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October 27, 2023

Commissioner Daniel Werfel
Internal Revenue Service
CC:PA: LPD:PR (Notice 2023-06)
Room 5203
P.O. Box 7604
Ben Franklin Station
Washington, DC 20044

RE: Comments on the Certification Criteria for Sustainable Aviation Fuel under Sections 40B and 45Z in Response to Notice 2023-06

Dear Commissioner Werfel:

Thank you for the opportunity to comment on the Internal Revenue Service's (IRS) interpretation of provisions of the Inflation Reduction Act (IRA) that will drive reductions in greenhouse gas (GHG) emissions and grow American jobs. Growth Energy is the nation's largest association of biofuel producers, representing 96 U.S. plants that each year produce 9.6 billion gallons of low-carbon, renewable fuel; 113 businesses associated with the production process; and tens of thousands of biofuel supporters around the country. Our members are committed to developing a robust sustainable aviation fuel (SAF) market in the United States, consistent with national climate goals and commitments. A number of our members have already made substantial investments in SAF production, and the IRA's Section 40B and 45Z tax credits have the potential to greatly accelerate this trend.

Scaling up SAF production will be critical to the decarbonization and future economic competitiveness of the U.S. aviation sector. The SAF Grand Challenge pledges to reach 3 billion gallons of SAF production per year by 2030 and 35 billion gallons per year by 2050. To meet these goals, it will be necessary to harness the U.S. ethanol industry, which at 17.4 billion gallons per year accounts for over 80% of biofuels production capacity in the U.S. Ethanol is one of the few readily-available feedstocks for SAF production that can be utilized in the aviation sector if the proper economic conditions are in place and if the process for certifying SAF for tax credits under the IRA is reasonable and workable for ethanol-to-jet (ETJ) SAF.

The core requirement for SAF to be eligible for 40B and 45Z tax credits is that it achieves the required 50% or greater reduction in lifecycle greenhouse gas ("GHG") emissions as compared to petroleum-based jet fuel.[1] SAF must also be certified as meeting the requirements in Section 40B (and corresponding Section 45Z) in order to be eligible for the tax credits.[2] In both the calculation of lifecycle GHG emissions and the certification of SAF, the IRA provides for flexibility — a producer may apply the methodologies and requirements in the Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA) or "any similar methodology which satisfies the criteria" set out in the RFS under the Clean Air Act.[3] The Greenhouse Gases, Regulated Emissions, and Energy Use in Technologies (GREET) model, for example, is one such "similar methodology" for calculating lifecycle GHG emissions that satisfies the criteria set out in the RFS, as elaborated in our prior letters attached here for ease of reference.

Similarly, the 40B and 45Z SAF certification provision allows for demonstrating compliance either with (1) certain CORSIA eligibility requirements or (2) if using an alternative lifecycle emissions methodology that satisfies the RFS criteria (such as GREET), compliance with "requirements similar to" those set out in CORSIA.[4]

All of the CORSIA eligibility requirements that are currently in place and were in place at the time of enactment of the IRA relate to ensuring the integrity of the lifecycle GHG analysis, including, for example, a requirement that feedstocks for SAF do not originate from forestland converted to agricultural production after 2007, and related supply chain traceability requirements. At their core, such requirements provide mechanisms to substantiate the lifecycle GHG reductions of the SAF. Beginning in 2024, however, the CORSIA framework will require expansive *new* "sustainability criteria" that reach far beyond lifecycle GHG analysis into issues such as labor standards, community engagement, and other socioeconomic conditions of the region where the SAF is produced. As explained in detail below, given (a) the focus on the statute on reducing lifecycle GHG emissions from aviation fuel and (b) the clear link between current CORSIA certification criteria and the lifecycle emissions analysis, it would be unreasonable to interpret Congress' intent in passing the IRA to require all of the far-reaching sustainability criteria under CORSIA to apply to the certification process under Sections 40B and 45Z. Moreover, requiring compliance with each of the newly-applicable sustainability criteria in 2024 would be burdensome or potentially infeasible for certain SAF producers.

As detailed in our comments below, we urge the IRS to interpret the 40B and 45Z certification process as calling for a workable alternative to CORSIA's requirements for the certification of SAF that is based on criteria that reasonably relate to substantiating the lifecycle GHG emissions reductions of the fuel. To do so in an efficient manner, the IRS

[1] *See* 26 U.S.C. § 40B(e).
[2] *See* 26 U.S.C. § 40B(f).
[3] *See* 26 U.S.C. § 40B(e).
[4] 26 U.S.C. § 40B(f)(2)(A)(ii).

may draw on existing registration and compliance assurance processes under EPA's Renewable Fuel Standards (RFS) and state low carbon fuel standards. The IRS should clarify these certification criteria in conjunction with confirming that GREET is an acceptable "similar methodology" for determining lifecycle greenhouse reductions of ETJ and other types of SAF.

I. The Core Purpose of § 40B(f) and § 45Z(f)'s Third-Party Certification Requirement is to Ensure Accurate Lifecycle GHG Emissions Calculations.

In order to claim a tax credit under § 40B and 45Z, the IRA requires a SAF producer to submit a "certification . . . from an unrelated party demonstrating compliance with":

> (i) any general requirements, supply chain traceability requirements, and information transmission requirements established under [CORSIA] or
>
> (ii) in the case of any [alternative] methodology . . ., requirements similar to the requirements described in clause (i).[5]

The language above in clause (i), "any general requirements, supply chain traceability requirements, and information transmission requirements" appears to refer to CORSIA's "Eligibility Framework and Requirements for Sustainability Certification Schemes," which includes a variety of certification requirements including those corresponding with each of the three categories set forth in this provision.[6] As applicable to SAF produced through December 31, 2023, CORSIA's "general requirements," "supply chain traceability requirements," and "information transmission requirements" pertain primarily to substantiation of the lifecycle GHG emissions calculations of the fuel. For example, the "general requirements" prescribe specified procedures for calculation of a fuel's lifecycle GHG emissions, including that it is "complete, accurate, and transparent" and uses the most recent data available.[7]

The two other certification criteria under subsection (f)(2)(A)(i) — compliance with "supply chain traceability requirements, and information transmission requirements" under CORSIA — each relate to lifecycle analysis as well. Supply chain traceability refers to the mass balance system that provides for the tracking of the materials used in SAF production, which, in turn, informs lifecycle emissions calculations.[8] Similarly, CORSIA's information transmission requirements generally relate to ensuring a third-party certifier has access to information necessary to ensure the SAF meets sustainability criteria,

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[5] 26 U.S.C. § 40B(f)(2)(A).

[6] *ICAO Document: CORSIA Eligibility Framework and Requirements for Sustainability Certification Schemes*, ICAO (June 2022), Tables 2-4.

[7] *Id*.

[8] *See id.*, Table 3.

which, through December 31, 2023, primarily pertain to lifecycle GHG emissions calculations.[9]

However, which fuels are eligible under CORSIA's "general requirements" is not static over time. These requirements specify that the fuel must "satisf[y] the CORSIA sustainability criteria" as set forth in the "CORSIA Sustainability Criteria for CORSIA Eligible Fuels,"[10] which includes dramatically different requirements for SAF produced through 2023 and fuel produced after 2024.[11] Specifically, the Sustainability Criteria in effect for SAF produced at the time the IRA was enacted through the end of this year include a limited set of requirements focused on (i) meeting a minimum 10% lifecycle GHG emissions reduction, and (ii) ensuring that fuel is not made from biomass obtained from land converted after 2007 that was primary forest, wetlands, or peat lands (i.e., land with high carbon stocks).[12] Each of those currently applicable criteria is directly related to the lifecycle emissions calculation of the fuel.

Beginning in 2024, however, the Sustainability Criteria under CORSIA will drastically expand to encompass compliance with a broad range of labor and social justice ideals in addition to myriad wide-ranging environmental best practices. Most of these criteria are unrelated to calculation of the fuel's GHG emissions. Summarized below are illustrative examples of the prescriptive 2024-onward Sustainability Criteria required by ISCC, one of the few entities authorized to provide CORSIA certification:[13]

a. "A self-declaration on good social practice regarding human rights must have been communicated to the workers."

b. "All environmental, social, economic and cultural impacts for surrounding areas, communities, users and land-owners are taken into account. Local historical, cultural and spiritual properties and sites are protected. A participatory social impact assessment should be conducted, where all relevant stakeholders including local communities and indigenous people are engaged."

c. "Fair and transparent contract farming arrangements are in place" such as "[t]here are minutes of meetings providing evidence of regular discussions or negotiations between parent company and contract farmers' or plantation

[9] *See id.*, Table 4.
[10] *ICAO Document: CORSIA Eligibility Framework and Requirements for Sustainability Certification Schemes*, ICAO (June 2022), p. 6.
[11] *See ICAO Document: CORSIA Sustainability Criteria for CORSIA Eligible Fuels*, ICAO (November 2022), pp. 2, 3–6; *see also ISCC CORSIA 202 Sustainability Requirements*, ISCC System GmbH (2021).
[12] If the fuel was made from biomass obtained from post-2007 converted high carbon stock land, emissions from that direct land use change would need to be calculated as part of the lifecycle emissions analysis of the fuel.
[13] *ISCC CORSIA 202 Sustainability Requirements*, ISCC System GmbH (2021), pp. 33–38.

managers' representatives."

d. "Records must indicate that regular weekly working hours do not exceed 48 hours. . . Every six sequential days of work, workers should receive at least one day off. . . . The company's pay slips demonstrate that living wages meet at least legal or industry minimum standards and are sufficient to meet the basic needs of workers and to provide some discretionary income."

In enacting the IRA, Congress did not intend for such sweeping obligations, many of which are wholly unrelated to the lifecycle GHG of the fuel, to determine the eligibility of SAF. Congress intended, rather, to apply a more reasonable set of requirements related to ensuring that the calculated lifecycle GHG emissions reductions of the SAF could be substantiated. This intent can be seen in the language of the act and its relation to CORSIA, the timing of the IRA's passage, and discussions regarding its development.

For example, the language of Sections 40B and 45Z demonstrate that Congress did not intend for the certification requirements for SAF under subsection (f) to expand beyond those reasonably related to the lifecycle analysis of GHG emissions. The lifecycle emissions reductions standard is the fundamental eligibility requirement for the tax incentive under those provisions and the central goal of this IRA program. SAF is defined, in this provision, as a fuel which, in addition to meeting certain standards and feedstock requirements, "has been *certified* in accordance with subsection (e) as having a lifecycle greenhouse gas emissions reduction percentage of at least 50 percent."[14] The statute's certification provisions in 40B(f) and 45Z(f) are thus best read to require third-party certification with respect to the lifecycle GHG emissions reductions of the fuel. Moreover, Congress did not define SAF as a fuel that meets all of the elaborate, ever-expanding requirements of the CORSIA framework's Sustainability Criteria. If Congress intended only CORSIA-eligible SAF to be eligible for tax incentives, it readily could have so specified in defining the term "sustainable aviation fuel."

Accordingly, the IRS, in developing allowable alternative certification procedures for SAF, should focus such requirements on substantiating through third-party certification the lifecycle GHG emissions of the fuel, not the suite of wide-ranging socioeconomic and social justice considerations encompassed in CORSIA's new sustainability criteria.

II. IRS Should Establish a Workable SAF Certification Alternative to CORSIA for Purposes of Confirming Lifecycle GHG Emissions Calculations.

Given the core statutory purpose of reducing lifecycle GHG emissions from aviation fuel, the IRS should interpret the SAF certification provision in Sections 40B and 45Z to allow a workable alternative to CORSIA that focuses on demonstration through a third-party certification of the lifecycle greenhouse reduction benefits of the fuel. In doing so, the

[14] 26 U.S.C. § 40B(d)(1) (emphasis added).

IRS could draw upon well-established third-party certification processes under existing renewable fuels regulatory programs, such as EPA's RFS program and state low-carbon fuel standards. Such existing regulatory processes related to confirmation of lifecycle GHG emissions reductions of particular fuels are sufficiently "similar" to requirements in the CORSIA Eligibility Framework (including the current, pre-2024 Sustainability Criteria) to meet the statutory criteria under sections 40B(f) and 45Z(f).

For example, renewable fuel producers under the RFS are required to conduct third-party engineering reviews as part of the RFS registration process.[15] The independent engineering review validates all of the information provided by the producer to register its fuel with the EPA. That information includes, for example, descriptions of (i) the feedstocks used at the facility, (ii) the facility's production processes, (iii) the types of co-products produced with the renewable fuel, and (iv) the process heat fuel supply plan for the facility, among other detailed aspects of the producer's operations that would affect the overall lifecycle GHG analysis of the fuel.[16] The third-party engineering review validates the accuracy of the information in the renewable fuel producer's registration documentation and provides assurances as to how the third-party was able to determine the quality of the information.[17]

Similarly, state renewable fuels programs have requirements that relate to the validation of the lifecycle GHG analysis that may reasonably apply in this context. For example, California's Low Carbon Fuel Standards ("LCFS") program requires validation and verification by an independent third party. This includes validation of information in the "fuel pathway," including, for example, (i) the methods used by the producer to quantity and report data, (ii) the data management systems and accounting procedures used to track data for the fuel pathway application, and (iii) information about the entities in the supply chain upstream and downstream of the fuel producer that contribute to site-specific carbon intensity data.[18] These requirements are similar to the supply chain traceability and information transmission requirements under the CORSIA Eligibility Framework.

The IRS should look to these existing regulatory requirements and processes described above for guidance on fashioning a certification for alternative lifecycle GHG emissions calculations (like GREET) that are "similar" to the requirements applicable under CORSIA today, which reasonably relate to substantiating the calculated lifecycle GHG emissions reductions. Such requirements would establish a workable alternative certification pathway to CORSIA's increasingly byzantine and infeasible eligibility requirements.

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[15] *See* 40 CFR § 80.1450(b)(2).
[16] *See* 40 CFR § 80.1450(b)(1).
[17] *See* 40 CFR § 80.1450(b)(2).
[18] *See* Cal. Code Regs. Tit. 17, § 95501(b)(1)(A).

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Growth Energy appreciates the IRS's consideration of this input as it implements the Section 40B and Section 45Z credit for Sustainable Aviation Fuel. We look forward to engaging further on this important work and would be happy to meet with your staff to present on these issues in more detail and answer any questions.

Sincerely,

Chris Bliley
Senior Vice President of Regulatory Affairs
Growth Energy

CC: The Honorable Janet Yellen, Secretary, U.S. Department of Treasury
The Honorable Tom Vilsack, Secretary, U.S. Department of Agriculture
The Honorable Jennifer Granholm, Secretary, U.S. Department of Energy
The Honorable Pete Buttigieg, Secretary, U.S. Department of Transportation
The Honorable Michael Regan, Administrator, U.S. Environmental Protection Agency
The Honorable Brenda Mallory, Chair, White House Council on Environmental Quality

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November 4, 2022

The Honorable Janet Yellen
Secretary
U.S. Department of the Treasury
1500 Pennsylvania Avenue, NW
Washington, D.C. 20220

Re: Implementation of Sustainable Aviation Fuel and Clean Fuel Production Tax Credits

Dear Secretary Yellen,

I write on behalf of Growth Energy to support the adoption of the U.S. Department of Energy's Greenhouse Gases, Regulated Emissions, and Energy Use in Technologies (GREET) model as a methodology for calculating 40B and 45Z tax credits for sustainable aviation fuel (SAF) produced using ethanol, as required by the Inflation Reduction Act of 2022 (IRA). Growth Energy is the leading association of ethanol producers in the country, with 90 bioprocessing plant producers and 106 innovative businesses that support biofuel production. We view U.S. leadership in the global SAF market to be vital to the decarbonization and future economic competitiveness of the U.S. aviation sector, and a number of our members have already made substantial investments in SAF production.

We applaud passage of the IRA as a significant step in supporting early growth of the U.S. SAF industry through the 40B Sustainable Aviation Fuel Credit and 45Z Clean Fuel Production Credit. We further applaud the Administration's SAF Grand Challenge, including its pledge to reach 3 billion gallons of American SAF production per year by 2030 and 35 billion gallons per year by 2050. Harnessing the U.S. ethanol industry—which at 17.4 billion gallons per year accounts for over 80% of biofuels production capacity in the U.S.[1]—will be necessary to achieve these goals because ethanol is one of the few readily available feedstocks for SAF production.

The Department of Treasury (Treasury) plays a critical role in implementing the IRA by ensuring the best available science is used to calculate greenhouse gas (GHG) emissions reductions associated with SAF. Specifically, the IRA ties both eligibility for and amount of the 40B and 45Z tax credits to a fuels' lifecycle GHG emissions, as determined through a lifecycle analysis (LCA). Accurate, complete, and consistent LCA measurement therefore is central to the effectiveness of the IRA.

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[1] U.S. Energy Information Administration, *2022 Fuel Ethanol Production Capacity*.

The U.S. has the largest and most developed biofuels industry in the world.[2] As a result, government scientists and academics have been closely studying biofuels production for decades, and have developed the model that is widely recognized as the "gold standard" in LCA science: GREET.[3] As explained in detail below, Treasury must allow ethanol-to-jet (ETJ) producers to use GREET as a qualifying alternative methodology for determining the fuel's lifecycle GHG emissions. That is because the GREET model, which accounts for complete lifecycle emissions, meets the statutory criteria under the Clean Air Act's (CAA) definition of "lifecycle greenhouse gas emissions" referenced in the IRA and sole reliance on the model mentioned in the statute as an option (CORSIA) would not yield as credible results. 26 U.S.C. § 40B(e)(2); *id.* § 45Z(b)(1)(B)(iii)(II). In addition, Treasury must ensure that producers can receive enhanced 40B and 45Z credits based on all GHG reduction practices across their fuel's complete lifecycle, in order to incentivize lower-carbon practices and meet the IRA's carbon-reduction goals.

The Treasury Department's implementation of the 40B and 45Z tax credits must rely on accurate and complete GHG lifecycle emissions accounting to determine credit eligibility and amount.

Starting January 1, 2023, the IRA establishes a $1.25/gallon SAF credit for fuels that have a "lifecycle greenhouse gas emissions reduction percentage of at least 50 percent" as compared to petroleum-based jet fuel. 26 U.S.C. § 40B(d)(1)(D). The value of this credit can be increased by $.01/gallon for each additional percentage of GHG reduction beyond 50 percent. *Id.* § 40B(b). Then, once the 40B SAF credit expires at the end of 2024, producers of aviation fuels with an emissions rate of less than 50kg CO2e/mmBTU may qualify for the 45Z Clean Fuel Production Credit. 26 U.S.C. § 45Z(d)(5)(A)(2). Like the 40B credit, the value of the 45Z credit also increases as a fuel's emissions rate drops below the threshold value. 26 U.S.C. § 45Z(a)(1). Thus, the 40B and 45Z tax credits incentivize lower carbon intensity production of SAF and other transportation fuels. For these incentives to function properly, it is essential that a fuels' lifecycle GHG emissions be calculated accurately, completely, and in accordance with the best available science.

The 40B and 45Z tax credit provisions both prescribe two options for calculating a fuel's lifecycle emissions. First, a producer could use "the most recent Carbon Offsetting and Reduction Scheme for International Aviation [CORSIA] which has been adopted by the International Civil Aviation Organization [ICAO]." 26 U.S.C. § 40B(e)(1); *id.* § 45Z(b)(1)(B)(iii)(I). Alternatively, producers may use "any similar methodology" which "satisfies the criteria under section 211(o)(1)(H) of the Clean Air Act." 26 U.S.C. § 40B(e)(2); *Id.* § 45Z(b)(1)(B)(iii)(II). The GREET model developed by the U.S. Department of Energy's Argonne National Laboratory is undeniably a similar methodology that satisfies those criteria. For the reasons explained below, Treasury must allow ETJ producers to use GREET in determining the fuel's lifecycle GHG emissions.

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[2] *See, e.g.* U.S. Energy Information Administration, *International Biofuels Production*.
[3] *See, e.g. Upstream Energy Analysis*, Argonne National Laboratory (Sep. 27, 2022) https://www.anl.gov/esia/upstream-energy-analysis (noting that GREET is "the gold standard for evaluating energy emissions and impacts").

GREET is a “similar methodology” to CORSIA. Both models calculate fuels’ well-to-wheel GHG emissions through an attributional lifecycle analysis of “core” process-based emissions (i.e., emissions from a biofuels production facility or feedstock production) combined with a consequential lifecycle analysis for indirect or induced emissions (i.e., land use change). *CORSIA Eligible Fuels – Life Cycle Assessment Methodology* (June 2019) at 10. CORSIA explicitly adopts GREET values for several of its inputs, including corn grain cultivation and harvest, transportation to the fuel production facility, and jet fuel transportation and distribution. *Id.* at 41. As a result, the CORSIA default value for ETJ core emissions varies from GREET by only 0.1 gCO2e/MJ. *Id.* at 41. The larger difference in total emissions between CORSIA and GREET comes nearly entirely from CORSIA’s overestimation of a single input—induced land use change or “iLUC”—as discussed further below.

GREET satisfies the criteria for lifecycle analysis under Clean Air Act (CAA) § 211(o). “Lifecycle greenhouse gas emissions” under the CAA’s Renewable Fuels Standard (RFS) must consider the “aggregate quantity of greenhouse gas emissions” including “direct emissions and significant indirect emissions” for the “full fuel lifecycle.” 42 U.S. Code § 7545(o)(1)(h). GREET, which comprehensively addresses direct emissions as well as utilizes the Carbon Calculator for Land Use Change from Biofuels Production (CCLUB), amply satisfies these requirements. Indeed, several provisions of the IRA mandate use of GREET to calculate the LCA for other transportation fuels, such as hydrogen. *See e.g.* 26 U.S.C. § 45V(c)(1)(B). Notably, these provisions require the use of GREET for other transportation fuels and hydrogen reference the same definition of “lifecycle greenhouse gas emissions’ under the Clean Air Act as the IRA’s SAF provisions. In addition, EPA utilized GREET, along with other models, to implement the RFS program’s major expansion in 2010. 74 Fed. Reg. 24,904, 24,916 (May 26, 2009). Multiple states that lead the nation on climate change regulation, including California and Oregon, also use GREET for evaluating lifecycle emissions of biofuels.

GREET and CORSIA have similar approaches to calculating ETJ lifecycle GHG emissions with one critical difference: CORSIA erroneously includes substantial induced land use change emissions.

As noted above, GREET and CORSIA are substantially similar, with multiple shared inputs, similar design and scope, and a core emissions value for U.S. ETJ within *one-tenth of one gram* CO2e/MJ of each other. Additionally, similar to CORSIA, GREET allows producers to select specific inputs that reflect a particular fuel’s production processes and feedstock inputs to allow precise calculation of GHG lifecycle emissions (rather than use of inaccurate default values).[4]

However, for ETJ SAF, CORSIA substantially overestimates the impact of iLUC, which significantly skews that model’s results. Recent analyses of iLUC converge on a central estimate much closer to GREET’s value for this input than CORSIA’s. For example, a recent paper by scientists from Harvard University on the current state of LCA modelling concluded that the

[4] At a *minimum*, Treasury must allow producers to use CORSIA’s actual value methodology in lieu of CORSIA default values. The actual value methodology, like GREET, determines emissions on a facility-specific basis, resulting both in more accurate LCA values and incentives to use lower carbon production processes (i.e. carbon capture).

"credible range" of iLUC values for U.S. corn ethanol lies between -1.0 and 8.7 gCO2e/MJ.[5] The relevant GREET/CCLUB iLUC value is within this range at 7.4 gCO2e/MJ.[6]

CORSIA, in contrast, falls far outside of this credible range with an iLUC value of 25.1 gCO2e/MJ.[7] Rather than utilizing the current best available science, CORSIA's iLUC value hews closer to outdated estimates from over a decade ago.[8] Modeling techniques have improved considerably in recent years due both to improvements in the models and improvements in the accuracy of inputs.[9] For example, older LCA models failed to account for the ability of intensification (increasing crop yield) rather than extensification (increasing crop acreage) to meet increases in demand.[10] Further, empirical data now allows for additional refinement to improve the accuracy of model results.[11]

Exclusive reliance on CORSIA for calculation of ETJ emissions risks incorporating the methodology's flawed iLUC calculation – which is based on non-U.S. standards – into U.S. tax policy and substantially disadvantaging U.S. ETJ producers. Congress avoids overreliance on CORSIA by requiring the acceptance of alternative LCA methodologies which meet certain minimum standards. 26 U.S.C. § 40B(e)(2); *Id.* § 45Z(b)(1)(B)(iii)(II). Indeed, U.S. tax policy should not tie itself to international aviation safety organizations that are far less experienced and sophisticated in biofuels LCA modeling than the U.S. Department of Energy's National Laboratories.

We strongly encourage Treasury to implement the alternative methodology provisions of 40B and 45Z by allowing use of the state-of-the-art, highly credible, U.S. Government-backed GREET model to measure ETJ's lifecycle emissions. In fact, precluding ETJ producers from utilizing GREET would be arbitrary, capricious, and contrary to the statute. 5 U.S.C. § 706(2)(a); *Chevron U.S.A., Inc. v. Natural Resources Defense Council, Inc*., 468 U.S. 837 (1984); *Physicians for Social Resp'y v. Wheeler*, 956 F.3d 634 (D.C. Cir. 2020) (finding that multiple statutory mandates require agencies to consider the best available science when enacting environmental policy).

Finally, Treasury must ensure that producers can reduce their lifecycle GHG emission values, and accordingly enhance their 40B and 45Z tax credits, based on GHG reductions they

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[5] Scully, et. al. *Carbon intensity of corn ethanol in the United States: state of the science* 16 Environ. Res. Lett. 043001 (2021).
[6] *Id.*
[7] *CORSIA Default Life Cycle Emissions Values for CORSIA Eligible Fuels*, International Civil Aviation Organization, (March 2021). Some of the differences in ILUC values can also be attributed to ICAO's political decision to amortize ILUC values over 25 years, the average of the European Union's 20 years and the United States' 30 years. Consistent with EPA's decision in 2010 with longstanding precedent under GREET and other U.S. modeling approaches, Treasury should amortize indirect emissions over 30 years.
[8] For example, EPA's 2010 analysis produced an iLUC value of 26.1 gCO2e/MJ. EPA has admitted that its 2010 analysis pre-dates significant advancements in the study of LCA modeling and has initiated work to update its analysis. *See Renewable Fuel Standard (RFS) Program: RFS Annual Rules Regulatory Impact Analysis*, U.S. EPA (June 2022) at 67-71; *Announcing Upcoming Virtual Meeting on Biofuel Greenhouse Gas Modeling*, 86 Fed. Reg. 73,756 (Dec. 28, 2021).
[9] Scully, et al. at 3.1.
[10] Taheripour, et. al. *The impact of considering land intensification and updated data on biofuels land use change and emissions estimates*, 10 Biotechnology for Biofuels 191 (July 2017).
[11] Life Cycle Associates, *Review of GHG Emissions of Corn Ethanol under the EPA RFS2* (Feb. 4, 2022) at 13.

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achieve across the entire lifecycle of their fuels. When fuel producers use GHG-reduction strategies, such as lower-carbon production practices and technologies, LCA methodologies account for those strategies and the resulting fuels have a lower lifecycle GHG emissions value. By incorporating that approach into the 40B and 45Z credits, Treasury will incentivize further GHG emissions reductions and further the IRA's goals. Any other approach, such as GHG emissions values that do not account for the array of potential GHG-reduction strategies, would fail to incentivize further reductions and accordingly frustrate the purpose of these tax credits.

*   *   *

Growth Energy appreciates Treasury's consideration of this input as it implements the IRA's tax credit provisions in a manner that ensures the best available science is used to calculate eligibility for and amount of credits. We look forward to engaging further on this important work and would be happy to meet with your staff to present on these issues in more detail and answer any questions.

Sincerely,

Emily Skor
CEO
Growth Energy

CC: The Honorable Tom Vilsack, Secretary, U.S. Department of Agriculture
The Honorable Jennifer Granholm, Secretary, U.S. Department of Energy
The Honorable Pete Buttigieg, Secretary, U.S. Department of Transportation
The Honorable Michael Regan, Administrator, U.S. Environmental Protection Agency
The Honorable Brenda Mallory, Chair, White House Council on Environmental Quality

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December 2, 2022

Commissioner Douglas O'Donnell
Internal Revenue Service
CC:PA: LPD:PR (Notice 2022-58)
Room 5203
P.O. Box 7604
Ben Franklin Station
Washington, DC 20044

RE: Notice 2022-58, Request for Comments on Credits for Clean Hydrogen and Clean Fuel Production

Dear Commissioner O'Donnell:

Thank you for the opportunity to comment on the Internal Revenue Service's (IRS) plan to issue guidance regarding important provisions of the Inflation Reduction Act (IRA) that will drive reductions in greenhouse gas (GHG) emissions and grow American jobs. Growth Energy is the nation's largest association of biofuel producers, representing 90 U.S. plants that each year produce more than 8 billion gallons of low-carbon, renewable fuel; 106 businesses associated with the production process; and tens of thousands of biofuel supporters around the country. Our members are critical to the decarbonization of transportation fuel in the United States, and have substantial interests in ensuring the effective, efficient, and science-based implementation of the new Section 45Z Clean Fuel Production Credit. Our industry is poised to assist the administration in achieving the ambitious climate goals Congress sought in enacting the IRA as we remain committed to helping our country diversify its energy portfolio and provide consumers with better and more affordable choices at the fuel pump.

A core goal of the IRA is to facilitate innovation in clean energy technologies and to incentivize development of these technologies at scale in order to reduce U.S. GHG emissions. The Section 45Z tax credit is one of the most important tools Congress created to realize these goals, as it is central to further decarbonization of the U.S. transportation fuel supply. And ethanol has long been the primary driver of GHG emissions reductions in transportation fuels, resulting in the avoidance of approximately 544 million metric tons of CO_2e emissions between 2005 and 2019.[1]

[1] Lee et. al, *Retrospective Analysis of the U.S. Corn Ethanol Industry for 2005–2019: Implications for Greenhouse Gas Emission Reductions* (May 4, 2021), https://doi.org/10.1002/bbb.2225.

In order to be eligible for Section 45Z credits, a transportation fuel must have a lifecycle emissions rate below 50 kilograms of carbon dioxide equivalent per million BTU (CO_2e/mmBtu). As explained further below, biofuels producers may use many different technologies to produce ethanol below this threshold, including technologies and agricultural practices that result in a biofuel with *negative* lifecycle GHG emissions. Thus, for the Section 45Z credit to function as Congress intended, the Treasury Department and the IRS will need to implement the law to take into account and thereby incentivize the varied approaches that biofuel producers can employ to produce low-carbon renewable fuels.

Congress intended the Section 45Z credit to be available to biofuel producers based on the best available science on the lifecycle GHG emissions reductions of biofuels, as reflected in a lifecycle analysis (LCA) model developed and maintained by the Department of Energy's Argonne National Laboratory, which is the gold-standard for LCA modeling for biofuels.[2] As discussed in detail below, this DOE model—known as the Greenhouse gases, Regulated Emissions, and Energy use in Transportation, or "GREET" model—includes a wide variety of inputs and parameters that reflect many GHG emissions reduction techniques available to biofuels producers. Using all of the available inputs and parameters from the GREET model in Section 45Z implementation will ensure that that taxpayers have a clear path forward as they plan investments in biofuels-related technologies, while allowing ease of administration for the IRS.

This letter suggests how the Treasury Department and the IRS may structure the Section 45Z program in order to achieve the IRA's important GHG reduction goals in an effective and efficient manner. We look forward to continued discussions with the IRS on these important issues.

I. The GREET-Based Emissions Rate Table for Ethanol Should Reflect the Key Technologies the Industry Uses to Reduce GHG Emissions

Congress enacted the clean energy tax credits in the IRA to incentivize and accelerate reductions in GHG emissions as a key tool in combatting climate change. *See* Exec. Order 14082 (listing "driving progress to achieve the climate goals of the United States" as an implementation priority for the IRA). Essential to this incentive structure is an accurate determination of lifecycle GHG emissions rates for determining the Section 45Z credit value a biofuel producer may receive. There is a wide variety of factors that influence a fuel's lifecycle emissions rate. To account for this, Section 45Z(b)(1)(B)(i) directs the IRS annually to publish a table that sets forth the emissions rate "for similar types and categories of transportation fuels" based on their lifecycle GHG emissions. This directive is best understood to mean that the nature of the fuel itself determines the "type" (*e.g.*, corn starch ethanol), that may be further categorized based on various factors affecting the fuel's

[2] 26 U.S.C. § 45Z(b)(1)(B)(ii).

lifecycle carbon intensity,[3] including in the case of ethanol, different production processes and agricultural practices used to grow the corn used as the feedstock. The Section 45Z emissions rate table should accurately reflect these distinctions in order to fulfill Congress's goal of incentivizing reductions in GHG emissions from transportation fuels using the GREET model.

To this end, we recommend that the IRS use the Argonne National Laboratories' most recent GREET model[4] to produce an emissions rate table for corn starch ethanol (one "type" of transportation fuel)[5] that reflects the variety of methods by which a biofuel producer can significantly reduce their fuels' emissions rate (e.g., different "categories" of corn starch ethanol). The model is itself a kind of "table" (or matrix), in which various inputs correspond to incremental adjustments in lifecycle GHG emissions.

For example, a typical dry-mill corn starch ethanol plant may capture and sequester carbon dioxide process emissions and source its corn from farms using no till agricultural practices in order to reduce the carbon intensity of the fuel. The GREET model includes inputs to address these and other scenarios that should be included in an emissions rate table. The IRS should adopt this interpretation of GREET as a type of emissions rate table that is annually updated, and allow biofuel producers to utilize the model's outputs as the foundation for Section 45Z credit eligibility. An additional benefit to interpreting the statutory language in this manner is that it likely will minimize the number of provisional emissions rate petitions the IRS must process under Section 45Z(b)(1)(D).

Specifically, taking into account the practices producers and corn farmers are currently pursuing and actively considering to achieve GHG emissions reductions, we recommend that the emissions rate table include at least the following production process factors and agricultural factors described below that the GREET model accounts for:

<u>Low-Carbon Production Process Enhancements</u>

- *Carbon capture and storage (CCS) technologies*. Capture and sequestration of carbon dioxide process emissions from ethanol plants will soon be a common, impactful, and readily-verifiable method to reduce the lifecycle carbon intensity of

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[3] "Carbon intensity" in this context is a measure of a fuel's lifecycle GHG emissions per unit of fuel energy. *See, e.g.*, 17 C.C.R. § 95481(a)(26) (defining "carbon intensity" under California's Low Carbon Fuel Standard).

[4] There are multiple versions of GREET used by various state jurisdictions in Low Carbon Fuel Standard programs, but Congress mandates use of the latest version of the model Argonne National Laboratory publishes. 26 U.S.C. § 45Z(b)(1)(B)(ii).

[5] Emissions rates for a type of transportation fuel should be limited to the fuel itself, and not include other substances or mixtures which may be blended into the final product prior to sale. For example, the "corn starch ethanol" fuel type should not include any added denaturant as denaturant is a separate substance that is added to the fuel to satisfy various regulatory requirements. The volume of denaturant would be excluded from a producer's calculation of volumes of clean fuel eligible under 45Z.

fuel ethanol. Different from carbon dioxide emissions from combustion processes, a substantial portion of carbon dioxide emissions in ethanol production result from anaerobic fermentation of corn starch, and are much more readily captured. Many ethanol plants already capture carbon dioxide for use in various food and beverage applications. The first EPA-approved permit for a CCS project was obtained by an ethanol producer, and the industry is poised to implement CCS on a large scale, which will result in substantial GHG emissions reductions.

- *Renewable electricity*. As the U.S. brings more renewable power onto the grid, GHG emissions attributable to a fuel production facility's power usage can decrease materially. Biofuels producers relying entirely on renewable power eliminate all emissions attributable to their power sources. As discussed below, biofuels producers' purchase of renewable energy credits (RECs) also should be recognized as a means of demonstrating the use of renewable power.

- *Use of biomass or renewable natural gas (RNG) for process heat*. Natural gas combustion is the largest contributor to carbon dioxide emissions in the ethanol production process. Facilities that use biomass or RNG to reduce or replace fossil natural gas as a heat source can therefore achieve substantial reductions in the ethanol's lifecycle GHG emissions rate. In addition, producers relying on shared commercial pipelines should be permitted to use "book and claim" accounting mechanisms—similar to RECs for renewable energy—as a means of demonstrating the use of RNG.[6]

<u>Low-Carbon Agricultural Practices</u>

- *Use of cover crops*. Use of cover crops improves soil health and enhances soil organic carbon (SOC) sequestration. By sequestering atmospheric carbon dioxide in the soil, such use of cover crops offsets other carbon dioxide emissions from feedstock production, and lowers the lifecycle GHG emissions ethanol produced from corn feedstock grown using this method. USDA currently offers cover crop initiatives as part of its climate smart agriculture programs and has issued national conservation practice standards to define the practice.[7] The IRS could incorporate the criteria in USDA's national standards by reference for purposes of the emissions rate table.

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[6] GHG reductions from use of biomass can be calculated in GREET based on biomass use. GHG reductions from RNG use can be calculated based on RNG use and the carbon intensity of the RNG source.

[7] USDA Press Release No. 0005.22, *USDA Offers Expanded Conservation Program Opportunities to Support Climate Smart Agriculture in 2022* (Jan. 10, 2022); USDA Conservation Practice Standard # 340, *Cover Crop (Ac.)* (Sep. 2014).

- *Effect of tillage*. Another method to enhance SOC sequestration is switching to no-till or reduced-till practices. Reduced disturbance of the soil supports greater sequestration of atmospheric carbon dioxide. USDA has also issued national conservation practice standards for both no-till and reduced-till agriculture, which may be incorporated by the IRS here.[8]

- *Manure application*. Application of agricultural byproducts and waste products such as manure can materially increase SOC sequestration. GREET's FD-CIC model (discussed further below) can calculate changes in SOC emissions resulting from the use of swine, dairy cow, beef cattle, or chicken manure.

- *Improved fertilizer practices.* Precision application of fertilizer through "4R" techniques (right time, right place, right form, right rate) can significantly reduce emissions attributable to fertilizer usage. Similarly, applying bio-based fertilizers to corn, such as nitrogen-fixing biological products, legumes, or manure can significantly reduce the need for conventional fertilizer, providing a lower carbon-intensive source of fertilizer for the corn. In addition, nitrogen stabilizers can reduce the loss of nitrogen into the environment. This often leads to a reduced application rate of fertilizer, further reducing its environmental impact.[9]

- *Green or low-carbon ammonia*. Ammonia used to make fertilizer can be produced using renewable energy (where hydrogen from electrolysis of water reacts with atmospheric nitrogen) or with carbon-reducing technologies, reducing lifecycle GHG for producing corn feedstock to ethanol production.[10]

These ethanol production and feedstock production factors each reduce lifecycle GHG emissions from corn starch ethanol and are among the most likely to be adopted by the industry. As calculated using the GREET model emissions factors, these production factors can be adopted in any combination. The GREET model has default values for upstream corn feedstock production absent these agricultural practices, and then provides incremental adjustments to account for each factor. Thus, each distinct combination of factors may be considered a "category" of ethanol fuel with a specific lifecycle emissions rate as determined using the GREET model.

Furthermore, for most such "categories" of ethanol, the IRS may incorporate default values from GREET, including for feedstock production factors GREET's Feedstock Carbon

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[8] USDA Conservation Practice Standard # 329, *Residue and Tillage Management, No Till (Ac.)* (Sep. 2016); USDA Conservation Practice Standard # 345, *Residue and Tillage Management, No Till (Ac.)* (Sep. 2016).

[9] GHG reductions from precision application of fertilizer and use of nitrogen stabilizers are available from standard values in GREET's FD-CIC module. GHG reductions from bio-based fertilizer can be calculated based on farming inputs.

[10] GHG reductions from green ammonia are available from standard values in GREET's FD-CIC module. GHG reductions for low carbon ammonia can be calculated based on the ammonia production process.

Intensity Calculator (FD-CIC) module, and where a default value does not exist, the IRS could incorporate in the emissions rate table certain simplified assumptions as presented below.[11] Argonne National Laboratory and the DOE's Advanced Research Projects Agency developed the FD-CIC calculator as a transparent and easy-to-use tool for regulatory agencies to "enable an accurate measurement of key farming parameters that can help robust accounting of the GHG benefits of sustainable, low-carbon agronomic practices." FD-CIC User Manual at 7. The tool both provides default values and allows biofuels producers to provide user specific input values to determine individualized estimates of SOC emissions. For example, a feedstock producer that applies manure from its own farm would obtain higher GHG emissions reductions than the default in FD-CIC, based on reductions in the amount of energy used in manure transportation.[12] As part of GREET, FD-CIC is updated annually to incorporate the best available science in GHG accounting.

Similarly, for categories of ethanol produced using low-carbon production processes, GREET supplies default numbers to account for various production factors. Book and claim accounting methods can be used to track power and process heat inputs. These well-established methods use contractual commitments to attribute clean energy entered onto a shared distribution network corresponding to the same amount of energy removed from the shared network. For example, RECs are issued to renewable energy producers for each megawatt-hour of electricity generated and put on the electricity grid. An ethanol producer who purchases those RECs from the renewable energy producer may then show that its facility is powered by renewable energy sources, and GREET accounts for that emissions reduction.[13]

Below is an illustrative example of a carbon intensity reduction table using GREET default values for a typical dry mill ethanol plant that includes certain production processes and agricultural practices to reduce the emissions rate of ethanol production. For a more detailed discussion of the factors included in this table, see the attached Life Cycle Associates report *GHG Analysis of Dry Mill for Corn Ethanol Production under IRA*.

[11] Available at https://greet.es.anl.gov/tool_fd_cic
[12] In addition, FD-CIC values could be averaged across a biofuels producer's feedstock sources to account for biofuels producers which contract with multiple suppliers with differing agricultural practices.
[13] Of course, a producer may also have an exclusive power purchase agreement or directly utilize an on-site wind farm for renewable electricity as well.

Table 1. Principal Options for GHG Reductions at Corn Ethanol Plants

Scenario	kg CO_2/MMBtu	Description	Assumption/ Calculation Basis[b]
Baseline	55.5	U.S. Average dry mill ethanol.	22,480 Btu/gal, 0.61 kWh/gal, 2.86 gal/btu
	CI Reduction[a]	**Low CI Production Technologies**	
CCS	-33.8	Store CO_2 underground	Capture 90% of fermentation CO_2
Renewable Power	-3.8	REC for electricity as well as on-site wind or solar power	0 g CO_2e/kWh, per GREET
Biomass Heat and Power	-20 to -25	Power and heat generated at corn ethanol plant.	Eliminates natural gas and electric power emissions. Calculate GHG emissions from biomass use in GREET.
RNG	-21	40% of natural gas from RNG	- 100 g CO_2/MJ diary, swine, or steer manure. Calculate GHG emissions based on RNG use and CI of RNG.
		Farming GHG Reductions	
Green NH_3	-6.1	Green Ammonia for Fertilizer	FD-CIC Green Ammonia
Low CI NH_3	-2 to -5	Ammonia with CO_2 capture	Calculate GHG emissions based on ammonia production process.
No Till	-3.4 to -6.5	Switch Reduced to No Till farming	FD-CIC Reduced Till to No Till depending upon region.
Fertilizer	-2.4 -5.2 -1 to -3	Nitrogen efficiency Precision application Bio-based fertilizer	FD-CIC Enhanced Efficiency Fertilizer FD-CIC (4R) Right time, place, form, rate Calculate based on farming inputs
Manure Application	-5.5 to -28	Mix of dairy, swine, cattle, poultry manure	FD-CIC Manure Application
Cover Crop	-20.4 to -39.1	Grow winter cover crop	FD-CIC Cover Crop

[a] Reductions apply to baseline for typical dry mill ethanol plant; where multiple technologies or practices apply, reductions may be added together to calculate the fuel's emission rate.
[b] GHG reductions are available from standard values in the FD-CIC or from additional calculations as indicated.

Because inputs for these factors are readily-ascertainable from GREET, we encourage the IRS to move promptly in publishing the emissions rate table. Increased certainty in the expected value of Section 45Z credits will stimulate investment in fuel technologies and practices with the greatest GHG emissions reduction benefits. Beyond these recommended starting factors and associated categories, the IRS can and should expand the table to include additional categories as appropriate through the annual update process. 26 U.S.C. § 45Z(b)(1)(B)(i). We also encourage the IRS to consult with the DOE and the USDA, which each have extensive experience studying accounting methodologies for GHG reductions from lower-carbon biofuel production processes and lower-carbon agricultural practices, respectively.[14] We look forward to a continuing dialogue with the IRS to develop a precise and manageable Section 45Z emissions rate table.

In addition to the emissions rate table that includes categories of ethanol produced using various low-carbon practices as summarized above, the IRS should allow biofuels producers to use the GREET model to calculate facility-specific emissions rates that take into account a wider range of practices than those summarized in the annually-promulgated emissions rate table. We look forward to working with the IRS to further develop recordkeeping requirements and other reasonable verification procedures relevant to a biofuel producer's calculation of its fuel's emissions rate based either on an emissions rate table or facility-specific GREET inputs.

Finally, regardless of the specifics of the emissions rate table, it is critical that the table take into account ethanol produced with *negative* lifecycle GHG emissions (meaning that more GHGs are sequestered than generated, so that the lifecycle GHGs are below an emissions rate of 0 kg CO2e/mmBTU). This is consistent with the text of Section 45Z, which specifically contemplates negative emissions rates. *See* 26 U.S.C. § 45Z(b)(1)(C)(ii) (recommending a rounding method for an emissions rate of -2.5 kgCO2e/mmBTU). Taking into account such negative emissions rates incentivizes production of the most advanced fuels that achieve the greatest GHG reductions.

II. The IRS Should Ensure Efficient Processing of Provisional Emissions Rate Petitions

The IRA establishes a petition process for a provisional emissions rate if a particular transportation fuel is not included within the emissions rate table. 26 U.S.C. § 45Z(b)(1)(D). For the Section 45Z credit, Congress defines "transportation fuel" based in part on the fuel's

[14] For example, USDA has published a list of climate change mitigation practices, many of which are relevant to determining the emissions rates of biofuels feedstocks. *See Climate-Smart Agriculture and Forestry (CSAF) Mitigation Activities List FY2023*, USDA, (Oct. 2022) https://www.nrcs.usda.gov/sites/default/files/2022-10/CSAF%20Mitigation%20Activities%202023_1028.pdf.

lifecycle emissions rate. *Id.* § 45Z(d)(5)(ii) (defining "transportation fuel" as a fuel that "is suitable for use as a fuel in a highway vehicle or aircraft," "has an emissions rate which is not greater than 50 kg CO_2e/mmBTU," and "is not derived from coprocessing" certain materials with a non-biomass feedstock). The statute specifies that, where the emissions rate table does not establish the transportation fuel's emissions rate—such as where the table does not account for production processes or agricultural practices that reduce the fuel's emissions rate—the taxpayer producing the fuel may file a petition with the Secretary for determination of the emission rate for that fuel. *Id.* § 45Z(b)(1)(D). Assuming the emissions rate table incorporates a full range of process and practice improvements using GREET under Section 45Z(b)(1)(B), the Section 45Z(b)(1)(D) provisional petition process could be tailored to producers of novel fuel categories with inputs that are not yet contained within GREET. Modeling tools used to establish provisional emissions rates for such fuels should be credible and of an equivalent caliber as GREET.

We recommend that the IRS allow producers to petition early in the technology/process development to ensure certainty related to investment decisions. For example, California's Low Carbon Fuel Standard (LCFS) contains regulatory provisions that allow a biofuel producer to establish a new fuel pathway under certain circumstances. 17 Cal. Code Reg. § 95488.9(c). The carbon intensity value can be adjusted later if necessary as additional data become available, thereby avoiding risk to the integrity of a provisional carbon intensity value. Similarly in the Section 45Z context, if a producer files a provisional emissions rate petition and the IRS is unable to process the petition in a timely manner by year-end, the producer should be allowed to rely on the provisional rate submitted in the application with a requirement to later amend a tax return as needed. A flexible and efficient approach to provisional emissions rate petitions that allows a petition to be filed as soon as the fuel's CI may be determined supports innovation and capital investments by providing new and advanced low-carbon processes and technologies equivalent access to the financial incentives provided by the Section 45Z credit.

III. Any Successor Model to GREET Will Need to be Equally Comprehensive, Consistent with the Best Available Science, and Adopted Only After Public Notice and Comment

Congress anticipated that, at a future time, it may be necessary to utilize a successor model to GREET to determine the emissions rates of some categories of transportation fuel. 26 U.S.C. § 45Z(b)(1)(B)(ii). Currently—and likely through the 2027 end date for the Section 45Z credit's initial eligibility period—there is no need to identify or develop a successor model for fuel ethanol. GREET is an annually updated model recognized as the gold-standard of lifecycle analysis science.[15] If, at a later date, the IRS considers adopting a successor model, that model should be equally comprehensive as GREET in addressing full

[15] *See, e.g.* Upstream Energy Analysis, Argonne National Laboratory (Sep. 27, 2022) https://www.anl.gov/esia/upstreamenergy-analysis (noting that GREET is "the gold standard for evaluating energy emissions and impacts").

lifecycle emissions. This should include the capacity to model the elements or inputs for a particular fuel's various production process and feedstock elements to calculate GHG lifecycle emissions (rather than relying on over-broad or imprecise default values). Further, before the IRS adopts a successor model for biofuels' lifecycle GHG emissions, it should obtain input from stakeholders and experts including DOE, USDA, and through a public notice-and-comment process in which biofuels industry experts and others can participate.

IV. GREET is a "Similar Methodology" to CORSIA Which Producers May Use to Determine the Emissions Rate of Sustainable Aviation Fuel

As explained in greater detail in the attached letter previously submitted to the IRS, Section 45Z establishes that the IRS should use the CORSIA model or a "similar methodology" that satisfies the criteria specified in the Clean Air Act Renewable Fuels Standard program to calculate lifecycle GHG emissions associated with aviation fuel. This flexibility allows producers of ethanol-to-jet sustainable aviation fuels to calculate emissions rates for their fuels using GREET. 26 U.S.C. § 45Z(b)(1)(B)(iii)(II). The U.S. government-developed GREET model amply satisfies the statute's requirements as an acceptable "similar methodology" that satisfies RFS program criteria. *Id.* Further, as explained in detail in the previously-submitted letter, GREET generates more credible results than the international CORSIA method, which substantially overestimates induced land use change (iLUC) allegedly caused by U.S. corn production. As with non-aviation fuels, a model for emissions rates that reliably addresses a wide range of inputs is important both to incentivize sustainable aviation fuels with the highest GHG-reduction potential and to ensure the integrity of the lifecycle emissions calculation. GREET satisfies these objectives.

V. Clean Fuel Producers Utilizing CCS Should Have Flexibility in Electing Section 45Z or Section 45Q Credits

Ethanol production processes have particularly high potential for deployment of carbon capture and sequestration (CCS) technologies due to the highly concentrated stream of carbon dioxide generated from the fermentation process that produces ethanol from corn starch.[16] Combining the sequestration of atmospheric CO_2 through photosynthesis by bioenergy feedstocks with the capture of high purity CO_2 streams from the bioenergy production process, ethanol production has enormous potential to reduce GHG emissions in liquid transportation fuels. The largest and most mature application of BECCS technologies is deployment of CCS onto U.S. ethanol production facilities.[17] Indeed, 25% of the ethanol

[16] International Energy Agency (IEA), *Bioenergy with Carbon Capture and Storage, Tracking Report* (Sep. 2022) https://www.iea.org/reports/bioenergy-with-carbon-capture-and-storage
[17] *See, e.g.* Bioenergy and Carbon Capture and Storage, Global CCS Institute (2019) https://www.globalccsinstitute.com/wp-content/uploads/2020/04/BIOENERGY-AND-CARBON-CAPTURE-AND-STORAGE_Perspective_New-Template.pdf

industry already captures carbon dioxide, and many other members are planning to install capture technology in the near future.[18]

To encourage the biofuels industry's continued deployment of CCS, the IRS should ensure producers have flexibility to elect either the Section 45Q or Section 45Z credit each year without compromising their ability to claim Section 45Q credits subsequently through the 12-year eligibility period. The statute does not prevent a taxpayer who previously received Section 45Q credits from later electing the Section 45Z credit in a different tax year. 26 U.S.C. § 45Z(d)(4). We request that the IRS clarify in guidance or regulation that the election to receive a particular credit in a taxable year applies only to that taxable year and is not an irrevocable election that locks a taxpayer into selecting the same tax credit for all subsequent years. Further, we request that the IRS clarify that any election previously made under Section 45Q with respect to a facility in a pre-IRA taxable year will not preclude such facility from qualifying as a "qualified facility" under Section 45Z in future taxable years.

VI. We Urge the IRS to Adopt Rounding Practices for Emissions Rates that Incentivize GHG Emissions Reductions

The IRS has discretion to choose an appropriate rounding methodology to determine a fuel's emissions rate. The statute specifies that "the Secretary may round the emissions rates under subparagraph (B) to the nearest multiple of 5 kilograms of CO_2e per mmBTU" (and may round a rate between 2.5 and -2.5 kg/mmBTU to zero). 26 USC § 45Z(b)(1)(C) Since the statute is permissive and thus does not require rounding, the IRS has discretion to round by smaller increments than 5 kg. The IRS should round to the nearest 0.1 kg/mmBTU in order to encourage emissions reductions that achieve lifecycle emissions reductions of less than 5 kg/mmBTU.

Process improvements that result in a less than 5 kgCO2e/mmBTU reduction in emissions rate can still have substantial impacts on total GHG emissions when spread across many gallons of biofuel production. For example, an emissions rate decrease of only *0.1* kg CO2e/mmBTU, if applied across the full U.S. ethanol production capacity, would result in an emissions reduction of approximately 130,000 metric tons of carbon dioxide[19]—the equivalent of taking over 28,000 gasoline vehicles off the road or operating 35 wind turbines for a year (in lieu of marginal sources of grid electricity).[20] The IRS should

[18] Growth Energy, *Putting Carbon to Work: Biorefineries' Critical Contributions to Net-Zero* (June 2022) https://growthenergy.org/wp-content/uploads/2022/06/GROW-22019-Issue-Brief-Carbon-Capture-2022-06-22-R8.pdf; *see e.g.,* "Navigator CO2, POET Sign Letter of Intent to Capture, Transport, and Store Five (5) Million Tons of CO2 Annually," https://poet.com/pr/navigator-co2-poet-sign-letter-of-intent.
[19] Calculated using ethanol production capacity data from the U.S. Energy Information Administration (data as of Jan. 1, 2022), https://www.eia.gov/petroleum/ethanolcapacity/ and ethanol energy content values from the U.S. Department of Energy, Alternative Data Center Fuel Properties Comparison, https://afdc.energy.gov/files/u/publication/fuel_comparison_chart.pdf.
[20] U.S. EPA Greenhouse Gas Equivalencies Calculator, https://www.epa.gov/energy/greenhouse-gas-equivalencies-calculator#

therefore round emissions rates to no greater interval than the nearest 0.1 kg CO2e/mmBTU in order to maximize the emissions-reduction potential of the Section 45Z credit, consistent with Congress's GHG emissions reduction goals and the Administration's priorities.

VII. Gallon Equivalence Should Only be Applied to Gaseous Fuel

The IRA specifies the clean fuel production credit as an amount equal to the product of "the applicable amount per gallon (or gallon equivalent)" produced and sold by the taxpayer and the emissions factor specified in the statute. 26 USC § 45Z(a)(1)(A). The reference to "gallon equivalent" provides a mechanism to address gaseous transportation fuels. For liquid transportation fuels, use of gallons are readily measured and any further accounting for differences in energy density are most directly addressed in calculating the fuel's lifecycle emissions rate. Specifically, the statute directs that emissions rates for a gallon of fuel is calculated on the basis of kg of CO2e/mmBTU, so that the emissions (of CO2e) for the gallon of fuel are already specified on the basis of the energy (mmBTU) contained in that gallon. Accordingly, differences in energy density between various liquid fuels are already incorporated into the amount of credits that a producer receives.

VIII. The IRS Should Clarify that Sale to an "Unrelated Person" in Section 45Z Has the Same Meaning as in Section 45

The IRS should clarify that "sale" as described in paragraph (a)(4) of Section 45Z includes the sale of fuel to an unrelated party through a related intermediary. In practice, it is common for a biofuel producer to transfer title to fuel it produces to a distributor under a common parent company for purposes of resale to an unrelated consumer. These types of sales should be included for purposes of Section 45Z credit generation because the end result—sale of fuel to an unrelated party—is the same, regardless of whether the fuel is first transferred to an affiliated distributor.

This is consistent with the concept of sales to an unrelated person in the Section 45 renewable electricity tax credits with respect to Indian coal facilities, which for such purposes allows sales "to an unrelated person (*either directly by the taxpayer or after sale or transfer to one or more related persons*)" to qualify for an increased credit. 26 U.S.C. § 45(e)(10)(A)(ii)(I)(emphasis added). Although Section 45Z does not include the same explanatory parenthetical as Section 45 with respect to sales or transfers to one or more related persons, it is reasonable to conclude that Congress intended to keep the concept of a sale "to an unrelated person" consistent throughout the Sections 45 - 45Z tax credits. Both Sections 45 and 45Z provide that, "[i]n the case of a corporation which is a member of an affiliated group of corporations filing a consolidated return, such corporation shall be treated as selling electricity to an unrelated person if such electricity is sold to such a person by another member of such group." 26 U.S.C. § 45(e)(4); 26 U.S.C. § 45Z(f)(3). There is no apparent reason that Congress would have intended that sales through an affiliated distributor would disqualify a producer from the 45Z credit but not the Section 45 renewable electricity tax credit for Indian coal facilities.

For these reasons, we encourage the IRS in its Section 45Z guidance to adopt language clarifying that sales through a related party to an unrelated person will fall within the meaning of paragraph (a)(4) of Section 45Z.

* * *

Growth Energy appreciates the IRS' consideration of this input as it implements the IRA's tax credit provisions in a robust and precise manner, relying on the best available science to maximally incentivize GHG emissions reductions. We look forward to engaging further on this important work and would be happy to meet with your staff to present on these issues in more detail and answer any questions.

Sincerely,

Chris Bliley
Senior Vice President of Regulatory Affairs
Growth Energy

CC:
The Honorable Janet Yellen, Secretary, U.S. Department of the Treasury
The Honorable Tom Vilsack, Secretary, U.S. Department of Agriculture
The Honorable Jennifer Granholm, Secretary, U.S. Department of Energy
The Honorable Pete Buttigieg, Secretary, U.S. Department of Transportation
The Honorable Michael Regan, Administrator, U.S. Environmental Protection Agency
The Honorable Brenda Mallory, Chair, White House Council on Environmental Quality

GHG Analysis of Dry Mill for Corn Ethanol Production under IRA

Prepared by Stefan Unnasch, Debasish Parida Life Cycle Associates, LLC

Date: December 1, 2022

The Inflation Reduction Act (IRA) requires the calculation of greenhouse gas (GHG) emissions based on the GREET model for credit generation under Section 45Z. As specified in the Act: "The lifecycle greenhouse gas emissions of such fuel shall be based on the most recent determinations under the Greenhouse gases, Regulated Emissions, and Energy use in Transportation (GREET) model developed by Argonne National Laboratory, …"

Meeting the requirements of the Act is possible by grouping the GHG reductions options from dry mill ethanol plants into categories that are readily verified. This document reviews the GHG analysis for corn ethanol in GREET and identifies leading options to reduce GHG emissions and their corresponding effect on life cycle GHG emissions.

- Typical Dry Mill Ethanol Plant
- Carbon Capture and Sequestration
- Renewable Power
- Renewable Natural Gas
- Low Carbon Ammonia
- Manure Application
- Fertilizer Usage, including Bio-based Fertilizer
- No Till Farming
- Cover Crop

Each of these emission reduction options is represented in the GREET model and fuel producers could identify a combination of ethanol plant operation and corn farming parameters that are consistent with the GHG emission thresholds of the IRA to calculate their life cycle GHG emissions. Readily available GREET results for corn ethanol plant operation could be used by fuel producers to demonstrate GHG reductions under Section 45Z.

An example of GHG emissions from corn ethanol production is shown in Figure 1. Ethanol plant reductions are shown sequentially with the effect of agricultural improvements shown incrementally on top of the ethanol plant reductions. Any combination of the reduction options shown here could be applied and the net GHG reductions are cumulative.[1]

[1] The GREET FD-CIC calculator, which is part of GREET, calculates the GHG emissions per bushel of corn based on farming practices. Some practices such as cover crops with manure application results in GHG savings that are greater than the additive effect of individual practices.

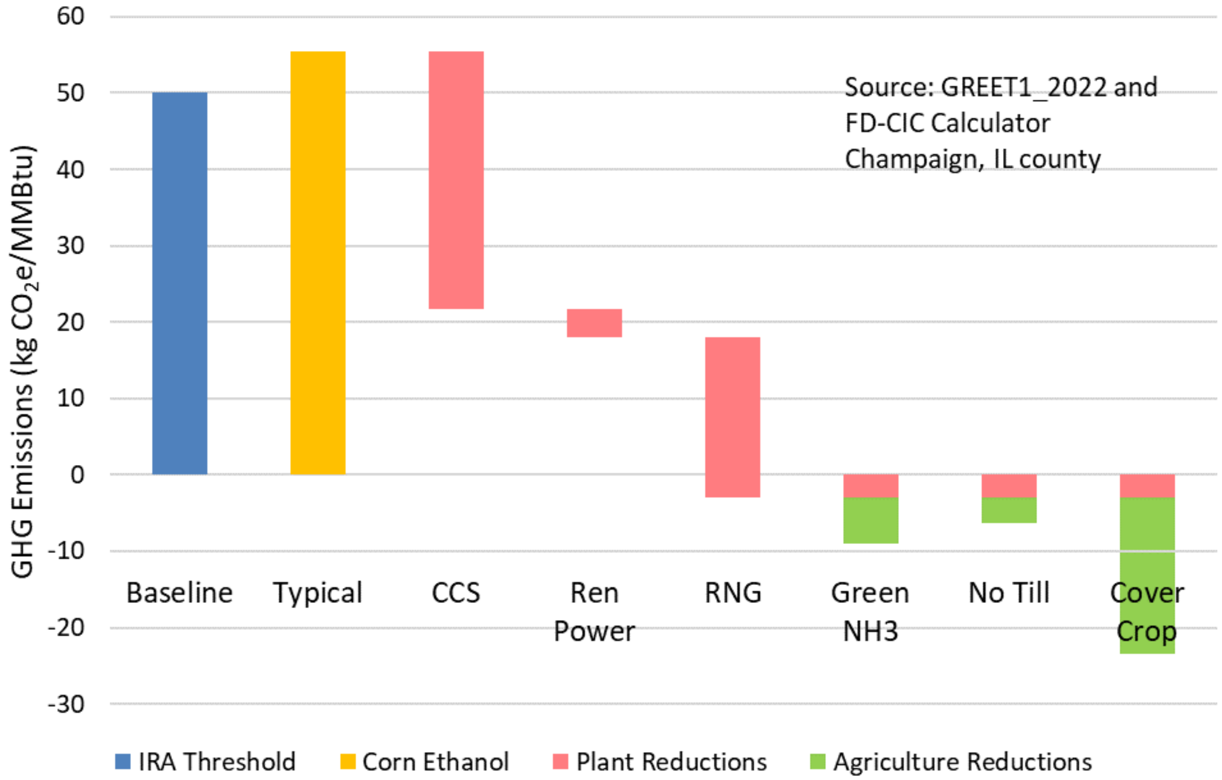

Figure 1. GHG Emission Reduction Options for Corn Ethanol.[2]

Corn Ethanol GHG Analysis

Dry mill corn ethanol plants process corn and sorghum into ethanol with distillers grains and corn oil as co-products. The majority of U.S. ethanol production are located in the Midwest and Upper Midwest States, where ethanol plants are close to a consistent supply of corn, water, and have ample livestock production nearby as a market for co-products.

Feedstock:	Corn Grain, Sorghum Grain
Products:	Ethanol, DGS, Corn Oil, Syrup
GREET Sheet	EtOH
Documentation	Corn Ethanol: Wang; 2012 & 2021; ANL, 2022 Farming: Kwon, 2021; Liu, 2022
Allocation Method	Substitution

Ethanol is produced from corn grain by hydrolysis and fermentation. Corn production inputs include farming energy, fertilizer production, changes in soil carbon, and N_2O emissions from fertilizer application. Ethanol is fermented from corn grain starch. Milling and distilling, which require electricity and heat, are the most significant uses of energy in ethanol production. The main co-products of corn ethanol are distiller´s grains and solubles (DGS), corn oil and corn syrup and result from corn ethanol production.

[2] Cumulative plant reductions are shown. Effect of agricultural reductions are shown individually.

The system boundary diagram for corn to ethanol as represented in the GREET model is shown in Figure 2. Corn is harvested, collected, and transported to a bio-refinery. Harvesting involves establishing the crop, applying fertilizer inputs, and collecting biomass with harvesting equipment. Fuel processing includes pretreatment and conversion to ethanol. CO_2 from combustion and fermentation are offset by the uptake of CO_2 from the atmosphere and any net carbon storage or release from the crop is represented as a change in soil organic carbon. Finished fuel is transported to fueling stations for blending and/or vehicle operation. Vehicle emissions contribute a small amount of methane and N_2O to the life cycle.

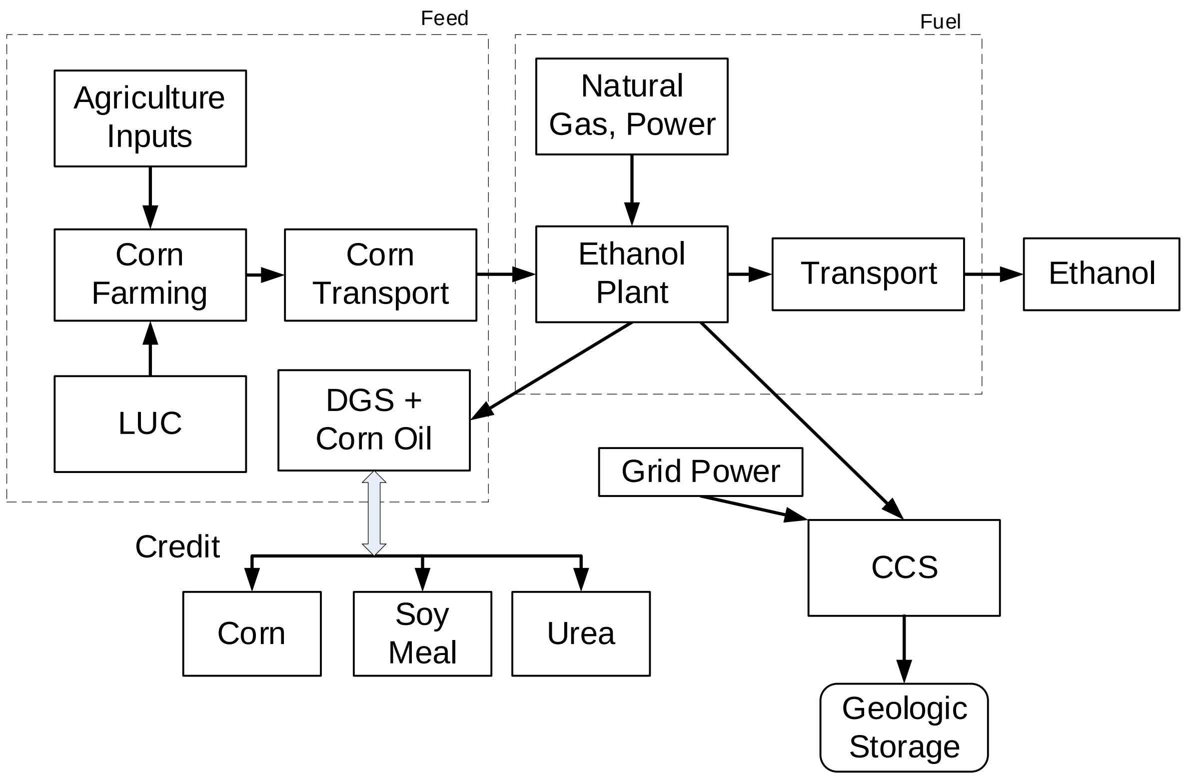

Figure 2. Corn Ethanol System Boundary Diagram

The GREET model calculates the life cycle GHG emissions for the corn ethanol pathway. The Feedstock Carbon Intensity Calculator (FD-CIC) which is a supplement to the GREET model (Liu, 2022) allows for the calculation of agricultural emissions with different farming practices.

Various emission reduction options for dry mill corn ethanol are shown in in Table 1. Opportunities for GHG reduction at the ethanol plant include the use of carbon capture and sequestration, renewable power, and renewable natural gas. Farm level GHG reductions include low carbon intensity (CI) ammonia, no till farming, and cover crops. The effect of each input and its quantification is described below. The total life cycle GHG emissions are shown in Table 1 with a combination of emission reduction options. Each of these options could be implemented independently or in combination.

Co-products from corn ethanol production include DGS, corn oil and syrup. Additionally, wet mill ethanol plants produce corn gluten feed, corn gluten meal, and a range of other products.

Corn syrup is either sprayed on the DGS following fermentation or sold as a stand-alone product. If corn oil is extracted, then it is added to the DGS following fermentation or sold as an animal feed supplement or a biodiesel feedstock. The GREET model uses the displacement method to calculate energy and emission credits based on co-product displacement ratios.

Table 1. Principal Options for GHG Reductions at Corn Ethanol Plants

Scenario	**kg CO_2/MMBtu**	**Description**	**Assumption/ Calculation Basis**[b]
Baseline	55.5	U.S. Average dry mill ethanol.	22,480 Btu/gal, 0.61 kWh/gal, 2.86 gal/Btu
	CI Reduction[a]	**Low CI Production Technologies**	
CCS	-33.8	Store CO_2 underground	Capture 90% of fermentation CO_2
Renewable Power	-3.8	REC for electricity as well as on-site wind or solar power	0 g CO_2e/kWh, per GREET
Biomass Heat and Power	-20 to -25	Power and heat generated at corn ethanol plant.	Eliminates natural gas and electric power emissions. Calculate GHG emissions from biomass use in GREET.
RNG	-21	40% of natural gas from RNG	- 100 g CO_2/MJ diary, swine, or steer manure. Calculate GHG emissions based on RNG use and CI of RNG.
		Farming GHG Reductions	
Green NH_3	-6.1	Green Ammonia for Fertilizer	FD-CIC Green Ammonia
Low CI NH_3	-2 to -5	Ammonia with CO_2 capture	Calculate GHG emissions based on ammonia production process.
No Till	-3.4 to -6.5	Switch Reduced to No Till farming	FD-CIC Reduced Till to No Till depending upon region.
Fertilizer	-2.4 -5.2 -1 to -3	Nitrogen efficiency Precision application Bio-based fertilizer	FD-CIC Enhanced Efficiency Fertilizer FD-CIC (4R) Right time, place, form, rate Calculate based on farming inputs
Manure Application	-5.5 to -28	Mix of dairy, swine, cattle, poultry manure	FD-CIC Manure Application
Cover Crop	-20.4 to -39.1	Grow winter cover crop	FD-CIC Cover Crop

[a] Reductions apply to baseline for typical dry mill ethanol plant; where multiple technologies or practices apply, reductions may be added together to calculate the fuel's emission rate.
[b] GHG reductions are available from standard values in the FD-CIC or from additional calculations as indicated.

Corn Ethanol GHG Emissions

Typical GHG emissions for a dry mill corn ethanol plant are available in the GREET model. The default values represent a mix of plant operating parameters which vary largely with the amount of DGS drying that occur at each plant.

Ethanol Plant Reductions

Several emission reduction options are available to ethanol plants and are discussed below.

Carbon Capture and Sequestration (CCS)

The GHG reduction associated with CCS is correspond to the capture of 90% of the ethanol fermentation CO_2. The fermentation of dextrose to ethanol produces one CO_2 molecule for every ethanol molecule. Thus, 44 kg of CO_2 is produced for every 46 kg of ethanol. After capture efficiency and power required for CO_2 capture CCS results in 33.8 kg CO_2/MMBtu of GHG reduction.

Renewable Power

Renewable power is available as source for processing energy with on-site production or behind the meter based on solar and wind power as well as the purchase of a renewable energy credit. (REC). A REC is a market-based instrument that represents the property rights to the environmental, social, and other non-power attributes of renewable electricity generation. RECs are issued to renewable energy producers when one megawatt-hour (MWh) of electricity is generated and delivered to the electricity grid from a renewable energy resource. The producer of renewable energy can monetize its RECs by selling or auctioning them on an exchange-based trading platform. Realizing the proceeds of REC sales as an offset to the cost of generating the renewable MWh lowers the cost of production which will spur additional renewable energy project development.

Because the physical electricity we receive through the utility grid says nothing of its origin or how it was generated, RECs play an important role in accounting, tracking, and assigning ownership to renewable electricity generation and use. On a shared grid—whether the electricity comes from on-site or off-site resources—RECs are the instrument that electricity consumers use to substantiate renewable electricity use claims. RECs can only be claimed once after which time they are extinguished.

The criteria that RECs should come from a region with an RPS or a new PPA should be required. A transition period of three years from the time RECs are used to the development of additional renewable resources for PPAs may be appropriate. The effect of RECs or other low CI power is that the contribution of electric power becomes zero. Note that GREET calculates the carbon intensity of electric power based on the U.S. Average.

Biomass sources such as crop residue and wood waste are also a potential source for renewable power. Biomass power plants could be collocated with ethanol plants and provide both heat and power to displace fossil sources.

Renewable Natural Gas (RNG)

RNG is a potential source of process fuel for ethanol plants. The CI of RNG depends on the source. RNG based on manure typically has a CI below -100 kg CO_2e/MMBtu. With book and claim accounting ethanol plants could eliminate the GHG contribution of natural gas. The same strategy is applied to hydrogen under IRA Section 45V. Proving 40% of the natural gas with RNG would result in net zero GHG emissions from natural gas plus RNG use.

Agricultural GHG Reductions

The effect of agricultural GHG reductions is available in Argonne National Laboratory's FD-CIC calculator. The calculator estimated GHG emissions per bushel of corn based on various farming practices. The results per bushel of corn are the same as those from the GREET model but are presented in an external calculator. FD-CIC presents the emissions in per bushel of corn based on the following agricultural practices. The emissions are estimated for each corn growing county. The effect of low CI ammonia is reflected in fertilizer production while agricultural practices affect the Soil Organic Carbon (SOC) change. The results for a range of practices are shown in Table 2.

- Low GHG ammonia used to make fertilizer can be produced using renewable energy (where hydrogen from electrolysis of water reacts with atmospheric nitrogen) or with carbon-reducing technologies, reducing lifecycle GHG for producing corn feedstock to ethanol production.
- Conventional, Reduced, No Till with less tillage resulting in lower disturbance of carbon in the soil.
- Precision Farming (nitrogen efficiency and as well as control of the right time, right place, right form, and right rate (4R) of fertilizer application).
- Bio-based fertilizers to corn such as nitrogen-fixing biological products, legumes, or manure can significantly reduce the need for conventional fertilizer, providing a lower carbon-intensive source of fertilizer for the corn.
- Nitrogen stabilizers can reduce the loss of nitrogen into the environment. In addition, this often leads to a reduced application rate of fertilizer, further reducing its environmental impact.
- Cover Crops result in additional carbon storage and prevent fertilizer run off.
- Manure Application provides additional fertilizer and accumulation of soil carbon.

Table 2. FD-CIC Results for a Range of Agricultural Practices

	Feedstock GHG Emissions (g CO_2e/bu)			GHG Reduction (g CO_2e/bu)		GHG Reduction (kg CO_2e/MMBtu)	
County	**w/o SOC**	**IL SOC**	**NE SOC**	**IL**	**NE**	**IL**	**NE**
Reduced Till	6,762	4	661	0	0	0.00	0.00
No Till	6,762	-743	-759	747	1,420	3.42	6.50
RT Cover Crop	6,762	-4,455	-7,874	4,459	8,535	20.43	39.10
RT Manure	6,762	-1,167	-5,596	1,171	6,257	5.36	28.66
RT, Manure, Cover Crop	6,762	-5,422	-12,122	5,426	12,783	24.9	58.6
RT 4R	5,638	4	661	1,124	1,124	5.15	5.15
RT Nitrogen efficiency	6,246	4	661	517	517	2.37	2.37
Green Ammonia	5,434	4	661	1,329	1,329	6.09	6.09

RT = Reduced till; 4R = Right time, Right place, Right form, and Right rate; SOC = Soil Organic Carbon, calculated for Champaign, Illinois and Frontier, Nebraska.

Figure 3 shows the GHG contribution for the first two GHG reduction strategies with the balance available in the FD-CIC for Illinois parameters that affect SOC change.

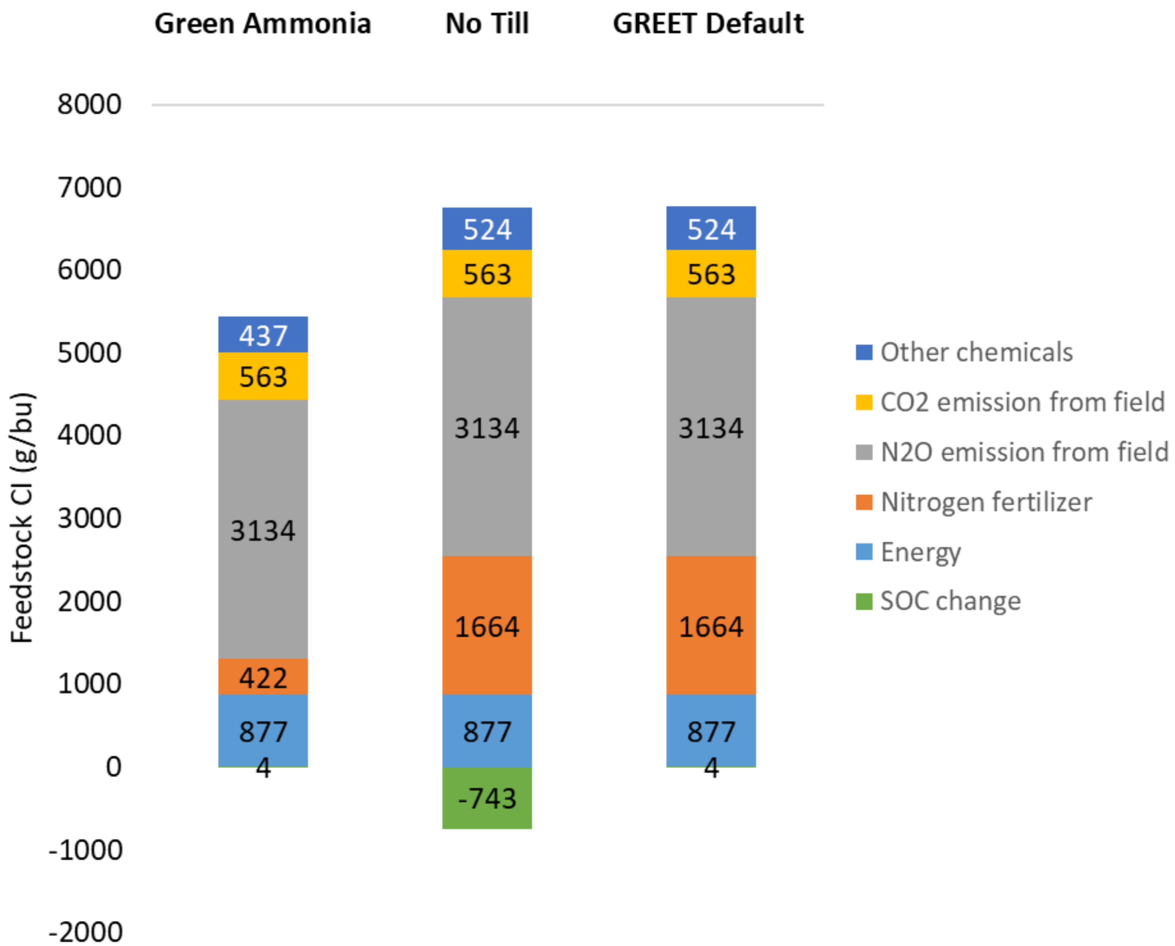

Figure 3. Life Cycle GHG Emissions from FD-CIC Calculator. (SOC Change for Illinois)

GHG Analysis

Life cycle GHG emissions were calculated for a typical corn ethanol plant and the same plant with the GHG reduction options described above. The GREET model tracks the emissions shown in Figure 4. CCS, electric power, and natural gas inputs are proportional to the processing inputs. Agricultural emissions are proportional to the corn to ethanol yield, which is typically 2.86 gallons per bushel.

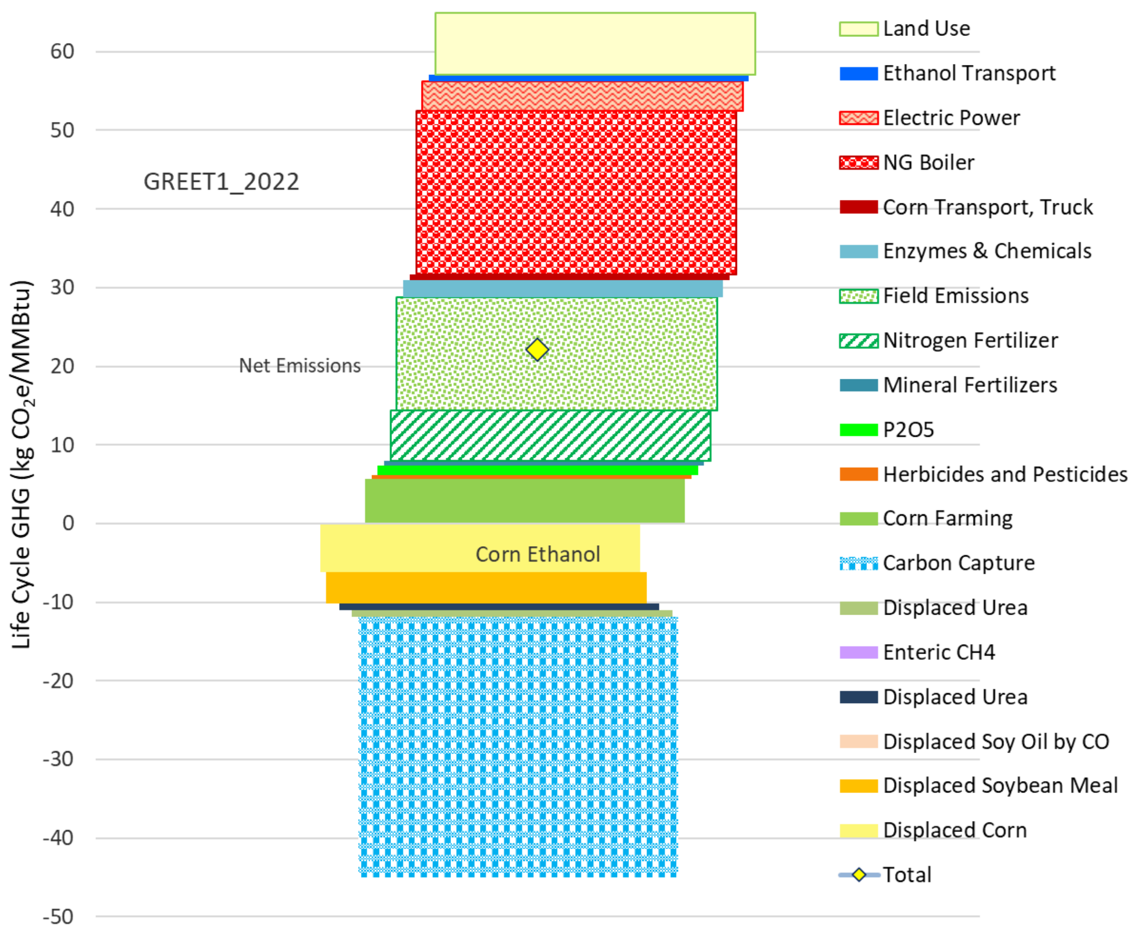

Figure 4. Life Cycle GHG Emissions for Dry Mill Corn Ethanol with CCS.

The effect of emission reduction options is readily calculated for each of the cases shown in Table 3 which combine the results from the FD-CIC calculator with GREET. Note that the FD-CIC calculator results vary by county.

This analysis shows that categories of dry mill corn ethanol can achieve GHG emissions below 0 kg CO_2e/MMBtu. For example, the following situations results in below or near zero GHG emissions.

- CCS, Renewable Power, 40% RNG: -3 kg/MMBtu
- CCS, Cover Crop: -1.6 kg/MMBtu
- Renewable Power, 40% RNG, Green Ammonia, No Till, Cover Crop: 0.9 kg/MMBtu

Table 2. Life Cycle GHG Emissions for Corn Ethanol Plants

GHG Emissions (kg CO_2e/MMBtu)			Cumulative Effect			Individual Agricultural Practices		
Step	**Baseline**	**Typical**	**CCS**	**Ren Power**	**RNG**	**Green NH3**	**No Till**	**Cover Crop**
LUC[a]		7.87	7.87	7.87	7.87	7.87	4.47	-12.54
Farming		19.11	19.11	19.11	19.11	13.04	19.11	19.11
Power		3.76	3.76	0	0	0	0	0
NG		21.60	21.60	21.60	0.62	0.62	0.62	0.62
Chemicals, etc.		2.11	2.11	2.11	2.11	2.11	2.11	2.11
CCS		0	-33.8	-33.8	-33.8	-33.8	-33.8	-33.8
Transport		1.09	1.09	1.09	1.09	1.09	1.09	1.09
Total	50	55.5	21.8	18.0	-3.0	-9.0	-6.4	-23.4
Reduction			**-33.8**	**-3.8**	**-21.0**	**-6.1**	**-3.4**	**-20.4**
Assumptions		22480 Btu/gal 0.61 kWh/gal	90% Capture Fermentation CO_2	100% REC Power	40% RNG -100 g/MJ	0 CI Ammonia	Reduced to No Till	Reduced Till w. Cover Crop

[a] Land Use Conversion emissions include direct and indirect land use as well as changes in soil carbon. SOC values based on Champaign County, IL from FD-CIC calculator.

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November 4, 2022

The Honorable Janet Yellen
Secretary
U.S. Department of the Treasury
1500 Pennsylvania Avenue, NW
Washington, D.C. 20220

Re: Implementation of Sustainable Aviation Fuel and Clean Fuel Production Tax Credits

Dear Secretary Yellen,

I write on behalf of Growth Energy to support the adoption of the U.S. Department of Energy's Greenhouse Gases, Regulated Emissions, and Energy Use in Technologies (GREET) model as a methodology for calculating 40B and 45Z tax credits for sustainable aviation fuel (SAF) produced using ethanol, as required by the Inflation Reduction Act of 2022 (IRA). Growth Energy is the leading association of ethanol producers in the country, with 90 bioprocessing plant producers and 106 innovative businesses that support biofuel production. We view U.S. leadership in the global SAF market to be vital to the decarbonization and future economic competitiveness of the U.S. aviation sector, and a number of our members have already made substantial investments in SAF production.

We applaud passage of the IRA as a significant step in supporting early growth of the U.S. SAF industry through the 40B Sustainable Aviation Fuel Credit and 45Z Clean Fuel Production Credit. We further applaud the Administration's SAF Grand Challenge, including its pledge to reach 3 billion gallons of American SAF production per year by 2030 and 35 billion gallons per year by 2050. Harnessing the U.S. ethanol industry—which at 17.4 billion gallons per year accounts for over 80% of biofuels production capacity in the U.S.[1]—will be necessary to achieve these goals because ethanol is one of the few readily available feedstocks for SAF production.

The Department of Treasury (Treasury) plays a critical role in implementing the IRA by ensuring the best available science is used to calculate greenhouse gas (GHG) emissions reductions associated with SAF. Specifically, the IRA ties both eligibility for and amount of the 40B and 45Z tax credits to a fuels' lifecycle GHG emissions, as determined through a lifecycle analysis (LCA). Accurate, complete, and consistent LCA measurement therefore is central to the effectiveness of the IRA.

[1] U.S. Energy Information Administration, *2022 Fuel Ethanol Production Capacity*.

The U.S. has the largest and most developed biofuels industry in the world.[2] As a result, government scientists and academics have been closely studying biofuels production for decades, and have developed the model that is widely recognized as the "gold standard" in LCA science: GREET.[3] As explained in detail below, Treasury must allow ethanol-to-jet (ETJ) producers to use GREET as a qualifying alternative methodology for determining the fuel's lifecycle GHG emissions. That is because the GREET model, which accounts for complete lifecycle emissions, meets the statutory criteria under the Clean Air Act's (CAA) definition of "lifecycle greenhouse gas emissions" referenced in the IRA and sole reliance on the model mentioned in the statute as an option (CORSIA) would not yield as credible results. 26 U.S.C. § 40B(e)(2); *id.* § 45Z(b)(1)(B)(iii)(II). In addition, Treasury must ensure that producers can receive enhanced 40B and 45Z credits based on all GHG reduction practices across their fuel's complete lifecycle, in order to incentivize lower-carbon practices and meet the IRA's carbon-reduction goals.

The Treasury Department's implementation of the 40B and 45Z tax credits must rely on accurate and complete GHG lifecycle emissions accounting to determine credit eligibility and amount.

Starting January 1, 2023, the IRA establishes a $1.25/gallon SAF credit for fuels that have a "lifecycle greenhouse gas emissions reduction percentage of at least 50 percent" as compared to petroleum-based jet fuel. 26 U.S.C. § 40B(d)(1)(D). The value of this credit can be increased by $.01/gallon for each additional percentage of GHG reduction beyond 50 percent. *Id.* § 40B(b). Then, once the 40B SAF credit expires at the end of 2024, producers of aviation fuels with an emissions rate of less than 50kg CO2e/mmBTU may qualify for the 45Z Clean Fuel Production Credit. 26 U.S.C. § 45Z(d)(5)(A)(2). Like the 40B credit, the value of the 45Z credit also increases as a fuel's emissions rate drops below the threshold value. 26 U.S.C. § 45Z(a)(1). Thus, the 40B and 45Z tax credits incentivize lower carbon intensity production of SAF and other transportation fuels. For these incentives to function properly, it is essential that a fuels' lifecycle GHG emissions be calculated accurately, completely, and in accordance with the best available science.

The 40B and 45Z tax credit provisions both prescribe two options for calculating a fuel's lifecycle emissions. First, a producer could use "the most recent Carbon Offsetting and Reduction Scheme for International Aviation [CORSIA] which has been adopted by the International Civil Aviation Organization [ICAO]." 26 U.S.C. § 40B(e)(1); *id.* § 45Z(b)(1)(B)(iii)(I). Alternatively, producers may use "any similar methodology" which "satisfies the criteria under section 211(o)(1)(H) of the Clean Air Act." 26 U.S.C. § 40B(e)(2); *Id.* § 45Z(b)(1)(B)(iii)(II). The GREET model developed by the U.S. Department of Energy's Argonne National Laboratory is undeniably a similar methodology that satisfies those criteria. For the reasons explained below, Treasury must allow ETJ producers to use GREET in determining the fuel's lifecycle GHG emissions.

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[2] *See, e.g.* U.S. Energy Information Administration, *International Biofuels Production*.

[3] *See, e.g. Upstream Energy Analysis*, Argonne National Laboratory (Sep. 27, 2022) https://www.anl.gov/esia/upstream-energy-analysis (noting that GREET is "the gold standard for evaluating energy emissions and impacts").

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GREET is a “similar methodology” to CORSIA. Both models calculate fuels’ well-to-wheel GHG emissions through an attributional lifecycle analysis of “core” process-based emissions (i.e., emissions from a biofuels production facility or feedstock production) combined with a consequential lifecycle analysis for indirect or induced emissions (i.e., land use change). *CORSIA Eligible Fuels – Life Cycle Assessment Methodology* (June 2019) at 10. CORSIA explicitly adopts GREET values for several of its inputs, including corn grain cultivation and harvest, transportation to the fuel production facility, and jet fuel transportation and distribution. *Id.* at 41. As a result, the CORSIA default value for ETJ core emissions varies from GREET by only 0.1 gCO2e/MJ. *Id.* at 41. The larger difference in total emissions between CORSIA and GREET comes nearly entirely from CORSIA’s overestimation of a single input—induced land use change or “iLUC”—as discussed further below.

GREET satisfies the criteria for lifecycle analysis under Clean Air Act (CAA) § 211(o). “Lifecycle greenhouse gas emissions” under the CAA’s Renewable Fuels Standard (RFS) must consider the “aggregate quantity of greenhouse gas emissions” including “direct emissions and significant indirect emissions” for the “full fuel lifecycle.” 42 U.S. Code § 7545(o)(1)(h). GREET, which comprehensively addresses direct emissions as well as utilizes the Carbon Calculator for Land Use Change from Biofuels Production (CCLUB), amply satisfies these requirements. Indeed, several provisions of the IRA mandate use of GREET to calculate the LCA for other transportation fuels, such as hydrogen. *See e.g.* 26 U.S.C. § 45V(c)(1)(B). Notably, these provisions require the use of GREET for other transportation fuels and hydrogen reference the same definition of “lifecycle greenhouse gas emissions’ under the Clean Air Act as the IRA’s SAF provisions. In addition, EPA utilized GREET, along with other models, to implement the RFS program’s major expansion in 2010. 74 Fed. Reg. 24,904, 24,916 (May 26, 2009). Multiple states that lead the nation on climate change regulation, including California and Oregon, also use GREET for evaluating lifecycle emissions of biofuels.

GREET and CORSIA have similar approaches to calculating ETJ lifecycle GHG emissions with one critical difference: CORSIA erroneously includes substantial induced land use change emissions.

As noted above, GREET and CORSIA are substantially similar, with multiple shared inputs, similar design and scope, and a core emissions value for U.S. ETJ within *one-tenth of one gram* CO2e/MJ of each other. Additionally, similar to CORSIA, GREET allows producers to select specific inputs that reflect a particular fuel’s production processes and feedstock inputs to allow precise calculation of GHG lifecycle emissions (rather than use of inaccurate default values).[4]

However, for ETJ SAF, CORSIA substantially overestimates the impact of iLUC, which significantly skews that model’s results. Recent analyses of iLUC converge on a central estimate much closer to GREET’s value for this input than CORSIA’s. For example, a recent paper by scientists from Harvard University on the current state of LCA modelling concluded that the

[4] At a *minimum*, Treasury must allow producers to use CORSIA’s actual value methodology in lieu of CORSIA default values. The actual value methodology, like GREET, determines emissions on a facility-specific basis, resulting both in more accurate LCA values and incentives to use lower carbon production processes (i.e. carbon capture).

"credible range" of iLUC values for U.S. corn ethanol lies between -1.0 and 8.7 gCO2e/MJ.[5] The relevant GREET/CCLUB iLUC value is within this range at 7.4 gCO2e/MJ.[6]

CORSIA, in contrast, falls far outside of this credible range with an iLUC value of 25.1 gCO2e/MJ.[7] Rather than utilizing the current best available science, CORSIA's iLUC value hews closer to outdated estimates from over a decade ago.[8] Modeling techniques have improved considerably in recent years due both to improvements in the models and improvements in the accuracy of inputs.[9] For example, older LCA models failed to account for the ability of intensification (increasing crop yield) rather than extensification (increasing crop acreage) to meet increases in demand.[10] Further, empirical data now allows for additional refinement to improve the accuracy of model results.[11]

Exclusive reliance on CORSIA for calculation of ETJ emissions risks incorporating the methodology's flawed iLUC calculation – which is based on non-U.S. standards – into U.S. tax policy and substantially disadvantaging U.S. ETJ producers. Congress avoids overreliance on CORSIA by requiring the acceptance of alternative LCA methodologies which meet certain minimum standards. 26 U.S.C. § 40B(e)(2); *Id.* § 45Z(b)(1)(B)(iii)(II). Indeed, U.S. tax policy should not tie itself to international aviation safety organizations that are far less experienced and sophisticated in biofuels LCA modeling than the U.S. Department of Energy's National Laboratories.

We strongly encourage Treasury to implement the alternative methodology provisions of 40B and 45Z by allowing use of the state-of-the-art, highly credible, U.S. Government-backed GREET model to measure ETJ's lifecycle emissions. In fact, precluding ETJ producers from utilizing GREET would be arbitrary, capricious, and contrary to the statute. 5 U.S.C. § 706(2)(a); *Chevron U.S.A., Inc. v. Natural Resources Defense Council, Inc*., 468 U.S. 837 (1984); *Physicians for Social Resp'y v. Wheeler*, 956 F.3d 634 (D.C. Cir. 2020) (finding that multiple statutory mandates require agencies to consider the best available science when enacting environmental policy).

Finally, Treasury must ensure that producers can reduce their lifecycle GHG emission values, and accordingly enhance their 40B and 45Z tax credits, based on GHG reductions they

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[5] Scully, et. al. *Carbon intensity of corn ethanol in the United States: state of the science* 16 Environ. Res. Lett. 043001 (2021).

[6] *Id.*

[7] *CORSIA Default Life Cycle Emissions Values for CORSIA Eligible Fuels*, International Civil Aviation Organization, (March 2021). Some of the differences in ILUC values can also be attributed to ICAO's political decision to amortize ILUC values over 25 years, the average of the European Union's 20 years and the United States' 30 years. Consistent with EPA's decision in 2010 with longstanding precedent under GREET and other U.S. modeling approaches, Treasury should amortize indirect emissions over 30 years.

[8] For example, EPA's 2010 analysis produced an iLUC value of 26.1 gCO2e/MJ. EPA has admitted that its 2010 analysis pre-dates significant advancements in the study of LCA modeling and has initiated work to update its analysis. *See Renewable Fuel Standard (RFS) Program: RFS Annual Rules Regulatory Impact Analysis*, U.S. EPA (June 2022) at 67-71; *Announcing Upcoming Virtual Meeting on Biofuel Greenhouse Gas Modeling*, 86 Fed. Reg. 73,756 (Dec. 28, 2021).

[9] Scully, et al. at 3.1.

[10] Taheripour, et. al. *The impact of considering land intensification and updated data on biofuels land use change and emissions estimates*, 10 Biotechnology for Biofuels 191 (July 2017).

[11] Life Cycle Associates, *Review of GHG Emissions of Corn Ethanol under the EPA RFS2* (Feb. 4, 2022) at 13.

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achieve across the entire lifecycle of their fuels. When fuel producers use GHG-reduction strategies, such as lower-carbon production practices and technologies, LCA methodologies account for those strategies and the resulting fuels have a lower lifecycle GHG emissions value. By incorporating that approach into the 40B and 45Z credits, Treasury will incentivize further GHG emissions reductions and further the IRA's goals. Any other approach, such as GHG emissions values that do not account for the array of potential GHG-reduction strategies, would fail to incentivize further reductions and accordingly frustrate the purpose of these tax credits.

* * *

Growth Energy appreciates Treasury's consideration of this input as it implements the IRA's tax credit provisions in a manner that ensures the best available science is used to calculate eligibility for and amount of credits. We look forward to engaging further on this important work and would be happy to meet with your staff to present on these issues in more detail and answer any questions.

Sincerely,

Emily Skor
CEO
Growth Energy

CC: The Honorable Tom Vilsack, Secretary, U.S. Department of Agriculture
The Honorable Jennifer Granholm, Secretary, U.S. Department of Energy
The Honorable Pete Buttigieg, Secretary, U.S. Department of Transportation
The Honorable Michael Regan, Administrator, U.S. Environmental Protection Agency
The Honorable Brenda Mallory, Chair, White House Council on Environmental Quality

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Commissioner Daniel Werfel
Internal Revenue Service
CC:PA: LPD:PR (Notice 2023-06)
Room 5203
P.O. Box 7604
Ben Franklin Station
Washington, DC 20044

RE: Comments on Sustainable Aviation Fuel 40B and 45Z Lifecycle Emissions Calculations in Response to Notices 2023-06 and 2023-58.

Dear Commissioner Werfel:

Thank you for the opportunity to comment on the Internal Revenue Service's (IRS) interpretation of several important provisions of the Inflation Reduction Act (IRA) that will drive reductions in greenhouse gas (GHG) emissions and grow American jobs. Growth Energy is the nation's largest association of biofuel producers, representing 92 U.S. plants that each year produce more than 9 billion gallons of low-carbon, renewable fuel; 115 businesses associated with the production process; and tens of thousands of biofuel supporters around the country. Our members are committed to developing a robust sustainable aviation fuel (SAF) market in the United States, consistent with national climate goals and commitments. A number of our members have already made substantial investments in SAF production, and the IRA's Section 40B and 45Z tax credits have the potential to greatly accelerate this trend.

Scaling up SAF production will be critical to the decarbonization and future economic competitiveness of the U.S. aviation sector. The SAF Grand Challenge pledges to reach 3 billion gallons of SAF production per year by 2030 and 35 billion gallons per year by 2050.[1] To meet these goals, it will be necessary to harness the U.S. ethanol industry, which at 17.4 billion gallons per year accounts for over 80% of

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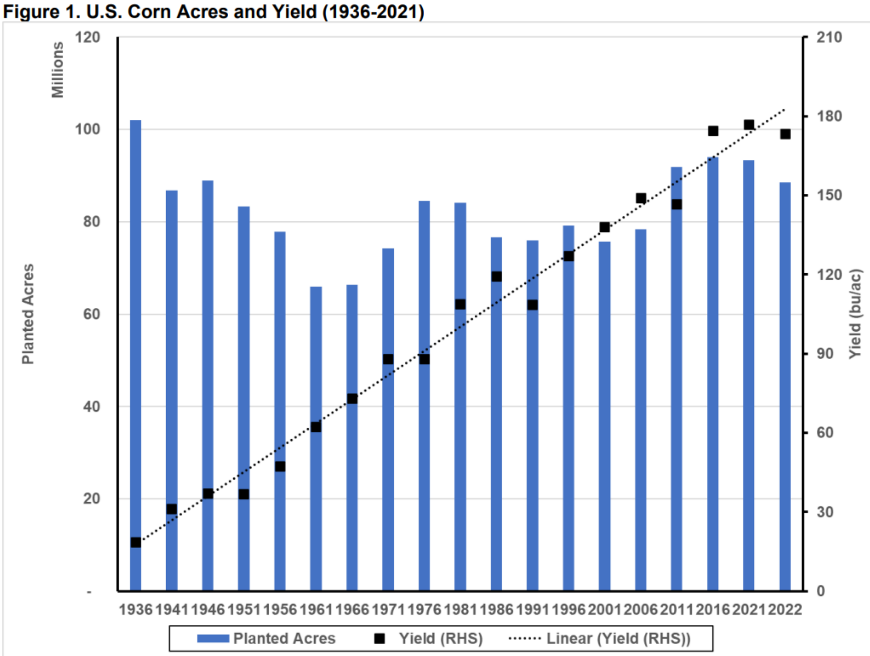
[1] *Sustainable Aviation Fuel Grand Challenge*, U.S. DOE, https://www.energy.gov/eere/bioenergy/sustainable-aviation-fuel-grand-challenge.

biofuels production capacity in the U.S.[2] Ethanol is one of the few readily-available feedstocks for SAF production that can be utilized in the aviation sector if the proper economic conditions are in place and if lifecycle analysis of greenhouse gas emissions associated with ethanol-to-jet (ETJ) SAF is conducted properly.

The U.S. has the largest and most developed biofuels industry in the world.[3] Over the past 20 years, U.S. fuel ethanol production has grown from 2.1 billion gallons/year to 15.4 billion gallons/year.[4] During this time, there has been no observable increase in corn acres planted or related adverse impacts to food prices. Instead, increases in corn demand have consistently been met by increased yield as agricultural practices have become more efficient over time:[5]

Figure 1. U.S. Corn Acres and Yield (1936-2021)



***Source**: USDA, Stillwater analysis*

[2] *2022 Fuel Ethanol Production Capacity*, U.S. Energy Information Administration, https://www.eia.gov/petroleum/ethanolcapacity.

[3] *See, e.g. International Biofuels Production,* U.S. Energy Information Administration, https://www.eia.gov/international/rankings/world?pa=28&u=2&f=A&v=none&y=01%2F01%2F2021&ev=false.

[4] *Oxygenate Production,* U.S. Energy Information Administration, https://www.eia.gov/dnav/pet/pet_pnp_oxy_dc_nus_mbbl_a.htm; *U.S. Production, Consumption, and Trade of Ethanol*, U.S. DOE Alternative Fuels Data Center, https://afdc.energy.gov/data/10323.

[5] For detailed analysis showing the lack of any empirical link between ethanol production and land use change, s*ee, e.g.* Growth Energy Comments on EPA's Renewable Fuel Standard (RFS) Program: Standards for 2023–2025 and Other Changes, Exhibits 2-3, EPA-HQ-OAR-2021-0427-0796, (Feb 10, 2023); Growth Energy Comments on EPA's Workshop on Biofuel Greenhouse Gas Modeling, EPA-HQ-OAR-2021-0324-0580 (Apr. 1, 2022); Growth Energy Comments on EPA's Proposed Renewable Fuel Standard Program: RFS Annual Rules, Exhibits 1-3, EPA-HQ-OAR2021-0324-0521, (Feb. 4, 2022).

Some economic models continue to impose a significant emissions penalty to crop-based biofuels based on predictions of indirect land use change (iLUC) despite the lack of empirical evidence these changes are occurring. For example, a recent International Energy Agency report concludes that "[c]ontrary to modelled relationships, statistics showed **no link** between expansion of U.S. biofuel production between 2005 and 2015 and corn production, corn export, or deforestation in Brazil."[6] After years of projecting land use change associated with corn ethanol that has yet to be observed, the assumptions shared across these economic models are in need of fundamental reconsideration.

Indeed, it is problematic for implementation of the IRA that iLUC assessments are constantly changing and evolving, and depending on the model assumptions used, generating widely-divergent results. For example, EPA initially estimated in 2009 iLUC associated with ethanol that was more than **double** the value it ultimately incorporated into its final rule establishing the 2010 Renewable Fuel Standard. Over a decade on, there is substantial evidence EPA's 2010 estimate is a significant overstatement given improvements in data inputs and modeling approaches in recent years. Indeed, the International Civil Aviation Organization (ICAO) that oversees the Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA) methodology is currently considering new scientific work on critical inputs to its iLUC estimates that could substantially lower the default lifecycle estimate for ETJ. As such, Treasury must incorporate the best available science into its lifecycle GHG assessments particularly where there have been significant refinements in iLUC estimates over time.[7]

To that end, the U.S.' extensive experience in biofuels production has led U.S. researchers to develop the best tools available for measuring biofuel lifecycle emissions, including the Greenhouse Gases, Regulated Emissions, and Energy Use in Technologies (GREET) model developed by the Department of Energy's Argonne National Laboratory.[8] Earlier this year, EPA highlighted that "the GREET model is well established, designed to adapt to evolving knowledge, and capable of including technological advances."[9] Even GREET is conservative, incorporating an iLUC estimate that is significantly higher than empirical evidence suggests would be realistic for domestically-produced ETJ over the next 5 to 10 years. Still, GREET's overestimate

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[6] *Towards an improved assessment of indirect land-use change,* International Energy Agency Bioenergy Technology Collaboration Program, (Oct. 2022) https://www.ieabioenergy.com/wp-content/uploads/2023/06/IEA-Bioenergy-iLUC-report_Final.pdf.
[7] Growth Energy anticipates submitting a technical paper to Treasury explaining evolution of iLUC estimates over time and what the best available science suggests is a sound approach to this issue.
[8] *See, e.g. Upstream Energy Analysis*, Argonne National Laboratory (Sep. 27, 2022) https://www.anl.gov/esia/upstream-energy-analysis.
[9] *New Source Performance Standards for Greenhouse Gas Emissions From New, Modified, and Reconstructed Fossil Fuel-Fired Electric Generating Units; Emission Guidelines for Greenhouse Gas Emissions From Existing Fossil Fuel-Fired Electric Generating Units; and Repeal of the Affordable Clean Energy Rule*, 88 Fed. Reg. 33,240, 33,328 (May 23, 2023).

is far more reasonable than the flawed, outdated, and substantially overstated iLUC estimates in CORSIA.

We strongly urge IRS to incorporate the GREET model as an option to demonstrate SAF lifecycle emissions for ETJ as it implements the Section 40B and 45Z tax credits. Sections 40B and 45Z explicitly authorize alternatives to the CORSIA methodology for calculating such emissions. In particular, these sections permit the use of either CORSIA "*or* … any similar methodology" that satisfies the Renewable Fuel Standard's definition of "lifecycle greenhouse gas emissions."[10] As explained below, the U.S. government-developed GREET model can and should be used to improve upon the international CORSIA approach. Specifically:

- IRS has ample discretion under the statute to adopt alternative LCA methodologies for SAF, and should do so, consistent with Congress's intent, when the alternative methodologies more accurately calculate lifecycle GHG emissions;

- GREET clearly satisfies all statutory criteria to qualify as an alternative LCA methodology;

- As applied to U.S. ETJ production, CORSIA has fundamental flaws, including a vastly overestimated projection of indirect land use change (iLUC) emissions; and

- GREET improves upon CORSIA's flaws in multiple respects, including by incorporating updated emissions factors and utilizing an amortization period that is well-recognized under U.S. biofuels policy.

I. Consistent with Congressional Intent Behind the IRA, the IRS Should Exercise Its Explicit Statutory Authority to Adopt Alternative Methodologies that More Accurately Determine the Lifecycle Emissions of U.S. SAF Production

Congress enacted the Inflation Reduction Act to stimulate clean energy production, technology, and innovation in the United States, in order to accelerate the energy transition and reduce greenhouse gas (GHG) emissions.[11] Sections 40B and 45Z, in particular, incentivize production of clean fuels with the greatest potential for emissions reductions by scaling the value of the tax credit to a fuels' carbon intensity, measured by the percentage reduction in lifecycle GHG emissions achieved compared

[10] 26 U.S.C. § 40B(e)(2).
[11] *See,* e.g. *Inflation Reduction Act Guidebook*, U.S. White House, (Jan. 2023), https://www.whitehouse.gov/cleanenergy/inflation-reduction-act-guidebook/#:~:text=To%20provide%20loans%20to%20support,from%20the%20Bipartisan%20Infrastructure%20Law.

with petroleum-based fuels.[12] Thus, for these incentives to function properly, it is essential that a clean fuels' lifecycle GHG emissions be calculated accurately and in accordance with the best available science.[13]

The Section 40B and 45Z tax credit provisions both provide two alternative pathways for calculating a fuel's lifecycle emissions. First, a producer could use "the most recent Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA) which has been adopted by the International Civil Aviation Organization (ICAO)." 26 U.S.C. § 40B(e)(1); *id.* § 45Z(b)(1)(B)(iii)(I). Alternatively, producers may use "any similar methodology" which "satisfies the criteria under section 211(o)(1)(H) of the Clean Air Act." 26 U.S.C. § 40B(e)(2); *Id.* § 45Z(b)(1)(B)(iii)(II).

This optionality is crucial for achieving Congress's core objectives. First, while CORSIA may be acceptable as a default approach for sustainable aviation fuels, due to its broad coverage of fuel types capable of being utilized as sustainable aviation fuel, CORSIA is fundamentally flawed when applied to certain fuels—including ETJ, as discussed further below. Additionally, as an internationally-negotiated compromise standard, CORSIA incorporates European or global assumptions that may be distorted or entirely inapplicable in the particular circumstances of the U.S. market. Congress avoids these and other potential problems by requiring IRS to consider alternative LCA methodologies that meet certain minimum standards.[14] Indeed, it would be contrary to congressional intent for IRS to ignore well-accepted, U.S.-based alternative methodologies that avoid CORSIA's flaws and demonstrably produce more accurate calculations in certain contexts.

Separately, Sections 40B(f) and 45Z(f)(1) address registration and third-party certification requirements. These procedural guardrails are largely independent of the choice of lifecycle analysis (LCA) methodology in 40B(e) and 45Z(b)(1)(B). To the extent an operator is able to comply with the CORSIA-based certification requirements of 40B(f)/45Z(f), including those relating to supply chain traceability and information transmission, it can do so regardless of which LCA methodology was used to derive the information being disclosed, so long as the choice of methodology is explicit. Moreover, where an alternative, higher-accuracy LCA methodology is utilized, certification requirements can be tailored to account for any differences from CORSIA.[15,16] Such third-party verification procedures have long been used in the federal RFS program and

[12] 26 U.S.C. § 40B(b); *id.* § 45Z.
[13] *See Physicians for Social Resp'y v. Wheeler*, 956 F.3d 634 (D.C. Cir. 2020) (agencies must consider best available science when enacting environmental policy).
[14] 26 U.S.C. § 40B(e)(2); *Id.* § 45Z(b)(1)(B)(iii)(II).
[15] 26 U.S.C. § 40B(f)(2)(A)(ii); *Id.* § 45Z(f)(1)(A)(i)(II)(aa)(BB).
[16] Certain parties have asserted that the certification requirements in § 40B(f) mandate the use of the CORSIA LCA methodology in § 40B(e). This assertion is entirely unfounded, both substantively and as a matter of statutory interpretation. Were § 40B(f) intended to mandate use of the CORSIA LCA methodology it would strip § 40B(e)(2) of all meaning and effect. Canons of statutory interpretation require that IRS avoid reducing other sections of the statute to mere surplusage.

numerous state clean fuels standards, which could readily be adapted for these purposes.

Notably, flexibility provided in § 40B(e)/§ 45Z(b)(1)(B)(iii) and § 40B(f)/§ 45Z(f) is not seen in other parts of the statute. For non-aviation fuel under Section 45Z, only GREET "or a successor model (as determined by the Secretary)" may be applied to determine lifecycle emissions.[17] Limiting the alternative model pathway in the non-aviation fuels context to one that has been "determined by the Secretary" to be a "successor" to the existing model is much narrower than the authority to accept "any similar methodology" in the sustainable aviation fuel context. Congress thus provided a heightened level of flexibility for SAF producers to rely on a more suitable, widely-accepted methodology to calculate lifecycle emissions – and it would defy congressional intent for IRS to ignore these alternative methodologies where they produce more accurate results than CORSIA. This heightened flexibility in the context of sustainable aviation fuel makes sense: not only is the international CORSIA standard a bad fit for certain markets and fuel types, but U.S. tax and climate policy should not be subservient to consensus-based international organizations, which are made up of foreign regulatory agencies far less experienced and sophisticated in biofuels LCA modeling compared with U.S. agencies such as the Department of Energy's Argonne Laboratory.

In short, when implementing the Section 40B and 45Z SAF tax credits, IRS must ensure LCA methodologies used for calculation of credits reflect the best available science so as to incentivize increased production of low carbon-intensity SAF in order to further Congress's core objective of accelerating the reduction of GHG emissions from the U.S. transportation system. Implementing the statute in this manner is critical to the decarbonization and continued economic competitiveness of the U.S. aviation sector.

II. CORSIA's Calculation of U.S. Ethanol-to-Jet SAF Lifecycle Emissions Is Fundamentally Flawed and Demonstrably Less Accurate Than the U.S.-Developed GREET Model

A. GREET is a "Similar Methodology" to the CORSIA-Approved Methodology

As Growth Energy has described in previous letters, the GREET model and methodologies that rely on it are similar to the methodology approved by CORSIA to calculate lifecycle GHG emissions, with multiple shared inputs, similar design, and similar scope. GREET-based methodologies (including GREET's reliance on the Argonne-developed input Carbon Calculator for Land Use Change from Biofuels Production (CCLUB)) plainly satisfy the criteria for lifecycle analyses under Clean Air Act (CAA) § 211(o) and were chosen by Congress to serve as the default lifecycle emissions methodology under other IRA provisions. Congress has also endorsed

[17] 26 U.S.C. § 45Z(b)(B)(ii).

GREET as an appropriate mechanism to determine the emissions intensity of ethanol in light duty vehicles. ICAO itself endorses the use of GREET for determining lifecycle greenhouse gas emissions; it has developed an ICAO-specific version of GREET it uses for calculation of the carbon intensity of various fuels *except* for emissions associated with indirect land use change (iLUC) of crop-based biofuels. For example, ICAO uses a modified version of GREET to calculate "core"/direct ETJ emissions (which includes emissions from feedstock production, feedstock transport, fuel production, and fuel transport)[18] as well as "lower carbon aviation fuels" that are produced from petroleum using lower carbon processes such as carbon capture and sequestration (CCS), clean hydrogen, or renewable electricity.[19] In contrast, ICAO seemingly arbitrarily incorporated in CORSIA a method for calculating indirect land use change (iLUC) of crop-based fuels that departs from GREET's approach and is disadvantageous to U.S. ETJ.

In this letter, we focus on one particular factor where there is a substantial, quantifiable distinction between GREET/CCLUB and CORSIA: iLUC. As explained further below, the differences in iLUC values between GREET/CCLUB and CORSIA primarily result from the selection of two inputs: emissions factors and amortization periods. The assumptions and inputs used in GREET/CCLUB, however, are more accurate for U.S. crop-based biofuels than the international CORSIA approach, which is outdated and incorporates policy decisions unique to the European context.

B. The CORSIA Methodology Substantially Overestimates iLUC Values for U.S. ETJ

The CORSIA methodology for calculating lifecycle emissions from aviation fuels reflects a compromise approach that is not the best or most scientifically-supported approach available for all nations or fuel types. Biofuels markets and industries across ICAO member nations are heterogeneous, with the existing U.S. production of crop-based biofuels an extreme outlier in size (~40% of global biofuel production[20]) and development (over 230 billion gallons of ethanol produced spanning the past two decades[21]). Despite considerable improvements over years of research, LCA modeling inevitably includes some degree of technical uncertainty and policy-driven choices and assumptions. CORSIA's approach to several of these modeling choices, especially those related to iLUC, is simply a bad fit for the uniquely-situated U.S. ethanol industry. This mismatch between the international assumptions within CORSIA and the specific

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[18] *CORSIA Supporting Document: CORSIA Eligible Fuels—Life Cycle Assessment Methodology*, ICAO, (June 2022) at 57.

[19] *CORSIA Methodology for Calculating Actual Life Cycle Emissions Values*, ICAO, (June 2022) at 23, 31.

[20] *See, e.g. International Biofuels Production*, U.S. Energy Information Administration, https://www.eia.gov/international/rankings/world?pa=28&u=2&f=A&v=none&y=01%2F01%2F2021&ev=false

[21] *U.S. Production, Consumption, and Trade of Ethanol*, U.S. DOE Alternative Fuels Data Center, https://afdc.energy.gov/data/10323

circumstances of U.S. markets is precisely what the IRA's flexible approach to alternative methodologies is designed to address.

As an initial matter, CORSIA uses two entirely separate and distinct LCA models (GTAP-BIO and GLOBIOM) that include different inputs and assumptions. It makes numerous tweaks to each of those models and then simplistically averages together the results to arrive at default values for various types of SAF. As CORSIA acknowledges, "GTAP-BIO (AEZ-EF) and GLOBIOM have different structures, and use data sets, parameters and emission factors from different sources."[22] This awkward "composite" approach reflects the consensus-driven nature of the ICAO body, where dozens of stakeholders offer disparate technical perspectives and the resulting compromise approach may not be scientifically defensible for all SAF in all jurisdictions. As part of this consensus approach, ICAO sought to avoid exclusive reliance on U.S.-developed models that are more applicable to the domestic context in favor of models developed by European researchers (like GLOBIOM).

In addition, the CORSIA methodology's default iLUC estimate is untethered from reality and fails to take into account the substantial potential diversion of U.S. ethanol production from current uses to the SAF market. CORSIA acknowledges that in jurisdictions where increased demand is met through yield increases or unused existing cropland, it is erroneous to apply CORSIA's default iLUC calculation.[23] Indeed, the methodology assumes, without support, that there will be a substantial amount of land conversion in the United States associated with ETJ production. To the contrary, however, increased demand for ethanol has historically been met in the United States with increased yield from *existing* acreage. It is well-documented that the billions of gallons of increased ethanol production (associated with the United States' transition from E0 to E10 as the predominant gasoline) did *not* result in the land conversion early modeling predicted. On this basis alone, it would be reasonable for Treasury to omit application of CORSIA's default iLUC calculation altogether; at a minimum, Treasury must allow use of an available, widely-accepted methodology that more accurately addresses this critical factor in the U.S. context.

Further, the CORSIA methodology fails to acknowledge that any increase in ETJ production in coming decades will coincide with declining production of internal combustion engine (ICE) vehicles, meaning there is significant opportunity to divert ethanol produced to fuel those vehicles to the SAF market. While liquid fuels will remain the predominant fuel source for light duty vehicles over at least the next decade, electric vehicles are nonetheless projected to displace an increasingly significant portion

[22] CORSIA 2022 Supporting Document at 99.
[23] CORSIA 2022 Methodology for Calculating Actual Life Cycle Emissions Values at 11-12.

of ICE vehicles — resulting in a projected decrease ethanol consumption, measuring in the billions of gallons.[24]

Moreover, each year since 2015, the U.S. has exported over a billion of gallons of ethanol to meet market demands.[25] If ethanol becomes more valuable in the domestic market as ETJ, the U.S. can produce billions of gallons of ETJ without needing to produce a single additional gallon of ethanol by diverting from current export flows. Diversion of ethanol from one use to the other, of course, entails no land conversion. However, the assumptions built into CORSIA's iLUC estimates completely fail to take this substitution effect into account. As a result, CORSIA substantially overestimates the amount of additional ethanol production (and relatedly, additional corn production) that would meet SAF demand, resulting in an artificially inflated iLUC estimate.

Recognizing these myriad shortcomings of CORSIA's methodology highlights the importance of the flexibility afforded by Congress to adjust and improve upon CORSIA's estimates—within the constraints of "similarity" and the Renewable Fuels Standard's definition of lifecycle greenhouse gas emissions.[26] We focus here on two factors in particular, choice of emissions factors and amortization period, that have a substantial impact on iLUC estimates that CORSIA's methodology approaches very differently from the GREET/CCLUB methodology. On both of these factors, the GREET/CCLUB approach is scientifically supported, consistent with U.S. policy whereas CORSIA is not, and well within the statutory contours of Section 40B(e)(2).

C. The Emissions Factors Used in CCLUB Are Consistent with the IPCC and the Best Available Science

iLUC estimates are the result of multiplying the acres of land that a model projects will be converted from various existing land uses to crop production (in order to meet a perceived increase in biofuel demand) by the additional GHG emissions that are attributable to that land conversion. The second input in this equation, estimating the GHG emissions attributable to each acre of land conversion, is referred to as the "emissions factor." Emissions factors vary based on the type of land converted. For example, converting forestland to cropland has greater GHG emissions than converting pastureland to cropland. Emissions factors are built on a multitude of assumptions relating to carbon stocks of particular land types, including both above ground carbon (i.e., in trees or vegetation) and below ground carbon (including soil organic carbon).

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[24] *See, e.g. The U.S. National Blueprint for Transportation Decarbonization: A Joint Strategy to Transform Transportation*, U.S. DOE, DOT, EPA, & HUD, (Jan. 2023) at 52, https://www.energy.gov/sites/default/files/2023-01/the-us-national-blueprint-for-transportation-decarbonization.pdf.
[25] *U.S. Exports of Fuel Ethanol*, U.S. Energy Information Administration, (May 31, 2023) https://www.eia.gov/dnav/pet/hist/LeafHandler.ashx?n=pet&s=m_epooxe_eex_nus-z00_mbbl&f=a.
[26] 26 U.S.C. § 40B(e)(2).

The choice of emissions factor that a model applies can have a significant impact on iLUC estimates.[27]

CORSIA's composite approach applies two different models with two different sets of emissions factors (e.g., the AEZ-EF emissions factor in GTAP along with GLOBIOM's embedded emissions factors). GREET's CCLUB instead utilizes CENTURY and Winrock emissions factors. The CCLUB emissions factors are more scientifically defensible than CORSIA's for multiple reasons. For example, CCLUB was developed by the Department of Energy over a decade ago and is updated regularly to improve its estimates as the best available science develops.[28] In contrast, AEZ-EF was created for a particular modeling exercise completed by California in 2014 and has not been updated since, notwithstanding significant refinements in understandings regarding critical inputs like soil organic carbon (SOC) estimates.[29] By its authors' own admission, AEZ-EF "relies heavily on IPCC greenhouse gas inventory methods and default values" from **2006**.[30] The Section 40B and 45Z tax credits, which together last through 2027, should incorporate the most up-to-date modeling techniques and not rely on emissions factors estimates incorporating data from nearly two decades ago.

CCLUB incorporates U.S. SOC estimates rather than relying on outdated international defaults, again demonstrating that GREET/CCLUB is a better fit for U.S. ETJ production than the international CORSIA standard.[31] Further, CCLUB's treatment of cropland pasture, one type of land that could potentially be converted for cropland, is informed by empirical data from USDA, and so is more evidence-based than AEZ-EF, which simply assumes that converting cropland pasture to cropland releases 50% of the emissions associated with converting pasture to cropland. In addition, CCLUB accounts for a broad range of soil, climate, and management conditions, which "is consistent with the technique of the Intergovernmental Panel on Climate Change of continuously updating carbon stock change factors based on such factors as management activities and various yield scenarios."[32]

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[27] Taheripour, et al., *Biofuels induced land use change emissions: The role of implemented emissions factors in assessing terrestrial carbon fluxes* (2022) at Table 2; *see also* Draft Regulatory Impact Analysis: RFS Standards for 2023-2025 and Other Changes, EPA-420-D-22-003, (Nov. 2022) at 162 (noting that "at the most basic level, we can clearly say that the land use change emissions factors are an influential part of biofuel GHG modeling.").
[28] *See, e.g.* Kwon, et al. *Carbon Calculator for Land Use and Land Management Change from Biofuels Production (CCLUB) Users' Manual and Technical Documentation*, Argonne National Laboratory (Oct. 2021).
[29] Plevin, et. al, *Agro-ecological Zone Emission Factor Model v52*, (Jan. 2014).
[30] Plevin, et. al, *Agro-ecological Zone Emission Factor Model* (Sep. 2011).
[31] *Cf.* Kwon, et al. (2021) at 8 (describing CCLUB approach to modeling soil organic carbon changes in the U.S.; Plevin, et. al. (2014) at Table 20 (citing IPCC defaults).
[32] Taheripour et al. *Response to "how robust are reductions in modeled estimates from GTAP-BIO of the indirect land use change induced by conventional biofuels?"* 310 Journal of Cleaner Production 127,431 (2021).

D. Consistent with Long-Standing U.S. Biofuels Policy, ETJ Lifecycle Emissions Modeling Should Apply an Amortization Period of 30 Years in iLUC Calculations

The amortization period is the length of time over which emissions impacts are evaluated. Lifecycle emissions models generally project an initial iLUC-driven increase in emissions in the first year that additional biofuel demand is introduced into a market, followed by many years of emissions reductions as biofuels displace higher-emitting fossil fuels.[33] As a result, longer amortization periods that consider longer-term emissions impacts generally result in lower LCA estimates for biofuels. U.S.-developed LCA models consistently apply a 30-year amortization period for biofuels, based in part, on the expected lifespan of U.S. biofuels production facilities. Europe instead applies a 20-year amortization period. The 25-year period utilized by CORSIA is simply "a compromise between the European use of 20 years and the U.S. value of 30 years."[34] CORSIA does not provide any scientific rationale to support its choices of 25-year period, acknowledging that the amortization period is "usually a decision made by policy-makers," given that it "play[s] an important role in affecting ILUC emission intensity."[35] A recent National Academy of Sciences (NAS) report agrees, noting that the "choice of the amortization periods in ILUC modeling may be a political decision and subject to the time period for policy goals" and that "[t]here is no single correct choice for amortization period."[36] As a result, NAS cautions that there is "significant parameter uncertainty" with respect to this input.[37] Indeed, a recent analysis found that, holding other inputs constant, adjusting the amortization period from 25 to 30 years reduces the resulting iLUC estimate by nearly 17%.[38]

In the U.S., federal and state agencies consistently apply a 30-year amortization period when evaluating the lifecycle emissions of biofuels, including in the U.S. Renewable Fuel Standard, the California Low Carbon Fuels Standard, and the Oregon and Washington Clean Fuel Programs. In fact, EPA recently confirmed its long-standing practice of using a 30-year amortization period, reasoning that "using 30 years as a reasonable time horizon for analysis is that biofuel production facilities last multiple

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[33] As Growth Energy has repeatedly demonstrated to EPA, this initial demand "shock" is not observed in the real world, and is one of several flaws in LCA modeling that results in a systematic overestimation of iLUC emissions across economic models. *See, e.g.* Growth Energy Comments on EPA's Renewable Fuel Standard (RFS) Program: Standards for 2023–2025 and Other Changes, EPA-HQ-OAR-2021-0427-0796, (Feb 10, 2023); Growth Energy Comments on EPA's Workshop on Biofuel Greenhouse Gas Modeling, EPA-HQ-OAR-2021-0324-0580 (Apr. 1, 2022); Growth Energy Comments on EPA's Proposed Renewable Fuel Standard Program: RFS Annual Rules, EPA-HQ-OAR2021-0324-0521, (Feb. 4, 2022).
[34] CORSIA 2022 Supporting Document at 105.
[35] *Id.*
[36] *Current Methods for Life Cycle Analyses of Low-Carbon Transportation Fuels in the United States,* National Academies of Sciences, Engineering, and Medicine, at 64 (Oct. 2022).
[37] *Id.*
[38] Taheripour et al. (2022) at Table 2.

decades after they are constructed."[39] Further, under the IRA, fuels utilizing GREET to calculate lifecycle emissions under the Section 45Z tax credit will apply a 30-year amortization period.[40]

The IRS should not force SAF producers to apply an amortization period for purposes of Section 40B that deviates from the amortization period utilized across the board in Section 45Z and by U.S. state and federal agencies. The IRA tax credits were carefully designed to provide the greatest incentivizes to fuels with the highest potential for greenhouse gas reductions. Inconsistencies across how those reductions are calculated, such as use of disparate amortization periods in the Section 40B and Section 45Z credits, will distort the balance struck by these incentives.

E. An Accurate LCA Methodology Must Account for Emissions Reductions in SAF Production Associated with Carbon Capture and Sequestration.

To properly incentivize the adoption of lower-carbon agricultural practices and production processes, any LCA methodology adopted by the IRS must incorporate the wide variety of methods by which a biofuel producer can significantly reduce their fuels' emissions rate. As described in our previous letter,[41] ETJ producers should receive appropriate credit for introducing any of the myriad of techniques available to measurably reduce lifecycle emissions, including use of cover crops, low- or no-till farming practices, manure application, improved fertilizer application, use of low-carbon ammonia, use of renewable electricity, use of biomass for process heat, and deployment of CCS technologies, among others. Commenters' suggestion that the IRS must modify the approach both CORSIA and GREET take to exclude consideration of GHG emissions reductions associated with CCS is not scientifically defensible. The U.S. ethanol industry is a first-mover in implementation of innovative CCS technologies. In coming years, production of low carbon intensity ETJ will incorporate CCS if the IRA's tax incentives, including the enhanced 45Q tax credit, are properly implemented. Significantly, both CORSIA and GREET's approach to evaluating lifecycle GHG emissions assess full feedstock-to-fuel lifecycle emissions and incorporate GHG emissions reductions from CCS. Specifically, CORSIA's LCA methodology highlights that "GHG emissions reductions could be achieved through measures such as **carbon capture and sequestration (CCS)**, renewable and low carbon intensity hydrogen, and

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[39] November 2022 Draft Regulatory Impact Analysis at 167 ("After considering public comments and the input of an expert peer review panel, in the March 2010 RFS2 rule (75 FR 14670), EPA determined that our lifecycle greenhouse gas emissions analysis for renewable fuels would quantify the GHG impacts over a 30-year period. One of the reasons for using 30 years as a reasonable time horizon for analysis is that biofuel production facilities last multiple decades after they are constructed. EPA continues to believe that 30 years is an appropriate timeframe for evaluating the lifecycle GHG emissions of renewable fuels…").

[40] *See, e.g.* 26 U.S.C. § 45Z(b)(1)(B)(ii); *Id.* § 45V.

[41] Growth Energy Comment on Notice 2022-58, IRS-2022-0029-0075, (Dec. 2, 2022).

renewable and low carbon intensity electricity."[42] Similarly, GREET provides inputs to calculate emissions of production processes that incorporate CCS.

Consistent both with Congressional intent and the widely-accepted understanding of the scope of lifecycle GHG emissions, the IRS must recognize GHG emissions reductions from CCS in ETJ LCA estimates.

F. GREET Reasonably Accounts for Methane Emissions Rates

Certain parties have asserted that GREET fails to accurately capture upstream methane emissions associated with natural gas used as process energy in SAF production. This is unfounded. GREET's estimate of upstream methane emissions related to natural gas production is linked to national emissions values published by the EPA.[43] EPA closely monitors methane emissions from the natural gas sector and has recently proposed more stringent methane regulations that, among other things, particularly target intermittent, large emission events.[44] IRS should defer to EPA's considerable expertise on U.S. methane emissions rates as incorporated into the GREET model.

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Growth Energy appreciates the IRS's consideration of this input as it implements the Section 40B credit for Sustainable Aviation Fuel. We look forward to engaging further on this important work and would be happy to meet with your staff to present on these issues in more detail and answer any questions.

Sincerely,

Chris Bliley
Senior Vice President of Regulatory Affairs
Growth Energy

CC:

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[42] *Id.* at 21.
[43] https://www.epa.gov/system/files/documents/2023-04/US-GHG-Inventory-2023-Main-Text.pdf at Table 3-65.
[44] *Standards of Performance for New, Reconstructed, and Modified Sources and Emissions Guidelines for Existing Sources: Oil and Natural Gas Sector Climate Review*, 87 Fed. Reg. 74,702, 74,749 (Dec. 26, 2022).

The Honorable Janet Yellen, Secretary, U.S. Department of the Treasury

The Honorable Tom Vilsack, Secretary, U.S. Department of Agriculture

The Honorable Jennifer Granholm, Secretary, U.S. Department of Energy

The Honorable Pete Buttigieg, Secretary, U.S. Department of Transportation

The Honorable Michael Regan, Administrator, U.S. Environmental Protection Agency

The Honorable Brenda Mallory, Chair, White House Council on Environmental Quality