February 26, 2024

The Honorable Lily Batchelder
Assistant Secretary (Tax Policy)
Department of the Treasury
1500 Pennsylvania Ave., NW
Washington, DC 20220

Daniel Werfel
Commissioner
Internal Revenue Service
1111 Constitution Ave., NW
Washington, DC 20224

Re: Notice IRS REG–117631–23 (submitted via www.regulations.gov)

Dear Ms. Batchelder & Mr. Werfel,

The Natural Resources Defense Council respectfully submits the following comments to the Department of Treasury and the Internal Revenue Service on the Notice of Proposed Rule: Section 45V Credit for Production of Clean Hydrogen; Section 48(a)(15) Election to Treat Clean Hydrogen Production Facilities as Energy Property (REG-117631-23),

We appreciate the opportunity to comment.

I. Summary of Comments

One of the stated goals of the Inflation Reduction Act is to "combat the climate crisis" and "[p]ut America on track to meet President Biden's climate goals . . . ."[1] It does so by promoting clean energy, in part through the Clean Hydrogen Production Credit (Section 45V). Section 45V plainly obligates the Department of Treasury and the Internal Revenue Service to (i) determine direct greenhouse gas emissions from eligible hydrogen production facilities, and (ii) provide an accurate and verifiable means to determine the greenhouse gas emissions from power plants that provide electricity to hydrogen production facilities.

[1] Press Release, White House, By the Numbers: The Inflation Reduction Act (Aug. 15, 2022), https://www.whitehouse.gov/briefing-room/statements-releases/2022/08/15/by-the-numbers-the-inflation-reduction-act/.

In these comments, we focus exclusively on forest-derived biomass,[2] by which we mean a woody fuel removed directly from a forest.[3] We address specifically the proposed rule's treatment of forest residues[4] as a feedstock in hydrogen production: (1) as a raw material in the gasification process to produce hydrogen; and (2) in the generation of electricity to power hydrogen production plants. We present the established scientific evidence showing that biogenic carbon emissions from both the combustion and gasification of forest residues cannot be treated as zero under Section 45V.

The GREET model used in this proposed rule to determine greenhouse gas emissions[5] erroneously assumes that producing hydrogen from forest residues categorically generates zero biogenic CO_2 emissions. Specifically, the Department of Energy's *GREET Module for Forest Residues to Bio-electricity Pathways*,[6] (herein, Argonne Forest Residue Module) adopts the fully discredited assumption that forest-derived feedstocks to produce energy are "carbon neutral." This assumption violates fundamental principles of biogenic carbon accounting, is rejected in the established peer-reviewed science, and has been characterized as "scientifically indefensible"[7] by the EPA's Science Advisory Board (SAB) convened expressly to assess the issue of biogenic emissions from energy production. The SAB specifically concluded that assuming *apriori* carbon neutrality absent a rigorous counterfactual evaluation of biogenic emissions is "*inconsistent with the underlying science.*"[8]

The Department of Treasury and IRS must reject the Argonne Forest Residue Module and accompanying assumptions in the GREET User Handbook as a basis for a forest residue production pathway and exclude forest residues as a hydrogen production technology[9] in the final rule altogether. Any successor module developed pursuant to Treasury's authority as provided by

[2] In these comments, we use the term "forest-derived biomass" synonymously with "forest biomass."
[3] We exclude from this definition industrial wastes, such as black liquor in pulping operations.
[4] As described in the U.S. Department of Energy, *Guidelines to Determine Well-to-Gate Greenhouse Gas (GHG) Emissions of Hydrogen Production Pathways using 45VH2-GREET 2023,* (Dec. 2023) (GREET User Manual).
[5] 88 Fed. Reg. at 89221.
[6] U. S. Department of Energy, Argonne National Laboratory, Energy Systems Division, *Summary of Expansions and Updates in GREET,* ANL/ESD-21/16 at 14 (2021), https://www.osti.gov/servlets/purl/1824336 at 14; Hui Xu et al., *Regionalized Life Cycle Greenhouse Gas Emissions of Forest Biomass Use for Electricity Generation in the United States*, 55 Env't Sci. & Tech. 14806, 14806–16, https://doi.org/10.1021/acs.est.1c04301.
[7] U.S. EPA Science Advisory Board, *SAB Review of Framework for Assessing Biogenic CO_2 Emissions from Stationary Sources (2014)*, EPA-SAB-19-002 (Mar. 4, 2019) Executive Summary at 5. Available by searching "biogenic" on the SAB's Advisory Reports webpage:
https://sab.epa.gov/ords/sab/r/sab_apex/sab/advisoryreports?session=9980983204871.
[8] U.S. EPA Science Advisory Board, *SAB Review of Framework for Assessing Biogenic CO_2 Emissions from Stationary Sources (2014)*, EPA-SAB-19-002 (Mar. 4, 2019) Executive Summary at 2. Original emphasis. Available by searching "biogenic" on the SAB's Advisory Reports webpage:
https://sab.epa.gov/ords/sab/r/sab_apex/sab/advisoryreports?session=9980983204871.
[9] See GREET User Manual Table 2.

Section 45V(c)(1)(B),[10] must rigorously determine both biogenic emissions and non-biogenic emissions using a scientifically defensible, transparent and robust assessment tool.

II. <u>Combustion of Forest Biomass to Generate Electricity for Hydrogen Production Facilities</u>

Summary: In determining the GHG emissions rate for a hydrogen production facility, Treasury must account for both biogenic and non-biogenic CO_2 associated with electricity supplied to the hydrogen production facility. The established science on the GHG impacts of burning forest biomass feedstocks for electricity shows that neither biogenic emissions nor non-biogenic emissions can be treated *apriori* as zero. In the case of forest residues specifically, the biogenic emissions alone from electricity production can exceed the average carbon intensity of the U.S. grid for a period of approximately fifteen years following combustion.

The Argonne GREET Module for Forest Residues to Bio-electricity Pathways (herein, Argonne Forest Residue Module) is wholly insufficient for identifying carbon emissions from the combustion of forest residues for electricity because it assumes carbon neutrality of forest residues in direct contradiction to the U.S. EPA Science Advisory Board's recommendations, which characterized the assumption as "scientifically indefensible." Moreover, the Argonne Forest Residue Module cites only one source to support its carbon neutrality assumption: the Trump administration's fully discredited and unmaterialized statement of agency intent regarding bioenergy issued by then-EPA Administrator Scott Pruitt.

1. Statutory Authority and Requirements for Clean Hydrogen Production Under Section 45V

Under Section 45V(c)(2)(A),[11] facilities that produce hydrogen are eligible for a tax credit, provided that "qualified clean hydrogen" is produced using a process that results in a lifecycle GHG emissions rate of not greater than 4 kilograms of CO2e per kilogram of hydrogen (herein, "statutory credit threshold").[12] In determining this emissions rate, Treasury is required to account for "lifecycle greenhouse gas emissions" as defined under section 211(o)(1)(H) of the Clean Air Act (42 U.S.C. 7545(o)(1)(H)), as in effect on August 16, 2022.

[10] Under section 45V(c)(1)(B), the term "lifecycle greenhouse gas emissions" includes emissions only through the point of production, as determined under the most recent GREET model or *a successor model as determined by the Secretary of the Treasury or her delegate*. Emphasis added.
[11] Except as otherwise noted, Section references herein are to the Internal Revenue Code of 1986, as amended (the "Code").
[12] Section 45V(b)(2).

Section 211 of the Clean Air Act defines "lifecycle greenhouse gas emissions" as follows:

> [T]he aggregate quantity of greenhouse gas emissions (including direct emissions and significant indirect emissions such as significant emissions from land use changes) ... related to the full fuel lifecycle, including all stages of fuel and feedstock production and distribution, from feedstock generation or extraction through the distribution and delivery and use of the finished fuel to the ultimate consumer ...[13]

The foregoing definition of "lifecycle greenhouse gas emissions" expressly includes both biogenic emissions and non-biogenic emissions. Specifically:

1. *Direct emissions* from the combustion of biomass are biogenic emissions—related to biological sources[14] and processes. They represent the transfer of carbon from the land to the atmosphere.
2. *Fuel and feedstock production and distribution, from feedstock generation or extraction through distribution and delivery* are non-biogenic emissions. They are unrelated to biological processes, and include, inter alia, emissions associated with logging and extraction, transporting, drying, and processing—most often from fossil fuel combustion.

For the purposes of hydrogen production, the proposed rule further clarifies that "lifecycle greenhouse gas emissions" includes:

> The emissions associated with the hydrogen production process, inclusive of the electricity used by the hydrogen production facility…[15]

Therefore, in determining the GHG emissions rate for a hydrogen production facility, Treasury must account for both biogenic and non-biogenic CO_2 associated with electricity supplied to a hydrogen production facility.

In the following two subsections, we describe the established science on the GHG impacts of burning forest biomass feedstocks for electricity and show that neither biogenic emissions nor non-biogenic emissions can be treated *apriori* as zero. As we present further in Section IV, in the case of forest residues specifically, the biogenic emissions alone from

[13] 42 U.S.C. § 7545(o)(1)(H). This definition appears in a provision of the Clean Air Act related to transportation fuels.
[14] Biogenic emissions are those that come from natural sources, such as plants and soils, though the term also can refer to emissions from volcanic activity, lightning, and other natural phenomena. EPA, Biogenic Emissions Sources, https://www.epa.gov/air-emissions-modeling/biogenic-emission-sources (last updated Apr. 12, 2022).
[15] 88 Fed. Reg. at 89224.

electricity production can exceed the average carbon intensity of the U.S. grid for a period of approximately fifteen years.

a. The *biogenic* carbon emissions from burning forest biomass for electricity cannot be treated as zero.

Biogenic emissions occur predominantly as direct smokestack emissions through combustion of woody materials (representing the transfer of carbon from the forest to the atmosphere) as well as through decay of forest materials such as timber harvest residues.

At the smokestack, power plants that burn forest biomass emit more CO_2 per kilowatt hour than power plants that burn fossil fuels. Wood is less energy-dense and more emissive than coal per unit of energy generated,[16] typically producing emissions in the range of approximately 1180 g CO_2e per kWh to 1460 g CO_2 per kWh.[17] As shown in the figure below, the CO_2 emissions rate at the smokestack from the combustion of woody biomass at a utility-scale power station is higher than the CO_2e emissions rate from a coal-fired power plant, and approximately triple that of natural gas.

CO_2 Emissions Rate (in grams of CO_2e per kilowatt hour generated) for Select Generating Technologies[18]

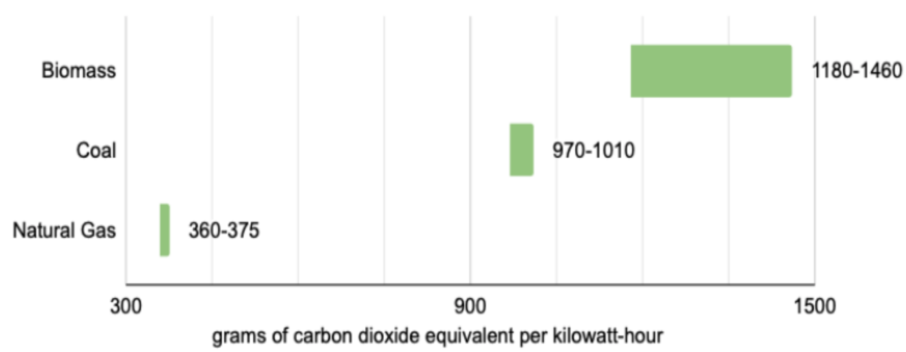

Figure 1: CO_2 Rate (in grams of CO2e per kilowatt hour generated) for Select Generating Technologies (Walker et al. 2010).

---

[16] IPCC guidelines provide the following default emissions factors: for wood, 112,000 kg CO_2 per TJ; for lignite coal, 101,000 kg CO_2 per TJ; and for natural gas, 56,000 kg CO_2 per TJ. Darío R. Gómez et al., *2006 IPCC Guidelines for National Greenhouse Gas Inventories 2.16*, https://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/2_Volume2/V2_2_Ch2_Stationary_Combustion.pdf.

[17] Thomas Walker et al., Manomet Center for Conservation Sciences, *Biomass Sustainability and Carbon Policy Study* 103–04 (June 2010), https://www.mass.gov/doc/manometbiomassreportfullhirezpdf/download; Jeremy Fisher et al., Synapse Energy Economics Inc., *The Carbon Footprint of Electricity from Biomass* 13 (June 11, 2012), https://www.synapse-energy.com/sites/default/files/Carbon-Footprint-of-Biomass-11-056.pdf.

[18] Values for biomass, natural gas, and coal emissions rates from Walker et al., *supra* note 17; Fisher et al., *supra* note 17.

Many biomass proponents claim that electricity produced by burning forest biomass in power plants is *apriori* "carbon neutral," as long as the forest is "sustainably managed." They claim that power plants that burn forest biomass produce zero CO_2 emissions because smokestack emissions are automatically offset—or canceled out—by *biogenic factors* such as forest regrowth or avoided decay emissions. They further argue that this biogenic, land-based mitigation can be counted immediately because forests generally sequester CO_2 from the atmosphere through photosynthesis.[19]

Such simplistic assumptions fail to acknowledge scientific fundamentals of forest carbon accounting.[20] As we show below, the "carbon neutrality" assumption has been widely rejected—in the scientific peer-reviewed literature and by the EPA's science panel expressly convened to review the subject.

The established science has demonstrated that burning forest-derived biomass increases CO_2 emissions at levels comparable to fossil fuels, and in most cases these emissions persist in the atmosphere for decades to centuries[21] while biogenic mitigation occurs—if it occurs at all.

---

[19] *See, e.g.*, *Center for Biological Diversity v. EPA*, 722 F.3d 401 (D.C. Cir. 2013) (holding that in the facility permitting context, a temporary exemption for biogenic CO_2 emissions from the evaluation of the stack emissions, as "carbon neutral," is not lawful, over industry arguments re same); *see also* Michael T. Ter-Mikaelian et al., *The Burning Question: Does Forest Bioenergy Reduce Carbon Emissions? A Review of Common Misconceptions about Forest Carbon Accounting*, 113 J. Forestry 57, 57–68 (2015), https://doi.org/10.5849/jof.14-016.

[20] Walker et al., *supra* note 17; Mirjam Röder et al., *How Certain Are Greenhouse Gas Reductions from Bioenergy? Life Cycle Assessment and Uncertainty of Analysis of Wood Pellet-to-Electricity Supply Chains from Forest Residues*, 79 Biomass & Bioenergy 50, 50–63 (2015), https://www.sciencedirect.com/science/article/pii/S0961953415001166.

[21] Pierre Bernier et al., *Using Ecosystem CO_2 Measurements to Estimate the Timing and Magnitude of Greenhouse Gas Mitigation Potential of Forest Bioenergy*, 5 Global Change Biology - Bioenergy 67, 67–72 (2012), https://onlinelibrary.wiley.com/doi/abs/10.1111/j.1757-1707.2012.01197.x; Bjart Holtsmark, *Harvesting in Boreal Forests and the Biofuel Carbon Debt*, 112 Climatic Change 415, 415–28 (2012), https://link.springer.com/article/10.1007/s10584-011-0222-6; Jérôme Laganière et al., *Range and Uncertainties in Estimating Delays in Greenhouse Gas Mitigation Potential of Forest Bioenergy Sourced from Canadian Forests*, 9 Global Change Biology - Bioenergy 358, 358–69 (2017), https://onlinelibrary.wiley.com/doi/epdf/10.1111/gcbb.12327; Jon McKechnie et al., *Forest Bioenergy or Forest Carbon? Assessing Trade-Offs in Greenhouse Gas Mitigation with Wood-Based Fuels*, 45 Env't Sci. Tech. 789, 789–95 (2011), https://www.pfpi.net/wp-content/uploads/2011/05/McKechnie-et-al-EST-2010.pdf; Kim Pingoud et al., *Global Warming Potential Factors and Warming Payback Time as Climate Indicators of Forest Biomass Use,* 17 Mitigation and Adaptation Strategies for Global Change 369, 369–86 (2012); Anna Stephenson et al., UK Department of Energy and Climate Change, *Life Cycle Impacts of Biomass Electricity in 2020: Scenarios for Assessing the Greenhouse Gas Impacts and Energy Input Requirements of Using North American Woody Biomass for Electricity Generation in the UK* (July 2014), www.gov.uk/government/uploads/system/uploads/attachment_data/file/349024/BEAC_Report_290814.pdf; Michael Ter-Mikaelian et al., *Debt Repayment or Carbon Sequestration Parity? Lessons from a Forest Bioenergy Case Study in Ontario, Canada,* 7 Global Change Biology - Bioenergy, 704, 704–16 (2015), https://onlinelibrary.wiley.com/doi/epdf/10.1111/gcbb.12198; Giuliana Zanchi, et al., *Is Woody Bioenergy Carbon Neutral? A Comparative Assessment of Emissions from Consumption of Woody Bioenergy and Fossil Fuel*, Global Change Biology - Bioenergy 761, 761–72 (2012), https://onlinelibrary.wiley.com/doi/epdf/10.1111/j.1757-1707.2011.01149.x; Walker et al., *supra* note 17.

The length of this recovery period (known as the "carbon debt period") depends upon many factors relating to land use and terrestrial sequestration rates, including: how the material is harvested; whether the forest regrows; how quickly forest regrowth occurs; how quickly forest residues decay; whether land use change has occurred; and what would have happened to land-based forest carbon stocks in the absence of biomass demand.[22]

In the case of whole trees and other large-diameter materials, even when sourced from "sustainably managed" forests, it can take anywhere from decades to several centuries for forest regrowth and the associated carbon sequestration just to reach net emissions parity[23] with fossil fuels.[24] In a scenario where the feedstock is forest harvest residues that would otherwise decay and release their carbon, the carbon debt period is often shorter because it is tied to the decomposition rate of that material and its size but is still typically on the order of decades.[25] In all of these cases, the carbon debt period extends well beyond timeframes determined essential by science to address the worst impacts of climate change.

These findings are supported by two independent meta-analyses[26] of published studies, which summarize the full breadth of quantitative studies conducted over the past 25 years that assess the extent of carbon impacts/benefits incurred by burning forest biomass to produce energy. The meta-analysis by Buchholz (2016) shows that over 80 percent of peer-reviewed

---

[22] Richard Birdsey et al., *Climate, Economic, and Environmental Impacts of Producing Wood for Bioenergy*, Env't Rsch. Letters (2018), https://iopscience.iop.org/article/10.1088/1748-9326/aab9d5/pdf; Stephen Mitchell et al., *Carbon Debt and Carbon Sequestration Parity in Forest Bioenergy Production*, 4 Global Change Biology - Bioenergy 818, 818–27 (2012), https://onlinelibrary.wiley.com/doi/epdf/10.1111/j.1757-1707.2012.01173.x; Anna Repo et al., *Sustainability of Forest Bioenergy in Europe: Land-Use-Related Carbon Dioxide Emissions of Forest Harvest Residues*, 7 Global Change Biology - Bioenergy 877, 877–87 (2014), https://onlinelibrary.wiley.com/doi/full/10.1111/gcbb.12179; Walker, *supra* note 17.

[23] Carbon sequestration parity is achieved when the sum of carbon in the regenerating stand and the GHG benefits of replacing fossil fuel equals the amount of carbon in the stand if it had remained unharvested. *See* Ter-Mikaelian et al., *The Burning Question*, *supra* note 19.

[24] Andrea Colnes et al., The Biomass Energy Resource Center, Forest Guild, and Spatial Informatics Group, *Biomass Supply and Carbon Accounting for Southeastern Forests* (Feb. 2012), https://www.southernenvironment.org/wp-content/uploads/legacy/publications/biomass-carbon-study-FINAL.pdf; John Hagan, The Manomet Center for Conservation Sciences, *Biomass Energy Recalibrated* (2012), http://www.inference.org.uk/sustainable/images/Manomet%20Biomass%20Article%202012%5B1%5D.pdf; Walker et al., *supra* note 17; Thomas Buchholz, et al. *When Biomass Electricity Demand Prompts Thinnings in Southern US Pine Plantations: A Forest Sector Greenhouse Gas Emissions Case Study*, Frontiers in Forests & Global Change (May 2021), https://doi.org/10.3389/ffgc.2021.642569.

[25] Repo et al., *supra* note 22; Stephenson et al., *supra* note 11; Mary S. Booth, *Not Carbon Neutral: Assessing the Net Emissions Impact of Residues Burned for Bioenergy*, Env't Rsch. Letters (2018), https://iopscience.iop.org/article/10.1088/1748-9326/aaac88/pdf.

[26] Thomas Buchholz et al., *A Global Meta-Analysis of Forest Bioenergy Greenhouse Gas Emission Accounting Studies*, 8 Global Change Biology - Bioenergy 281–89 (2016), https://onlinelibrary.wiley.com/doi/epdf/10.1111/gcbb.12245; Niclas Scott Bentsen, *Carbon Debt and Payback Time – Lost in the Forest?*, 73 Renewable & Sustainability Energy Rev. 1211, 1211–17 (2017), https://www.sciencedirect.com/science/article/pii/S1364032117302034.

assessments found carbon debt periods associated with the use of forest biomass feedstocks, ranging from several years to many centuries. The Bentsen (2017) meta-analysis found when forest biomass is used to displace coal the mean payback time is 31 years, and it is 105 years for natural gas substitution. Similarly, a study done jointly by the Spatial Informatics Group and the Woods Hole Research Center, in reviewing both meta-analyses, found that "the vast majority of all published quantitative assessments of the GHG emissions of forest-derived biomass for electricity production have concluded that there are net emissions associated with the use of woody biomass feedstocks to generate energy when compared to generating an equivalent amount of energy from fossil sources, even when accounting for subsequent regrowth and avoided emissions."[27]

Mean and Range of Carbon Payback Times in Years Across Influential Independent Variables

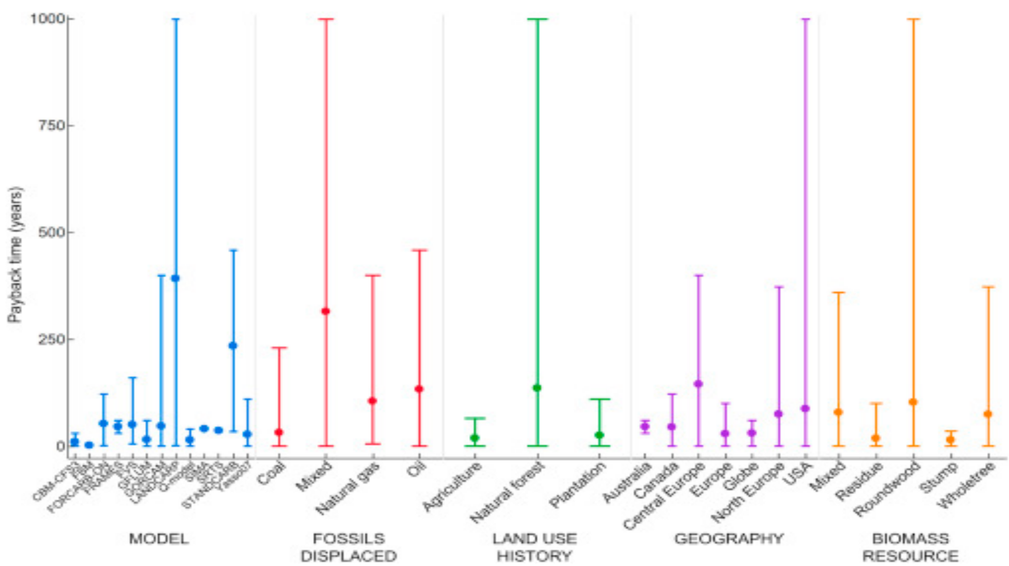

Figure 2: Mean and range of carbon payback times in years across influential independent variables (Bentsen et al. 2017). This meta-analysis found when forest biomass is used to displace coal the mean payback time is 31 years and 105 years for natural gas substitution.[28]

Taken together, these studies show that the carbon neutrality of forest biomass is not supported in the peer-reviewed scientific literature. In the "vast majority" of cases, burning forest-derived biomass for energy has been demonstrated to increase emissions to the

---

[27] John Gunn et al., Spatial Informatics Group, Natural Assets Laboratory, *Scientific Evidence Does Not Support the Carbon Neutrality of Woody Biomass Energy: A Review of Existing Literature* at 3 (Oct. 31, 2018), https://www.sig-nal.org/_files/ugd/f5c52e_a51f246c8a854cf594ce47e6d05d9616.pdf. (Attachment 1)

[28] Bentsen, *supra* note 26.

atmosphere, in many cases for decades to centuries[29]—even when land-based biogenic mitigation is considered.

The Intergovernmental Panel on Climate Change ("IPCC") has clarified that its guidelines for GHG reporting and accounting "do not automatically consider or assume biomass used for energy as 'carbon neutral,' even in cases where the biomass is thought to be produced sustainably."[30]

In its 2014 assessment of the science on climate change mitigation, the IPCC explicitly raised this issue, addressing the assumption that "the CO_2 emitted from biomass combustion is climate neutral because the carbon that was previously sequestered from the atmosphere [before combustion] will be re-sequestered if the bioenergy system [i.e., the growing stock] is managed sustainably," The IPCC report found that "[t]he shortcomings of this assumption have been extensively discussed in environmental impact studies and emission accounting mechanisms."[31] The authors further rejected carbon neutrality as a fundamental misunderstanding of its guidelines, arguing "the neutrality perception is linked to a misunderstanding of the guidelines for GHG inventories . . . ."[32]

Finally, treatment of forest biopower as categorically carbon neutral has also been rejected by the EPA's Science Advisory Board ("SAB"). The SAB established that carbon impacts to the atmosphere vary widely among different types of forest-derived biomass feedstocks from differing forest management regimes. In its charge, the EPA asked the SAB to review the validity of a categorical exclusion (carbon neutrality), which would treat emissions as zero. The SAB's response was to reject *apriori* assumptions of carbon neutrality.[33] The SAB instead affirmed the need for the specific assessment of carbon impacts of individual feedstocks. In its finding, the SAB noted that net biogenic carbon emissions will vary considerably, and therefore carbon neutrality cannot be assumed. More specifically, the SAB concluded: "*Carbon neutrality cannot be assumed for all biomass energy apriori*,"[34] and "*not all biogenic emissions*

[29] Gunn et al., *supra* note 27.
[30] *Frequently Asked Questions: Q2-10*, IPCC Task Force on National Greenhouse Gas Inventories, https://www.ipcc-nggip.iges.or.jp/faq/faq.html.
[31] Pete Smith, et al., Working Group III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change, *Climate Change 2014: Mitigation of Climate Change, Agriculture, Forestry and Other Land Use (AFOLU)* 879 (2014), https://www.ipcc.ch/site/assets/uploads/2018/02/ipcc_wg3_ar5_chapter11.pdf.
[32] *Id*.
[33] U.S. EPA Science Advisory Board, *SAB Review of EPA's Accounting Framework for Biogenic CO_2 Emissions from Stationary Sources (September 2011)*, EPA-SAB-12-011 (Sept. 28, 2012); U.S. EPA Science Advisory Board, *SAB Review of Framework for Assessing Biogenic CO_2 Emissions from Stationary Sources (2014)*, EPA-SAB-19-002 (Mar. 4, 2019). Both of these reports are available by searching "biogenic" on the SAB's Advisory Reports webpage: https://sab.epa.gov/ords/sab/r/sab_apex/sab/advisoryreports?session=9980983204871.
[34] U.S. EPA Science Advisory Board, *SAB Review of EPA's Accounting Framework for Biogenic CO_2 Emissions from Stationary Sources (September 2011)*, EPA-SAB-12-011 (Sept. 28, 2012), Executive Summary at 3.

are carbon neutral nor net additional to the atmosphere, and assuming so is inconsistent with the underlying science."[35]

In sum, the established science[36] clearly demonstrates that net biogenic emissions resulting from the combustion of forest biomass to produce electricity cannot be treated as categorically zero.

b. The *non-biogenic* carbon emissions associated with extraction, transport, drying, and processing of forest-derived fuels for electricity cannot be treated as zero.

Independent of biogenic factors above, emissions associated with forest feedstock extraction, distribution, processing, drying, and delivery of forest-derived fuels for electricity production typically range from approximately 50 g CO_2e per kWh to many hundreds of grams of CO_2e per kWh generated. These emissions occur offsite from the biomass-burning facility and are therefore uncapturable using carbon capture and storage technologies. We summarize a few representative studies below.

- A lifecycle study examining wood pellets made from forest residues to produce electricity showed significant emissions from harvest, transport, chipping, and drying—totaling many hundreds of grams CO_2e per kWh, depending upon assumptions. Key drivers of emissions include timber harvest methods, wood hauling distance, type of fuel used for drying, duration of storage (methane emissions from decay could bring total supply chain emissions to more than 800 g CO_2e per kWh after four months of storage), and total dry matter losses (which can increase emissions by a range of 2-4% after one month and 11-13% after four months of storage).[37]

- A 2019 case study evaluating electricity from forest-derived biomass sourced in the Southeast U.S. published values for emissions from site establishment, mid-rotation

[35] U.S. EPA Science Advisory Board, *SAB Review of Framework for Biogenic CO_2 Emissions from Stationary Sources (2014)* at 2 (Mar. 4, 2019); *see also* U.S.EPA, Office of Air and Radiation, Office of Atmospheric Programs, Climate Change Division, *Framework for Assessing Biogenic CO2 Emissions from Stationary Sources* at 2, https://archive.epa.gov/epa/production/files/2016-08/documents/framework-for-assessing-biogenic-co2-emissions.pdf. Note that the SAB came to these conclusions after examining the biogenic emissions associated with a broad variety of biomass feedstocks, not just forest-derived biomass. In addition, because its charge was limited to biogenic emissions, it did not conduct a review of non-biogenic emissions.
[36] *See* Memorandum from President Biden, to Heads of Executive Departments and Agencies re: Restoring Trust in Government Through Scientific Integrity and Evidence-Based Policymaking (Jan. 27, 2021), https://www.whitehouse.gov/briefing-room/presidential-actions/2021/01/27/memorandum-on-restoring-trust-in-government-through-scientific-integrity-and-evidence-based-policymaking/ ("It is the policy of my Administration to make evidence-based decisions guided by the *best available science and data*." (emphasis added)).
[37] Röder et al*., supra* note 20.

fertilization, harvesting, processing, and domestic land transport totaling approximately 145 g CO_2e per kWh.[38]

- A report by UK-based Drax Group, a major wood-pellet-producing and power-generating entity, shows that supply chain emissions excluding those related to international shipping and trade range from approximately 58-76 g CO_2e per kWh.[39] These estimates include only a small fraction of emissions produced from drying feedstocks, which Drax elsewhere has estimated as 206 g CO_2e per kWh.[40] Drax's annual report also indicates that around 2 percent of these emissions originate at combustion in the form of CH_4 and N_2O. These non-CO_2 GHG emissions alone would disqualify forest biopower per Section 45Y(b)(1)(A)(iii) (GHG emissions can be no greater than zero g per kWh), even if carbon capture, utilization, and storage ("CCUS") technology were equipped.

- An August 2021 study estimated upstream emissions associated with biomass production and transport as 237 g CO_2e per kWh for wood pellets made from sawmill residues imported from mills in North America and 40 g CO_2e per kWh for wood pellets made from coppiced willow trees.[41]

c. The Argonne GREET Module for Forest Residues to Bio-electricity Pathways (2021) is wholly insufficient for identifying carbon emissions from the combustion of forest residues for electricity.

In 2021, Argonne National Laboratory developed a forest bioelectricity module as an update to the GREET model that "enables regionalized, life-cycle analysis of forest residues to

[38] *See* Mirjam Röder et al., *Understanding the Timing and Variation of Greenhouse Gas Emissions of Forest Bioenergy Systems*, 121 Biomass & Bioenergy 99, App. A-4 (2019), https://ars.els-cdn.com/content/image/1-s2.0-S0961953418303532-mmc1.pdf.
[39] Drax Group, Annual Report and Accounts (2021), https://www.drax.com/wp-content/uploads/2022/03/Drax_AR2021_2022-03-07.final_.pdf. Drax estimates its total supply chain emissions ranging from 100-131 kg CO_2eq per MWh from 2017-2021. The report estimates supply chain emissions for pellets produced from forests in the Southeast United States, of which approximately 42 percent are associated with international trade (transport to ports, international shipping, and rail transport).
[40] Natural Resources Defense Council, *Bad Biomass Bet* 7, https://www.nrdc.org/sites/default/files/bad-biomass-bet-beccs-ib.pdf.
[41] Samira García-Freites et al., *The Greenhouse Gas Removal Potential of Bioenergy with Carbon Capture and Storage (BECCS) to Support the UK's Net-Zero Emission Target*, Biomass & Bioenergy (2021), https://www.sciencedirect.com/science/article/pii/S0961953421002002. Emissions from energy generation were estimated to be 911 kg CO_2e per MWh for sawmill residue wood pellets, and even with an estimated negative 879 kg CO_2e per MWh from carbon sequestration from forest growth, total emissions for sawmill residue wood pellet supply chains were estimated at 269 kg CO_2e per MWh. *See also* Hui Xu et al., *supra* note 6; NREL, *Life Cycle Greenhouse Gas Emissions from Electricity Generation: Update* (2021), https://www.nrel.gov/docs/fy21osti/80580.pdf; Laganière, *supra* note 21; Walker et al., *supra* note 17.

bio-electricity pathways…."[42] This module appears to be the sole basis for identifying carbon emissions from the combustion of forest residues for electricity in this proposed hydrogen rule.[43] This Argonne Forest Residue Module assumes carbon neutrality and excludes counterfactual net emissions calculations altogether[44]. Therefore, it produces estimates that significantly underestimate the actual carbon emissions of forest-derived feedstocks for electricity.

According to the developers of the module:

> *"This study* ***assumes carbon neutrality****, meaning that the CO_2 emitted during forest biomass combustion is offset by the CO_2 uptake from the atmosphere by trees*."[45] (emphasis added)

The Argonne Forest Residue Module cites only one source[46] to support its claim of carbon neutrality: the Trump administration's 2018 statement of agency intent regarding bioenergy issued by then-EPA Administrator Scott Pruitt[47] (herein "Statement").

- The Statement is an unsigned, undated, non-binding statement and acknowledges that it *"does not represent a final agency action."*[48]

---

[42] U. S. Department of Energy, Argonne National Laboratory, Energy Systems Division, *Summary of Expansions and Updates in GREET,* ANL/ESD-21/16 at 14 (2021), https://www.osti.gov/servlets/purl/1824336 at 14; Hui Xu et al., *supra* note 6.

[43] U.S Department of Energy, *Guidelines to Determine Well-to-Gate Greenhouse Gas (GHG) Emissions of Hydrogen Production Pathways using 45VH2-GREET 2023,* (Dec. 2023) https://www.energy.gov/sites/default/files/2023-12/greet-manual_2023-12-20.pdf.

[44] This exclusion is in direct contradiction to earlier Argonne studies on the subject. See for example, U.S. DOE, Argonne National Laboratory, *Carbon Dynamics for Biofuels Produced from Woody Feedstocks,* ANL/ESD-18/10, (2014) at 43. "*From the analytic basis built in the current study, therefore, reliable counterfactual scenarios (or business-as-usual [BAU] cases) should be developed and compared with the bioenergy scenarios. For example, the forest operations for softwood currently leave thinnings and residues on the ground. In a counterfactual scenario, this biomass would either decay or be burnt or sequestered in soil, changing the level of SOC."*

[45] Hui Xu et al., *Regionalized Life Cycle Greenhouse Gas Emissions of Forest Biomass Use for Electricity Generation in the United States*, 55 Env't Sci. & Tech. 14806, at 14811, https://doi.org/10.1021/acs.est.1c04301.

[46] Hui Xu et al., *Regionalized Life Cycle Greenhouse Gas Emissions of Forest Biomass Use for Electricity Generation in the United States*, 55 Env't Sci. & Tech. 14806, at 14811 footnote 52, https://doi.org/10.1021/acs.est.1c04301.

[47] U.S. Environmental Protection Agency*, EPA's Treatment of- Biogenic Carbon Dioxide (CO2) Emissions from Stationary Sources That Use Forest Biomass for Energy Production,* (2018), https://www.epa.gov/sites/default/files/2018-04/documents/biomass_policy_statement_2018_04_23.pdf

[48] U.S. Environmental Protection Agency*, EPA's Treatment of- Biogenic Carbon Dioxide (CO2) Emissions from Stationary Sources That Use Forest Biomass for Energy Production,* at 2 (2018), https://www.epa.gov/sites/default/files/2018-04/documents/biomass_policy_statement_2018_04_23.pdf.

- The Statement was not published in the Federal Register or CFR. By Administrator Pruitt's own written admission, the Statement is not guidance, not the result of a rulemaking, and not subject to administrative procedures such as public comment.

- The Statement acknowledges the scientific arguments against *apriori* biomass carbon neutrality: *"**it is not scientifically valid to assume that all biogenic feedstocks are carbon neutral**, but rather that the net biogenic carbon profile related to the use of biomass feedstocks depends upon factors related to feedstock characteristics, production and consumption, and alternative uses"*[49] and concedes that the document *"is not a scientific determination."*[50]

- The Statement *"does not revise or amend any scientific determinations that EPA has previously made"*[51] and clarifies the document is not a policy decision but rather "this statement of policy is intended to signal the Agency's intent..."[52]

The Pruitt Statement is plainly *not* established "policy adopted"[53] as characterized by the Argonne Forest Residue Module's citation. More importantly, given the Statement's extensive shortcomings listed above, it cannot be a basis for – let alone the sole determinant of – agency analysis that underlies climate policy rulemaking.

The decision in the Argonne Forest Residue Module to exclude biogenic emissions and to rely on an unmaterialized Trump-era policy vision as the sole basis for this exclusion is arbitrary, unscientific, and counter to the statutory requirements under the IRA. Moreover, it frustrates the emissions reduction goals of the Biden administration.

For these reasons, the Department of Treasury and the Internal Revenue Service must reject the Argonne Forest Residue Module and accompanying assumptions in the GREET User Handbook as the basis for a forest residue production pathway and exclude forest residues as a hydrogen production technology[54] in the final rule altogether. Any successor module developed pursuant to Treasury's authority as provided by Section 45V(c)(1)(B),[55] must rigorously determine both biogenic emissions and non-biogenic emissions using a scientifically defensible,

---

[49] U.S. Environmental Protection Agency*, EPA's Treatment of- Biogenic Carbon Dioxide (CO2) Emissions from Stationary Sources That Use Forest Biomass for Energy Production,* at 3 (2018), emphasis added, https://www.epa.gov/sites/default/files/2018-04/documents/biomass_policy_statement_2018_04_23.pdf.
[50] U.S. Environmental Protection Agency*, supra* note 48.
[51] *Id.*
[52] *Id.*
[53] Hui Xu et al., *supra* note 44.
[54] See GREET User Manual Table 2.
[55] Under section 45V(c)(1)(B), the term "lifecycle greenhouse gas emissions" includes emissions only through the point of production, as determined under the most recent GREET model or *a successor model as determined by the Secretary of the Treasury or her delegate*. Emphasis added.

transparent and robust assessment tool. Moreover, the GREET User Manual's background data assumptions fail to take into account the full range of estimates for non-biogenic emissions (see Section II (1)(b) of these comments for our critique of non-biogenic emissions in electricity production) and must be revised.

III. <u>Hydrogen Production Through Gasification of Forest Residues</u>

Summary: As we demonstrate below, when forest residues are used as a feedstock to produce hydrogen through gasification, neither biogenic emissions nor non-biogenic emissions can be treated *apriori* as zero (for the reasons cited above). Gasification of forest residues during the production of hydrogen generates approximately 30 kg CO2/ kg H_2 of biogenic emissions at the hydrogen plant flue, and these emissions can persist at levels *above* the statutory threshold of 4 kg CO2/kg H_2 for a period of approximately three decades. The Guidelines to Determine Well-to-Gate Greenhouse Gas (GHG) Emissions of Hydrogen Production Pathways reiterates the carbon neutrality assumptions for forest residues found in the Argonne Forest Residues Module, and therefore similarly violates fundamental principles of GHG biogenic accounting. In addition, evidence from the peer-reviewed literature shows that the non-biogenic emissions associated with sourcing the feedstock for production can typically range in the hundreds of kg CO_2/kW-h.

1. Statutory Authority and Requirements for Clean Hydrogen Production Under Section 45V

As described in Section II of these comments, both the statutory language and the agency's proposed definition of "lifecycle greenhouse gas emissions" expressly include biogenic emissions and non-biogenic emissions. The draft rule proposes that lifecycle greenhouse gas emissions account for *"emissions associated with the hydrogen production process"*[56] which includes biogenic CO_2 resulting from the thermo-chemical gasification of wood emitted directly from the flue of the hydrogen plant. It represents the biological source of carbon in the forest residue feedstock itself. These emissions are separate and distinct from the emissions produced in generating electricity to *operate* the plant, described above. Biogenic flue emissions at a hydrogen production facility represent the transfer of carbon from the land to the atmosphere.

Emissions from feedstock *"gathering, extraction, processing, and delivery"*[57] are typically non-biogenic emissions. They are unrelated to biological processes, and include, inter alia, emissions associated with extracting, transporting, drying, and preparation of forest residue materials. These non-biogenic emissions occur most often from fossil fuel combustion.

---

[56] 88 Fed. Reg. at 89246.
[57] *Id.*

As we show below, gasification during the production of hydrogen generates approximately 30 kg CO_2/ kg-H of biogenic emissions at the plant flue, and these emissions persist at levels *above* the statutory threshold of 4 kg CO_2/kg H_2 for a period of approximately three decades. Section II (1)(b) of these comments presents evidence from the literature showing that the non-biogenic emissions can typically range in the hundreds of kg CO2/kW-h.

a. The 45VH2-GREET 2023 model[58] fails to accurately account for biogenic and non-biogenic emissions from forest residues.

When forest residues are used as a feedstock to produce hydrogen through gasification, neither biogenic emissions nor non-biogenic emissions can be treated *apriori* as zero (for the reasons cited extensively in Section II above).

To summarize: Any claim of *de facto* carbon neutrality rests on the flawed assumption that the biogenic carbon released through the combustion or gasification of forest biomass is inherently offset by forest growth or other biogenic processes.[59] In the case of unmerchantable forest residues used as a raw material for gasification, proponents erroneously argue that biogenic emissions are immediately offset because the feedstock would otherwise decay and generate emissions in the process. As noted above, this assumption has been rebutted by numerous scientific bodies, including EPA's Science Advisory Board.[60] Such assumptions fail to encompass the scientific fundamentals of carbon accounting, which require accounting for the extent and timing of any biogenic mitigation using counterfactual analysis.[61] Using forest biomass to produce energy releases CO_2 at the source, and in most cases - including those cases where forest residue feedstocks would otherwise decay - these emissions persist in the atmosphere for many decades.[62]

The Guidelines to Determine Well-to-Gate Greenhouse Gas (GHG) Emissions of Hydrogen Production Pathways using 45VH2-GREET (GREET User Manual) reiterates[63] the

[58] Under section 45V(c)(1)(B), the term "lifecycle greenhouse gas emissions" includes emissions only through the point of production, as determined under the most recent GREET model or a successor model as determined by the Secretary of the Treasury or her delegate.
[59] For the purposes of these comments, the term "offset," or "offsetting" refers specifically to subsequent biogenic uptake and storage of a matching volume of carbon elsewhere in the global system, for example, as a harvested forest regrows. We use the term here as distinct from any association with the Voluntary Carbon Market.
[60] U.S. EPA Science Advisory Board, *supra* note 33.
[61] Ter-Mikaelian, *The Burning Question*, *supra* note 19.
[62] Bernier et al., *supra* note 21; Gert-Jan Nabuurs et al., *European Forests Show No Carbon Debt, Only a Long Parity Effect*, 75 Forest Pol'y Econ. 120–25 (2017); Bentsen, *supra* note 26; David Pare*, Using Ecosystem CO_2 Measurements to Estimate the Timing and Magnitude of Greenhouse Gas Mitigation Potential of Forest Bioenergy*, 5 Global Change Biology - Bioenergy, 67, 67–72 (2013); Bjart Holtsmark, *supra* note 21; Laganière et al., *supra* note 21; McKechnie et al., *supra* note 21; Pingoud et al., *supra* note 21; Stephenson et al., *supra* note 21; Ter-Mikaelian et al., *supra* note 21; Zanchi et al., *supra* note 21; Walker et al., *supra* note 17.
[63] U.S Department of Energy, *supra* note 43, footnote 15.

carbon neutrality assumptions in the Argonne Forest Residues Module referenced above, and therefore similarly violates fundamental principles of GHG biogenic accounting. According to the GREET User Manual:

> *"45VH2-GREET 2023 currently allows for biomass gasification to be modeled using … forest logging residue with no significant market value, such as bark, branches, cutter shavings, leaves, needles, and pre-commercial thinnings (i.e., not milling residues from industrial processing or whole trees). In hydrogen production pathways that use allowable feedstocks,* ***45VH2-GREET assumes that biogenic CO2 emissions that result from gasification equal CO2 emissions that were captured during growth of the feedstock."***[64] (emphasis added)
>
> *In the case of forest logging residues, as these materials otherwise would have likely decayed over time or been pile-burned, the resulting emissions associated with using the materials to produce hydrogen are expected to be negligible or about the same as if the material were not collected and used.*[65]

In these two excerpts above, the Manual puts forth two separate erroneous assumptions - both of which have been wholly discredited in the peer-reviewed literature[66]: (i) emissions are "pre-captured" during feedstock growth; and (ii) emissions from decay can be treated as instantaneous and automatic.

As we show below, in the case of unmerchantable forest residues that would otherwise decay, when counterfactual analysis is properly done, the gasification during the production of hydrogen generates approximately 30 kg CO_2/ kg-H of biogenic emissions at the plant flue, and these emissions persist at levels *above* the statutory threshold of 4 kg CO_2/kg H_2 for a period of approximately three decades.

IV. The Treasury Department Must Reject the Argonne Forest Residue Module and its Related Assumptions in the GREET User Manual and Rely Instead on a Rigorous Counterfactual Framework for Biogenic Emissions.

Foremost, the Department of Treasury's underlying analysis supporting this rule must not presume carbon neutrality of forest biomass, including forest residues. As discussed above, such an assumption is contrary to the established science and expressly disavowed by both the IPCC

[64] U.S Department of Energy, *Guidelines to Determine Well-to-Gate Greenhouse Gas (GHG) Emissions of Hydrogen Production Pathways using 45VH2-GREET 2023 footnote 15,*(Dec. 2023) https://www.energy.gov/sites/default/files/2023-12/greet-manual_2023-12-20.pdf.
[65] *Id.*
[66] Ter-Mikaelian, et al., *The Burning Question*, *supra* note 19.

and EPA's Science Advisory Board. Treasury should instead rely on counterfactual analyses described in Section III above.

Counterfactual modeling[67] generates a direct numeric estimate of net biogenic emissions by comparing a scenario *with* biomass demand against a business-as-usual scenario *absent* biomass demand (BAU). The net biogenic emissions are calculated as the difference between the BAU and the demand scenario.[68] In the case of forest residues that would otherwise decay, the biogenic mitigation can be directly determined from the decay rates of the forest materials. The exponential decay constants have been published in several sources.[69]

Using a basic counterfactual framework from the peer-reviewed literature,[70] Hammerschlag[71] generated estimates for the cumulative net emissions resulting from electricity production from unmerchantable timber harvest residues sourced in New York state for successive years of production.[72]

His results, based on EPA-published decay functions, show a biogenic emissions intensity factor of 0.57 after twenty years from the year of initial emissions. For energy production tax credit purposes, this means: at the taxable year that falls twenty years after the year of initial production (inclusive of all successive years of emission), 57% of the original stack emissions remain in the atmosphere while 43% have been mitigated through avoided biological decay. Net emissions exceed this amount for all prior years.

---

[67] Ter-Mikaelian, et al., *The Burning Question*, *supra* note 19; Walker et al., *supra* note 17.

[68] U.S. EPA Science Advisory Board, *supra* note 33.

[69] For example, the U.S. EPA has developed an analytical approach using counterfactual modeling for determining biogenic emissions from burning forest biomass for electricity, *Framework for Assessing Biogenic CO_2 Emissions from Stationary Sources*, in which decay functions for different regions of the U.S. are published. EPA, *Framework for Assessing Biogenic CO2 Emissions from Stationary Sources,* Appendix J, Table 2, at J-19, (2014), https://archive.epa.gov/epa/production/files/2016-08/documents/framework-for-assessing-biogenic-co2-emissions.pdf. The values reported in the U.S. EPA Framework were generated with the greenhouse gas version of the Forest and Agricultural Sector Optimization Model (FASOM-GHG). FASOM-GHG simulates forest production in eleven primary regions. Within the Northeast region, for example, the U.S. EPA Framework offers two values for *k*, one for softwoods $k_s = 0.053$ and one for hardwoods $k_h = 0.069$.

[70] Booth, *supra* note 25.

[71] Roel Hammerschlag, Memorandum to the NRDC*, Net Emissions Impact of Biomass Harvested in New York State,* (Feb. 2019). (Attachment 2)

[72] Hammerschlag assumed the residues are sourced in New York State based on hardwood/softwood partitioning based on customary practices and state records.

1. **For Forest Residues that Decay, the Net Biogenic Emissions for Gasification Exceed the 45V Credit Threshold of 4 kg CO_2/kg H_2, and the Net Biogenic Emissions for Electricity Generation Exceed the Average U.S. Emissions Rate.**

Adapting the Hammerschlag (2019) results using a more generalized decay constant representative of a national average ($k = 0.065$) and simplifying to just a single year of production (for the purposes of illustration) generates the following results:

- Hydrogen gasification[73] creates net emissions that exceed the statutory credit threshold of 4 kg CO_2/kg H_2 for a period of approximately thirty years after production.[74]
- Electricity generation creates net emissions that exceed the average emissions intensity from the U.S. grid for approximately fifteen years after electricity generation.[75]

Both counterfactual analyses are depicted in the figures below.

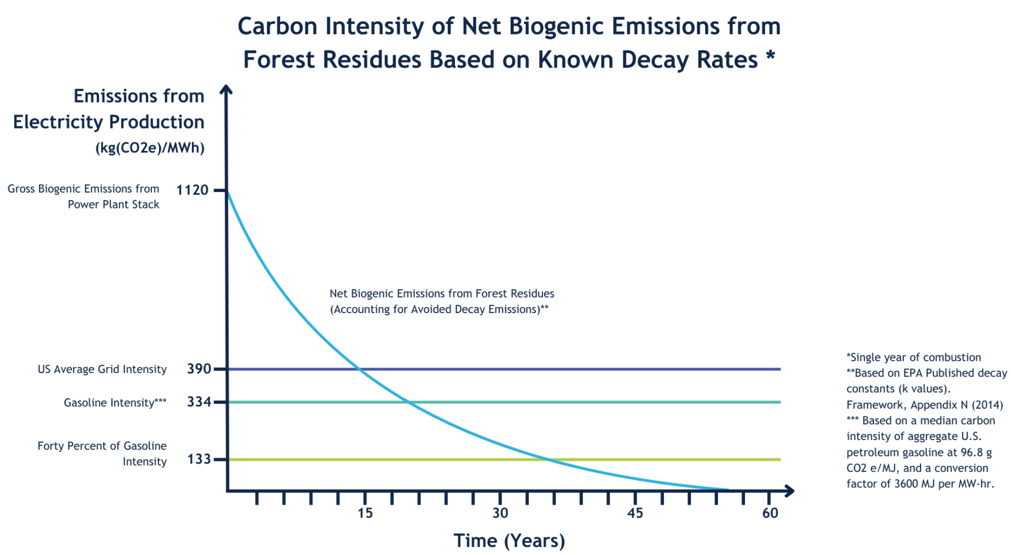

Figure 3: Carbon Intensity of Net Biogenic Emissions from Forest Residues Based on Known Decay Rates – Emissions from Electricity Production.

---

[73] We calculate stack emissions from the flue during hydrogen production based on first principles, using data and calculations from Klass, Donald L, *Biomass for Renewable Energy, Fuels, and Chemicals*, Academic Press 1998, p.76. (Table 3.5), https://doi.org/10.1016/B978-012410950-6/50003-9. ($kgCO_2/kgH_2 = (51.8 \times 44/12) / 6.3 = 30$ kg CO2/kg-H_2).

[74] This assumes the following input parameters: a decay constant of .065, production flue emissions of 30 kg CO_2/kg H_2, and a credit threshold of 4 kg CO2/kg H_2.

[75] This assumes the following input parameters: a decay constant of .065, stack emissions of 1120 kg CO_2/kW-h, and an average grid intensity of 390 kg CO_2/kW-h.

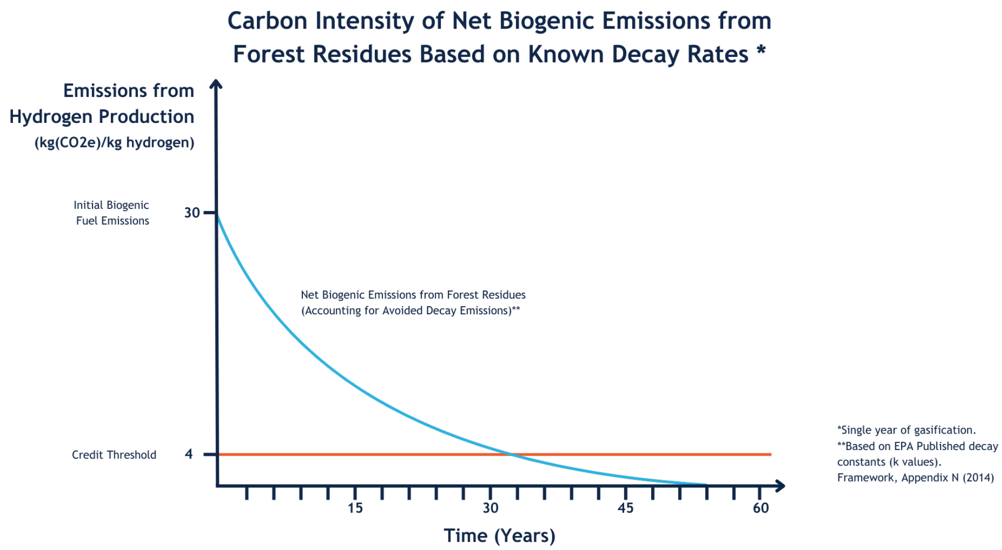

Figure 4: Carbon Intensity of Net Biogenic Emissions from Forest Residues Based on Known Decay Rates – Emissions from Hydrogen Production.

V. **Conclusion**

The Department of Treasury must rigorously account for biogenic and non-biogenic sources of CO_2 in determining lifecycle GHG emissions under Section 45V. With respect to forest-derived feedstocks to produce energy, it is scientifically indefensible to assume biogenic emissions are *apriori* carbon neutral.

The carbon neutrality assumptions underlying the GREET forest residues pathway therefore renders that analysis unscientific, arbitrary, and wholly inadequate. Moreover, it runs counter to statutory requirements and frustrates the emissions reduction goals of the Biden administration.

For these reasons, the Department of Treasury and IRS must reject the Argonne Forest Residue Module and similar assumptions in the GREET User Handbook as a basis for a forest residue production pathway and exclude forest residues as a hydrogen production technology in the final rule altogether. Any successor module developed pursuant to Treasury's authority as provided by Section 45V(c)(1)(B), must rigorously determine both biogenic emissions and non-biogenic emissions using a scientifically defensible, transparent and robust assessment tool.

Thank you for the opportunity to comment. We welcome the opportunity to discuss these issues further with the Department of Treasury and the Internal Revenue Service.

Respectfully Submitted,

Sami Yassa
Senior Scientist
Natural Resources Defense Council
(415) 269-1355
syassa@nrdc.org