Challenge: Driving Green Hydrogen While Reducing Emissions

Accelerating green hydrogen production through the Inflation Reduction Act's clean hydrogen tax credits can help spur decarbonization across U.S. Green hydrogen

of renewable energy.

As ACP represents a broad and diverse range of entities, the views in this consensus document-906a-4429 igated emissions potential from green

[2] Energy Innovation, *Smart Design Of 45V Hydrogen Production Tax Credit Will Reduce Emissions and Grow the Industry* at 9-10 (discussing the numerous industrial applications for green hydrogen in otherwise difficult to decarbonize sectors).

for further investment in clean power[3] and create tens of thousands of new domestic jobs.[4]

The implementation of the clean hydrogen tax credit is key to ensuring this nascent industry successfully unlocks these benefits. Part of the challenge of effectively implementing this incentive rests in accounting for differences between known near-term realities and long-term uncertainties. While most view green hydrogen as a key ingredient to reducing carbon emissions over the long term, a rigorous debate exists as to how to incentivize the development of a stable, green hydrogen market in the near term while ensuring green hydrogen production does not exacerbate the current climate crisis.

At present, green hydrogen is objectively not cost competitive[5] with other forms of existing hydrogen production. There has been intense debate within ACP, as well as other stakeholders, on how to best encourage first movers in commercializing this new technology – while also ensuring emissions reductions. Early market entrants in the green hydrogen industry are concerned that overly restrictive near-term requirements will prevent the industry from competitively entering the domestic marketplace and producing a long-term, stable industry that drives down emissions. These stakeholders are seeking a glide path into a more restrictive regulatory requirement. On the other side, certain stakeholders are concerned that the demand from green hydrogen could pull existing clean power away from serving other loads without driving additional clean energy and, in turn, result in greater levels of carbon-intensive generation being dispatched. These groups are seeking highly restrictive qualification criteria to be put in place from the outset.

This dueling debate has centered on how the implementation of the clean hydrogen tax credit should define the "three pillars" for green hydrogen powered by clean power being pulled from the grid (through the procurement of credits): temporality (time matching), additionality, and regionality. With respect to time matching, there have been varying opinions on the necessary granularity of the timing between when grid-tied clean electricity used to power a green

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[3] *See* IEA, How much will renewable hydrogen production drive demand for new renewable energy capacity by 2027, https://www.iea.org/reports/how-much-will-renewable-hydrogen-production-drive-demand-for-new-renewable-energy-capacity-by-2027.

[4] *See* Department of Energy, *U.S. National Clean Hydrogen Strategy and Roadmap* at 1, https://www.hydrogen.energy.gov/pdfs/us-national-clean-hydrogen-strategy-roadmap.pdf (estimating that the buildout of hydrogen facilities and infrastructure could create over 100,000 direct and indirect jobs by 2030); *See also* Hydrogen Council, *Hydrogen scaling up: A sustainable pathway for the global energy transition* at 9, https://hydrogencouncil.com/wp-content/uploads/2017/11/Hydrogen-Scaling-up_Hydrogen-Council_2017.compressed.pdf (asserting that the green hydrogen economy could support 30 million jobs worldwide).

[5] *See* International Energy Agency (IEA) in partnership with Statistical Office of the European Communities (EUROSTAT), and International Renewable Energy Agency (IRENA), *Global Average Levelized Cost of Hydrogen Production by Energy Source and Technology, 2019 and 2050*, https://www.iea.org/data-and-statistics/charts/global-average-levelised-cost-of-hydrogen-production-by-energy-source-and-technology-2019-and-2050 (discussing the cost competitiveness of green hydrogen relative to other hydrogen production, such as steam methane reforming—gray hydrogen—the current dominant form of domestic hydrogen production for most industrial applications).

emissions, the majority of studies conclude that green hydrogen projects cannot be competitive[7] on a wide scale basis under an hourly regime at the outset.[8] Of note, some studies have concluded that annual time-matching can decrease emissions over hourly time-matching in some regions.[9] Currently, green hydrogen is scarce and expensive, especially in comparison to conventional hydrogen—gray and blue—due in large part to the high capital costs inherent with a new market or technology.[10] Requiring strict hourly accounting rules out of the gate will further increase these costs, making it difficult for green hydrogen to compete.[11]

Hourly matching requires procuring clean electricity at all hours of operation or operating electrolyzers at low capacity factors.[12] Green hydrogen projects would thus be forced to significantly over-procure renewables and/or storage to ensure production equipment will not

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

[8] See, e.g., MIT Energy Initiative, *Producing Hydrogen from Electricity* at 5, https://energy.mit.edu/wp-content/uploads/2023/04/MITEI-WP-2023-02.pdf ("Our findings suggest that enforcing an hourly time-matching requirement in the near-term, when the risk of high emissions from annual time-matching is low, creates additional cost and implementation barriers for scaling up electrolytic H2 production") ("MIT Study"); Boston Consulting Group, *Green Hydrogen: An assessment of near-term power matching requirements* at 23, *https://media-publications.bcg.com/Green-Hydrogen-assessment-of-near-term-power-matching-requirements.pdf* ("On an aggregate annual basis, decarbonization potential under annual matching with and without conditions is likely larger than hourly given the lower cost and thus creates more economically viable demand to generate realized downstream decarbonization.") ("BCG Study"); Energy Futures Initiative, *The U.S. Hydrogen Demand Action Plan* at 17, https://subscriber.politicopro.com/eenews/f/eenews/?id=00000186-32b2-d681-ab8f-f3b6569b0001 (recommending "IRS could initially require annual estimates of life cycle emissions—allowing producers to combine multiple energy input types—and phase to daily or hourly data over time") ("EFI Study"); E3 and ACORE, *Analysis of Hourly & Annual GHG Emissions* at 44, https://acore.org/wp-content/uploads/2023/04/ACORE-and-E3-Analysis-of-Hourly-and-Annual-GHG-Emissions-Accounting-for-Hydrogen-Production.pdf ("An hourly matching requirement results in significantly higher costs for hydrogen production than an annual matching requirement with the same GHG intensity across a wide range of renewable

be idled during periods of low resource availability.[13] Under an hourly regime, if capacity factors cannot be met on a highly consistent basis, downstream sectors needing a continuous hydrogen stream to run effectively will likely not embrace green hydrogen.[14] Hydrogen storage facilities are potential solutions but come with added costs.[15] In short, an immediate hourly matching requirement would likely impose barriers that would severely limit the green hydrogen industry before it can get off the ground, limiting the role it can play to decarbonize our economy over the long term.

In light of these realities, ACP is proposing to phase in an hourly accounting system as the cost curve declines for green hydrogen upon greater scale and maturity. Specifically, to provide needed short-term certainty for early green hydrogen movers, the proposed framework enables investors to start the project development process under annual time-matching so long as projects begin construction before the end of 2028. The proposal transitions to hourly matching for projects commencing construction in 2029 and beyond. The current safe harbor requirement for hydrogen facilities requires a project to be placed in service within four years of when it begins construction.[16] As a result, all new green hydrogen facilities placed in service after 2032 would be under an hourly time-matching regime. The ACP proposal would grandfather in the early movers from the more stringent hourly regime as long as they start construction before January 1, 2029 .ioaruteor rgcualr ce1 wigcrcrruac4 (l).

Additionality

Additionality is a key requirement to ensure that developers are offsetting the emissions of new load from grid-connected electrolyzers.[17] Under ACP's proposal, electrolyzers must procure "new" clean generation to match their demand in order to offset emissions linked to new grid power consumption. Absent additionality requirements, electrolyzers could offset grid emissions from clean power already built to serve other purposes and, in turn, not truly offset the emissions of the new load from grid-connected electrolyzers.[18]

While a strict additionality requirement could diminish early green hydrogen production,[19] it also serves as an opportunity to drive new clean energy deployment, utilize existing renewables that would otherwise have been curtailed, and reward the repowering of older facilities. A strict additionality requirement will accelerate renewable energy deployment and reduce the carbon intensity of the grid while imposing lower costs than a strict time-matching requirement.

ACP proposes three options to demonstrate additionality using "new" clean energy generation. First, electrolyzers should be able to purchase new clean energy from projects that are operational no earlier than 36 months prior to the green hydrogen facility becoming operational. As renewable energy takes time to build, permit, and interconnect, this would provide a time-bound grace period for new clean energy projects to come online to power green hydrogen facilities.

Second, green hydrogen facilities should be able to draw electricity from existing clean energy projects experiencing persistent congestion. A framework will need to be put in place to verify, based on a historical assessment, that the clean energy projects have been experiencing chronic curtailment and/or zero or negative real-time power prices absent demand from the green hydrogen project.[20] While transmission is the best long-term solution to address congestion and curtailment, this policy would help ensure that existing clean energy generation is not being wasted or underutilized while the grid is being expanded.

Third, renewable energy facilities that have a new placed-in-service date under the 80/20 rule[21] should be treated as newly built renewable electricity facilities, provided the repowering occurs

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[17] See, e.g., Energy Innovation, *Smart Design Of 45V Hydrogen Production Tax Credit Will Reduce Emissions and Grow the Industry* at 18 ("Absent additionality, electrolyzers would unquestionably raise GHG emissions. Additionality is also the bedrock upon which the other two principles lie—without additionality, time-matching and deliverability do not avoid emissions as intended" ("Energy Innovation Study").

[18] *Id.*

[19] E3 and ACORE Study at 27 (arguing that additionality will increase the LCOH of hydrogen and consequently decrease the amount of green hydrogen deployed).

[20] ACP is currently working with members on producing a proposed framework and hopes to share further recommendations on this issue in the near future.

[21] *See* Dep't of Treasury, *Electricity Produced from Certain Renewable Resources*, Notice 2008-60, https://www.novoco.com/sites/default/files/atoms/files/notice_08-60_0.pdf ("A facility may qualify as originally

within 36 months of the green hydrogen facility being operational. This is consistent with tax law that treats repowered facilities as “new” facilities because they have a similar useful life as a newly built facility. These facilities also achieve efficiencies by reutilizing and not wasting certain property and equipment from the “old” facility.

Regionality

Regionality establishes a geographical boundary within which both the clean energy project that the electrolyzer is relying on and the electrolyzer must be located. The boundary can range from “anywhere” (i.e., no restrictions), to the same grid, to the same RTO, to the same interconnection node. ACP’s proposal creates sufficient operational guardrails to ensure clean energy resources powering electrolyzer loads are located in a region that allows for an appropriate degree of electricity physical delivery. Specifically, our proposal uses the 66 U.S. "balancing authorities" that each operate a portion of the grid.[22] Most balancing authorities are individual utilities, while most of the total power flow is managed by seven larger regional entities (RTOs/ISOs) that perform the balancing function in their own footprints.[23]

Because transmission constraints can prevent procured renewable projects from physical delivery of electricity into the region/grid where the electrolyzer is located, our proposed geographic boundaries are drawn tight enough to decrease the risks of increased emissions due to transmission constraints, while also being large enough to provide access to areas with the best clean energy potential. In addition, since some balancing authorities are saturated with clean energy, our proposal would allow clean energy from connected balanced authorities to count, as long as.23 0 Td( )Tjs(ti)4 (a)4 (s)6 (l)14 (o)2dlsnc0 (ho)2 (r)4 (i)14 (e)3 (s)6oti as -1 ()6.1 ( )9.9c6 (l)14

Comparison With Europe

In comparison to the European Union (EU) proposal, some elements in ACP's proposal are more flexible for first-mover projects while others are more restrictive.

- ***Time Matching*:** The EU proposal transitions from annual to hourly in 2030,