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November 4, 2022

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

Charles P. Rettig
Commissioner
Internal Revenue Service
1111 Constitution Ave., NW
Washington, DC 20224

Re: Notice 2022-49 - Comments on the Treatment of Forest-Derived Biomass Electricity Under Section 45Y

Dear Ms. Batchelder & Mr. Rettig,

The undersigned respectfully submit the following comments to the Department of the Treasury and the Internal Revenue Service in response to the Request for Comments on Certain Energy Generation Incentives (Notice 2022-49) under the Inflation Reduction Act of 2022 ("IRA" or the "Act"). The undersigned are a group of non-governmental organizations that have worked extensively on issues related to the use of forest biomass for electricity production. These comments therefore focus exclusively on the role of forest-derived biomass and demonstrate that the emissions rate for power plants utilizing such material is well above zero. Accordingly, Treasury must classify forest-biomass-burning power plants as non-zero emissions sources ineligible for Clean Electricity Production Tax Credits ("CEPTC") under Section 45Y.[1]

[1] Except as otherwise noted, Section references herein are to the Internal Revenue Code of 1986, as amended (the "Code").

I. Summary of Comments

One of the stated goals of the IRA is to "combat the climate crisis" and "[p]ut America on track to meet President Biden's climate goals . . . ."[2] It does so by promoting clean energy, in part through the introduction of the CEPTC. Although the IRA does not define "clean energy" or "clean electricity," Section 45Y plainly limits eligibility for CEPTC to zero-emitting facilities. Consistent with that limitation, the Act obligates Treasury to set greenhouse gas ("GHG") emissions rates for types and categories of facilities in order to determine a taxpayer's eligibility for CEPTC under Section 45Y.

As described in further detail below, power plants that burn forest biomass (i.e., forest biopower) as fuel cannot meet this zero-emissions criterion. Net emissions from forest biopower exceed those from fossil fuels and persist in the atmosphere over the long term. Even assuming that biogenic emissions from the smokestack are fully captured, the uncapturable, non-biogenic emissions involved with logging, transporting, processing, and drying the fuel remain significant. Accordingly, the Treasury Department must classify power plants that burn forest biomass as non-zero emissions sources and therefore ineligible for the new CEPTC under Section 45Y.

In these comments, we focus exclusively on forest-derived biomass,[3] by which we mean a woody fuel removed directly from a forest.[4] We present the established scientific evidence showing that power plants generating electricity from forest-derived biomass should not be treated as "zero emissions" sources under Section 45Y. While burning forest biomass for electricity in some very limited cases can provide benefits when compared to fossil fuels, the total net lifecycle emissions from logging, transporting, drying, processing, and combustion typically persist in the atmosphere over the long term, even accounting for mitigating factors like forest regrowth.

As we show in these comments, biogenic stack emissions from burning forest-derived fuels for electricity can range from approximately 1180 g CO_2e per kilowatt hour ("kWh") to 1460 g CO_2e per kWh, and while the emissions vary based upon the moisture content of the fuel, they exceed those from coal-fired plants. Although these emissions can abate over time due to biogenic mitigation such as forest regrowth, they typically remain in the atmosphere for decades to centuries depending upon the feedstock, well past timeframes to address the worst impacts of climate change.

Non-biogenic CO_2 emissions from forest biopower, which forest regrowth cannot directly mitigate, are also non-zero and significant. These emissions result from logging, transporting, processing, and drying the fuel, among other factors, and can amount to several hundreds of grams CO_2e per kWh, depending upon the feedstock and the production process.

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[2] 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/.
[3] In these comments, we use the term "forest-derived biomass" synonymously with "forest biomass."
[4] We exclude from this definition industrial wastes, such as black liquor in pulping operations.

Taken in sum, total net emissions from forest biopower exceed those from fossil fuels and persist in the atmosphere over the long term. Uncapturable emissions involved with logging, transporting, processing, and drying the fuel remain significant. Plainly, power plants that burn forest biomass as fuel cannot meet the zero-emissions criterion under Section 45Y, and such plants therefore should be ineligible for CEPTC.

U.S. policymakers must avoid making the same mistakes as policymakers in the EU and the UK, which erroneously treat biomass as zero emissions at the smokestack and heavily subsidize bioelectricity production. Those miscalculations undermine ambitions to reduce GHG emissions in the energy sector.[5] Treatment of forest biomass as categorically zero-carbon will create a false sense of optimism in our progress toward decarbonization, without translating into real and measurable emissions reductions, and even worsening climate impacts.

II. Statutory Authority and Requirements Under Section 45Y: Treasury is required to establish greenhouse gas emissions rates for specific facility types or categories of facilities to determine eligibility for Clean Electricity Production Tax Credits.

Under Section 45Y, qualified facilities that generate electricity are eligible for a tax credit provided the GHG emissions rate of the facility is not greater than zero, expressed as grams of CO_2e per KWh.[6] The Act requires that Treasury establish GHG emissions rates for specific "types or categories of facilities."[7]

In the case of facilities that produce electricity through combustion or gasification—which includes power plants that burn forest biomass for electricity—Section 45Y requires Treasury to account for "lifecycle greenhouse gas emissions" in determining the GHG emissions rate:

> [T]the greenhouse gas emissions rate for such facility shall be equal to the net rate of greenhouse gases emitted into the atmosphere by such facility (taking into account lifecycle greenhouse gas emissions, as described in section 211(o)(1)(H) of the Clean Air Act (42 U.S.C. 7545(o)(1)(H))) in the production of electricity, expressed as grams of CO_2e per KWh.[8]

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

[5] For example, in 2019, wood pellets produced in the U.S. and burned for power in the UK were responsible for 13-16 million tons of CO_2. Duncan Brack et al., *Greenhouse Gas Emissions from Burning US-Sourced Woody Biomass in the UK* (Oct. 2021), Chatham House, https://www.chathamhouse.org/sites/default/files/2021-10/2021-10-14-woody-biomass-us-eu-uk-summary.pdf. The Drax Selby plant, a major bioenergy producer, is the UK's single largest CO_2 emitter and one of the top five emitters of particulate matter (PM_{10}) in Europe. Tom Harrison, *UK Biomass Emits More CO_2 than Coal* (Oct. 8, 2021), Ember, https://ember-climate.org/insights/research/uk-biomass-emits-more-co2-than-coal/.
[6] Section 45Y(b)(1)(A)(iii) & (b)(2)(A).
[7] Section 45Y(b)(2)(C).
[8] Section 45Y(b)(2)(B).

production and distribution, from feedstock generation or extraction through the distribution and delivery and use of the finished fuel to the ultimate consumer ….[9]

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

1. *"[D]irect emissions" from the combustion of biomass and "significant indirect emissions from land use changes"* are biogenic emissions—related to biological sources[10] and processes. They represent the transfer of carbon from the land to the atmosphere.

2. *"[F]uel 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.

Arguably, then at the very least, Treasury must, in determining the GHG emissions rate for a forest biomass-combusting facility, account for both biogenic and non-biogenic sources of GHG emissions.

III. When Accounting for Biogenic and Non-Biogenic Sources, the Net Emissions Rate for Forest Biopower Facilities Significantly Exceed Zero. Forest Biopower Facilities Therefore Cannot Qualify for the Clean Electricity Production Tax Credit Under Section 45Y.

In the following two subsections, we describe the established science on the GHG impacts of burning forest biomass for electricity and show that neither biogenic emissions nor non-biogenic emissions can be treated as zero.

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

Biogenic emissions can occur as direct smokestack emissions through combustion of woody materials (representing the transfer of carbon from the forest to the atmosphere) and during logging, processing, and pretreatment (i.e., as the result of disturbances to above-ground and below-ground forest carbon during harvest, or as the result of decomposition during storage), as well as by means of subsequent decay of timber harvest residues.

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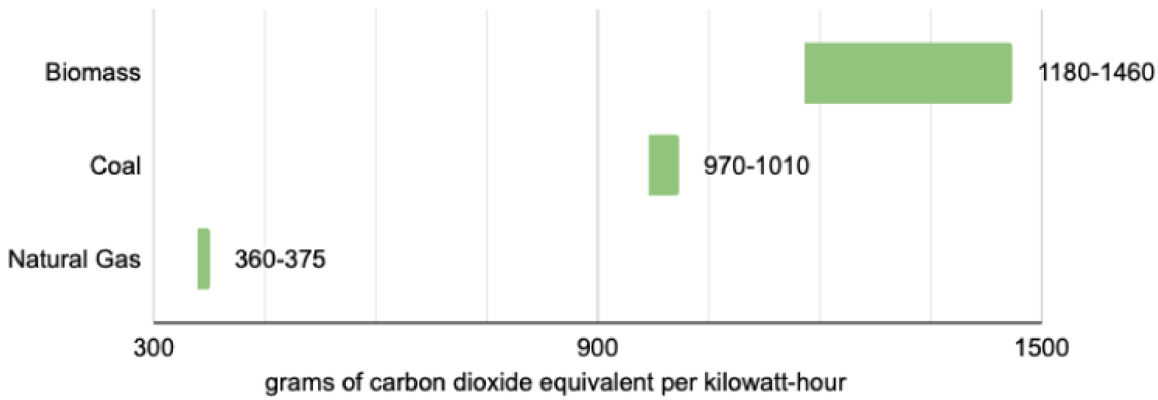
[9] 42 U.S.C. § 7545(o)(1)(H). This definition appears in a provision of the Clean Air Act related to transportation fuels.

[10] 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).

At the smokestack, power plants that burn forest biomass emit more CO_2 per kilowatt hour than identical power plants that burn fossil fuels.[11] With its high moisture content, wood is less energy-dense and more emissive than coal per unit of energy generated, typically producing emissions in the range of approximately 1180 g CO_2e per kWh to 1460 g CO_2 per kWh.[12] As shown in the table 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[13]



Many biomass proponents have long claimed that electricity produced by burning forest biomass in power plants is categorically "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, arguing that this biogenic, land-based mitigation can be counted immediately because forests generally sequester CO_2 from the atmosphere through photosynthesis.[14]

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[11] 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.

[12] 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.

[13] Values for biomass, natural gas, and coal emissions rates from Walker et al., *supra* note 12; Fisher et al., *supra* note 12.

[14] *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 [hereinafter Ter-Mikaelian et al., *The Burning Question*].

Such simplistic assumptions fail to acknowledge scientific fundamentals of forest carbon accounting.[15] 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[16] while biogenic mitigation occurs—if it occurs at all. 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.[17]

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

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[15] Walker et al., *supra* note 12; 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.

[16] 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 12.

[17] 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 12.

regrowth and the associated carbon sequestration just to reach net emissions parity[18] with fossil fuels.[19] 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.[20] In all of these cases, the carbon debt period extends well beyond timeframes to address the worst impacts of climate change.

These findings are supported by two recent independent meta-analyses[21] 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. They show that over 80 percent of peer-reviewed assessments found positive net emissions associated with the use of woody biomass feedstocks—after accounting for biogenic mitigation. Carbon debt periods in these studies range from several years to many centuries. Similarly, a study done jointly by the Spatial Informatics Group and the Woods Hole Research Center has found that "[t]he vast majority of all published quantitative assessments have concluded that there are net greenhouse gas (GHG) emissions associated with the use of forest-derived woody biomass for electricity production when compared to generating an equivalent amount of energy from fossil sources, even when accounting for subsequent biomass regrowth and avoided fossil emissions."[22]

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 biomass

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[18] 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 14.

[19] 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 12; 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.

[20] Repo et al., *supra* note 17; Stephenson et al., *supra* note 16; 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.

[21] Two comprehensive meta-analyses on the topic of greenhouse gas emissions of woody biomass energy, Buchholz et al. (2016) and Bentsen (2017), summarize the full breadth of quantitative studies conducted over the past 25 years that assess the extent of carbon impacts/benefits incurred by burning biomass to produce energy. 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.

[22] 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* 3 (Oct. 31, 2018), https://www.sig-nal.org/_files/ugd/f5c52e_a51f246c8a854cf594ce47e6d05d9616.pdf.

for energy has been demonstrated to increase emissions to the atmosphere, in many cases for decades to centuries[23]—even when land-based biogenic mitigation is considered.

Despite misunderstandings to the contrary, 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."[24]

In its 2014 assessment of the science on climate change mitigation, the IPCC explicitly addressed this issue again. Although many assume 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 report clarifies that "[t]he shortcomings of this assumption have been extensively discussed in environmental impact studies and emission accounting mechanisms."[25] 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 . . . ."[26]

Finally, treatment of forest biopower as categorically carbon neutral has also been rejected by the EPA's Science Advisory Board ("SAB"). Instead, 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 a priori assumptions of carbon neutrality. 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 a priori*,"[27] and "*not all biogenic emissions are carbon neutral nor net additional to the atmosphere, and assuming so is inconsistent with the underlying science*."[28]

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[23] *Id*. at 3, 6.
[24] *Frequently Asked Questions: Q2-10*, IPCC Task Force on National Greenhouse Gas Inventories, https://www.ipcc-nggip.iges.or.jp/faq/faq html.
[25] 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.
[26] *Id*.
[27] Letter from EPA Science Advisory Board to Administrator Jackson (Sept. 28, 2012), Executive Summary, at 3 (Attachment A).
[28] EPA, Office of the Administrator, Science Advisory Board, *SAB Review of Framework for Biogenic CO_2 Emissions from Stationary Sources (2014)* at 2 (Mar. 2019) (Attachment B); *see also* 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.

In sum, the established science[29] 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 40 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).[30]

- 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 fertilization, harvesting, processing, and domestic land transport totaling approximately 145 g CO_2e per kWh.[31]

- 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.[32] These estimates include only a small fraction of emissions produced from drying feedstocks, which Drax

[29] *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)).
[30] Röder et al*., supra* note 15.
[31] *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.
[32] 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).

elsewhere has estimated as 206 g CO_2e per kWh.[33] 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.[34]

IV. Should Treasury decide to undertake a lifecycle GHG analysis for forest biopower facilities, then it must apply scientifically rigorous analytic methods.

As noted above, Treasury has the statutory authority under Section 45Y(b)(2)(C) to establish the emissions rate of forest biopower facilities (a type or category of facility) as non-zero, provided it accounts for the lifecycle factors enumerated in Section 211 of the Clean Air Act as required by Section 45Y. The established science, summarized above, is more than sufficient to support an agency finding that disqualifies forest biopower as a zero-emitting source under Section 45Y.

Nevertheless, in the event that Treasury chooses to carry out a lifecycle analysis of forest biopower facilities, on its own or jointly with other agencies, to demonstrate and document the existence of these non-zero emissions, the agency must rely on and adopt rigorous, established GHG accounting protocols.

Foremost, Treasury's analysis must not presume carbon neutrality of forest biomass. As discussed above, such an assumption is contrary to the established science and expressly disavowed by both the IPCC and SAB. Treasury should assess both: (1) biogenic factors regarding the carbon balance in the forest (i.e., the carbon stocks and fluxes, and resulting biogenic emissions); and (2) the supply chain emissions (both biogenic and non-biogenic).[35]

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[33] Natural Resources Defense Council, *Bad Biomass Bet* 7, https://www.nrdc.org/sites/default/files/bad-biomass-bet-beccs-ib.pdf.

[34] 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., *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; NREL, *Life Cycle Greenhouse Gas Emissions from Electricity Generation: Update* (2021), https://www.nrel.gov/docs/fy21osti/80580.pdf; Laganière, *supra* note 16; Walker et al., *supra* note 12.

[35] Mirjam Röder et al., *Understanding the Timing and Variation of Greenhouse Gas Emissions of Forest Bioenergy Systems*, 121 Biomass & Bioenergy 99, 99–114 (2019), https://www.sciencedirect.com/science/article/pii/S0961953418303532; Walker et al., *supra* note 12; Fisher et al., *supra* note 12.

The agency should rely on counterfactual modeling[36] to estimate the changes in stored carbon in forests. This approach compares emissions from increased biomass harvesting to a scenario absent increased biomass demand for bioenergy and reflects what is "additional" to business as usual. Beginning in 2012, the EPA undertook significant effort to develop an analytical approach using counterfactual modeling for determining biogenic emissions from burning forest biomass for electricity. This resulted in their *Framework for Assessing Biogenic CO_2 Emissions from Stationary Sources*.[37]

The net GHG emissions rate will vary regionally and with forest type, harvest method, transportation distance, plant efficiency, and numerous other factors. To get a reasonable degree of confidence on the numeric quantity of net emissions, the analysis would likely require evaluations and modeling that are specific to particular regions, facility types and their associated feedstock(s).[38] A rigorous accounting by Treasury therefore would require substantial resources while ultimately yielding the same outcome as the established science (i.e., ineligibility).

V. A Facility Cannot Qualify for Credits Under Both Section 45Y and Section 45Q.

While emissions removed via CCUS can factor into the net emissions rate for a facility under Section 45Y,[39] that same facility cannot simultaneously qualify for a CCUS credit under Section 45Q. This is clearly established in the statutory text:

> The term 'qualified facility' shall not include any facility for which a credit determined under section 45, 45J, **45Q,** 45U, 48, 48A, or 48D is allowed under section 38 for the taxable year or any prior taxable year.[40]

Power plants that burn forest biomass to generate electricity and capture smokestack CO_2 emissions using CCUS technology, therefore, may be eligible for tax credits under Section 45Q or may apply captured carbon in calculating the net emissions rate under Section 45Y, but not both.

Although the Act explicitly prohibits such double dipping, we remain concerned that power plants that burn forest biomass (with or without CCUS) may improperly try to claim both credits by pointing to the carbon reductions achieved through tree growth as a form of sequestration (under Section 45Q) while also claiming that those same reductions lead to zero-emissions electrical generation (under Section 45Y). For example, if a taxpayer owns large tracts of

[36] Ter-Mikaelian, et al., *The Burning Question*, *supra* note 14; Walker et al., *supra* note 12.
[37] EPA, *Framework for Assessing Biogenic CO2 Emissions from Stationary Sources* (2014), https://archive.epa.gov/epa/production/files/2016-08/documents/framework-for-assessing-biogenic-co2-emissions.pdf.
[38] *See* attached documents from the EPA Science Advisory Board (2012, 2019), *supra* notes 27 and 28.
[39] *See* Section 45Y(b)(2)(D) ("For purposes of this subsection, the amount of greenhouse gases emitted into the atmosphere by a facility in the production of electricity shall not include any qualified carbon dioxide that is captured by the taxpayer and—(i) pursuant to any regulations established under paragraph (2) of section 45Q(f), disposed of by the taxpayer in secure geological storage, or (ii) utilized by the taxpayer in a manner described in paragraph (5) of such section.").
[40] Section 45Y(d) (emphasis added).

forested lands as well as a biomass power plant, that taxpayer might seek the Section 45Q credit for the forested lands and the Section 45Y credit for the facility, despite the fact that the same carbon reductions (through tree regrowth) are being used for both credits and are therefore not additional. Other variations of common control, through contract or other property interest, or "relatedness"[41] are similarly possible. Regardless of ownership, Treasury should be explicit that every ton of carbon reduction can only be applied to the requirements of these credits once, and for only one of the two credits, consistent with the clear legislative intent to prevent double counting.

VI. Congressional Intent: The New Clean Electricity Production Tax Credits Under the IRA Differ from Existing Renewable Energy Production Tax Credits

A key feature of the of the clean electricity tax credits included in the IRA is the shift from the existing Renewable Energy Production Tax Credit to the new CEPTC in 2025. The sponsors of the IRA could have extended the existing Renewable Energy PTC for the duration of the IRA period but chose instead to end the existing PTC in 2025 in favor of a different approach. It is a widely recognized canon of statutory interpretation that the use of different words in legislation demonstrates a difference of intent, meaning that the new CEPTC is meant to be materially different from the existing credit.[42] Importantly, the Renewable Energy PTC includes language that is noticeably lacking from the new CEPTC—language expressly including open- and closed-loop biomass as a qualified energy resource. The removal of that language demonstrates that biomass does not automatically qualify under the new CEPTC.

Additionally, congressional intent to provide Treasury with time to implement the new CEPTC may be inferred from the length of the phase-out period for the existing Renewable Energy PTC. If the CEPTC were meant to follow the existing Renewable Energy PTC without change, a transition period would not be needed.

VII. Conclusion

Both biogenic sources and non-biogenic sources are essential to a full accounting of lifecycle emissions. Typical values for biogenic smokestack emissions range from approximately 1180 g CO_2e per kWh to 1460 g CO_2e per kWh,[43] significantly in excess of emissions from fossil fuels. Such emissions from burning forest biomass can abate over time due to biogenic mitigation, but positive emissions commonly remain in the atmosphere for decades to centuries depending upon the specifics of the feedstock, well beyond timeframes to address the worst impacts of climate change.

[41] *See* Section 45Y(g)(4).
[42] *See* Cong. Research Serv., R45153, Statutory Interpretations: Theories, Tools, and Trends 26–27 (2022), https://crsreports.congress.gov/product/pdf/R/R45153.
[43] Walker et al., *supra* note 12; Fisher et al., *supra* note 12.

Non-biogenic emissions, which forest regrowth cannot directly mitigate, are also significant. These emissions result from logging, transporting, processing, and drying the fuel, among other factors, and range from approximately 50 g CO_2e per kWh to many hundreds of grams per kWh.

Taken in sum, net emissions from forest biopower exceed those from fossil fuels and persist over the long term. Even assuming that smokestack emissions are fully captured, the uncapturable, non-biogenic emissions involved with logging, transporting, processing, and drying the fuel remain significant. Plainly, power plants that burn forest biomass cannot meet the zero-emissions criterion in Section 45Y. Accordingly, the Treasury Department must classify power plants that burn forest biomass as non-zero emitting sources that are therefore ineligible for the CEPTC under Section 45Y of the IRA.

* * *

We would be happy to discuss this matter further with you or to provide any assistance that you may require.

Sincerely,

Athens County's Future Action Network
Center for Biological Diversity
Common Defense
Dogwood Alliance
Earthjustice
Friends of the Earth
League of Conservation Voters
Mighty Earth
National Wildlife Federation
Natural Resources Defense Council
Partnership for Policy Integrity
Pivot Point
Sierra Club
Southern Environmental Law Center

cc: Douglas O'Donnell, IRS Deputy Commissioner for Services and Enforcement