesting section 45V production tax credits (instead of the current approach which focuses on annual averaging). The logic underpinning this approach is as follows:

- EAC registries are currently grappling with less granular temporal matching: According to a recent Center for Resource Solutions (CRS) review, the majority of registries presently rely on monthly temporal matching.¹¹ Findings from 2023 interviews between CRS and U.S. REC tracking systems reveal that six out of nine systems lack hourly tracking functionality. 12 For these systems, the estimated timeline for implementing hourly matching varies between one to five years. ¹³ The wide range in projected hourly matching capabilities across U.S. regions raises concerns for the GHC. Regions with longer timeframes for achieving hourly matching may face potential penalties. Take, for instance, the Western Renewable Energy Generation Information System (WREGIS), covering the Western Interconnection territory, which is currently utilizing monthly tracking and anticipates implementing hourly matching within three to five years. Crucially, WREGIS underwent a platform switch in late 2022, where functionality from the old monthly tracking system was not immediately transferable to the new system. Bugs in the new system caused issues with REC creation, and over a year post-changeover, WREGIS is still working to restore previous functionality to the monthly tracking system. It remains uncertain if they have the capacity to initiate the necessary transition to hourly tracking by the Proposed Rulemaking's 2028 deadline amid these ongoing system challenges.
- Requirement of hourly matching by 2028 is more stringent than international requirements, namely the European Commission's Renewable Energy Directive: 14 In 2023, the European Commission formally adopted two Delegated Acts outlining rules on the EU definition of renewable hydrogen, which similarly outlines the criteria for incremental generation ("additionality"), temporal matching ("temporal")

¹⁰ Enforcing the January 1, 2030, deadline should be predicated on the market availability of hourly time matching for an entire year prior (January 1, 2029). If hourly time matching is not available by January 1, 2029, it is imperative to reevaluate 2030 compliance deadline.

¹¹ Center for Resource Solutions, "Readiness for Hourly: U.S. Renewable Energy Tracking Systems." Accessed February 26, 2024. https://resource-solutions.org/document/061523/.

¹² Ibid.

¹³ Ibid.

¹⁴ European Commission, "Renewable Hydrogen Production: New Rules Formally Adopted."



correlation"), and deliverability ("geographic correlation"). As stated, the European Commission acknowledges that "implementation of temporal correlation is hampered in the short term by technological barriers to measure hourly matching, the challenging implications for electrolyser designs, as well as the lack of hydrogen infrastructure enabling storage and transportation of renewable hydrogen to end users in need of constant hydrogen supply."¹⁵ Therefore, the Delegated Act requires that hourly matching begin on January 1, 2030 (with monthly matching prior). By implementing a more stringent requirement in the U.S., the GHC worries this may hamstring the U.S. market.

The need for an "operational optionality" approach for credit calculation. Currently, to qualify for the hydrogen production tax credit, the calculation of the lifecycle emissions "must include all hydrogen production during the taxable year." This approach seems to suggest that hydrogen producers must input all the hydrogen produced throughout the 8760 hours of the year into the 45V-H2 GREET model. An important limitation of this approach is that it does not take into account the various factors outside of a hydrogen producer's control (i.e., a requirement to provide firm hydrogen supply to the customer or the reality that there may simply be hours when the procured renewable energy is not generated) that may interfere with the producer's ability to stop production when renewable electricity is not available. As a result of this approach, producers may risk losing out on credits due to outside factors. Therefore, the GHC recommends allowing "operational optionality," an approach under which hydrogen producers can choose the kilograms of hydrogen on which they choose to claim the credit. This would enable a hydrogen producer to continue to supply a customer with a firm hydrogen need, even when renewable electricity is available. The goal in changing this approach is to allow a hydrogen producer to bifurcate their hydrogen production into "qualified hydrogen" eligible for the 45V credit and non-qualified hydrogen that is not eligible for 45V.

Given the reasoning discussed above, the GHC believes that from January 1, 2030, onwards, the time matching requirement for green hydrogen production should utilize electricity from the grid during the same hour as renewable energy production. Until January 1, 2030, the GHC recommends that the use of **flexible** quarterly correlation (see below) that accommodates the use of renewable energy credits for the renewable electricity supplied should be acceptable. In

¹⁶ Federal Register. "Section 45V Credit for Production of Clean Hydrogen; Section 48(a)(15) Election To Treat Clean Hydrogen Production Facilities as Energy Property," Section 1.45V-4(b).

¹⁵ "Commission Delegated Regulation (EU) 2023/1184 of 10 February 2023 supplementing Directive (EU) 2018/2001 of the European Parliament and of the Council by establishing a Union methodology setting out detailed rules for the production of renewable liquid and gaseous transport fuels of non-biological origin," 157 OJ L § (2023). http://data.europa.eu/eli/reg_del/2023/1184/oj/eng.



other words, we recommend the Treasury adjust the requirement and transition period so that flexible quarterly time matching can occur through December 31, 2029, with hourly matching beginning thereafter. The logic underpinning this approach is to implement a more stringent requirement (quarterly rather than annual) in the near-term so as to balance out the later start date for hourly time matching.

Until January 1, 2030, the GHC recommends the quarterly approach be implemented as follows: time matching for renewable electricity can be achieved through the purchase and retirement of renewable electricity certificates, which can be 'banked' for up to three quarters. This approach, which is currently adopted in California's Low Carbon Fuel Standard (LCFS), works as follows: if a given quantity of renewable electricity is supplied to the grid in the first calendar quarter (Q1), the corresponding amount claimed for reporting must be used for hydrogen production no later than the end of the third calendar quarter (Q3).

Table 1. Three Quarter Limit for Time Matching Accounting

Q1	Q2	Q3	Q4
"X" MWh electricity generated			
"X" RECs listed in tracking system for "X" MWh			
"X" RECs can be retired and matched with electricity supplied and reported for Q1			Q1 "X" RECs cannot be claimed

• *Legacy Requirement:* All projects should achieve hourly time matching criteria by January 1, 2030, either by direct supply or renewable electricity delivered from energy storage (e.g., batteries, pumped hydro, etc.). Projects with existing PPAs in place should be exempt from this requirement.

• *Grandfathering Requirement:* Quarterly grandfathering should be allowed for projects placed into service before 2030.

https://ww2.arb.ca.gov/sites/default/files/classic/fuels/lcfs/guidance/lcfsguidance 19-01.pdf.

¹⁷ California Air Resources Board, "Low Carbon Fuel Standard (LCFS) Guidance 19-01: Book-and-Claim Accounting for Low-CI Electricity." 2019.



- 3) <u>DELIVERABILITY:</u> Efficient resource allocation and regional sustainability are paramount in green hydrogen projects. To achieve this goal, the source of renewable electricity and production must be physically linked by being in the same region or via transmission contract and corresponding tag. The GHC therefore appreciates Treasury's proposal to require a grid-connected project to source its clean power from the same region, as derived from the Department of Energy's 2023 National Transmission Needs Study (NTNS)¹⁸ (Image 1). In our discussions with key stakeholders, however, the GHC has identified the following two reasons that support expanding the deliverability requirement to apply within a common Regional Reliability Entity (Image 2):
 - Potential to Increase Costs: The proposed approach (Image 1) is more geographically restrictive in some areas (i.e., in California, where the California Independent System Operator [CAISO] region roughly corresponds with state boundaries) and less restrictive in others (i.e., the Mountain region). As a result, the GHC worries that limiting hydrogen production in certain parts of the U.S. may drive up the cost of renewable electricity due to limited resource availability. This, in turn, may drive up the cost of PPAs and become overly restrictive on the nascent hydrogen market in these areas. In recognition of the fact that Section 45V is meant to spur green hydrogen production, the GHC maintains that it is important to ensure that deliverability can be met in a manner that does not undermine the goal of the tax credit.
 - Have A Sufficiently Large Footprint To Not Only Avoid Additional Administrative Costs But Also Have Access To A Broad Portfolio Of Renewable Resources: The current regional approach outlined by the Treasury (Image 1) does not align with the boundaries of the EAC/REC registries (Image 3). As a result, the GHC worries that the deliverability requirement (as currently outlined) will be at odds with the temporal matching criteria. Since the current registries and the processes that regulate them are predefined, the GHC worries that deviating from these regions may generate administrative complexities. For example, a state that falls within the REC tracking system's service territory but is not "deliverable" to that tracking system may have to find a separate process for its tracking. The GHC is concerned that this complexity may generate obstacles to meeting the deliverability requirement, while also working at odds with the temporal matching requirement. Additionally, it is important that regions have sufficient access to key renewable resources, namely wind and solar, so that they have the capacity to produce the renewable electricity needed to ensure a grid-connected project does not result in induced emissions. For example, the GHC is

¹⁸ U.S. Department of Energy, "National Transmission Needs Study," 2023. https://www.energy.gov/sites/default/files/2023-12/National%20Transmission%20Needs%20Study%20-%20Final 2023.12.1.pdf.

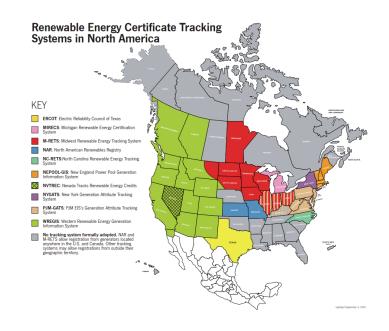


concerned that some of the regions in the proposed map – given their geography and access to wind and solar – may not have sufficient access to renewables.

Image 1. NTNS Geographic Regions¹⁹ Image 2. Regional Entities in the U.S.²⁰



Image 3. U.S. REC Tracking System Map²¹



¹⁹ U.S. Department of Energy, "National Transmission Needs Study," 2023.

https://www.nerc.com/AboutNERC/keyplayers/Pages/default.aspx.

²⁰ "ERO Enterprise | Regional Entities." Accessed February 26, 2024.

²¹ US EPA, OAR. "Renewable Energy Tracking Systems." Overviews and Factsheets, January 10, 2022. https://www.epa.gov/green-power-markets/renewable-energy-tracking-systems.



In summary, the GHC advocates for an expanded deliverability requirement that aligns with the regional entities within the U.S. An important caveat is recommended: while these regional entities extend into both Mexico and Canada, the GHC suggests limiting the deliverability requirement to only include segments within the U.S.

4) GRANDFATHERING OPTION FOR THE GREET MODEL

The GHC appreciates the introduction of the new 45VH2-GREET model that is specific to the clean hydrogen production tax credit. While we recognize that new iterations of the GREET model will be available each year to help capture new technology pathways, we also note that regular updating of the model may have the unintended effect of making hydrogen producers shift their calculation requirements regularly. As a result, we worry this may undermine the need for market certainty.

Instead, we recommend allowing producers to employ the version of GREET in use during the year their given project was placed in service or to choose a subsequent GREET version if it benefits the hydrogen producer. In other words, we recommend that hydrogen producers have the ability to grandfather or "lock in" on the GREET model so as to build out greater certainty.

5) IMPORTANCE OF A PHASED APPROACH: RECOMMENDED TIMING

The key element of our suggested approach is that it allows the criteria to be implemented over time. The logic behind this approach is that — by establishing an on-ramp towards full implementation of the criteria — it becomes possible to foster market development while also ensuring climate integrity. As discussed in the introduction, we also believe it is important to ensure that we do not hamstring the U.S. hydrogen production market by making the requirements more stringent than other international markets.

Specifically, we believe our proposed approach will foster faster near-term progress, scale, and ultimate achievement of tighter restrictions beginning January 1, 2028, for facility criteria and January 1, 2030, for time matching, as summarized in the table below:



Table 2: Summary of GHC's Recommendations

Pillar	Near-term	Longer-term
	(Present - December 31, 2027)	(January 1, 2028 / 2030 - onwards)
Incremental	Not required	Required (2028)
Generation		
Temporal	Quarterly (with the ability to 'bank'	Hourly (January 1, 2030)
Matching	energy attribute credits for up to	
	three quarters)	
Deliverability	Required	Required

The rationale for this phased approach is to avoid immediate implementation of the facility criteria and hourly time matching requirements. This is because such rapid implementation could potentially lead to increased costs, limiting market expansion. Given the early stage of the green hydrogen market's development, starting with stringent requirements could discourage the participation of various market stakeholders. This, in turn, might hinder the market's growth potential, its ability to swiftly reduce costs throughout the supply chain, and its overall development. It is therefore important to recognize that if the market's progression is impeded, the timely and critical climate benefits associated with green hydrogen might not be fully realized.

By establishing a deadline in the near future for full implementation, we believe the requirements will be flexible enough in the early years to incentivize participants to enter the market while also ensuring climate integrity. Given the fact that a similar phase-in approach has already been implemented in the European Union²² and incorporated in legislation passed in Colorado,²³ we believe this is a reasonable approach that will help the United States not only set guidelines for the production of green hydrogen domestically but also establish alignment internationally.

In conclusion, 45V implementation rules will set an important and timely baseline that is integral for international and state-level policies. The United States is already a world leader in its recognition and support for the production and use of green hydrogen domestically; however, the details surrounding its implementation are equally as important for ensuring its market design

²² European Commission, "Renewable Hydrogen Production: New Rules Formally Adopted."

²³ Priola, Kevin, Lisa Cutter, Stephanie Vigil, and Brianna Titone. Advance The Use Of Clean Hydrogen, Pub. L. No. HB23-1281 (n.d.). https://leg.colorado.gov/bills/hb23-1281



achieves both rapid commercial progress and climate integrity. Since the United States has significant domestic resources for the production of green hydrogen, it plays an outsized role in serving as a role model for other countries and our future clean hydrogen international trading partners.

The GHC appreciates this opportunity to discuss the implementation of guidelines to support Section 45V of the Inflation Reduction Act and would be happy to discuss our comments further at your convenience.

Sincerely,

Janice Lin

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