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Lily Batchelder
Assistant Secretary, Tax Policy
U.S. Treasury Department
1500 Pennsylvania Avenue NW
Washington, DC 20220

Douglas W. O'Donnell
Deputy Commissioner for Services and Enforcement
Internal Revenue Service
1111 Constitution Avenue NW
Washington, DC 20224

Submitted via the Federal eRulemaking Portal at: www.regulations.gov

Re: Comments of the Appalachian Regional Clean Hydrogen Hub (ARCH2) on the Notice of Proposed Rulemaking for the Section 45V Credit for the Production of Clean Hydrogen ("Proposal") (REG-117631-23)

Dear Assistant Secretary Batchelder and Deputy Commissioner O'Donnell:

ARCH2 appreciates this opportunity to submit initial comments in response to the regulations proposed by the U.S. Department of the Treasury (Treasury) and Internal Revenue Service (IRS) relating to the credit for production of clean hydrogen (clean hydrogen production credit) and the energy credit, as established and amended by the Inflation Reduction Act of 2022, respectively.

We view implementing the proposed rules as hurting the evolution of the hydrogen economy by penalizing an embryonic industry requiring a low-cost feedstock, such as natural gas, that is abundant in the ARCH2 region. We believe that the 45V GREET model lacks the maturity and flexibility to adapt to a current shale gas production approach that lowers the upstream carbon intensity considerably versus a rigid approach based on outdated leak rates from former oil-producing regions combined with other penalty-inducing deficiencies. The proposed rules will lead to a loss of $6 billion in private investments by key ARCH2 partners in the region and negatively impact 10,000 jobs in the early stages of siting and construction and reaching almost 3,200 jobs towards the project end. Equally importantly, the ability to affordably transition to a Clean Hydrogen economy for the region and the nation will be muted. Our major concerns with the guidance as written involve the following topics, and our particular concerns are further elaborated below.

- 45V GREET is lacking the functionality of existing GREET models, limiting its application
    - Does not include industrial off-gassing or coal mine methane
    - Using a national natural gas carbon intensity that disincentivizes local responsible natural gas producers
- First productive use and additionality
- Hourly matching

Thanks to the great work of this Administration and Congress on both the Inflation Reduction Act and the Bipartisan Infrastructure Law (BIL), Appalachia is poised to assist in the unprecedented energy transition by decarbonizing and providing equitable employment to the region through the implementation of the

ARCH2 hydrogen hub. Deploying and adopting clean hydrogen in the industrial sectors is paramount to achieving net zero emissions. However, without a workable and fair 45V tax credit, it will be extremely difficult to meet those goals, especially in areas of the country such as Appalachia, where there is currently little to no hydrogen production or consumption.

If these rules are left as currently written, it will impact ARCH2's 14 projects in the states of West Virginia, Ohio, Kentucky, and Pennsylvania. ARCH2 brings diverse projects in terms of technologies used, H_2 production feedstock, delivery pathways, end-use sectors, and locational benefits. These projects will also catalyze an economically viable clean H_2 economy while achieving equitable community and labor engagements, good paying jobs, diversity, equity, inclusion and accessibility, and Justice40 objectives. The intent of 45V was to incentivize or catalyze and derisk a hydrogen economy. This tax credit goes hand in hand with the BIL's creation of hydrogen hubs as a way to encourage switching from typical fossil fuel use to clean hydrogen. ARCH2 is based in the country's largest, lowest carbon-intensive, and cheapest natural gas region.

Our hub's biggest competition isn't other forms of hydrogen; ARCH2 is primarily blue, meaning much of the produced hydrogen will be derived from natural gas and with carbon capture and sequestration. To encourage our region to switch fuel from natural gas or other forms of fossil fuels to hydrogen and building out the necessary infrastructure to allow for the lift-off of a hydrogen economy will require financial incentives. Without a sizable credit to offset the high production cost of hydrogen expected by first adopters of new technologies, the hydrogen economy will struggle with market adoption in an area that could be its greatest success story. Additionally, it completely ignores the fact that blue hydrogen infrastructure built for blue hydrogen will be in place to take advantage of other forms of hydrogen as those prices come down. It is imperative to incentivize the build-out to prepare ourselves for the hydrogen future and not limit our ability based upon preferred fuel choices that may not be applicable to achieving lift-off in select regions of the country.

If this guidance is implemented as currently proposed, it will have far-reaching negative consequences for the entire domestic clean hydrogen industry and the U.S. Department of Energy's (DOE) H2Hubs program. Specific impacts vary by partners, but each will be negatively impacted in their own way.

The proposed guidance also significantly threatens the Administration's efforts to combat climate change. The selected hubs are estimated to reduce 25 million metric tons of carbon dioxide (CO_2) emissions from end-uses annually, the equivalent of taking 5.5 million gas-powered vehicles off the road, according to the DOE. This reduction in CO_2 emissions is a vital step towards addressing climate change and achieving the Biden Administration's goal of reaching net-zero emissions no later than 2050. However, if implemented without necessary adjustments, the proposed guidance poses a significant threat to the ability to deploy the clean hydrogen industry and the ability for the U.S. to be a global leader in the hydrogen economy. After reviewing the proposed rules, we hope to offer several improvements to be considered to allow for the 45V to have the biggest impact, allow for the most significant adoption of a clean hydrogen economy to be built out, and help us reach our climate goals.

ARCH2's most significant concern and most important to allowing for liftoff in our region is a workable and flexible GREET Model. As it is currently written for 45V, the GREET Model is far too restrictive and not representative of current operations in Appalachia. The current model does not allow for inputs that reflect our region and instead relies on an average that incorporates emissions rates that are more reflective of oil-producing regions. To be clear, natural gas operators in the Marcellus and Utica target primarily natural gas, and since this is their commodity, they are heavily incentivized to minimize their methane losses from production to delivery of their product. This means their methane loss is far lower than national averages and their carbon intensity scores should reflect that. In addition, ARCH2 is committed to using certified responsibly sourced natural gas. As the draft rule is written, the treasury incentivizes the lowest-cost natural gas instead of the lowest-emitting natural gas.

As currently written, the Treasury went further than the legislative intent by prescribing a 45VH2-GREET model specifically tailored to apply to the administration of the tax credit opportunities rather than using the science behind the work of Argonne National Labs in determining lifecycle greenhouse gas emissions rate through the point of production regardless of feedstock source. There is no clear indication of what process the Treasury will utilize to determine how low CI gas pathways will enter the 45VH2-GREET model, i.e., whether an updated 45VH2-GREET will come out with final rules or whether all gas pathways need to qualify through Provisional Emissions Rate (PER) initially.

Allowing our partners to submit actual reported greenhouse gas (GHG) emissions data as validated by the EPA would allow for a more accurate reporting of our Carbon Intensity (CI) score. The carbon intensity should be based on an ISO-specified energy allocation methodology from specific extraction, processing, and transmission inputs into the 45VH2-GREET model. This can easily be accomplished by utilizing EPA's GHG Reporting Program Subparts W and C and as required by Methane Emissions Reduction Program (MERP) that was also established in the IRA.

A perfect example of the inadequacy of the current GREET Model is our partner KeyState. KeyState will extract all gas used in clean hydrogen production from its own onsite wells, all new wells and all new gathering system and supply this captive gas directly to the clean hydrogen production facility only a few miles away. This closed system is not connected to the gas grid. There is not a molecule of natural gas used at the facility that is from outside this closed gas supply system.

Second, in the context of this captive gas supply system, KeyState has innovated a powerful 'Upstream Emissions Avoidance & Monitoring Program' of technologies and protocols with the effect of virtually eliminating methane and CO_2 emissions typically associated with natural gas production and transport. This is a sort of innovative thinking and approach that should be incentivized, but instead, it is being discouraged.

Third, this Upstream Emissions Avoidance and Monitoring Program was designed for ease of auditing, for real-time and historic data of every well pad, every process, every valve, every foot of gathering system 24/7/365. This Program was tailored to the IRA requirement of an annual audit of a clean hydrogen production facility to determine actual carbon emissions of the facility as opposed to an estimate of carbon emissions.

Recent 45V Guidance nullifies this innovation by insisting a default value of upstream emissions must be used in the GREET model rather than actual data and that is just one example of how this proposed GREET model is not ready to satisfy the market innovators that are participating in this space.

Furthermore, EQT Corporation, which is also an ARCH2 partner, has developed a process to produce clean hydrogen from Responsibly Sourced Natural Gas ("RSG", chemically CH_4) using an integrated facility that will utilize autothermal reforming ("ATR") of RSG, with carbon capture, utilization and storage (CCUS), to produce qualified clean hydrogen and other products such as low-carbon aviation fuel ("LCAF"). We would like to respectfully request that the Treasury confirm that the definition of "facility" accommodates the entire production processes for qualified hydrogen that may include functionally interdependent components that synergistically utilize hydrogen and carbon oxides in the production of co-products such as LCAF. In other words, recognize that the hydrogen may be an intermediate product but not the end product of a "single production line." Recognizing this interdependency as part of a "single production line" will yield a single carbon intensity factor for the full hydrogen production facility. This will enable producers to maximize carbon utilization, energy efficiencies, and CCUS while measurably reducing the carbon intensity of all products along the value chain beyond that which two disconnected processes can provide. Treasury could enable this by including an example of such co-production pursuant to Prop. Treas. Reg. §1.45V-1(a)(7)(iv). We also would like to ask that Treasury confirm that qualified clean hydrogen, which is contained in process waste streams and otherwise would be vented to the atmosphere, that is used to power functionally interdependent components to enable the production

of additional hydrogen and low-carbon energy products such as LCAF is an acceptable “use” under Section 45V(c)(2)(B)(i)(III) of qualified clean hydrogen.

Another example is not recognizing the benefits of hydrogen derived from industrial off-gassing. The 45V GREET model does not include hydrogen recycled from industrial processes as a specified production pathway. This can potentially increase project development time and financial risk for ARCH2 members’ Independence Hydrogen’s Ashtabula, Ohio plant. Not being able to calculate the value of PTC tax credits with reasonable certainty increases the difficulty of raising capital to finance Independence Hydrogen’s project in the ARCH2 hub. This ambiguity risks project development—potentially leaving five tons per day of hydrogen un-recycled and continuing to vent into the atmosphere. This will present a missed opportunity to power thousands of vehicles with clean hydrogen from an otherwise wasted source.

Summary Points

- Hydrogen recycled from industrial chlor-alkali or chlorate production is not included as a pathway in the ‘45VH2-GREET’.
- The Provisional Emissions Rate (PER) for this production pathway should be calculated consistent with the latest ANL GREET model where it is treated as a zero GHG emissions feedstock.

The GREET 2023 model released from Argonne National Labs includes a fully defined pathway for calculating GHG emissions from a chlor-alkali process. The model includes four ‘H2 handling methods’, and it recommended that the first option, ‘H2 diverted from vented emissions (carrying no energy/emissions burdens)’, is used when calculating PERs for hydrogen recycling facilities utilizing a chlor-alkali feedstock.

In addition to industrial off-gas, we would like to offer ARCH2’s position on writing rules that will incentivize the use of fugitive emissions, such as coal mine methane (CMM) since the ARCH2 area has a lot of legacy coal mines that currently emit into the atmosphere. CMM is a byproduct of the mining process that is overwhelmingly emitted into the atmosphere, which continues long after mining has ceased, leading to an environmental challenge. CMM is a significant source of fugitive methane that is frequently overlooked, is abundant across the Appalachian region, represents 8% of US methane emissions,[1] and can be used to help drive down the carbon intensity of hydrogen projects significantly. ARCH2 participants are uniquely qualified to provide insight on CMM capture for productive use projects as there have been projects developed within Appalachia in the past and opportunities for new future projects are being evaluated. ARCH2 members have worked through a rigorous vetting and diligence process with a wide stakeholder group, including mine operators, service providers, low carbon gas users, life cycle assessment professionals, state agencies, the Global Methane Initiative (GMI), United States (U.S.) Environmental Protection Agency (EPA), Coalbed Methane Outreach Program (CMOP), and U.S. Department of Energy (DOE) to improve the understanding of the challenges facing CMM capture projects. Unfortunately, today, there is no clear economic incentive to capture CMM for productive use. The Section 45V Credit for Production of Clean Hydrogen could prove to be that incentive if the implementation of this policy aligns with the goals of reducing emissions, creating jobs, and kickstarting the clean hydrogen economy.

One key limiting factor associated with deploying wide-scale CMM capture and beneficial use systems is that such investments, absent government subsidy or demand side premiums, are often uneconomic. CMM capture and productive use projects involve significant up-front capital expenditure, including, but

[1] U.S. Environmental Protection Agency (2023) Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2021. EPA 430-R-23-002. https://www.epa.gov/ghgemissions/inventory-us-greenhouse-gas-emissions-and-sinks-1990-2021

not limited to, the installation of miles of new gathering and transmission pipeline, processing stations, compression facilities, measurement/telemetry facilities, and interconnections to existing interstate pipeline systems. In addition, ongoing active mining operations are constantly expanding, requiring the deployment of new and ongoing capture infrastructure. There are significant operational expenses and energy requirements associated with the transportation and processing of gas, and current gas prices, combined with the dearth of tax or other economic incentives for CMM do not justify these investments. Fortunately, the section 45V credit has the potential to tip the economic scale to drive innovation and investment in capturing fugitive CMM emissions and utilizing this methane for clean hydrogen production. This outcome will be a true win-win for the Biden Administration's goals of reducing greenhouse emissions, increasing clean hydrogen production, and creating jobs. This tremendous opportunity can become a reality through implementing section 45V, as we suggest below, representing a just environmental remediation opportunity for the Appalachian region, which has been among the hardest hit by the energy transition.

REG – 117631-23 requests comments on several key areas relevant to our business and industry with respect to the section 45V credit for the production of clean hydrogen. Key areas that ARCH2 has identified that could dictate investment decisions for hydrogen production facilities are summarized below:

1) GREET Model and Determining Emissions Rates: Generally speaking, ARCH2 appreciates the work that Argonne National Laboratories has done to include CMM to Hydrogen production as a pathway within their model. The GREET model is a transparent and well-respected lifecycle model that follows science, and has a long history of recognizing avoided emissions accounting. However, Treasury and/or Department of Energy must include the pathways for CMM to Hydrogen established in the R&D GREET 2023 Model (R&D GREET model) within the 45VH2-GREET model. It is of particular importance to the CMM pathway that a scientific and fair process be implemented to allow pathways currently within the R&D GREET model to be included in the 45VH2-GREET model and acknowledge methane venting to the atmosphere as the counterfactual scenario in emissions avoidance accounting for CMM capture projects.
2) First productive use and additionality: Specifically for the capture of CMM, each new borehole, well, or ventilation shaft is its own specific investment decision. Treasury should define the "source" on an individual CMM borehole, well, or ventilation shaft basis. Existing carbon offset registry protocol frameworks have adopted CMM borehole, well, or ventilation shaft additionality, which aims to incentivize the most impactful CMM capture opportunities while not penalizing projects that necessarily ceased former capture operations.
3) Waste generation anti-abuse considerations: CMM Capture project investment decisions are separate from mining operations. Treasury must not limit qualifying resources to pre-existing reported waste streams as the most prolific sources of CMM emissions, and best opportunities for CMM capture, did not exist or were not reported to EPA's Greenhouse Gas Reporting Program (GHGRP) prior to IRA enactment.

Regarding additionality, ARCH2 has significant concerns for our green hydrogen partners. Draft regulation requires immediate incrementality (aka additionality). The power resource cannot have come online more than 36 months before the hydrogen facility placed in service. This is not workable for our green hydrogen partners in ARCH2 as the ability to build out these projects are limited due to difficulties in the permitting and siting of appropriate sites within the ARCH2 region. While other states have embraced green energy projects, these projects face headwinds to get permitted in our region and the lack of appropriate conditions. To penalize them for items out of their control is punitive and does not help adoption in the ARCH2 region. In addition, facilities that already began construction are not exempt from the three pillars in any way. This is punitive and directly impactful to industry first movers. We should embrace the ability to satisfy a market and not penalize them.

Regarding hourly matching, the draft rules state that all facilities must switch to hourly in 2028, even if already “placed in service” or “began construction.” This lack of certainty (particularly given the visibility on the hourly RECs market) makes project financing incredibly tenuous.

This becomes a requirement for everyone in 2028, without a grandfathering or “beginning of construction” cutoff, effectively eliminating any safe harbor window as projects will need to plan for a transition to hourly matching for project economics and financing. There is no hourly RECs market; imposing hourly matching on one industry will not create a market. In addition to the years required to update REC tracking systems to enable hourly matching, developing a liquid market for these instruments will also take substantially longer after that. Furthermore, without requiring all accounts within tracking systems to have hourly tracking functionality, very few will voluntarily opt to use hourly-matched EACs, thus considerably limiting supply and creating a premium.

ARCH2’s green hydrogen producers are also concerned that the draft rules require hydrogen facilities to calculate an annualized carbon intensity for all hydrogen produced during the year. This is devastatingly burdensome, particularly when compounding the lack of a baseload asset (such as nuclear or hydro) and the hourly-matching post-2027. It would not only be uneconomic to constantly curtail operations and operate at a 30% capacity factor, but constantly having to turn facilities on and off is also significantly detrimental to capital equipment. Taxpayers should be able to claim the PTC for any duration of clean hydrogen production – not just an annualized average.

We hope the Department of Treasury will consider these comments in their final rule-making. The clean hydrogen hub program will ensure the hydrogen economy becomes a reality in the United States. However, only by removing barriers currently in place and encouraging a technology-agnostic final rule with accurate emission accounting will we be able to be successful and make the U.S. a leader in the global energy transition.

Sincerely,

Shawn Bennett

Shawn Bennett
Division Manager
Energy and Resilience