THE DEPUTY ADMINISTRATOR
WASHINGTON, D.C. 20460

December 20, 2023

The Honorable Lily Batchelder
Assistant Secretary for Tax Policy
Department of Treasury
1500 Pennsylvania Avenue, NW, Room 3120
Washington, D.C. 20220

Dear Assistant Secretary Batchelder:

This letter responds to a U.S. Department of Treasury request that the U.S. Environmental Protection Agency provide information related to the definition of lifecycle greenhouse-gas emissions under the Clean Air Act to support Treasury's interpretation and implementation of Internal Revenue Code Section 45V.

Enacted by section 13204 of the Inflation Reduction Act, IRC section 45V provides a tax credit to produce qualified clean hydrogen. IRC section 45V(b)(2) creates a system of tiers under which the amount of the tax credit varies based on, *inter alia*, the "lifecycle greenhouse-gas-emissions rate" of the production process. IRC section 45V(c)(1)(A) defines "lifecycle greenhouse-gas emissions" as having the same meaning as CAA section 211(o)(1)(H),[1] subject to section 45V(c)(1)(B).[2] CAA section 211(o)(1)(H), in turn, defines "lifecycle greenhouse-gas emissions" in relevant part to mean "the aggregate quantity of greenhouse-gas emissions, including direct emissions and significant indirect emissions such as significant emissions from land use changes, as determined by the Administrator of the EPA.

Treasury has therefore requested that the EPA provide guidance on the agency's interpretation of CAA section 211(o)(1)(H) – in particular the term "significant indirect emissions" – to inform Treasury's implementation of IRC section 45V. Specifically, Treasury has asked whether it would be consistent with the EPA's interpretation of CAA section 211(o)(1)(H) in the Renewable Fuel Standard program for

[1] IRC 45V(c)(1)(A) states that, subject to subparagraph B, "lifecycle greenhouse-gas emissions" generally "has the same meaning given such term under subparagraph (H) of section 211(o)(1) of the Clean Air Act (42 U.S.C. 7545(o)(1)), as in effect on the date of enactment of this section."

[2] IRC 45V(c)(1)(B) states that "[t]he term 'lifecycle greenhouse-gas emissions' shall only include emissions through the point of production (well-to-gate), as determined under the most recent Greenhouse gases, Regulated Emissions and Energy use in Transportation model (commonly referred to as the "GREET model") developed by Argonne National Laboratory, or a successor model (as determined by the Secretary)."

Treasury to determine that indirect greenhouse-gas emissions associated with increased demand for electricity from electrolytic hydrogen production constitute "significant indirect emissions." Relatedly, Treasury has asked under what circumstances and for what purposes, if any, it would be reasonable and consistent with the EPA's interpretation of CAA section 211(o)(1)(H) to use energy attribute certificates to substantiate claims about electricity used in electrolytic hydrogen production for purposes of IRC section 45V.

The EPA emphasizes that it has not analyzed the lifecycle greenhouse-gas emissions associated with or conducted a lifecycle analysis for electrolytic hydrogen production. Nor has it interpreted CAA 211(o)(1)(H) in the context of hydrogen production. However, based on the EPA's prior implementation of CAA 211(o)(1)(H), the EPA believes it would be reasonable and consistent with the agency's precedent for Treasury to determine that induced grid emissions are an anticipated real-world result of electrolytic hydrogen production that must be considered in lifecycle greenhouse-gas analyses under IRC section 45V. Such interpretation would be consistent with the EPA's long-standing interpretation and application of CAA section 211(o)(1)(H) in the context of the RFS program. The EPA additionally believes that Treasury can reasonably rely on EACs with attributes that meet the specific criteria discussed below to document and verify claims of zero greenhouse-gas-emitting electricity[3] use and to serve as a methodological proxy in lieu of quantifying certain indirect greenhouse-gas emissions associated with electrolytic hydrogen production.

I. The EPA's interpretation of CAA section 211(o)(1)(H)

Congress provided the definition of "lifecycle greenhouse-gas emissions" in CAA section 211(o)(1)(H) for the purpose of the RFS program, and it is within that context that the EPA has interpreted and applied this term. The EPA promulgated its interpretation in a 2010 notice-and-comment rulemaking establishing the regulatory framework for the updated RFS program (the "RFS2 rulemaking"). The EPA interpreted CAA section 211(o)(1)(H) in the context of the facts and policy framework of the RFS2 program and based on information available at that time; however, the analysis and implementation of the RFS2 rule offer relevant precedent in this context.

In the RFS2 rulemaking the EPA addressed whether greenhouse-gas emissions from, *inter alia*, international indirect land use change[4] induced by biofuel production are "significant indirect

[3] The EPA uses "zero greenhouse-gas-emitting" and "zero-emitting" to mean electricity generation that has zero direct greenhouse-gas emissions. As discussed in section III of this letter, the EPA believes it would be reasonable for Treasury to use EACs with attributes that meet appropriately stringent criteria as a methodological proxy in lieu of calculating induced grid emissions as part of a lifecycle greenhouse-gas analysis. Electricity generation may have direct and indirect greenhouse-gas emissions in addition to induced grid emissions that should be considered in a lifecycle analysis. For non-zero greenhouse-gas-emitting electricity generation, in particular, it is necessary to address any additional direct and indirect greenhouse-gas emissions, in addition to induced grid emissions, in order to consider the full range of relevant emissions pursuant to CAA section 211(o)(1)(H).

[4] Indirect land use change can occur when bioenergy production leads to the displacement of production of land-based products (crops or animals) to other locations, either directly or through changes in agricultural prices. Indirect land use change can occur domestically and internationally; however, a key aspect of the EPA's analysis in the RFS2 rulemaking focused on international indirect land-use change. One example of international indirect land use change from that rulemaking is increased volume of corn used for ethanol production in the U.S. could lead to decreased corn exports, which in turn results in increased corn production and land use impacts (such as conversion of forested lands to cropland), and associated greenhouse-gas emissions, in other countries.

emissions" under CAA 211(o)(1)(H). The EPA determined that they are.[5] In addition to land use changes, the EPA also included other sources of indirect emissions in its assessments of lifecycle greenhouse-gas emissions, such as indirect emissions associated with crop and livestock production.[6] The agency has consistently applied this interpretation of CAA 211(o)(1)(H) in rulemakings and other actions under the RFS program since 2010.

First and foremost, in the RFS2 rulemaking the EPA interpreted CAA 211(o)(1)(H) as requiring the agency to account for the real-world emissions consequences of increased production of renewable fuels.[7] Thus, the EPA determined that CAA section 211(o)(1)(H)'s inclusion of "direct emissions and significant indirect emissions such as significant emissions from land-use changes" requires a "consequential" approach to considering the real-world emissions associated with biofuel production.[8] Such an approach includes consideration of market interactions induced by expanded biofuel production and use that may result in secondary or indirect greenhouse-gas emissions.

In determining whether market-based interactions and resulting greenhouse-gas emissions are "related to" the full fuel lifecycle of biofuels, the agency explained that "[t]he term 'related to' is generally interpreted as providing a broad and expansive scope for a provision. It has routinely been interpreted as meaning to have a connection to or refer to a matter."[9] Consequential modeling of systems involved in biofuel production and use expected that increased demand for feedstocks to produce biofuels would likely result in international land use change as a consequence of meeting that demand. The EPA therefore concluded that greenhouse-gas emissions resulting from international land use change may be attributable to biofuel production under the RFS program, noting that the linkages between biofuel production and its market-mediated impacts "are generally close, and are not extended or overly complex."[10] Moreover, the EPA explained that it is not necessary for biofuel producers to have direct control over land-use changes occurring overseas for the resulting emissions to be "related to" biofuel production.[11] Again, the agency's focus under CAA section 211(o)(1)(H) was

[5] 75 Fed. Reg. 14670, 14765-67 (Mar. 26, 2010) ("RFS2 Final Rule").

[6] RFS2 Final Rule at 14770 ("Our analysis addresses the lifecycle greenhouse-gas emissions from feedstock production by capturing both the direct and indirect impacts of growing corn, soybeans and other renewable fuel feedstocks. For both domestic and international agricultural feedstock production, we analyzed four main sources of greenhouse-gas emissions: agricultural inputs (e.g., fertilizer and energy use), fertilizer N_2O, livestock and rice methane.").

[7] RFS2 Final Rule at 14766 ("Ignoring international emissions, a large part of the greenhouse-gas emission associated with the different fuels, would result in a greenhouse-gas analysis that bears no relationship to the real-world emissions impact of transportation fuels.").

[8] RFS2 Regulatory Impact Analysis for Final Rule at 299, available at https://nepis.epa.gov/Exe/ZyPURL.cgi?Dockey=P1006DXP.txt (definition of lifecycle greenhouse-gas emissions in CAA section 211(o)(1)(H) "and specifically the clause '*(including direct emissions and significant indirect emissions such as significant emissions from land use changes)*' requires the agency to consider a consequential lifecycle analyses [sic] and to develop a methodology that accounts for all of the important factors that may significantly influence this assessment, including the secondary or indirect impacts of expanded biofuels use."). The EPA further explained that a consequential approach "provides information about the greenhouse-gas emitted, directly or indirectly, as a consequence of changes in demand for a product. This approach typically describes changes in greenhouse-gas emissions levels from affected processes, which are identified by linking causes with effects." Id.

[9] RFS2 Final Rule at 14767.

[10] Id.; see also 74 Fed. Reg. 24904, 25021-24 (May 26, 2009).

[11] RFS2 Final Rule at 14767.

on the real-world emissions that can be expected to result from biofuel production, regardless of where those emissions occurred.[12]

The EPA also noted in the RFS2 rulemaking that the significance of indirect emissions should be assessed "in terms of their relationship to total greenhouse-gas emissions for given fuel pathways."[13] The agency determined that emissions from indirect international land use change were significant by this measure. To take just two examples, relative to total mean lifecycle greenhouse-gas emissions of 38 $kgCO_2e$/mmBTU for sugarcane ethanol, mean international land use change greenhouse-gas emissions were estimated to be 5 $kgCO_2e$/mmBTU[14]; for switchgrass ethanol produced through a thermochemical process, mean international land use change greenhouse-gas emissions were estimated to be 16 kg CO_2e/mmBTU, compared to total lifecycle greenhouse-gas emissions of 27 $kgCO_2$/mmBTU.[15]

II. It would be reasonable for Treasury to include induced grid emissions under IRC section 45V

Increased demand for electricity from electrolyzers for hydrogen production can result in indirect greenhouse-gas emissions. Specifically, adding new incremental electricity demand to the electric grid will often result in either increased generation from existing generators, with associated emissions, or new incremental capacity coming online. If the new incremental generation is not zero-emitting, it will also lead to increased systemwide greenhouse-gas emissions from the electric grid. Such indirect emissions, sometimes referred to as "induced grid emissions," are an anticipated real-world impact of increased electricity demand due to electrolytic hydrogen production.

The EPA believes that based on its precedent in the RFS context Treasury may reasonably conclude that induced grid emissions resulting from electrolytic hydrogen production must be considered when determining "lifecycle greenhouse-gas emissions" as defined by CAA section 211(o)(1)(H). However, the agency reiterates that it is not determining here what emissions associated with electrolytic hydrogen constitute "lifecycle greenhouse-gas emissions" pursuant to CAA section 211(o)(1)(H) for purposes of the RFS program.

In the RFS2 rulemaking the EPA discussed induced grid emissions associated with biofuel production generally and indicated that such emissions may be significant indirect emissions. However, the agency concluded that the analytical tools available at the time were not sufficient to include induced grid emissions in LCAs.[16] Therefore, for most of its LCAs the EPA currently uses an "emission factor" for electricity use in biofuel production that represents grid average emissions. In doing so, the EPA attempts to capture, on a systemwide basis, both the direct and indirect emissions associated with increased electricity demand due to biofuel production.

In the context of IRC section 45V, the EPA believes Treasury may reasonably determine that induced grid emissions are "related to" increased electrolytic hydrogen production. Electricity users, including

[12] RFS2 Final Rule at 14765 ("It is clear that, especially when considering commodity feedstocks, including the market interactions of biofuel demand on feedstock and agricultural markets is a more accurate representation of the impacts of an increase in biofuels production on greenhouse-gas emissions than if these market interactions are not considered.").
[13] Id. at 14766.
[14] Id. at 14791, Table V.C-3.
[15] Id. at 14793, Table V.C-4.
[16] RFS2 Regulatory Impact Analysis for Final Rule at 445-46.

hydrogen producers, can cause or induce emissions by adding new load and consuming electricity. Because the grid must always balance electricity demand with supply, this increased electricity demand results in increased electricity supply and, if the new electricity is not zero-emitting, additional emissions from the grid. The linkage between increased electricity demand from grid-connected electrolyzers and greenhouse-gas emissions induced by that demand does not appear to be "extended or overly complex" and, as the EPA noted in the RFS2 rulemaking, it is not necessary for hydrogen producers to have control over induced grid emissions for them to be considered significant indirect emissions under CAA section 211(o)(1)(H).

Further, publications have noted that electrolysis projects that use large amounts of grid electricity to produce hydrogen have the potential to be several times more greenhouse-gas intensive than the threshold for even the lowest value IRC section 45V tax credit tier, and could in fact be more greenhouse-gas intensive than existing forms of conventional hydrogen production.[17] Assuming that electrolytic hydrogen production is not expected to entail large greenhouse-gas emissions from sources or activities other than electricity use, Treasury could reasonably determine that induced grid emissions are "significant," consistent with the EPA's interpretation of that term in CAA section 211(o)(1)(H).

III. EACs are an appropriate tool in conjunction with zero-emitting electricity use in the 45V context

The emissions profile of electricity used by an electrolyzer may largely dictate which tier of the IRC section 45V tax credit applies to the resulting hydrogen. Thus, it is important to document that any zero-emitting electricity that a hydrogen producer claims for the purposes of IRC section 45V corresponds to the generation and use of zero-emitting electricity for electrolytic hydrogen production. EACs are an established mechanism for verifying the purchase of such electricity, and the EPA believes that their use is an appropriate way for Treasury to document zero-emitting electricity inputs to electrolytic hydrogen production for the purpose of IRC section 45V.

In addition to being a means to document and verify the generation and purchase of zero-emitting electricity, EACs provide further information on attributes of generation. Particular attributes documented by EACs can inform whether the electricity meets criteria designed to match generation to use – electricity that is matched geographically with use, matched temporally with use, and generated by new incremental capacity. EACs whose attributes satisfy these specific criteria are referred to as meeting the "three pillars."

The EPA has not considered the use of three-pillar EACs in conjunction with its lifecycle analyses for fuels that involve the use of grid electricity under the RFS program. However, the agency believes that Treasury could reasonably rely on such EACs to substantiate the deliverability of zero-emitting electricity to a hydrogen producer. Similarly, the EPA's regulations under the RFS program governing the use of renewable natural gas to produce renewable fuel are designed to, *inter alia*, demonstrate deliverability of renewable natural gas transported via commercial pipeline. These regulations require a contractual pathway between renewable natural-gas providers and users. They also require that a volume of renewable natural gas claimed for use to produce renewable fuel must be placed into and withdrawn from a commercial pipeline in a manner consistent with that volume actually being used by

[17] See, e.g., Pathways to Commercial Liftoff: Clean Hydrogen at 10-12, U.S. Department of Energy, available at https://liftoff.energy.gov/wp-content/uploads/2023/05/20230523-Pathways-to-Commercial-Liftoff-Clean-Hydrogen.pdf.

the downstream renewable fuel producer.[18] That is, the renewable natural-gas injection point must be physically connected to and upstream of the withdrawal point and the volume(s) injected must be equal to or larger than the volume(s) withdrawn; additionally, the injection must occur before the associated withdrawal.

Moreover, the EPA believes it would be reasonable for Treasury to use three-pillar EACs that meet appropriately stringent criteria as a methodological proxy in lieu of calculating induced grid emissions as part of a lifecycle greenhouse-gas analysis. Although such use does not constitute a quantification of induced grid emissions, it would be reasonable to expect that the purchase and use of zero-emitting electricity represented by three-pillar EACs does not result in induced grid emissions.[19] In the context of its Green Power Partnership, the EPA has similarly recognized partners with awards for renewable energy purchasing that has attributes that satisfy the criteria of geographic proximity, temporal matching and power sourced from newer capacity, which are in line with the goal of ensuring that power consumption does not result in induced grid emissions.[20]

IV. CONCLUSION

In summary, the EPA believes it would be reasonable for Treasury to determine that induced grid emissions are an anticipated real-world result of electrolytic hydrogen production that must be considered in lifecycle greenhouse-gas analyses under IRC section 45V. Such interpretation would be consistent with the EPA's long-standing interpretation and application of CAA section 211(o)(1)(H) in the context of the RFS program. Moreover, EACs with attributes that meet the criteria of new incremental capacity, geographic matching and temporal matching are an appropriate way of verifying the generation and delivery of zero greenhouse-gas-emitting electricity and can serve as a reasonable methodological proxy for quantifying induced grid emissions associated with electrolytic hydrogen production.

The EPA thanks Treasury for the opportunity to provide information regarding its interpretation of CAA section 211(o)(1)(H) and the use of EACs. I look forward to our continued support of Treasury as it proceeds with its important work in implementing IRC section 45V. In the meantime, please accept my warmest wishes.

Sincerely,

Janet G. McCabe

[18] See 40 CFR 80.1426(f)(11)(ii), 40 CFR 80.125(b)(3); see also RFS2 Final Rule at 14712 ("Producers may therefore take into account such displacement provided that they demonstrate that a verifiable contractual pathway exists and that such pathway ensures that (1) a specific volume of landfill gas was placed into a commercial pipeline that ultimately serves the transportation fueling facility and (2) that the drawn into the facility [sic] from that pipeline matches the volume of landfill gas placed into the pipeline system.").

[19] While this letter addresses the use of EACs with attributes that meet appropriately stringent criteria in conjunction with electrolytic hydrogen production under IRC section 45V, the EPA believes that it would be reasonable for Treasury to extend the rationale and conclusions herein to the use of zero greenhouse-gas-emitting electricity under hydrogen production pathways in the context of IRC section 45V more generally.

[20] See Green Power Partnership at https://www.epa.gov/greenpower.