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February 26, 2024

Internal Revenue Service
CC:PA:LPD:PR (REG–117631–23)
Room 5203
P.O. Box 7604
Ben Franklin Station
Washington, DC 20044

Re: Response to Notice of Proposed Rulemaking ("NPRM") (REG-117631-23) regarding Section 45V Credit for Production of Clean Hydrogen and Section 48(a)(15) Election to Treat Clean Hydrogen Production Facilities as Energy Property

To Whom It May Concern:

California Resources Corporation ("CRC") is respectfully submitting this letter to the Department of Treasury ("Treasury") and Internal Revenue Service ("IRS") in response to the NPRM and notice of public hearing (REG-117631-23) ("Proposed Regulations") requesting comments for the implementation of the Internal Revenue Code ("IRC") section 45V clean hydrogen production credit ("45V credit") and the IRC section 48(a)(15) election to treat clean hydrogen production facilities as energy property to claim the investment tax credit ("ITC Election").

About CRC and Carbon TerraVault Holdings, LLC (CTV)

CRC is an independent oil and gas exploration, production and carbon management company operating properties exclusively in California. CRC is committed to the energy transition and has some of the lowest carbon intensity energy production in the United States. CRC focuses on maximizing the value of its land, mineral, and technical resources for decarbonization by developing carbon capture and storage ("CCS") and other emissions-reducing projects.

CRC's primary activities involve exploration, production, gathering, processing, and marketing of crude oil, natural gas, and natural gas liquids. We leverage advanced technologies to enhance safety and boost production efficiency across our expansive mineral acreage and diverse portfolio. These cutting-edge technologies allow us to increase production while minimizing the environmental footprint of our oil and gas development operations. For more information about CRC, please visit www.crc.com.

CRC is in the early stages of developing several CCS projects in California. Carbon TerraVault Holdings, LLC ("CTV"), a subsidiary of CRC, is expected to build, install, operate and maintain CO_2 capture equipment, transportation assets and storage facilities in California. CTV is engaging in a series of CCS projects that inject CO_2 captured from industrial sources into depleted underground reservoirs and permanently store the CO_2 deep underground. For more information about CTV, please visit www.carbonterravault.com.

About Carbon TerraVault Joint Venture

Carbon TerraVault Joint Venture ("CTV JV") is a carbon management partnership focused on CCS development and was formed between CTV and BGTF Sierra Aggregator LLC (Brookfield). The CTV JV is expected to develop both infrastructure and storage assets required for CCS development in California. CRC owns 51% of the CTV JV with Brookfield Renewable owning the remaining 49% interest.

CTV and CTV JV are involved in several clean hydrogen initiatives. These include the Grannus Ammonia and Hydrogen Project, which will sequester 370,000 MT of CO_2 annually and produce clean ammonia and hydrogen in Northern California. The project aims to be California's first clean ammonia and hydrogen facility, producing 150,000 MT per year of clean ammonia and 10,000 MT per year of clean hydrogen. The Lone Cypress Hydrogen Project, in collaboration with Lone Cypress Energy Services, will sequester 205,000 MT of CO_2 per year and produce 65 tons per day of clean hydrogen. Lastly, the Yosemite Hydrogen Facility, in partnership with Yosemite Clean Energy, will sequester 40,000 MT of CO_2 per year from a new hydrogen plant expected to produce 24 tons per day of hydrogen, with plans for additional expansion facilities. These projects contribute to our sustainability goals to reduce carbon emissions and promote clean energy.

Proposed Recommendations

As CTV and CTV JV progress with substantial capital investments to build out the necessary infrastructure and storage assets for CCS and hydrogen production projects in California, we respectfully request that our comments be considered for purposes of drafting the final 45V regulations. The final regulations will have important implications for the entire low-carbon hydrogen industry and will largely determine the extent to which the 45V credit program achieves Congress' desire to provide a meaningful incentive for low-carbon hydrogen production. Our primary recommendations center around hydrogen production modeling under the current 45VH2–GREET model, as well as the proposed incrementality and deliverability requirements.

We are grateful for the opportunity to provide comments on these significant issues that affect the clean energy production industry. We acknowledge your persistent efforts in issuing further guidance, express our deep appreciation for your work, and welcome the opportunity to speak to you regarding our comments.

Thank you for your consideration.

Sincerely,

Noelle Repetti
Chief Accounting Officer
California Resources Corporation

I. Summary of Recommendations

1. Expand the Renewable Natural Gas ("RNG")-to-Hydrogen pathways in 45VH2–GREET to include RNG derived from additional low-carbon feedstocks;
2. Modify 45VH2–GREET to include project-specific upstream methane and electricity generation emissions;
3. Pathways that use RNG as an input should not be subject to incrementality requirements; and
4. Provide flexible RNG deliverability requirements and indirect accounting.

II. Explanation of Recommendations

1. Expand the RNG-to-Hydrogen pathways in 45VH2–GREET to include RNG derived from additional low-carbon feedstocks and not only landfill gas

We urge the Treasury and the IRS to work with the Department of Energy ("DOE") to include more pathways with additional low-carbon feedstocks to further promote clean hydrogen production. Specifically, 45VH2–GREET should incorporate additional RNG pathways to promote low or negative GHG hydrogen feedstocks, including feedstocks derived from livestock, dairy, coal mine methane, wastewater, agricultural, and woody biomass. The carbon intensity of RNG can vary based on site-specific constraints, so each project should be permitted to use a third-party verified carbon intensity analysis that takes into account the specific features and attributes of that project, rather than a single background assumption, as currently used for landfill gas.

GREET 2021 could provide a reasonable starting point, as it includes more feedstocks than 45VH2–GREET. However, we suggest that the Treasury, IRS and DOE be as expansive as possible when it comes to pathways. This broader approach would allow the model to accommodate new pathways as they arise and allow taxpayers to more accurately capture their emissions rates.

We support the use of GREET to determine greenhouse gas ("GHG") emissions for hydrogen production. The GREET model is widely used and is accepted as the standard for calculating GHG emissions, and other criteria pollutants, for transportation fuels and advanced vehicles across various industries, research institutions, universities, and public interest groups, as well as by government agencies, such as the U.S. Environmental Protection Agency ("EPA") and the California Air Resources Board ("CARB"), for regulation development. However, 45VH2–GREET 2023 limits the types of feedstocks and technologies that would qualify for 45V credits.

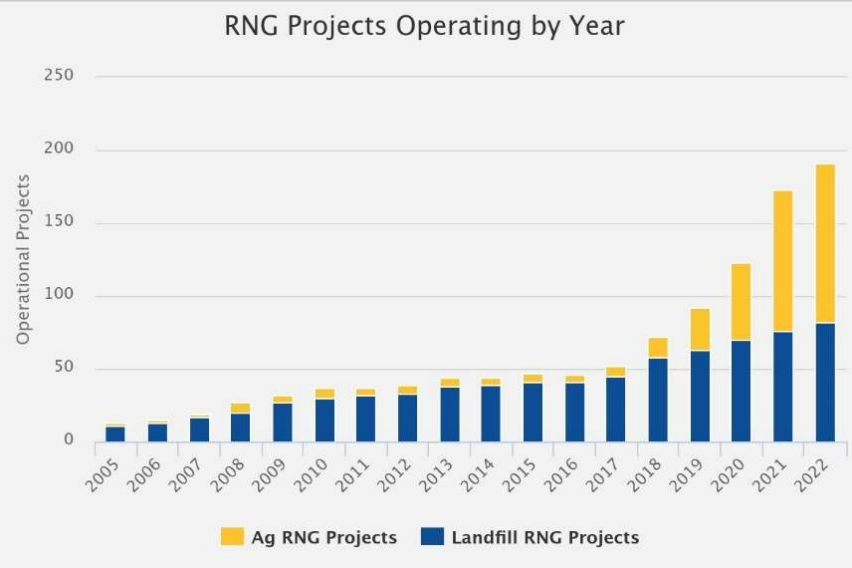
Within 45VH2–GREET 2023, steam methane reforming ("SMR") and autothermal reforming ("ATR") have only two feedstock options – conventional natural gas and RNG derived from landfill gas. In addition, there are only two feedstock options for biomass gasification – corn stover and forest logging residue. These pathways do not adequately cover the wide variety of feedstocks used to produce hydrogen. For example, 45VH2–GREET 2023 excludes critical pathways for RNG envisioned in current hydrogen production projects such as coal bed methane and woody biomass. It is crucial that 45VH2–GREET 2023 includes other types of RNG so the user can accurately model the specific production process to calculate the associated emissions rate. With a limited number of pathways, taxpayers would have to select inaccurate feedstocks to fit within

the prescribed pathways. This could lead to inaccurate emissions rates and preclude projects that use RNG derived from other pathways from qualifying for 45V credits.

An inclusive regulation that incorporates multiple RNG pathways within 45VH2–GREET will accelerate the reduction of GHG emissions and improve the accuracy of project emissions rates. The environmental benefits of producing and using RNG include GHG mitigation, as well as improved waste management, energy decarbonization, and improved air and water quality. RNG is a viable emission reduction strategy due to the diversity of feedstocks and multiple production technologies (e.g., landfill gas, animal manure, food waste, coal bed methane, woody biomass). Also, the existing pipeline infrastructure network enables RNG to flow from points of production to areas of demand across the U.S.

Although the majority of currently available RNG by volume is derived from landfill waste, the number of non-landfill RNG projects continue to increase. Based on EPA data, the number of RNG projects derived from agriculture soared from only seven in 2017 to 109 in 2022, jumping from 13% of total RNG projects to 57% over the course of five years.[1]

Figure 1: Landfill and Agriculture RNG Projects in the United States (2005-2022)



The carbon intensity of RNG production varies greatly based on source and site-specific factors. Accordingly, it is crucial that 45VH2–GREET 2023 is updated to include other types of RNG so the user can accurately model the specific production process to calculate the associated emissions rate.

Users should be able to select a pathway representative of their technology and feedstock, which is more extensive in GREET 2021. In general, a variety of feedstocks are already covered in GREET 2021 for different technologies, including grains, sugar, and cellulosics for the production of ethanol, waste feedstock for the production of RNG, cellulosics for aviation and marine fuels, algae and oil crops for biodiesel and renewable diesel production. The GREET 2021 model even addresses GHG emissions related to soil for growing

[1] U.S. EPA, 2024. "RNG Project Map" accessed February 20, 2024, https://www.epa.gov/lmop/renewable-natural-gas#rngmap.

feedstocks, including farming scenarios (e.g., stover removal, tillage, crop rotation, cover crop, manure application), and feedstock scenarios (e.g., corn grain, cellulosics from corn stover).

Current hydrogen production is primarily from fossil fuels, but U.S. policies must promote various strategies to reduce GHG emissions. The majority of hydrogen production is currently from conventional natural gas and coal. Producing hydrogen from fossil fuels has historically been the cheapest option in most parts of the world. It will take time for additional technologies to advance and for costs to decrease. For example, although the high cost of electrolyzers is expected to decrease in the future, today, clean hydrogen production via electrolysis is often cost prohibitive compared to other alternatives in the U.S. It is crucial that U.S. policies encourage the deployment of various strategies to reduce GHG emissions into the atmosphere to help the United States move toward a clean energy and industrial future and achieve net-zero emissions by 2050.

According to the International Energy Agency, faster action is required to create demand for low-emission hydrogen and unlock investment that can accelerate production scale-up and bring down the costs of technologies for producing and using clean hydrogen, such as electrolyzers, fuel cells and hydrogen production with carbon capture. The use of RNG will help foster demand for low-emissions hydrogen as additional technologies advance.

2. Modify 45VH2–GREET to include project-specific upstream methane and electricity generation emissions

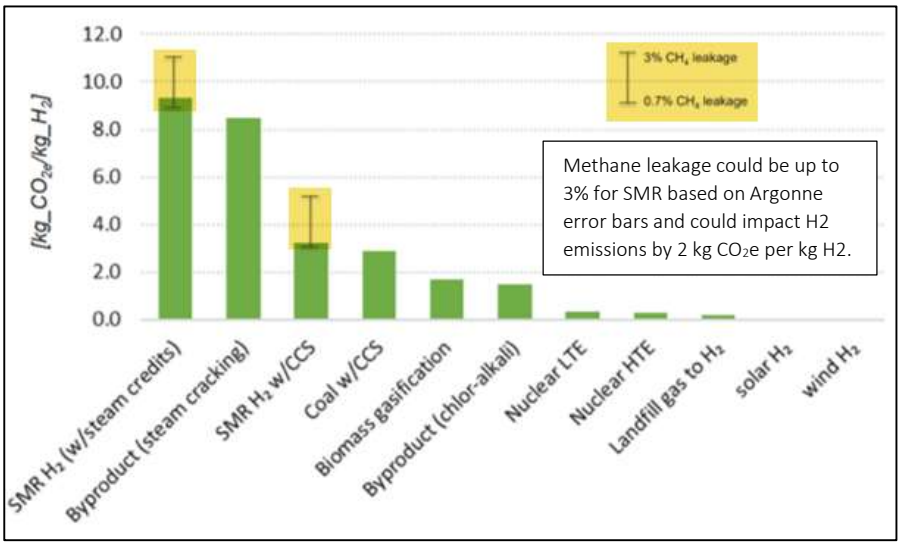
We encourage the shift of methane leakage rates from background data to foreground data in 45VH2–GREET. 45VH2–GREET currently assumes that methane leakage during the natural gas recovery process and subsequent gas processing and transmission sums to approximately 0.9 percent of methane consumed by the reformer. We propose that each user should be able to input project-specific upstream methane emissions, as opposed to the hardcoded emissions leakage rate of 0.9 percent. The recommended revision would enable taxpayers to calculate and verify project-specific upstream methane loss using existing formulas acknowledged by industry stakeholders. Only in the case when a leakage rate is unknown or cannot be verified, the current 0.9 percent emissions standard should then be used.

The DOE Guidelines to Determine Well-to-Gate *GHG* Emissions of Hydrogen Production Pathways using 45VH2–GREET ("GREET User Manual") provide that parameters in 45VH2–GREET are either: (1) background data – fixed assumptions that may not be changed (e.g., upstream methane leakage rates for the natural gas supply chain, carbon intensity of electricity supply to the hydrogen production facility in a particular region), or (2) foreground data – inputs by the user (e.g., type and quantity of feedstock, energy used, valorized co-products, impurities, quantity of hydrogen produced). The preamble of the Proposed Regulations state that the "*background data are parameters for which bespoke inputs from hydrogen producers are unlikely to be independently verifiable with high fidelity, given the current status of verification mechanisms*."

Users should have the option to input their project's verified upstream methane loss rates within their own facilities. Utilizing a single hard-coded leakage rate may unfairly skew project emission calculations, particularly on projects with significantly higher or lower than average loss rates. In fact, according to

Argonne National Laboratories, project well-to-gate methane leakage emissions vary greatly, depending on the region or place where the hydrogen is produced.[2,3]

Figure 2: Argonne Well-to-gate GHG Emissions of Hydrogen Production Pathways



Such variances in methane leakage emissions can have a significant impact on the carbon intensity of the hydrogen produced – inaccurate leakage assumptions could increase or decrease a project's CO_2e emissions by 2 kg of CO_2e per kg of hydrogen (see image above from Argonne National Laboratory). To put such a range in perspective, qualified clean hydrogen must have lifecycle GHG emissions rate of not more than 4 kg of CO_2e per kg of hydrogen to be eligible for the 45V credit. Therefore, a 2 kg variance can easily determine whether a project is eligible for any credit or could be the difference between whether a project is eligible for a $0.75 per kg 45V credit or a $3.00 per kg 45V credit. A static 0.9 percent leakage factor reduces the accuracy of the model. For example, efficient projects with a methane leakage rate of 0.5 percent would be unjustly subject to a higher carbon intensity potentially resulting in a lower credit amount. Conversely, projects with a less efficient methane leakage rate (e.g., 3 percent) could unfairly qualify for the 45V credit, even though they may not truly be producing clean hydrogen.

The DOE has already created an international working group to develop a consistent framework for the measurement, monitoring, reporting, and verification ("MMRV") of methane, carbon dioxide, and other GHG that occur during the production, processing, transmission, liquefaction, transport, and distribution of natural gas. This platform will support independent third-party verification of the emissions data and GHG emissions intensity and will support an accreditation process to ensure that certifiers are independent

[2] Amgad Elgowainy, Argonne National Laboratory. "GREET Model for Hydrogen Life Cycle GHG Emissions", Argonne National Laboratory, June 15, 2022, https://www.energy.gov/sites/default/files/2022-06/hfto-june-h2iqhour-2022-argonne.pdf. *"...there are certain upstream factors or parameters upstream of the SMR that could be influential, and those are results, and there we learned at a lower limit—this is, I believe, the latest EPA of 0.7 leakage rate, and the natural gas supply chain, and the upper end was 3.0."*

[3] U.S. Office of Energy Efficiency and Renewable Energy, "H2IQ Hour: GREET Model for Hydrogen Life Cycle Emissions: Text Version", https://www.energy.gov/eere/fuelcells/h2iq-hour-greet-model-hydrogen-life-cycle-emissions-text-version.

of the reporting entity and are technically qualified to conduct these reviews.[4] A third party verification process would also be consistent with the existing verification requirements for hydrogen production and end use. We respectfully request the Treasury, IRS, and DOE to build more nuance and accuracy into the 45VH2–GREET model by allowing taxpayers to input verified "background data" such as methane leakage rates. If such data is note verifiable, the default value may then be used.

3. Pathways that use RNG as an input should not be subject to incrementality requirements

The preamble of the Proposed Regulations provides that the Treasury and the IRS "*anticipate requiring that for purposes of the section 45V credit, for biogas or biogas-based RNG to receive an emissions value consistent with that gas (and not standard natural gas), the RNG used during the hydrogen production process must originate from the first productive use of the relevant methane*." We request that the Treasury and the IRS reconsider this interpretation and allow the RNG to receive an emissions value consistent with that gas regardless of when the RNG producer first begins using or selling it for productive use. This would give the clean hydrogen industry access to existing RNG infrastructure to serve the dual purpose of accelerating the growth of the domestic clean hydrogen industry while also introducing a long-term use for RNG as future demand for combustion fuels in the transportation sector potentially declines.

Unlike the well-developed and broad coverage of the U.S. electrical grid, RNG-production infrastructure is concentrated around the East Coast and Midwest. The majority of the RNG projects reported to the EPA are east of the Mississippi River,[5] many of which would fail incrementality requirements under the Proposed Regulations.

Figure 3: U.S. Renewable Natural Gas Production Facilities

[4] U.S. Department of Energy, "Public Announcement of International Working Group to Establish a Greenhouse Gas Supply Chain Emissions Measurement, Monitoring, Reporting, and Verification (MMRV) Framework for Providing Comparable and Reliable Information to Natural Gas Market Participants", November 22, 2023, https://www.energy.gov/sites/default/files/2023-11/MMRVFramework_PublicAnnouncement_22%20Nov2023.pdf.

[5] U.S. Environmental Protection Agency (EPA), "Renewable Natural Gas", Landfill Methane Outreach Program (LMOP), February 12, 2024, https://www.epa.gov/lmop/renewable-natural-gas#rngmap.

Applying the incrementality requirements to RNG would risk disincentivizing the use of hydrogen in large swaths of the country as limiting the use of existing RNG infrastructure would significantly delay the development of low-carbon hydrogen projects, resulting in less supply and higher costs of low-carbon hydrogen. New infrastructure would likely take several years to develop and construct, which would impact the market with a significant cost and time burden.

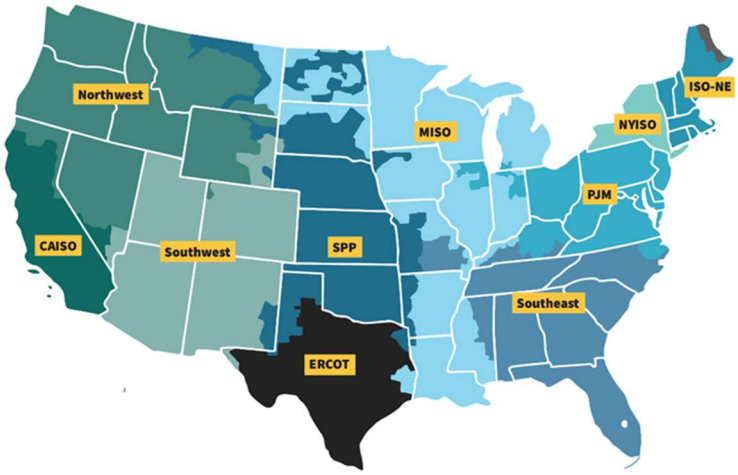
4. Provide flexible deliverability requirements and indirect accounting for RNG

The geographic or temporal deliverability requirements for RNG in the hydrogen production process would limit clean hydrogen production in areas lacking appropriate infrastructure. We propose to use indirect accounting, or book-and-claim accounting, as a solution; this would allow hydrogen producers to match domestically-produced biomethane associated with RNG from across the U.S.

The anticipated deliverability requirements for hydrogen produced from RNG would require production to source solely from directly-piped feedstock within the same operating region. This would hinder the development of clean hydrogen production in regions that do not have the appropriate infrastructure, and clean hydrogen needs to be a nation-wide pursuit if we are to meet our climate goals.

The preamble of the Proposed Regulations specifically calls out that deliverability requirements are necessary to ensure a resilient electric grid, as diverting electricity to hydrogen production without adding more electricity could cause grid insecurity with brownouts and blackouts. However, these risks are not applicable for RNG. The electric grid requires careful load balancing to ensure that electricity consumption matches electricity production at any moment within an electrical grid. Supply and demand do not have to be as carefully matched for fuel production as for electricity production – as fuel demand increases, prices rise, and supply increases to match demand. This process takes place over months and years, not moments, and would not decrease fuel resiliency. In addition, electricity grids are regional infrastructure, while natural gas pipelines are national (see figures below). Since natural gas and electricity grid resilience and load balancing differ, we strongly recommend that these two sources of energy are not treated the same.

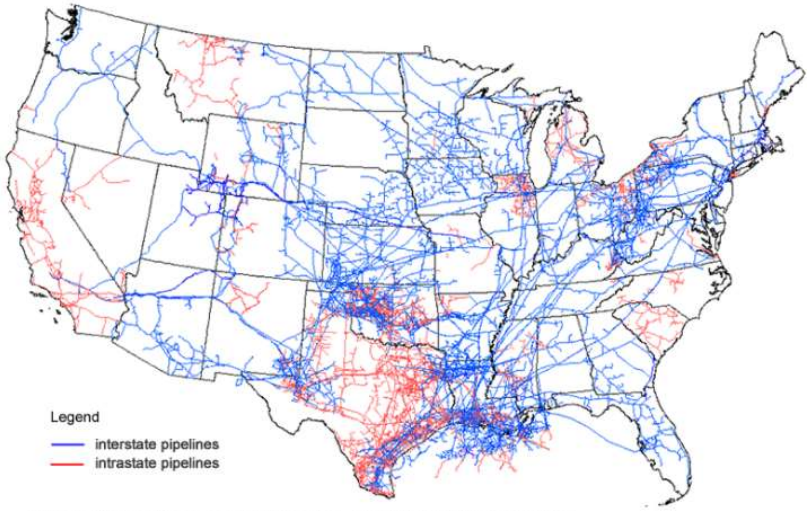
Figure 4: FERC Regional Transmission Organizations and Independent System Operators Map



Hydrogen producers who utilize RNG would be disadvantaged if they are required to procure RNG from the same region where they produce hydrogen. First, access to pipelines that transport RNG is not uniform across the U.S. (see map below). Some hydrogen producers have more access than others to a critical input if they need to procure it. As a result, this practice would require many companies that desire to produce low-carbon hydrogen with RNG to construct and operate new RNG facilities in order to procure the requisite RNG. These co-located facilities would become mandatory for producers with less regional access and will limit regional hydrogen production. Due to its low density, transporting hydrogen can be challenging and pose some specific issues in terms of safety. Accordingly, clean hydrogen production facilities will need to be located nationwide. The RNG deliverability requirements contemplated by the preamble of the Proposed Regulations would act as a barrier to developing clean hydrogen facilities that are not located near RNG facilities, and building a new RNG facility may not be feasible, or may be cost-prohibitive, in that area.

As noted above, many regions in the U.S. lack access to RNG facilities because they are concentrated in certain regions due to feedstock availability (see Figure 3: U.S. Renewable Natural Gas Production Facilities).

Figure 5: Map of U.S. Natural Gas Pipelines



Source: U.S. Energy Information Administration, *About U.S. Natural Gas Pipelines*

Indirect accounting allows companies that do not have access to regional RNG to participate in the clean hydrogen economy and scale the sector. Renewable Identification Numbers ("RINs") under the Renewable Fuel Standard Program allow companies to purchase assigned RINs (directly associated with a batch of fuel) and separated RINs (acquired separately from the batch of fuel).[6] RINs allow taxpayers to support renewable energy and meet their goals while separating the use of that fuel from their emissions. By bifurcating these aspects, RINs support the industry while remaining accessible for many parties. RINs are not limited by region but support a U.S.-wide goal to increase production of renewable fuels.

[6] EPA, "Renewable Identification Numbers (RINs) under the Renewable Fuel Standard Program", Renewable Fuel Standard Program, January 23, 2024, https://www.epa.gov/renewable-fuel-standard-program/renewable-identification-numbers-rins-under-renewable-fuel-standard.

The 45V credit stands as a pivotal factor in the advancement of domestic clean hydrogen production. Flexible deliverability requirements that expand beyond directly-piped RNG would support substantial production and deployment of clean hydrogen across the entire nation. Rigid deliverability requirements would unfairly punish and hinder the development of hydrogen production in areas where fuel sources are not readily available and fully developed. The Proposed Regulations, as currently drafted, may inflate clean hydrogen production costs, stalling vital investments and delaying the Administration's goals of positioning the United States as a leader in this key energy technology of the future. We appreciate your attention to our concerns and look forward to further collaboration on this critical issue.