Comments on 45V Proposed Rules REG-117631-23

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We appreciate the detailed prompts to provide comments on so many aspects of the 45V proposed rules. Overall, we commend the rules' support for and responsiveness to innovation, enabled by provisional emissions rates (PERs) and annual updates to 45VH2-GREET, along with mechanisms to prevent gaming of the credit calculation.

Our comments and recommendations focus primarily on lifecycle analysis (LCA), temporal matching, and renewable natural gas (RNG). We begin with general comments followed by comments explicitly requested in the proposed rules.

Broader Environmental Impacts and EJ Considerations

While the rules include thoughtful consideration of LCA for greenhouse gas emissions, there is no appreciable **consideration of other environmental impacts such as particulate matter, NOx, and water usage.** The GREET model already supports the gathering, analysis, and reporting of such data. Furthermore, these impacts have significant environmental justice implications, about which EJ communities are already expressing concern in the context of hydrogen production. We would like to see the rules address these concerns, either through **incentive calculations that reward reduced non-GHG environmental impacts or penalties that discourage increased non-GHG environmental impacts**, perhaps compared to typical SMR-based hydrogen production rather than regulatory limits, as the initial baseline, to reflect real improvement.

Indirect Environmental Impacts of Feedstocks

The proposed rules ask for comments about indirect emissions for non-minimally emitting electricity generation and RNG only. We assume that indirect emissions are incorporated per feedstock by the GREET model. This has the unfortunate effect of disincentivizing efforts to reduce indirect impacts, for example by reducing transportation emissions or fertilizer use, or using no-till practices or enhanced weathering on agricultural fields. We strongly recommend that there be an **option for the hydrogen producer to declare and substantiate (with third-party MRV) a customized value for indirect emissions from a feedstock**. Perhaps in this case they would be required to provide customized values for all system feedstocks, to avoid gaming.

Broader View of Incrementality, Temporal Matching, and Deliverability

Looking at indirect impacts with a different lens, the concepts that the proposed rules apply to electricity could apply more broadly to all feedstock LCA, to incentivize feedstock sustainability. For example, how local is the feedstock? Is the feedstock incremental or is its use for hydrogen production negatively impacting the market at times (for example, is it competing with food production or limiting the public water supply)? Can the feedstock be sustainably supplied without compromising environmental or social standards? We note that the preamble suggests this approach for RNG and fugitive emissions.

Transparency

We applaud the transparency exhibited in the proposed rules and the 45VH2-GREET manual. **We recommend increased transparency in how LCA restrictions and assumptions are determined**, including engagement with industry stakeholders, technologists, and environmental scientists to ensure that the restrictions are based on accurate and up-to-date information.

System Expansion / Allocation Methods

The system expansion approach takes a comprehensive view of environmental impacts by considering what products are displaced in the market by the co-products of hydrogen production. This method can offer a more holistic assessment of environmental benefits or burdens, potentially leading to more sustainable decisions in the lifecycle management of hydrogen production. However, it can also introduce significant uncertainties and complexities, especially when determining the displacement effects of co-products in the market. **The assumptions made about what products are displaced and the extent of displacement can significantly influence the calculated environmental impacts, potentially leading to misleading conclusions if not accurately represented.**

We are pleased to see in the GREET manual that the steam co-product limitation is based on a literature review of state-of-the-art reformers, including a 2022 NETL report. That report notes that it performed analysis with and without “displacement to credit the emissions that would otherwise be needed to produce the extra steam,” though it **does not give details on how the displacement number was arrived at or whether market dynamics were considered.**

In the GREET1 spreadsheet’s hydrogen sheet, it appears that the allocation method can be selected separately for each co-product. **Does the 45VH2-GREET program intend to leave the choice of allocation method open on a per co-product basis, or is there an implied commitment to use the same (system expansion) method for all co-products?** Allowing for the selection of different allocation methods for each co-product offers flexibility but may compromise the consistency and comparability of the environmental assessments. This variability can introduce a level of subjectivity and potential manipulation, as different methods can significantly affect the calculated carbon intensity of hydrogen production.

We prefer the use of **system expansion where feasible**, because it attempts to account for the broader environmental impact by considering the displacement of equivalent products in the market. This method is more holistic and can better reflect the net environmental benefits or burdens associated with the production of hydrogen and its co-products. We also recommend that the 45VH2-GREET program encourages or mandates the use of a **consistent allocation method across all co-products, unless there's a compelling reason to diverge**. This approach would enhance the comparability and reliability of the environmental assessments.

If you use different allocation methods, provide clear justification based on specific criteria (e.g., market dynamics, energy content, environmental impact) and **transparent reporting on which method was chosen for each co-product and why**. This transparency is crucial for ensuring that the allocation methods are applied judiciously and that the results are interpretable and trustworthy.

Provide detailed guidance on selecting the appropriate allocation method, including the scenarios in which system expansion is preferred over other methods such as BTU or market-based value allocation. This guidance can help ensure that the chosen method aligns with the goals of accurately representing the environmental impacts of hydrogen production.

In reviewing the GREET1 spreadsheet hydrogen sheet, we noticed that the **co-product emissions credits are referenced from the scope 1 emissions for transmission and distribution, which are negative. Please verify whether this is functioning as intended**. (The proposed rules request comments on transmission and distribution, so perhaps this functionality is still in flux.)

To support innovation:

1. For 45VH2-GREET updates, conduct an **annual review of new publications and data** to ensure that supported co-products and associated displacement limits continue to reflect the state of the art.
2. Provide a way for the taxpayer to **challenge or customize a co-product's carbon intensity or displacement limitation(s)** without having to wait for the next 45VH2-GREET release to benefit from such a change. (Perhaps this could fall under the PER process.)

To ensure accountability and enable independent analysis:

3. **Provide documentation of all assumptions** made in determining co-product carbon intensity and displacement limits (presumably in the 45VH2-GREET manual).
4. **Require the taxpayer to document and third-party verify all valorized co-product claims,** including quantity and any customized carbon intensities.
5. **Publicly report all carbon intensity calculations and methodologies accepted** for the tax credit, including those that are provisional or otherwise customized.

Storage

Developing storage rules should be one of your highest priorities, as they are essential for public acceptance of the hourly matching requirement and transition. If one ignores energy

storage, hourly matching of electricity generation and usage is crucial for ensuring that the use of renewable energy is accurately reflected in carbon intensity calculations and lifecycle analyses. However, due to financing ROI requirements and equipment limitations, production systems are generally not built to withstand the intermittency of renewable energy generation. Storage systems (battery, pumped hydro, thermal, etc.) help address this by providing reliable power, at least until the store is exhausted. With seasonal storage generally being less available and more costly than diurnal storage, the rules could treat the two differently.

The justification behind hourly matching is to ensure that minimal-emissions electricity is used. That electricity does not actually need to be generated during the same hour it is used: iIt can be stored, then used as needed. If the electricity source is demonstrably minimally-emitting, leveraging storage is arguably sufficient, even preferable, compared to significantly overbuilding a combination of solar and wind (where that is even feasible) and matching generation to usage hourly, simply to satisfy IRS rules.

We strongly recommend that electricity generators and suppliers be able to use an **accrual system for temporal matching that allows a "clean generation to storage to clean delivery" pathway** to count the same as an EAC associated with the delivery time. Similarly, hydrogen plants should be able to use an **"EAC to storage to usage" pathway** to count the same as "EAC to usage" associated with the storage retrieval time. Effectively, storage delays the EAC timestamp until the electricity is retrieved from storage, **in exchange for a loss penalty** by storage type. Note that it is possible to store electricity at multiple stages between generation and usage.

The counting, tracking, and validation mechanisms enabling this need to be defined and implemented, but this is eminently doable. Losses and emissions associated with the storage mechanism (similar to T&D losses) would need to be accounted for. However, with our recommended approach, **"hourly matching" becomes a misnomer. It is more accurately described as tracking, not matching.** This distinction may help address some of the trepidation around this requirement.

Hourly Matching Transition

We applaud the effort that went into determining the readiness of the various regions to implement the hourly matching requirement. The preamble documents the wide range of readiness by region, yet the rules institute a blanket adoption date of 2028. We wonder whether it would be feasible and/or desirable to **allow for later transition dates for regions that are less prepared to implement hourly matching infrastructure.** (Similarly, we wonder if there would be a benefit to stepping down from yearly, to monthly and/or daily, and then to hourly, or if that is just needless complication.) The issue is not just the ability to create, track, and purchase hourly EACs: it lies in (1) the buildout of an energy and storage system that can

reliably provide the needed supply at all times of the day and all times of the year and, **perhaps most importantly, (2) developers' and financiers' belief that this will be ready in time**.

Renewable Natural Gas (RNG) and Fugitive Emissions

Developing rules to determine first productive use, identify intentional increases in RNG production, determine and mitigate indirect emissions, address leakage, and allow PERs is certainly a tall order. Ensuring that 45V does not incentivize increased production of RNG, release of fugitive emissions, or indirect emissions is paramount. To that end, it is worth being conservative in qualifying sources and amounts.

Flaring

LCA should be used to compare the overall environmental impacts of using biogas and fugitive emissions for hydrogen production versus current flaring practices. Specifically, when using counterfactuals to shape RNG and fugitive emissions rules, **non-GHG pollutants and health and EJ impacts** should be considered in addition to GHGs.

List of RNG Comment Requests

1. **Data sources and studies** – Transparent, peer-reviewed data sources and studies can provide a solid foundation for assessing the lifecycle emissions of RNG and fugitive methane. **Regular reviews of new publications,** perhaps associated with annual 45VH2-GREET updates, would help ensure that assumptions, methods, and formulas continue to **reflect the state of the art.**
2. **Limiting indirect emissions** - To address leakage concerns, allowing the use of pipelines should be limited, with **leakage maximums** for the pipeline between the injection and withdrawal locations, perhaps with lower maximums if the pipeline goes through EJ communities. Leakage maximums could be lowered over time. **Leakage could be determined using a best-available per-mile leakage estimate for the region and weighted age of the pipeline, multiplied by the pipeline distance between the injection and withdrawal sites. If the taxpayer can document and provide third-party verification of a lower leakage value, that should be honored.** Such a structure would encourage regionality and leakage reduction.
3. **Tracking systems** – We support the use of book and claim to allow the limited use (see #2) of common carrier pipelines. As we understand that book and claim is done only on a one-to-one contract basis for other commodities like sustainable aviation fuel and CO2, **a simple but robust electronic book and claim system for RNG would be a valuable model** that could later be applied to other commodities as needs develop. It need not be as complex (or problematic) as a RECs system.
4. **First productive use** (FPU) - The definition of FPU should **focus on the intent of the FPU requirement**, which is unclear at first read. Specifically, the preamble states that the RNG "must originate from the first productive use of the relevant methane," where FPU

is “the time when a producer of that gas first begins using or selling it for productive use” (Section IX, p. 89239). The intent is later revealed as ensuring that using the RNG for hydrogen “is not displacing a previous productive use” for that RNG (p. 89240). The FPU requirement is meant **to ensure that a RNG source is not being diverted, that the use of the RNG for hydrogen is incremental rather than displacing an existing use.**

5. **Transportation emissions** – Rather than calculating and assuming average transportation emissions, the rules should **incentivize emissions reductions** that may be achieved through logistical optimizations, the use of lower-emission transport modes, shorter transport distances (see #2), and other means.
6. **Indirect emissions from future uses** – By limiting the source eligibility to a certain date (see #8), any future increases in RNG and fugitive emissions would not contribute to indirect emissions from future uses, as far as 45V Is concerned. Given that the use of RNG or fugitive emissions presumably results in CO2 emissions, **the rules could phase in a CCS requirement**. (One could argue that some sources of biogas are on a fast carbon cycle, so the resulting CO2 emissions are effectively net-zero. In this case, a CCS incentive rather than a requirement could be considered, though this would not address the issue of indirect emissions from future uses.) The CCS cost would incentivize less expensive future uses or potentially shift the taxpayer toward applying for 45Q instead of 45V.
7. **Growing waste streams** – LCA should account for the emissions reductions achieved by diverting waste from landfills and converting it into usable energy. (See also #8.)
8. **Limiting eligibility by date** - We agree with the idea that **eligibility be limited to sources and quantities that are clearly not the result of increased RNG production or fugitive emissions**. Any sources that can be documented and verified as existing prior to the passage of the IRA or other applicable milestone, with quantity estimates tied to that timeframe, would be a sensible first step. If that is not tenable, the rules could **allow for limited exceptions**. At minimum, the taxpayer would need to document, quantify, and third-party verify factors leading to an increase in qualifying RNG compared to the previous year. The rules could provide examples of allowed and disallowed factors.
9. **Geographic and temporal deliverability** – To address indirect emissions, we support **loose geographic and temporal deliverability**. Qualifying book and claim transactions must reflect physical deliverability through the common carrier pipeline (aided by ancillary transport as needed). For temporal deliverability, the rules could require that the claim be applied within the same tax year as the incentive is given, and that a claim only qualifies for e.g. 12 months after the book transaction. Given that fuel pipeline operations are fundamentally different than the grid, **hourly matching should not be required** in this case.
10. **Leakage estimation** – **Variation in methane leakage should be considered**, to more accurately reflect impacts and reward leakage reduction. While we are not familiar with the extent of datasets available, it is reasonable to incorporate distance between injection and withdrawal, weighted age of the pipeline, and regional averages. The

taxpayer should also be able to submit for consideration third-party verified data and analysis specific to their project, which the taxpayer considers to be more accurate or up to date (perhaps satellite data or measurements taken after relevant leakage management activities).

11. **Counterfactuals** – **Assumptions used for counterfactual scenarios should be both transparent and conservative**, to avoid the gaming of emissions reductions claims, ensure that PERs are accurately assessed, and provide a realistic comparison to other types of RNG usage. Counterfactuals should be **updated to reflect the given tax year's regulatory requirements** (including state and local requirements if feasible) so, for example, if venting is prohibited then it is no longer a valid counterfactual scenario.
12. **Unintended consequences** – We agree that **conservative** assumptions, counterfactuals, and formulas should be used and that the taxpayer or third party can **propose and prove alternatives** that they believe are more appropriate (generally or specific to their situation).

We would be happy to clarify or elaborate on any of the above points. Thank you for the opportunity to provide feedback on the 45V proposed rules.

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