The Impacts of New York's Non-Alignment with IPCC-Based Accounting Systems: Preliminary Results

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Executive Summary

New York's Climate Leadership and Community Protection Act (CLCPA) establishes a greenhouse gas (GHG) accounting system that is fundamentally incompatible with the accounting systems based on the United Nations Intergovernmental Panel on Climate Change (IPCC) that are used by critical U.S. climate incentive programs such as the Inflation Reduction Act (IRA). Clean energy investors and developers are unlikely to develop capacity in New York that would qualify for the IRA and other federal government IPCC-based incentive programs so long as this incompatibility exists, not least because clean energy-friendly states such as California, Oregon, and Washington have all adopted IPCC-compatible systems of their own.

New York's consumers and workforce will be negatively impacted in the event that the CLCPA is implemented while non-aligned with IPCC-based accounting systems. Absent alignment with the federal government's GHG accounting system, New York may be unable to access:

- Recurring federal incentives for decarbonization with a **combined annual value of between $9 billion and $16 billion** or more that would offset most or even all of the costs of producing certain types of clean energy.
- **$1 billion under the extended Investment Tax Credit** that would primarily be directed to municipalities and rural upstate economies.
- **Up to 63,000 or more new full-time positions** (construction and operations) that would be covered by the IRA's prevailing wage and apprenticeship requirements. These new positions would primarily be located in and around upstate communities where labor standards are weaker than in New York City.
- A**pproximately $4.7 billion in the form of increased GHG emission reduction requirements** compared to under an IPCC-compatible system, and these additional costs will bring no additional benefits to U.S. decarbonization obligations under the Paris Climate Agreement.

In addition, the continued use of the existing CLCPA accounting system will also substantially increase the costs of reducing the state's GHG emissions compared to an IPCC-compatible system. These additional costs will primarily be borne by New York ratepayers and consumers in the event that a Cap-and-Invest program is deployed as part of the CLCPA's implementation.

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Contents

1. Introduction

New York's Climate Leadership and Community Protection Act of 2019 (CLCPA) establishes an ambitious economywide decarbonization target of at least 85%, and up to 100%, by 2050 compared to 1990 levels. While the law's "Legislative Findings and Declaration" section heavily references the United Nations Intergovernmental Panel on Climate Change's (IPCC) work on the magnitude of decarbonization that is required if global warming is to be kept below catastrophic levels, it then creates a novel greenhouse gas (GHG) accounting system that is incompatible with all IPCC-based GHG accounting systems and programs. The IPCC's accounting system has been adopted by the U.S. federal government, most recently through the Inflation Reduction Act of 2022 (IRA), as well as by the state governments of California, Oregon and Washington. The incompatibility of the CLCPA's GHG accounting system with that of the IPCC in turn makes it incompatible with those of other U.S. jurisdictions as a consequence.

The IRA builds upon earlier federal policies by explicitly linking the value of certain financial incentives it makes available for decarbonization investments to the GHG emission reductions achieved by those investments. Specifically, the IRA mandates the use of an IPCC-based GHG accounting model developed by Argonne National Laboratory called the Greenhouse Gases, Regulated Emissions, and Energy Use in Technologies (GREET) model[2] to determine the value of certain tax credits awarded under the IRA. The GREET model is already in use by the U.S. Environmental Protection Agency, the California Air Resources Board,[3] the Oregon Department of Environmental Quality,[4] and the Washington Department of Ecology.[5] The IRA also ties the use of the GREET model together with the adoption of specific labor standards covering prevailing wage and apprenticeship requirements when determining the value of the financial incentives awarded under the IRA.

New York will need to attract clean fuels investors and developers to the state if it is to benefit from the IRA's IPCC-based incentives. The incompatibility of the CLCPA with the IRA's incentives makes such participation unlikely to occur for two reasons. First, the CLCPA intentionally undercounts the climate benefits that are provided by the clean fuels that the IRA's IPCC-based incentives are designed to support. Given that all other U.S. states are aligned with the IPCC either explicitly (California, Oregon, and Washington) or implicitly (those states that have not adopted a GHG accounting system but participate in federal IPCC-based incentive programs), and that incentives are increasingly valued according to a clean fuel's climate benefits, clean fuels investors and developers will see lower returns in New York than in other states. Second, should a clean fuel developer still choose to participate in New York, it will experience high costs of compliance due to the need to hire support separate support staff with expertise in New York's IPCC-incompatible GHG accounting system. This incompatibility

[2] https://www.epa.gov/system/files/documents/2022-03/biofuel-ghg-model-workshop-biofuel-lifecycle-analysis-greet-model-2022-03-01.pdf
[3] https://ww2.arb.ca.gov/resources/documents/lcfs-life-cycle-analysis-models-and-documentation
[4] https://www.oregon.gov/deq/ghgp/cfp/pages/clean-fuel-pathways.aspx
[5] https://ecology.wa.gov/DOE/files/23/233f865b-6758-482d-98e2-59e4f624a84b.pdf

therefore places New York entities at high risk of missing out on both the IRA's IPCC-based financial incentives as well as the corresponding labor standard requirements.

This report explains why the CLCPA is incompatible with the internationally accepted best practice on GHG accounting and provides a preliminary assessment of the consequences to New York of this incompatibility. The rest of the report is divided into the following sections. Section 2 summarizes the GHG accounting system that is required by the CLCPA and compares it to the IPCC-based GHG accounting system that has been adopted elsewhere in the U.S. Section 3 summarizes the existing IPCC-based federal incentives that NY is unable to fully utilize due to the adoption of the CLCPA's accounting system. Section 4 summarizes the new IPCC-based federal incentive programs that were created by the IRA that New York is unable to fully utilize under the CLCPA's current language. Section 5 quantifies the total annual value of the incentives that New York is at risk of missing out on due to the incompatibility of the accounting systems. Section 6 quantifies the number and regional locations of the jobs that would be covered by the IRA's new labor standards in the event that New York's GHG accounting system were to be aligned with the GREET model. Finally, Section 7 concludes with a summary of the economywide impacts that are created by New York's incompatibility with IPCC-based systems and programs.

2. The CLCPA's Greenhouse Gas Accounting System

The CLCPA requires New York to develop a "Statewide Greenhouse Gas Emissions Report" for the dual purposes of establishing a 1990 GHG emission baseline and quantifying progress toward the law's decarbonization targets relative to that baseline. § 75-0105 details what data the report must incorporate, and these provisions differ from IPCC-based accounting systems in two notable ways. First, § 75-0105(2)(c) requires that "information relating to emissions from non-fossil fuel sources, including, but not limited to, garbage incinerators, biomass combustion, landfills and landfill gas generators, and anaerobic digesters" be contained in the report. Second, § 75-0105(3) requires that GHG emissions associated with "the extraction and transmission of fossil fuels imported into the state" be counted, but no reference is made to those emissions (positive or negative) associated with the production of *renewable* fuels imported into the state.

The implementation of IPCC-based GHG accounting systems in climate incentive programs has been universally characterized by adherence to three important scientific principles. The first principle is that of lifecycle GHG emission accounting (also known as lifecycle assessment, or LCA). This requires that the emissions associated with the production and use of a fuel or product be accounted for along its entire supply chain; LCA analysts commonly refer to "well-to-wheel" or "cradle-to-grave" emissions, dependent on whether the product in question is disposed of via combustion (fuel) or landfilling (product).[6] LCA is a critical tool in the quantification of the climate impacts of fossil fuels/products and lower-emission substitutes since many of the latter's emissions occur at different stages of the supply chain than is the case for

[6] See, e.g., https://afdc.energy.gov/vehicles/electric_emissions.html

their fossil counterparts (two classic examples being electric vehicles powered by coal-fired electricity and corn ethanol production that utilizes natural gas-derived fertilizers as a feedstock input).

The second principle is that direct biogenic CO_2 emissions do not count toward a clean fuel's lifecycle carbon intensity (CI) score[7] when that fuel is derived from sustainable biomass. This reflects the scientific recognition that the carbon released during a clean fuel's use was removed from the atmosphere during the previous growing season and will be once again removed from the atmosphere during the subsequent growing season. Notably, LCA best practice carefully distinguishes between sustainable and non-sustainable biomass feedstocks. For example, CO_2 emissions incurred by the clear-cutting of old-growth forest and combustion of that biomass are counted toward the lifecycle CI score, whereas those from managed forests are not.[8]

The third principle is that the global warming potential of GHG emissions should be measured based on their impacts over 100 years (GWP100). The primary rationale for this is that individual GHGs (CO_2, CH_4, N_2O, etc.) contribute to global warming over very different timescales, ranging from one decade (CH_4) to hundreds or even thousands of years. The global climate policy community has adopted GWP100 as a middle ground between fringe policy proposals to utilize GWPs that emphasis either short-lived GHGs (i.e., GWP20) or long-lived GHGs (i.e., GWP500).[9] The CLCPA's requirement that New York quantify its total GHG emissions on the basis of GWP20 is unusual among climate policies, as the IPCC and all IPCC-based programs instead utilize GWP100. In doing so, the CLCPA artificially increases the state's total GHG emissions on a carbon dioxide-equivalent (CO_2e) basis (see Section 7).

Taken together, the first two principles cause IPCC-based accounting systems to track GHG emissions over the full lifecycle of a fuel or product but then subtract the direct biogenic CO_2 emissions from the total CI score (under the sustainability constraints discussed above).[10] An example is California's own GHG inventory,[11] which states:

> "Consistent with the IPCC Guidelines for National GHG Inventory and the annual GHG inventories submitted by the U.S. and other nations to the United Nations Framework Convention on Climate Change, CO2 emissions from biofuels (the biofuel components of fuel blends) are classified as 'biogenic CO_2.' They are tracked separately from the rest of the emissions in the inventory and are not included in the total emissions when comparing to California's 2020 and 2030 GHG Limits. Biogenic CO_2 emissions data are available on California Air Resources Board webpage. Emissions of methane (CH_4) and nitrous oxide (N_2O) from biofuel combustion are included in the inventory along with CO_2, CH_4, and N_2O from fossil fuel combustion."

[7] As with golf, lower CI scores are better than higher CI scores.
[8] https://www.epa.gov/sites/default/files/2018-04/documents/biomass_policy_statement_2018_04_23.pdf
[9] https://www.epa.gov/ghgemissions/understanding-global-warming-potentials
[10] See, e.g., https://www.energy.gov/sites/prod/files/2017/05/f34/analysis_and_sustainability_wang_4.1.1.10.pdf
[11] https://ww2.arb.ca.gov/sites/default/files/classic/cc/inventory/2000-2020_ghg_inventory_trends.pdf

The CLCPA's accounting system is unable to be reconciled with IPCC-based systems and programs due to the former's incompatibility with these two principles. The discrepancy ensures that any attempt to calculate lifecycle GHG emissions under the CLCPA's system will be fundamentally inaccurate since the calculated CI scores of certain low-carbon fuels will be too high while those of other low-carbon fuels will be too low.[12] An example of the former is renewable natural gas (RNG), which is characterized by substantial negative "upstream" (i.e., near the point of production) emissions due to the capture and conversion of a powerful GHG, methane, into the weaker GHG CO_2. Under the CLCPA's accounting system, RNG's negative emissions are ignored, depending on whether they occur within or outside of New York's border (raising a major federal constitutional conflict with the Dormant Commerce Clause in turn). An opposite example is corn ethanol, which is frequently characterized by substantial upstream emissions associated with feedstock production and conversion to ethanol. Almost all U.S. corn ethanol production occurs outside of New York, and these emissions do not necessarily count towards the biofuel's total CI score under the CLCPA's accounting system.

3. Incentives Available to New York Under the Federal Renewable Fuel Standard

The federal Renewable Fuel Standard, also known as the revised Renewable Fuel Standard (RFS2), requires the blending of specific categories of biofuels into the nation's transportation fuel infrastructure. Each biofuel category is classified according to feedstock and maximum CI score. The two categories most relevant to New York, according to the scenarios presented in the Scoping Plan, are "biomass-based diesel", which covers biodiesel and renewable diesel fuels[13] that achieve lifecycle CI score reductions of at least 50% relative to petroleum diesel, and cellulosic biofuels, which cover biofuels from lignocellulosic feedstocks (including RNG) that achieve lifecycle CI score reductions of at least 60% relative to petroleum fuels.[14] The Argonne GREET model has historically been utilized by the U.S. EPA, which administers the RFS2, as a data source in its IPCC-based pathway certification process.[15]

The RFS2 employs tradeable compliance commodities called Renewable Identification Numbers (RINs) to track compliance with the program's biofuels blending requirements. RIN prices vary for the different biofuels, and they have historically been highest for the biomass-based diesel (D4 in the EPA's classification system) and cellulosic biofuel (D3) categories. Biomass-based

[12] The Scoping Plan makes an allusion to this reality with the statement that "the emission values provided here are not comparable to those reported by other governments, nor are they comparable to values reported by New York State in the past" (p. 46). It would be more accurate to state that its emission values are not comparable to those of any government that follows internationally recognized best practices – i.e., those of the IPCC.
[13] While there is no universal nomenclature in place, "biodiesel" commonly refers to fatty acid methyl esters and "renewable diesel" refers to a renewable hydrocarbon fuel. The U.S. government classifies both as "biomass-based diesel" fuels, and New York classifies both (along with sustainable aviation fuel) as "renewable distillate" fuels. While biodiesel is only produced from lipid feedstocks such as used cooking oil, renewable diesel and sustainable aviation fuel can be produced from either lipid or lignocellulosic (e.g., herbaceous or woody biomass) feedstocks.
[14] https://sgp.fas.org/crs/misc/R40155.pdf
[15] https://www.epa.gov/system/files/documents/2022-12/rfs-set-rule-nprm-2022-11-30.pdf (pp. 389-390)

diesel RIN values have consistently traded at around $2.00/gasoline gallon-equivalent (GGE)[16] in recent years, while cellulosic biofuel RINs have traded between $3.00 and $4.50/GGE over the same period (this report uses a weighted average value of $3.80/GGE for the latter).[17]

The Scoping Plan's "Strategic Use of Low-Carbon Fuels" scenario forecasts annual renewable diesel consumption of approximately 1.5 billion gallons (1.7 billion GGE) and annual RNG consumption of 114 tBtu (0.9 billion GGE) by 2030. This consumption would generate annual RIN values of approximately $3.4 billion for renewable diesel[18] and $3.6 billion for RNG, reducing the total costs of achieving decarbonization with those clean fuels to a corresponding degree.[19]

4. Summary of the Inflation Reduction Act of 2022's Tax Credits

The Inflation Reduction Act of 2022 (IRA) creates two new production tax credits that require the use of the Argonne National Laboratory GREET lifecycle assessment model: the 45V Clean Hydrogen Credit and the 45Z Clean Fuel Production Credit. Tax-paying entities are allowed to transfer both tax credits without increasing their income tax liability, effectively making both credits refundable where a counterparty is available.[20] Tax-exempt entities are allowed to treat both credits as refundable by receiving direct payments from the IRS.

The IRA employs a sliding scale in which the value of each credit is a function of (1) the carbon intensity (CI) of the qualifying clean hydrogen or clean fuel, as determined by the GREET model (for hydrogen and non-aviation fuel), and (2) whether or not the facility producing the qualifying fuel meets prevailing wage and apprenticeship requirements.[21] The IRA's incentives are additional to those of the RFS2, and qualifying entities are able to capture the value of both RINs and the IRA's incentives.

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[16] RINs confusingly have different energy contents depending on the category, with D3, D5, and D6 RIN prices being based on ethanol gallons-equivalent and D4 RIN prices being based on biodiesel gallons-equivalent (which is effectively gasoline gallon-equivalent). More confusingly still, the 45Z tax credit discussed in Section 4 are based on gasoline gallons-equivalent. This report converts liquid fuels to the latter for the sake of uniformity.

[17] https://www.epa.gov/fuels-registration-reporting-and-compliance-help/rin-trades-and-price-information

[18] Assuming that New York's renewable distillate fuel consumption is entirely within the RFS2's D4 RIN category. The use of lignocellulosic feedstocks to produce 1.5 billion gallons of renewable distillate fuel, as is assumed in Appendix A of NYSERDA's "Pathways to Deep Decarbonization in New York State report, would increase this value to $6.5 billion per year.

[19] The amount of these values ultimately delivered to New York taxpayers depends on the location of the supply chain. The RNG volume accords with the ICF Resources report's ("Potential of Renewable Natural Gas in New York State) projected in-state RNG production range of 47.4-146.6 tBtu, so the total RIN values for RNG would primarily be captured by New York taxpayers. There is no operational renewable diesel production capacity located within New York, however, so the total RIN values for that biofuel would need to be shared with outside entities (although New York would still benefit in the form of discounted biofuel prices) absent the development of in-state production capacity. RIN values have historically been shared across the full biofuel supply chain in the form of price premiums.

[20] https://www.bakerlaw.com/inflation-reduction-act-clean-energy-tax-credits

[21] https://www.irs.gov/pub/irs-drop/n-22-58.pdf

While the IRA requires the use of the GREET model to determine CI scores under both the 45V and 45Z credits, the two credits utilize CI scores differently.[22] The 45V credit's value is based in part on the qualifying clean hydrogen's absolute CI score in terms of kilograms of CO_2-equivalent per kilogram of hydrogen produced (kg CO_2e/kg H_2) (see Table 1). This results in a maximum value of $0.60/kg (if the labor standards are not met) or $3.00/kg (if the labor standards are met) for all hydrogen that has a CI score of less than 0.45 kg CO_2e/kg H_2.

Table 1. Summary of 45V tax credit values in IRA

CI score (kg CO_2e/kg H_2)	2.5 – 4	1.5 – 2.5	0.45 – 1.5	< 0.45
45V value (labor reqts. not met)	$0.12/kg	$0.15/kg	$0.20/kg	$0.60/kg
45V value (labor reqts. met)	$0.60/kg	$0.75/kg	$1.00/kg	$3.00/kg

No upper limit is placed on the 45Z credit's value, by contrast, due to the fact that the 45Z credit's value is based in part on the qualifying clean fuel's relative (rather than absolute) CI score in relation to the petroleum (gasoline/diesel) baseline. Specifically, the IRA establishes minimum (or base) financial values for the 45Z credit, dependent on satisfaction of the labor standards requirement (see Table 2). Higher minimum values are established for (1) sustainable aviation fuels (SAF) than for non-aviation fuels, and (2) facilities meeting the labor standards than for those that do not. The minimum values are then multiplied by an emissions factor that is determined via the formula:

(50 kg CO_2e/MMBtu – qualifying fuel's emissions rate)/50 kg CO_2e/MMBtu

The GREET model allocates average CI scores of as low as -225 kg CO_2e/MMBtu for clean fuels such as dairy manure-derived RNG that convert methane emissions to biogenic CO_2 emissions (which are not counted toward the fuel's total CI score – see below).[23] The types of clean fuels that the Scoping Plan proposes for use in New York achieve average emissions factors of between 0.7 (biodiesel, renewable diesel, sustainable aviation fuel) and 5.5 (dairy RNG) under the IRA's formula for the 45Z credit.[24]

[22] An exception is when the 45Z credit is applied to sustainable aviation fuel, in which case the most recent Carbon Offsetting and Reduction Scheme for International Aviation's CI scores are to be used.
[23] https://ww2.arb.ca.gov/resources/documents/lcfs-pathway-certified-carbon-intensities
[24] Based on certified CI scores for existing projects as calculated by the California Air Resources Board (CARB) GREET model.

Table 2. Summary of 45Z tax credits in IRA.

	45Z credit	45Z credit (SAF)
Base value (labor reqts. not met)	$0.20/gasoline gallon-eq. (GGE)	$0.35/gallon
Max. value (labor reqts. not met)	$1.10/GGE*	$1.93/gallon*
Base value (labor reqts. met)	$1.00/GGE	$1.75/gallon
Max. value (labor reqts. met)	$5.50/GGE*	$9.63/gallon*

*Assumes maximum emissions factor of 5.5 (dairy RNG)[25]

CO_2 emissions from the combustion of hydrogen and clean fuels do not contribute to the respective CI scores under the 45V and 45Z credits. When determining the CI score of clean hydrogen, §45V(c)(1)(b) states:

> "The term 'lifecycle greenhouse gas emissions' shall only include emissions through the point of production (well-to-gate), as determined under the most recent Greenhouse gases, Regulated Emissions, and Energy use in Transportation model (commonly referred to as the 'GREET model') developed by Argonne National Laboratory, or a successor model (as determined by the Secretary).

The 45Z language does not explicitly state that biogenic CO_2 emissions from combustion of clean fuels are excluded from the tax credit's corresponding CI scores, but this meaning is inferred from §45Z(b)(1)(B)(ii):

> "In the case of any transportation fuel which is not a sustainable aviation fuel, 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 model developed by Argonne National Laboratory, or a successor model (as determined by the Secretary)."

The Argonne National Laboratory GREET model does not count biogenic CO_2 emissions from combustion towards total CI scores, nor do the versions of the model that have been adopted by the states of California, Oregon, and Washington. Biogenic CO_2 emissions are initially counted as part of the "well-to-wheels" lifecycle accounting,[26] but then subtracted out to calculate the

[25] The GREET model defaults to a global warming potential of 100 years (GWP100) rather than the GWP20 that is mandated by the CLCPA.

[26] The use of the word "wheels" reflects the focus of early climate policies on the transportation sector. Similarly, the "T" in GREET initially referred to "transportation" before being changed to "technologies" to reflect the modeling of non-transportation technologies. The LCA community has yet to find an equally transferable replacement for the word "wheels", however.

total CI score. The EPA also formally adopted this practice in a 2010 rulemaking[27] that in turn serves as the basis for §45Z(b)(1)(B)(i):

> "Subject to clauses (ii) and (iii), the Secretary shall annually publish a table which sets forth the emissions rate for similar types and categories of transportation fuels based on the amount of lifecycle greenhouse gas emissions (as described in section 211(o)(1)(H) of the Clean Air Act (42 U.S.C. 7545(o)(1)(H)), as in effect on the date of the enactment of this section) for such fuels, expressed as kilograms of CO_2e per MMBtu, which a taxpayer shall use for purposes of this section."

Finally, the IRA expands the existing Investment Tax Credit (ITC) for renewable electricity by including "qualified biogas property" that is under construction before 2025. This expansion enables anaerobic digesters that produce biogas for ultimate conversion to RNG for use in non-power applications (e.g., heating, transportation) to qualify for the ITC.[28] The ITC also applies to equipment for the cleaning and/or conditioning of biogas. The new ITC's base rate is 6% of eligible costs, increasing to 30% if prevailing wage and apprenticeship requirements are met. Additional bonus rates are available for projects that meet domestic content (10%) and energy community requirements (10%), resulting in a maximum ITC rate of 50%. RNG projects are characterized by very high capital costs relative to operations and maintenance costs,[29] so the new ITC will substantially reduce RNG production costs.

Appendices I and II present the IRA's statutory language on the 45V and 45Z tax credits.

5. Potential Annual Value of IPCC-Based Federal Incentives to New York

This analysis just quantifies those federal incentives that are directly available to New York through IPCC-based programs. Competing IPCC-based incentive programs made available to New York entities by other states such as California (under its Low Carbon Fuel Standard) and through voluntary carbon credit programs are not included here, but they are designed to be compatible with other IPCC-based programs and would potentially also be available in certain circumstances as a result. This analysis instead focuses on the federal RFS2 and the IRA's 45V and 45Z tax credits. It also accounts for the expanded ITC since that is intended to be complementary to the 45Z tax credit despite not being explicitly based on the IPCC itself.

As highlighted in Section 3 above, the total potential financial value available to New York under the RFS2 (based on the Scoping Plan's "Strategic Use of Low-Carbon Fuels" scenario) is **approximately $3.4 billion for renewable diesel[30] and $3.6 billion for RNG**. Two factors give these projected values a high degree of certainty. First, the RFS2 simply requires qualifying biofuels to achieve a specific CI reduction threshold based on their category, and exceeding this threshold does not produce a higher RIN value. Second, while RIN prices have experienced

[27] https://www.govinfo.gov/content/pkg/FR-2010-03-26/html/2010-3851.htm (page 14787)
[28] https://www.natlawreview.com/article/inflation-reduction-act-gives-boost-to-biogas-sector
[29] ICF Resources, "Potential of Renewable Natural Gas in New York State," Report Number 21-34, April 2022.
[30] Greater if lignocellulosic feedstocks are used for renewable diesel production.

periods of high volatility over the last decade, recent prices for the biomass-based diesel and cellulosic biofuels RIN categories have been near their respective long-term averages.[17] It is important to note, though, that any gallons classified here as renewable diesel that actually took the form of SAF would receive the 75% bonus to the 45Z credit.

The total potential financial value available to New York under the IRA (again based on the Scoping Plan's "Strategic Use" scenario's projected clean fuels volumes) is more sensitive to the actual CI scores achieved by qualifying clean fuels due to how these are incorporated by the 45V and 45Z tax credits. Furthermore, data on potential hydrogen production and use volumes in New York are not presented by the Scoping Plan, although market analysis studies are underway at the time of writing through NYSERDA.[31] Approximate values for renewable diesel and RNG through the 45Z tax credit are able to be calculated, however. **On an annual basis these are $0.7 billion for renewable diesel[32] and between $0.9 billion and $5.2 billion for RNG**.[33] All values assume compliance with the IRA's labor standard requirements for enhanced tax credit values.

The combined effect of RIN prices and the 45Z tax credit on clean fuel costs in New York would be drastic. Renewable diesel's price has historically traded at a premium of approximately $2/GGE over petroleum diesel,[34] and this premium would be more than offset by the combination of RINs and the 45Z tax credit (see Table 3). Likewise, the ICF Resources report calculates weighted average RNG production costs in New York of between $11.29/MMBtu (high CI) and $34.56/MMBtu (low CI),[29] whereas combined RIN prices and 45Z credit values are $39.97/MMBtu (high CI) and $77.46/MMBtu (low CI). Note that the weighted average cost calculations do not account for the expanded ITC, so actual production cost would most likely be lower still. In conclusion, then, **RINs and the 45Z tax credit alone would eliminate the market premium for renewable diesel and enable RNG to achieve a negative production cost in New York**, making investments – and associated job creation -- very attractive to developers.

Table 3. IPCC-based incentive programs value stack

	Renewable diesel ($/GGE)[35]	RNG ($/MMBtu)
RIN	$2.00	$31.64
45Z (high CI)	$0.50	$8.33
45Z (low CI)	$0.90	$45.82
Total (high CI)	**$2.50**	**$39.97**
Total (low CI)	**$2.90**	**$77.46**

[31] https://www.nyserda.ny.gov/Researchers-and-Policymakers/Hydrogen
[32] Assuming an emissions factor of 0.7. This factor would be closer to or greater than 1 for in-state feedstocks, especially lignocellulosic feedstocks.
[33] The wide range reflects the differences in CI scores for RNG from different sources, with dairy manure and food waste producing much lower CI scores than landfill gas. Using the ICF Resource's report's weighted average feedstock percentages for RNG yields an estimated midpoint value of $2.7 billion.
[34] https://farmdocdaily.illinois.edu/2023/02/biodiesel-and-renewable-diesel-its-all-about-the-policy.html
[35] Assuming no use of lignocellulosic biomass as feedstocks. Any renewable diesel produced from such feedstocks would generate the much more valuable D3 RIN.

Finally, New York's buildout of RNG production facilities with a combined capacity of 114 tBtu would qualify for $1.0 billion under the expanded ITC[29] (assuming that the labor standard and domestic content requirements are both met). This would be a one-time rather than recurring benefit to New York, but one that would reduce the weighted average RNG production costs discussed above.

6. New York Jobs Impacts of IPCC-Based Federal Incentives in New York

As with Section 5 above, this section focuses on the 45Z tax credit's impacts due to a current lack of data relevant to the application of the 45V tax credit in New York. This section assumes that the 45Z credit is applied to the production of renewable diesel from lignocellulosic feedstocks and RNG in New York. Renewable diesel employment numbers come from the combination of published data on feedstock supply chains[36] and an unpublished analysis that was conducted by Professor Mark Mba Wright, Ph.D. of the Department of Mechanical Engineering at Iowa State University.[37] These numbers are extrapolated based on assumed annual in-state production of 1.5 billion gallons. RNG employment numbers are derived from an input-output analysis of the U.S. RNG industry[38] as applied to the "optimistic growth" volumes in the ICF Resources report.[29] In both cases, the regional distribution of jobs is based on the regional feedstock numbers presented in the ICF Resources report (with the "thermal gasification" scenario being incorporated into the renewable diesel employment numbers).

Almost 63,000 new full-time employment positions would be needed to achieve the necessary renewable diesel and RNG production volumes within New York. These are roughly divided between temporary construction and permanent operations jobs. RNG production is characterized by a high construction-to-operations employment ratio (6:1) due to the capital-intensive nature of anaerobic digester projects. Renewable diesel, by contrast, is characterized by a low ratio (1:8) due to the more labor-intensive nature of its feedstock supply chains. 94% of the new positions are located outside of New York City (and 98% located in New York's upstate regions) due to a relative lack of renewable diesel and RNG feedstocks in urban areas. Figure 1 presents the regional breakdown of the new employment positions. Upstate and especially rural regions where labor standards are currently weak relative to urban downstate regions[39] are disproportionately represented, meaning that the new employment positions would benefit from stronger labor standards than are available at present.

[36] https://onlinelibrary.wiley.com/doi/full/10.1002/bbb.2316
[37] Personal communication, Prof. Mark Mba Wright, February 15, 2021.
[38] https://static1.squarespace.com/static/53a09c47e4b050b5ad5bf4f5/t/639b3e7fd137bc1175286d7d/1671118464387/RNG+Coalition+Final+Report+2022.pdf
[39] See, e.g., https://dol.ny.gov/system/files/documents/2022/06/prevailingwageschedule_art8.pdf

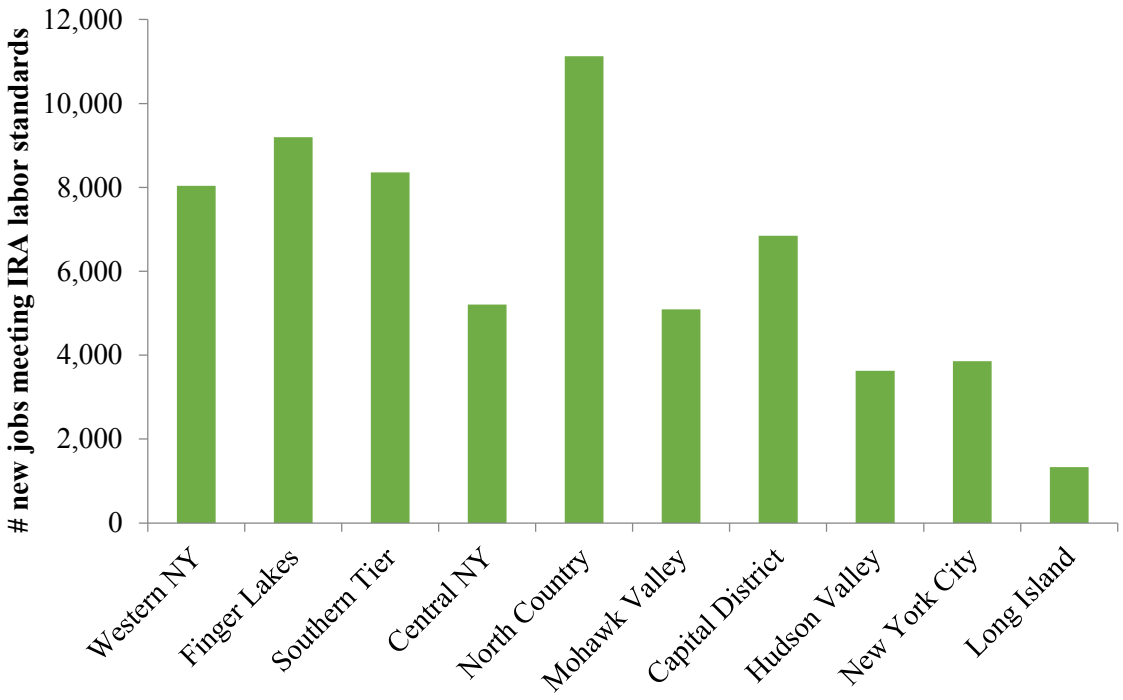

Figure 1. Regional breakdown of new jobs needed to achieve maximum generation of 45Z tax credits in New York.

7. Economywide Impacts

New York's non-alignment with IPCC-based GHG accounting systems and corresponding policies in the U.S. can be expected to have two major direct impacts and two major indirect impacts on the state's decarbonization process. The first direct impact is caused by its use of GWP20 rather than the GWP100 that IPCC-based incentive programs utilize. As noted in Section 2 above, this choice artificially increases the volume of GHGs as measured by CO_2e that is released by New York, in turn substantially increasing the volume of CO_2e that New York must eliminate by 2050 in order to comply with the CLCPA's minimum 85% reduction target relative to a GWP100 system.

The impact of the choice of GWP20 is illustrated by comparing the volumes of CO_2e that are equivalent to 85% of New York's total GHG emissions in 2016[40] under both GWP20 and GWP100 (see Figure 2). **New York must reduce 20.3% more CO_2e under GWP20 than under GWP100 in order to meet the CLCPA's targets**. Importantly, this additional decarbonization will provide no benefit to U.S. efforts to adhere to its requirements under the 2015 Paris Climate Accords since that agreement is also IPCC-based.

[40] While the CLCPA requires an 85% reduction to statewide emissions relative to 1990 levels, data from 2016 was used for illustrative purposes due to data availability constraints.

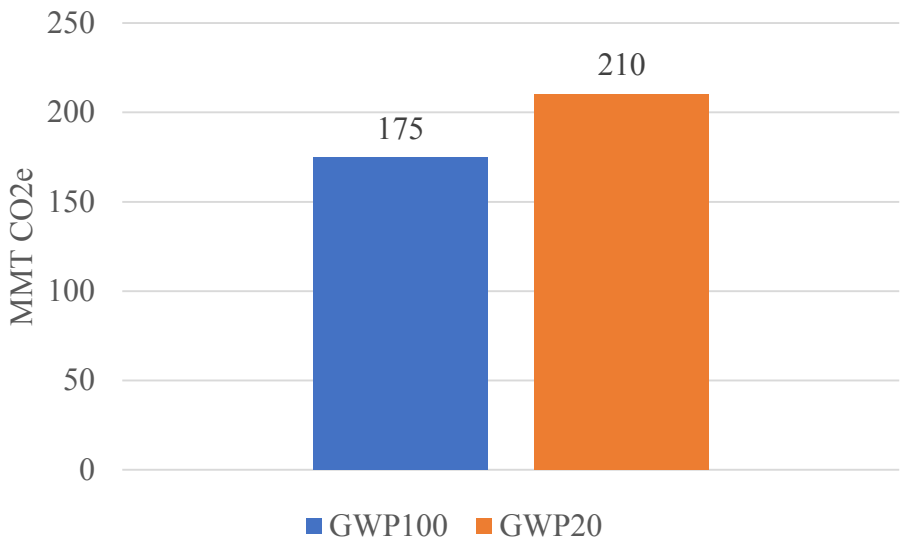

Figure 2. MMT of CO_2e equal to 85% of New York's total GHG emissions in 2016[41]

The economywide financial impact of the use of GWP20 can be illustrated by applying the Department of Environmental Conservation's (DEC) social cost of carbon (SCC) central value of $121/ton[42] as an analog for the actual cost of reducing CO_2e emissions by one ton.[43] **The additional CO_2e that must be abated under GWP20 relative to GWP100 is equal to $4.7 billion**. In other words, the CLCPA's choice of GWP20 increases the total cost of achieving the CLCPA's targets by almost $5 billion without, according to the world's prevailing IPCC-based accounting systems, providing any additional benefits to the climate compared to the use of GWP100.

The second direct impact is on the total annual value of IPCC-based incentives that New York entities can potentially receive. **The combined potential value of RINs and 45Z tax credits that New York entities can qualify for based on the clean fuel consumption volumes contained in the Scoping Plan's "Strategic Use" scenario is between $8.6 billion and $16 billion per year** (see Table 4). The expanded ITC would contribute an additional one-time benefit of $1 billion. The 45V tax credit's impact cannot be quantified at this time due to data constraints, but it would apply to any clean hydrogen production in the state as well. Given that the Scoping Plan envisions a strategic role for clean hydrogen, it is safe to assume that the 45V tax credit's contribution to the total potential annual value would be positive (if unknown with any degree of certainty at this time).

[41] https://www.nyserda.ny.gov/-/media/Project/Nyserda/Files/EDPPP/Energy-Prices/Energy-Statistics/greenhouse-gas-inventory.pdf
[42] https://www.dec.ny.gov/docs/administration_pdf/vocguid22.pdf
[43] While the DEC's SCC is not based on the state's average carbon abatement cost, in theory the state should be willing to pay up to the SCC on average to reduce one ton of CO_2e.

Table 4. Total annual value of IPCC-based incentives in New York

IPCC-based incentive	bn$ per year
RINs	$7 - $10.1
45Z tax credit	$1.6 - $5.9
45V tax credit	+
Total	$8.6 - $16+

The first major indirect impact is on the number of new jobs, and especially new jobs adhering to the IRA's enhanced labor standards, that would be created in the state in order to achieve the Scoping Plan's "Strategic Use" scenario's clean fuel consumption volumes. The 45Z tax credit alone would cover the creation of **almost 63,000 new full-time positions meeting the IRA's labor standards**, the overwhelming majority of which would be located in New York's upstate regions. Furthermore, this number is conservative for the reasons stated above in that it does not account for the impact of clean hydrogen jobs that would be covered by the IRA's 45V tax credit.

The second major indirect impact is that the undercounting by New York of the universally-recognized climate benefits[44] that are provided by clean fuels will unnecessarily move the state higher along the carbon abatement cost curve,[45] forcing it to rely on more expensive technologies to achieve the same decarbonization outcome. The impacts of these higher abatement costs will be felt primarily by ratepayers, consumers, and industry, particularly under an economywide Cap-and-Invest program.

In conclusion, the CLCPA's mandated use of a GHG accounting system that is incompatible with the prevailing IPCC-based accounting systems and policies that are in use in other U.S. jurisdictions will make the CLCPA's implementation less affordable than would otherwise be the case. New York will only be able to obtain the IPCC-based financial incentives described in this report if clean fuel investors and developers are able[46] and willing to master an entirely novel GHG accounting system that is incompatible with the IPCC-based systems in place in the rest of the country just for the purpose of deploying capital in New York. New York is an extreme outlier in that all other U.S. states have adopted the IPCC-based GREET system either explicitly (in the case of California, Oregon, and Washington) or implicitly (all other states that have no specific IPCC-based programs in place but that allow participation in other jurisdiction's IPCC-based programs), and clean fuels investors and developers have many other jurisdictions that are IPCC-compliant to choose from when determining where to locate their projects.

[44] In those jurisdictions that follow the IPCC's accounting system, at least.
[45] https://www.mckinsey.com/about-us/new-at-mckinsey-blog/a-revolutionary-tool-for-cutting-emissions-ten-years-on
[46] Many such companies already report difficulties hiring sufficient numbers of employees with the necessary educational backgrounds and skills to comply with existing IPCC-based accounting systems and policies.

Appendix I

§45V. Credit for production of clean hydrogen

(a) Amount of credit

For purposes of section 38, the clean hydrogen production credit for any taxable year is an amount equal to the product of-

(1) the kilograms of qualified clean hydrogen produced by the taxpayer during such taxable year at a qualified clean hydrogen production facility during the 10-year period beginning on the date such facility was originally placed in service, multiplied by

(2) the applicable amount (as determined under subsection (b)) with respect to such hydrogen.

(b) Applicable amount

(1) In general

For purposes of subsection (a)(2), the applicable amount shall be an amount equal to the applicable percentage of $0.60. If any amount as determined under the preceding sentence is not a multiple of 0.1 cent, such amount shall be rounded to the nearest multiple of 0.1 cent.

(2) Applicable percentage

For purposes of paragraph (1), the applicable percentage shall be determined as follows:

(A) In the case of any qualified clean hydrogen which is produced through a process that results in a lifecycle greenhouse gas emissions rate of-

(i) not greater than 4 kilograms of CO2e per kilogram of hydrogen, and

(ii) not less than 2.5 kilograms of CO2e per kilogram of hydrogen, the applicable percentage shall be 20 percent.

(B) In the case of any qualified clean hydrogen which is produced through a process that results in a lifecycle greenhouse gas emissions rate of-

(i) less than 2.5 kilograms of CO2e per kilogram of hydrogen, and

(ii) not less than 1.5 kilograms of CO2e per kilogram of hydrogen, the applicable percentage shall be 25 percent.

(C) In the case of any qualified clean hydrogen which is produced through a process that results in a lifecycle greenhouse gas emissions rate of-

(i) less than 1.5 kilograms of CO2e per kilogram of hydrogen, and

(ii) not less than 0.45 kilograms of CO2e per kilogram of hydrogen,

the applicable percentage shall be 33.4 percent.

(D) In the case of any qualified clean hydrogen which is produced through a process that results in a lifecycle greenhouse gas emissions rate of less than 0.45 kilograms of CO2e per kilogram of hydrogen, the applicable percentage shall be 100 percent.

(3) Inflation adjustment

The $0.60 amount in paragraph (1) shall be adjusted by multiplying such amount by the inflation adjustment factor (as determined under section 45(e)(2), determined by substituting "2022" for "1992" in subparagraph (B) thereof) for the calendar year in which the qualified clean hydrogen is produced. If any amount as increased under the preceding sentence is not a multiple of 0.1 cent, such amount shall be rounded to the nearest multiple of 0.1 cent.

(c) Definitions

For purposes of this section-

(1) Lifecycle greenhouse gas emissions

(A) In general

Subject to subparagraph (B), the term "lifecycle greenhouse gas emissions" has the same meaning given such term under subparagraph (H) of section 211(o)(1) of the Clean Air Act (42 U.S.C. 7545(o)(1)), as in effect on the date of enactment of this section.

(B) GREET model

The term "lifecycle greenhouse gas emissions" shall only include emissions through the point of production (well-to-gate), as determined under the most recent Greenhouse gases, Regulated Emissions, and Energy use in Transportation model (commonly referred to as the "GREET model") developed by Argonne National Laboratory, or a successor model (as determined by the Secretary).

(2) Qualified clean hydrogen

(A) In general

The term "qualified clean hydrogen" means hydrogen which is produced through a process that results in a lifecycle greenhouse gas emissions rate of not greater than 4 kilograms of CO2e per kilogram of hydrogen.

(B) Additional requirements

Such term shall not include any hydrogen unless-

(i) such hydrogen is produced-

(I) in the United States (as defined in section 638(1)) or a possession of the United States (as defined in section 638(2)),

(II) in the ordinary course of a trade or business of the taxpayer, and

(III) for sale or use, and

(ii) the production and sale or use of such hydrogen is verified by an unrelated party.

(C) Provisional emissions rate

In the case of any hydrogen for which a lifecycle greenhouse gas emissions rate has not been determined for purposes of this section, a taxpayer producing such hydrogen may file a petition with the Secretary for determination of the lifecycle greenhouse gas emissions rate with respect to such hydrogen.

(3) Qualified clean hydrogen production facility

The term "qualified clean hydrogen production facility" means a facility-

(A) owned by the taxpayer,

(B) which produces qualified clean hydrogen, and

(C) the construction of which begins before January 1, 2033.

(d) Special rules

(1) Treatment of facilities owned by more than 1 taxpayer

Rules similar to the rules section 45(e)(3) shall apply for purposes of this section.

(2) Coordination with credit for carbon oxide sequestration

No credit shall be allowed under this section with respect to any qualified clean hydrogen produced at a facility which includes carbon capture equipment for which a credit is allowed to any taxpayer under section 45Q for the taxable year or any prior taxable year.

(3) Credit reduced for tax-exempt bonds

Rules similar to the rule under section 45(b)(3) shall apply for purposes of this section.

(4) Modification of existing facilities

For purposes of subsection (a)(1), in the case of any facility which-

(A) was originally placed in service before January 1, 2023, and, prior to the modification described in subparagraph (B), did not produce qualified clean hydrogen, and

(B) after the date such facility was originally placed in service-

(i) is modified to produce qualified clean hydrogen, and

(ii) amounts paid or incurred with respect to such modification are properly chargeable to capital account of the taxpayer,

such facility shall be deemed to have been originally placed in service as of the date that the property required to complete the modification described in subparagraph (B) is placed in service.

(e) Increased credit amount for qualified clean hydrogen production facilities

(1) In general

In the case of any qualified clean hydrogen production facility which satisfies the requirements of paragraph (2), the amount of the credit determined under subsection (a) with respect to qualified clean hydrogen described in subsection (b)(2) shall be equal to such amount (determined without regard to this sentence) multiplied by 5.

(2) Requirements

A facility meets the requirements of this paragraph if it is one of the following:

(A) A facility-

(i) the construction of which begins prior to the date that is 60 days after the Secretary publishes guidance with respect to the requirements of paragraphs (3)(A) and (4), and

(ii) which meets the requirements of paragraph (3)(A) with respect to alteration or repair of such facility which occurs after such date.

(B) A facility which satisfies the requirements of paragraphs (3)(A) and (4).

(3) Prevailing wage requirements

(A) In general

The requirements described in this subparagraph with respect to any qualified clean hydrogen production facility are that the taxpayer shall ensure that any laborers and mechanics employed by the taxpayer or any contractor or subcontractor in-

(i) the construction of such facility, and

(ii) with respect to any taxable year, for any portion of such taxable year which is within the period described in subsection (a)(2), the alteration or repair of such facility, shall be paid wages at rates not less than the prevailing rates for construction, alteration, or repair of a similar character in the locality in which such facility is located as most recently determined by the Secretary of Labor, in accordance with subchapter IV of chapter 31 of title 40, United States Code. For purposes of determining an increased credit amount under paragraph (1) for a taxable year, the requirement under clause (ii) of this subparagraph is applied to such taxable year in which the alteration or repair of qualified facility occurs.

(B) Correction and penalty related to failure to satisfy wage requirements

Rules similar to the rules of section 45(b)(7)(B) shall apply.

(4) Apprenticeship requirements

Rules similar to the rules of section 45(b)(8) shall apply.

(5) Regulations and guidance

The Secretary shall issue such regulations or other guidance as the Secretary determines necessary to carry out the purposes of this subsection, including regulations or other guidance which provides for requirements for recordkeeping or information reporting for purposes of administering the requirements of this subsection.

(f) Regulations

Not later than 1 year after the date of enactment of this section, the Secretary shall issue regulations or other guidance to carry out the purposes of this section, including regulations or other guidance for determining lifecycle greenhouse gas emissions.

Appendix II

§45Z. Clean fuel production credit

(a) Amount of credit

(1) In general

For purposes of section 38, the clean fuel production credit for any taxable year is an amount equal to the product of-

(A) the applicable amount per gallon (or gallon equivalent) with respect to any transportation fuel which is-

(i) produced by the taxpayer at a qualified facility, and

(ii) sold by the taxpayer in a manner described in paragraph (4) during the taxable year, and

(B) the emissions factor for such fuel (as determined under subsection (b)).

(2) Applicable amount

(A) Base amount

In the case of any transportation fuel produced at a qualified facility which does not satisfy the requirements described in subparagraph (B), the applicable amount shall be 20 cents.

(B) Alternative amount

In the case of any transportation fuel produced at a qualified facility which satisfies the requirements under paragraphs (6) and (7) of subsection (f), the applicable amount shall be $1.00.

(3) Special rate for sustainable aviation fuel

(A) In general

In the case of a transportation fuel which is sustainable aviation fuel, paragraph (2) shall be applied-

(i) in the case of fuel produced at a qualified facility described in paragraph (2)(A), by substituting "35 cents" for "20 cents", and

(ii) in the case of fuel produced at a qualified facility described in paragraph (2)(B), by substituting "$1.75" for "$1.00".

(B) Sustainable aviation fuel

For purposes of this subparagraph (A),[1] the term "sustainable aviation fuel" means liquid fuel, the portion of which is not kerosene, which is sold for use in an aircraft and which-

(i) meets the requirements of-

(I) ASTM International Standard D7566, or

(II) the Fischer Tropsch provisions of ASTM International Standard D1655, Annex A1, and

(ii) is not derived from palm fatty acid distillates or petroleum.

(4) Sale

For purposes of paragraph (1), the transportation fuel is sold in a manner described in this paragraph if such fuel is sold by the taxpayer to an unrelated person-

(A) for use by such person in the production of a fuel mixture,

(B) for use by such person in a trade or business, or

(C) who sells such fuel at retail to another person and places such fuel in the fuel tank of such other person.

(5) Rounding

If any amount determined under paragraph (1) is not a multiple of 1 cent, such amount shall be rounded to the nearest cent.

(b) Emissions factors

(1) Emissions factor

(A) Calculation

(i) In general

The emissions factor of a transportation fuel shall be an amount equal to the quotient of-

(I) an amount equal to-

(aa) 50 kilograms of CO_2e per mmBTU, minus

(bb) the emissions rate for such fuel, divided by

(II) 50 kilograms of CO_2e per mmBTU.

(B) Establishment of emissions rate

(i) In general

Subject to clauses (ii) and (iii), the Secretary shall annually publish a table which sets forth the emissions rate for similar types and categories of transportation fuels based on the amount of lifecycle greenhouse gas emissions (as described in section 211(o)(1)(H) of the Clean Air Act (42 U.S.C. 7545(o)(1)(H)), as in effect on the date of the enactment of this section) for such fuels, expressed as kilograms of CO_2e per mmBTU, which a taxpayer shall use for purposes of this section.

(ii) Non-aviation fuel

In the case of any transportation fuel which is not a sustainable aviation fuel, 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 model developed by Argonne National Laboratory, or a successor model (as determined by the Secretary).

(iii) Aviation fuel

In the case of any transportation fuel which is a sustainable aviation fuel, the lifecycle greenhouse gas emissions of such fuel shall be determined in accordance with-

(I) the most recent Carbon Offsetting and Reduction Scheme for International Aviation which has been adopted by the International Civil Aviation Organization with the agreement of the United States, or

(II) any similar methodology which satisfies the criteria under section 211(o)(1)(H) of the Clean Air Act (42 U.S.C. 7545(o)(1)(H)), as in effect on the date of enactment of this section.

(C) Rounding of emissions rate

(i) In general

Subject to clause (ii), the Secretary may round the emissions rates under subparagraph (B) to the nearest multiple of 5 kilograms of CO_2e per mmBTU.

(ii) Exception

In the case of an emissions rate that is between 2.5 kilograms of CO_2e per mmBTU and -2.5 kilograms of CO_2e per mmBTU, the Secretary may round such rate to zero.

(D) Provisional emissions rate

In the case of any transportation fuel for which an emissions rate has not been established under subparagraph (B), a taxpayer producing such fuel may file a petition with the Secretary for determination of the emissions rate with respect to such fuel.

(2) Rounding

If any amount determined under paragraph (1)(A) is not a multiple of 0.1, such amount shall be rounded to the nearest multiple of 0.1.

(c) Inflation adjustment

(1) In general

In the case of calendar years beginning after 2024, the 20 cent amount in subsection (a)(2)(A), the $1.00 amount in subsection (a)(2)(B), the 35 cent amount in subsection (a)(3)(A)(i), and the $1.75 amount in subsection (a)(3)(A)(ii) shall each be adjusted by multiplying such amount by the inflation adjustment factor for the calendar year in which the sale of the transportation fuel occurs. If any amount as increased under the preceding sentence is not a multiple of 1 cent, such amount shall be rounded to the nearest multiple of 1 cent.

(2) Inflation adjustment factor

For purposes of paragraph (1), the inflation adjustment factor shall be the inflation adjustment factor determined and published by the Secretary pursuant to section 45Y(c), determined by substituting "calendar year 2022" for "calendar year 1992" in paragraph (3) thereof.

(d) Definitions

In this section:

(1) mmBTU

The term "mmBTU" means 1,000,000 British thermal units.

(2) CO_2e

The term "CO_2e" means, with respect to any greenhouse gas, the equivalent carbon dioxide (as determined based on relative global warming potential).

(3) Greenhouse gas

The term "greenhouse gas" has the same meaning given that term under section 211(o)(1)(G) of the Clean Air Act (42 U.S.C. 7545(o)(1)(G)), as in effect on the date of the enactment of this section.

(4) Qualified facility

The term "qualified facility"-

(A) means a facility used for the production of transportation fuels, and

(B) does not include any facility for which one of the following credits is allowed under section 38 for the taxable year:

(i) The credit for production of clean hydrogen under section 45V.

(ii) The credit determined under section 46 to the extent that such credit is attributable to the energy credit determined under section 48 with respect to any specified clean hydrogen production facility for which an election is made under subsection (a)(15) of such section.

(iii) The credit for carbon oxide sequestration under section 45Q.

(5) Transportation fuel

(A) In general

The term "transportation fuel" means a fuel which-

(i) is suitable for use as a fuel in a highway vehicle or aircraft,

(ii) has an emissions rate which is not greater than 50 kilograms of CO_2e per mmBTU, and

(iii) is not derived from coprocessing an applicable material (or materials derived from an applicable material) with a feedstock which is not biomass.

(B) Definitions

In this paragraph-

(i) Applicable material

The term "applicable material" means-

(I) monoglycerides, diglycerides, and triglycerides,

(II) free fatty acids, and

(III) fatty acid esters.

(ii) Biomass

The term "biomass" has the same meaning given such term in section 45K(c)(3).

(e) Guidance

Not later than January 1, 2025, the Secretary shall issue guidance regarding implementation of this section, including calculation of emissions factors for transportation fuel, the table described in subsection (b)(1)(B)(i), and the determination of clean fuel production credits under this section.

(f) Special rules

(1) Only registered production in the United States taken into account

(A) In general

No clean fuel production credit shall be determined under subsection (a) with respect to any transportation fuel unless-

(i) the taxpayer-

(I) is registered as a producer of clean fuel under section 4101 at the time of production, and

(II) in the case of any transportation fuel which is a sustainable aviation fuel, provides-

(aa) certification (in such form and manner as the Secretary shall prescribe) from an unrelated party demonstrating compliance with-

(AA) any general requirements, supply chain traceability requirements, and information transmission requirements established under the Carbon Offsetting and Reduction Scheme for International Aviation described in subclause (I) of subsection (b)(1)(B)(iii), or

(BB) in the case of any methodology described in subclause (II) of such subsection, requirements similar to the requirements described in subitem (AA), and

(bb) such other information with respect to such fuel as the Secretary may require for purposes of carrying out this section, and

(ii) such fuel is produced in the United States.

(B) United States

For purposes of this paragraph, the term "United States" includes any possession of the United States.

(2) Production attributable to the taxpayer

In the case of a facility in which more than 1 person has an ownership interest, except to the extent provided in regulations prescribed by the Secretary, production from the facility shall be allocated among such persons in proportion to their respective ownership interests in the gross sales from such facility.

(3) Related persons

Persons shall be treated as related to each other if such persons would be treated as a single employer under the regulations prescribed under section 52(b). In 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 fuel to an unrelated person if such fuel is sold to such a person by another member of such group.

(4) Pass-thru in the case of estates and trusts

Under regulations prescribed by the Secretary, rules similar to the rules of subsection (d) of section 52 shall apply.

(5) Allocation of credit to patrons of agricultural cooperative

Rules similar to the rules of section 45Y(g)(6) shall apply.

(6) Prevailing wage requirements

(A) In general

Subject to subparagraph (B), rules similar to the rules of section 45(b)(7) shall apply.

(B) Special rule for facilities placed in service before January 1, 2025

For purposes of subparagraph (A), in the case of any qualified facility placed in service before January 1, 2025-

(i) clause (i) of section 45(b)(7)(A) shall not apply, and

(ii) clause (ii) of such section shall be applied by substituting "with respect to any taxable year beginning after December 31, 2024, for which the credit is allowed under this section" for "with

respect to any taxable year, for any portion of such taxable year which is within the period described in subsection (a)(2)(A)(ii)".

(7) Apprenticeship requirements

Rules similar to the rules of section 45(b)(8) shall apply.

(g) Termination

This section shall not apply to transportation fuel sold after December 31, 2027.