WORLD RESOURCES INSTITUTE

10 G Street, NE Suite 800 Washington, DC 20002 USA (PH) +1 (202) 729-7600 (FAX) +1 (202) 729-7610 www.WRI.org

Honorable Janet Yellen
1500 Pennsylvania Avenue NW
Washington, DC 20220

February 26, 2024

RE: Proposed Rule on the Credit for Production of Clean Hydrogen, Election to Treat Clean Hydrogen Production Facilities as Energy Property (IRS-2023-0066)

Dear Secretary Yellen,

The World Resources Institute (WRI) is submitting the following response to the Treasury's December 23, 2023, guidance on the treatment of clean energy facilities in the implementation of the 45V Hydrogen Production Tax Credit and we thank you for this opportunity. As a global think tank dedicated to turning ideas into action at the nexus of environment, economic opportunity, and human-wellbeing, WRI is invested in U.S. climate policy. WRI's Industrial Innovation and Decarbonization team researches opportunities and challenges for decarbonizing heavy industry, much of which focuses on producing and using low and zero-carbon hydrogen.

We are writing **in support of the Treasury's guidance on incrementality, hourly-matching, and deliverability—also known as the three pillars**. We applaud Treasury for prioritizing federal taxpayer dollars going towards clean hydrogen production that can demonstrate the highest standards of carbon abatement and **urge that the final rules are not excessively flexible, at the risk of producing inadvertent emissions.**

WRI's support for the rules are predicated on several key points, explained below.

1. **<u>A tax credit intending to propel clean hydrogen production must prioritize maximizing emissions reductions, as provisioned in the Inflation Reduction Act.</u>**

The Inflation Reduction Act (IRA) was designed to be one of the most significant policies in U.S. history for the purpose of reducing greenhouse gases and meeting the U.S.' commitment to reducing global average temperature increases under the Paris Agreement. To achieve that purpose, the 45V tax credit was designed to fund and develop the production of clean hydrogen. The Natural Resource Defense

Council and Clean Air Task Force's April 23, 2023 letter to Treasury provides compelling argument for this intention, with key points provided below.[1]

45V defines "qualified clean hydrogen" as being produced with lifecycle emissions not exceeding $4kgCO_{2e}/kgH_2$.[2] Furthermore, the law defines "lifecycle greenhouse gas emissions" as reflecting the definition provided in the Clean Air Act, comprising both direct and indirect emissions.[3] Considering that this selected definition includes both direct and indirect emissions resulting from, among other steps, feedstock production and extraction, lifecycle emissions from grid-connected electrolyzers would include emissions from electricity generation, whether from additional or diverted existing clean energy generation. 45V is designed to spur clean hydrogen to minimize greenhouse gas emissions; consequential emissions incurred outside of the limits set by the law, whether direct or indirect, would run counter to the law's purpose.

2. **Models have found that stringent rules are the best guarantee of reducing emissions and will likely not reduce near-term production of clean hydrogen.**

WRI's support for the three pillars is based off comprehensive system modeling by research and academic institutions seeking to understand the emissions and production impacts of 45V. Across these studies, some of which are summarized below, there is agreement that stringent adherence to the three pillars will be needed to reduce emissions. Moreover, some exemptions proposed in the guidance may sacrifice emission reductions to accommodate possible early growing pains for the nascent industry.

WRI strongly cautions Treasury on the implementation of exemptions for incrementality and deliverability, as well as the hourly-matching phase-in. Our positions on key exemptions are as follows:

- 5 Percent Generator Allowance: Only permissible if Treasury can guarantee the electricity used at the time of the hydrogen production is low emitting and results in emissions reductions. The emission consequences would be large if this does not encourage use of clean energy that would otherwise be curtailed.
- Deferred Retirement: Only permissible if existing clean energy generators facing retirement undergo a financial distress test or similar credible test demonstrating that diverting energy to hydrogen production leads to a financially viable avenue to relicense. For example, clean energy generators could follow the process for determining closure risk provided by the Civil Nuclear Credit Program under the Bipartisan Infrastructure Law.
- Hourly Matching Phase-In: In recognition of the Center for Research Solutions' survey findings that most renewable energy credit tracking systems would be able to implement hourly tracking within two years,

[1] Natural Resource Defense Council and Clean Air Task Force. April 23, 2023. "RE: Notice 2022-49 Request for Comments on Certain Energy Generation Incentives – Hydrogen (IRC Section 45V)." https://www.nrdc.org/sites/default/files/2023-04/nrdc-catf-memo-ira-45v-legal-necessity-3-pillars-20230410.pdf

[2] 26 U.S.C. § 45V(c)(2)(A)
[3] 42 U.S.C. § 7545(o)(1)(H))

WRI supports the 2028 phase-in.[4] However, grandfathering projects with annual matching systems should not be allowed, as it could risk a flurry of annual matching projects before 2028 creating indirect emissions for years past 2028.

- Uprated Capacity: WRI supports uprating clean energy capacity for the purpose of generating power for electrolysis.
- 80/20 Retrofit: WRI supports the retrofit rule.

The rationale for WRI's caution around exemptions is provided in the summaries below, which contain key takeaways from reputable studies on the climate and production-forward effects of 45V, starting with 2023 analyses that likely informed the guidance's stringency, followed by 2024 analyses addressing specific questions offered in the guidance. Because there is significant agreement across studies, the below descriptions may include specific results over a comprehensive summary.

Ricks, W., et al (2023)[5]: Grid-connected electrolysis without guardrails could lead to indirect emissions equal to conventional steam-methane reforming emissions at best, and four times more emissions at worst. The costs of hourly matching, particularly in the near-term, would likely be offset by the full PTC value. A phase-in of hourly matching could be useful for initial electrolyzer deployment, but would incur emissions; thus, early grid-connected hydrogen not procuring hourly energy attribute credits (EAC) should be directed towards uses with the best decarbonization potential, such as heavy industry.

Evolved Energy (2023)[6]: Near-term electrolysis deployment will hardly be impacted by the three pillars; because any resulting production costs would be near-zero, any possible deployment constraints would be more so associated with supply chains issues. The three pillars would avoid 192-416 MtCO_2 through 2030 and even more beyond.

Electric Power Research Institute (EPRI) (2023)[7]: Subsidies with strict pillars would prompt about 13 MtH_2 production by 2035 and are the only scenario that ensures net economy-wide CO_2 reductions before the subsidy expires in 2035. Additionally, the three pillars increase competition for hydrogen, which reduces demand for lower-quality use in the power sector—this increases the relative share of hydrogen use in sectors where it can induce larger emission reductions.

---

[4] Center for Research Solutions. 2023. "Readiness for Hourly: U.S. Renewable Energy Tracking Systems. https://resource-solutions.org/wp-content/uploads/2023/06/Readiness-for-Hourly-U.S.-Renewable-Energy-Tracking-Systems.pdf

[5] Ricks, W., Xu, Q., Jenkins, J. "Minimizing emissions from grid-based hydrogen production in the United States." Environmental Research Letters. https://iopscience.iop.org/article/10.1088/1748-9326/acacb5/meta

[6] Evolved Energy. 2023. "45V Hydrogen Production Tax Credits: Three-Pillars Accounting Impact Analysis." https://www.evolved.energy/post/45v-three-pillars-impact-analysis

[7] EPRI. 2023. "Impacts of IRA's 45V Clean Hydrogen Production Tax Credit." https://www.epri.com/research/products/000000003002028407

Energy Innovation (2023)[8]: Loose guidance would harm the long-term viability of electrolytic hydrogen by funding uncompetitive energy markets to produce hydrogen for uncompetitive off-takers. It would also incentivize inflexible electrolyzers that are less economically able to ramp up and down with clean energy availability. Strict pillars incentivize strong project economics, as facilities would use energy generated in areas with high-renewable potential with large industrial clusters, namely the Midwest and Texas.

Rhodium Group (2024)[9]: Early flexibility could yield emissions, particularly when allowing pre-2028 projects to "grandfather" their annual matching EACs after the hourly-matching phase in. The criteria for the deferred retirement exemption, must be strictly followed, such that only facilities that would otherwise not relicense their plant for purposes other than hydrogen production be considered incremental; if a facility could relicense for standard grid energy generation but elects to power electrolysis, backfilled fossil generation would lead to emissions. Finally, the five percent rule allowance for existing zero-emitting generation must be designed to ensure diverted generation only occurs during the cleanest hours, such as when renewable energy is curtailed, because diverting dirty energy could yield up to nearly 1.5 billion tonnes of increased cumulative emissions through 2035.

Energy Innovation (2024)[10]: The proposed general carve-out that would exempt 5 percent of existing clean energy generation from the incrementality requirement would allow for 1.5 Mt of dirty electrolytic hydrogen per year, contributing to 30-60 $MtCO_2$ per year in emissions, and increasing the exemption to 10 percent would double this emissions output. This proposed exemption also hampers innovation in that it does not prepare producers for a post-45V world. If a general carve-out is maintained, it should be set at the lowest possible percentage; applied on a per-generator basis and a per-hour basis; and the resultant EACs should preserve time-matching and deliverability requirements. If more targeted exemptions are included – such as for generation that otherwise would have been curtailed or retired and generators in areas with fully decarbonized grids or binding emissions caps – they must include rigorous implementation parameters to minimize negative outcomes.

Ricks, W. et al (2024)[11]: In a supplement to their 2023 work, the Princeton Net-Zero Lab modeled a 5 and 10 percent exemption in California and found that the resulting hydrogen carbon intensity was roughly twice that of conventional steam methane reforming. Additionally, they modeled a possible incrementality exemption for states with binding carbon cap policies, a

---

[8] Energy Innovation. 2023. "Smart Design of 45V Hydrogen Production Tax Credit will Reduce Emissions and Grow the Industry." https://energyinnovation.org/wp-content/uploads/2023/04/Smart-Design-Of-45V-Hydrogen-Production-Tax-Credit-Will-Reduce-Emissions-And-Grow-The-Industry.pdf

[9] Rhodium Group. 2024. "How Clean Will US Hydrogen Get? Unpacking Treasury's Proposed 45V Tax Credit Guidance." https://rhg.com/research/clean-hydrogen-45v-tax-guidance/

[10] Energy Innovation. 2024. "45V exemptions Need Strong Guardrails to Protect Climate, Grow Hydrogen Industry. https://energyinnovation.org/wp-content/uploads/2024/02/Energy-Innovation-45V-Exemptions-Need-Strong-Guardrails.pdf

[11] Ricks, W. and Jenkins, J. 2024. "Research Addendum: Examination of Proposed Exemptions to Incrementality Requirements for Section 45V." https://zenodo.org/records/10689836

proposed exemption for states that would presumably not backfill demand with additional fossil energy. Their modeled scenario avoided local emission increases but increased emissions across state lines where clean energy would have been exported had electrolysis demand not come online.

3. **Slower hydrogen development, guided by 45V rules, could provide time for sectors with the best abatement potential, such as heavy industry, to ready their facilities to switch to hydrogen.**

As the referenced studies above demonstrate, the three pillars are not expected to significantly reduce the availability of clean hydrogen, but a lack of pillars will increase its availability and affordability to an extent that incentivizes poor uses and higher emissions. Thus, it is crucial to consider where hydrogen could be used versus where it *should* be used. WRI's work on hydrogen has prioritized its uses in the industrial sector, in applications where there are effectively no alternatives or clean hydrogen has the highest abatement potential. This differs from power or transport sectors, where other options like electrification are more feasible, efficient, and effective at reducing emissions.

Successfully decarbonizing heavy industry and other sectors requires determining where hydrogen is a high-quality abatement measure versus where it could increase emissions if it is subsidized with low standards. In short, hydrogen quality over quantity. Stringent 45V requirements from the onset will make hydrogen less attractive to low-quality offtakers while funneling it to priority offtakers.[7] Because some of these priority offtakers have room to innovate, both they and a sound clean hydrogen market can mature in tandem. Comparing hydrogen for use in the power sector versus steel illustrates these trade-offs.

Low-quality use case: Power-to hydrogen-to power

One of the key proposed uses for clean hydrogen, specifically electrolytic hydrogen, is combusting it to generate power for the electricity grid. Many utility and power companies are announcing projects to blend hydrogen into natural gas-powered turbines or convert coal power plants to eventually run on hydrogen.[12] But using clean grid energy to make a hydrogen blend fuel that is burned to make grid energy is a poor use of electrons, and disastrous if loose rules lead to backfilled fossil energy generation. From a physics and emissions perspective, it will always be more effective to directly use low-carbon energy—particularly when it is scarce and in high demand—rather than convert it to hydrogen, blend and burn with natural gas, and generate energy that is sent to the grid.

WRI is aware that Treasury is knowledgeable of the efficiency losses incurred by taking energy from a renewable resource (i.e. wind or solar), converting it electricity and then hydrogen, potentially transporting and storing the hydrogen, and then burning the hydrogen to convert it back to electricity. Yet, it's worth reiterating that across the end-to-end conversions of electrons, the final electrical output of a hydrogen-powered turbine would be between 40 and 45 percent of the electricity generated by the

---

[12] Clean Energy Group. N.d. "Hydrogen Projects in the U.S." https://www.cleanegroup.org/initiatives/hydrogen/projects-in-the-us/

original power generator.[13] This could be higher or lower depending on electrolysis and turbine efficiencies and whether the hydrogen was transported or stored. When incorporating these efficiency losses with the low capacity factors of solar and wind, which are respectively about 25 and 35 percent, the overall availability of clean electricity is even lower. Directly connecting clean electricity to the grid avoids these significant efficiency losses.

From an emissions perspective, today's proposed projects to blend hydrogen in a natural gas turbine will still be far higher emitting than displacing fossil energy with renewable or other zero-carbon energy. Table 1 estimates the potential emissions changes of using a 30 percent blend hydrogen, which several projects have proposed as near-term demonstrations for hydrogen-fired turbines. The EIA reports that the average U.S. natural gas turbine emits 0.97 pounds of CO_2/kWh, or 440 $kgCO_2$/MWh.[14] Assuming the hydrogen qualified for the highest 45V tier by incurring zero direct or indirect production emissions, and that 8.93 kgH_2 are needed to produce 0.3MWh of energy,[15] the average plant would still emit 396 $kgCO_2$/MWh. Thus, a 30 percent blend would only reduce emissions relative to a natural gas turbine without hydrogen blending by about 10 percent.[16]

Table 1 also estimates the emission reductions across the rest of the 45V tiers. At the highest emitting 45V tier, a blended turbine would only reduce emissions by 2 percent relative to the all-natural gas baseline. In the absolute worst case modeled by Princeton's Net Zero Lab, where loose 45V rules yield 40$kgCO_2/kgH_2$ due to backfilled fossil energy, the total emissions are 753 $kgCO_2$/MWh, a 71 percent increase from the natural gas baseline.

Table 1 Estimated Emission Changes in a 30% Hydrogen-Natural Gas Blend Turbine

100% NG ($kgCO_2$/MWh) [16]	NG-H_2 Blend, 30% ($kgCO_2$/MWh)	Hydrogen production emissions (CO_{2e}/kg)	Emissions to produce 8.93 kgH_2 ($kgCO_{2e}/kgH_2$)	Lifecycle Emissions from NG-H_2 Blend ($kgCO_{2e}$/MWh)	Percent Change from Baseline
440	396	0	0	**396**	**-10%**
440	396	0.45	4	**400**	**-9%**
440	396	1.5	13	**409**	**-7%**
440	396	2.5	22	**418**	**-5%**
440	396	4	36	**432**	**-2%**
440	396	40	357	**753**	**71%**

[13] Assuming an 65 percent efficient alkaline electrolyzer and 64 percent of a newer efficient combined cycle turbine.
[14] EIA. 2023. "How much carbon dioxide is produced per kilowatt hour of U.S. electricity generation?" https://www.eia.gov/tools/faqs/faq.php?id=74&t=11
[15] Based off of an energy content of 33.6 kWh/kgH_2 or 29.76 kgH_2/MWh
[16] Environmental Protection Agency. 2023. "Hydrogen in Combustion Turbine Electric Generating Units—Technical Support Document." https://www.epa.gov/system/files/documents/2023-05/TSD%20-%20Hydrogen%20in%20Combustion%20Turbine%20EGUs.pdf

Source: Author Analysis.

These are simple equations with assumptions that are liable to change as energy and electrolysis innovations develop, but the takeaway is clear: in today's landscape, it is better to generate a given amount of electricity with renewables than to use those renewables to create a hydrogen-natural gas blend while prolonging the life of fossil fuel plants.

That said, some blended fuel projects state plans to eventually convert to a 100 percent hydrogen turbine. As zero-carbon and renewable energy increasingly dominate the grid in the long run, a pure hydrogen turbine could serve as a peaker plant using curtailed renewable energy stored as hydrogen, specifically in areas where supply and demand gaps are not smoothed by other storage options or interregional transmission. But this would require electrolyzers and turbines that can remain economic with a relatively low utilization rate, which according to Energy Innovation, is more likely if strict 45V rules force project developers to design systems that price-hunt for the cheapest and cleanest energy. This would be particularly important if 45V is not reauthorized.[8]

In sum, loose 45V rules would make hydrogen cheaper and more available, raising its perceived utility as an emission reduction option for fossil generators. But, this hydrogen would be dirtier across its lifecycle, both eliminating its emission benefits and wasting valuable renewable energy that would have avoided large efficiency losses. The best way for the power sector to decarbonize is to displace fossil energy with renewable or zero-carbon energy, improve efficiency (e.g. heat pumps), other storage mechanisms (e.g. lithium or thermal batteries), and demand-response systems, and save hydrogen turbines for select and niche applications that do not prolong fossil fuel infrastructure.

High end use case: Decarbonizing primary steel production

Clean hydrogen used to reduce iron to make steel is one of that sector's highest abatement options. The two main pathways for making primary steel are: 1) blast furnaces followed by basic oxide furnace (BF/BOF) and 2) direct reduced iron followed by electric arc furnaces (DRI-EAF). EAF can also be used independently to recycle steel to produce secondary steel. In the U.S., secondary steel accounts for 70 percent of production, one of the highest rates of secondary steel production in the world.[17] There are multiple pathways to decarbonize steel production. Maximizing steel recycling—i.e., scrap to expand secondary steel production—is one readily available, low-carbon pathway.

However, supply of scrap is limited and not all steel demand can be satisfied with recycled steel. Demand for primary steel will persist and electrolytic hydrogen is a high-quality abatement measure. According to the Center on Global Energy Policy, DRI-EAF with green hydrogen and clean electricity yields the highest carbon abatement for any emission-reduction option for primary steel production, at just over 80 percent. In comparison, using conventional natural gas DRI with clean EAF and using DRI with "blue hydrogen," the respective second and third best abatement options for primary steel, abate around 60

[17] RMI. 2023. "Forging a Clean Steel Economy in the United States." https://rmi.org/forging-a-clean-steel-economy-in-the-united-states/#:~:text=Roughly%2070%20percent%20of%20the,between%2080%20and%2090%20percent

percent each.[18] Another study found DRI-EAF with green hydrogen and clean electricity can reduce 90 percent of emissions.[19]

Although H_2-DRI with EAF is a crucial abatement option for primary steel, it is one of the most expensive. The levelized cost of carbon abatement for DRI-EAF with green hydrogen and clean electricity is $200 per ton of CO_2; DRI-EAF with just clean electricity and DRI-EAF with blue hydrogen cost about $125 and $370 per ton, respectively. Finally, the green premium per steel ton of steel for H_2-DRI with EAF is about $250 over the baseline cost of a conventional blast furnace, the highest green premium of all decarbonization options.[18] [20] While H_2-DRI with EAF is one of the more expensive pathways, it would push steel producers to innovate and deploy new facilities to reduce the green premium

The steel sector has fewer alternatives compared to other sectors to achieve drastic emission cuts or near-zero carbon intensive steel production—it would have to compete for clean hydrogen. According to the Electric Power Research Institute, higher competition for clean hydrogen induced by strict 45V rules decreases the share of low-quality offtakers like the power sector because they have more economic abatement options.[7] As the supply of clean hydrogen goes towards high-quality offtakers like steel, increasingly economic hydrogen and steel facilities will be built. While loose rules could make more hydrogen available to all offtakers, high and low-quality alike, there would very likely be net-positive emissions, negating the purpose of 45V.

Clean hydrogen for primary steel production is available today in small volumes and commercial scale plants are in development. Other federal incentives aside from 45V will increase the number of green steel plants and chip away the green premium, which in turn will reduce the costs for nth-of-a-kind plants.[21][22] Indeed, existing programs like the Industrial Demonstrations Project, Advanced Facility Deployment Program, Advanced Manufacturing Program, and the Hydrogen Hubs will pave the way for cost reductions, particularly in areas where renewable and clean energy potential are high.[17] One analysis estimates that $1.63/kg$H_2$ of electrolytic hydrogen would make green steel cost competitive, which is within reach for $3.00-5.00/kgH-$_2$ receiving the full 45V credit.[23]

Other emission and cost analyses could be conducted across high-quality and low-quality offtakers to show the importance of a stringent 45V. In other industries like refining and chemical production,

---

[18] Center on Global Energy Policy. 2020. "Levelized Cost of Carbon Abatement: An Improved Cost-Assessment Methodology for a Net-Zero Emissions World." https://www.energypolicy.columbia.edu/wp-content/uploads/2020/10/LCCA_CGEP-Report_111522.pdf

[19] Gailani, A., et al. 2024. "Assessing the potential of decarbonization options for industrial sectors." Joule. ttps://doi.org/10.1016/j.joule.2024.01.007

[20] These estimates do not consider policy enacted after 2020, including IRA subsidies such as 45V.

[21] S&P Global. 2022. "Direct-reduced iron becomes steel decarbonization winner." https://www.spglobal.com/commodityinsights/en/market-insights/blogs/metals/062222-dri-steel-decarbonization-direct-reduced-iron

[22] Reuters. 2021. "Sweden's HYBRIT delivers world's first fossil-free steel." https://www.reuters.com/business/sustainable-business/swedens-hybrit-delivers-worlds-first-fossil-free-steel-2021-08-18/

[23] Rosner. 2023. "Green steel: design and cost analysis of hydrogen-based direct iron reduction." https://pubs.rsc.org/en/content/articlelanding/2023/ee/d3ee01077e

hydrogen is and will remain a valuable feedstock, and its clean production and use will be important to reduce those sectors' high emissions. For power, transport, and low-to-mid grade heat production, hydrogen as a fuel or energy source will mostly fall behind direct electrification, biofuels with prudently managed feedstocks, and efficiency measures, with some exemptions for niche applications or long-haul and heavy transport that look prospective in the medium-to-long term. Comparing hydrogen fuel blends with green steel illustrates that the steel case better supports U.S. goals by reducing emissions from harder-to-abate sectors and creating demand for cleaner hydrogen**.**

4. **45V is a subsidy, not a regulation, and producers would be electing to conditions on their own volition, not imposed with rules for current practices.**

Ultimately, 45V is an **elective incentive** and **not a regulation** to produce clean hydrogen. The rules will ultimately set conditions for incentivizing clean pathways for hydrogen production but will not define requirements for all hydrogen production – less clean production processes will still be able to avail credits, albeit at a lower rate. A tax credit intending to propel clean hydrogen production must prioritize maximizing emissions reduction.

This, however, does not diminish its importance as a policy to reduce emissions, which is evident by the vast debate and lobbying around its implementation. But if hydrogen producers and consumers are seeking taxpayer money geared to reduce emissions, they should be held to high standards to avoid subsidizing sub-par climate outcomes for those taxpayers.

With an incentive such as 45V, producers are relying on support from the government to build an industry for clean hydrogen. Rules that do not support maximizing emissions reduction and climate benefits could lead to perverse incentives and make climate action weaker, and risk locking in emitting systems in place for multiple decades. In contrast, a regulation, if effectively designed and implemented, leads to quality outcomes by forcing an industry to improve and achieve competitiveness. Strict 45V rules would strike a balance by providing the support needed for hydrogen production but also encouraging producers to innovate toward the cleanest pathways.

Finally, 45V will likely be instrumental to help power generators abide by EPA's proposed Clean Power Plant regulation, which allows fossil generators to convert to hydrogen turbines by 2038 as one option—in addition to efficiency measures and carbon capture and storage—to meet mandated emission standards. Although hydrogen for the power sector should not be considered the highest quality use, the possibility that it becomes a mandated option in 2038 necessitates that clean hydrogen producers become established enough to ensure converted fossil energy plants achieve the lowest emissions as possible. As reiterated throughout this response, a weak 45V will greatly reduce the ability for power plants to achieve that standard.

Conclusion

Building the market for clean hydrogen on a shaky foundation will result in increased carbon emissions and erode trust in the Biden Administration's work to maintain its position as a climate champion. Strong 45V rules abide by Congress' intent and are the surest guarantee of reducing emissions and achieving U.S. climate goals; they will help drive new high quality industrial markets that enable offtakers to decarbonize and enable the U.S. to build a dependable hydrogen industry without funding emissions with taxpayer money. Less stringent rules could result in more direct and indirect emissions and risk locking in emitting systems for multiple decades. And if some flexibility is allowed, its use should be monitored with extreme diligence to avoid unintended emissions and leakage. If these exemptions cannot be implemented and monitored in such a way that prevents emissions leakage or risks unacceptably high short-term emissions, Treasury should err on the side of stringency.

With billions of taxpayers' dollars poised to go toward hydrogen production, the government should not subsidize potentially millions of tonnes of carbon going into the atmosphere. Cleaner, innovative, higher quality hydrogen producers will build a robust market and lead to true emission reductions and American innovation/leadership in the hydrogen economy.

Please do not hesitate to reach out to us and thank you for your consideration,

Angela Anderson
Director, Industrial Innovation and Carbon Removal, WRI United States

Zachary Byrum
Associate II, Industrial Innovation and Carbon Removal, WRI United States