



40B GREET Model Guidance

Growth Energy Vice President of Government Affairs, John Fuher, will present an update on the 40B GREET model Guidance.


On April 30th, Treasury released updated guidance for the Internal Revenue Code Section 40B SAF blenders credit, including details and calculations for the new 40B GREET model, which guides how those in the SAF value chain can determine the value of any tax credit under this incentive. Below is a simplified corn ethanol ATJ default emissions profile under 40B GREET.

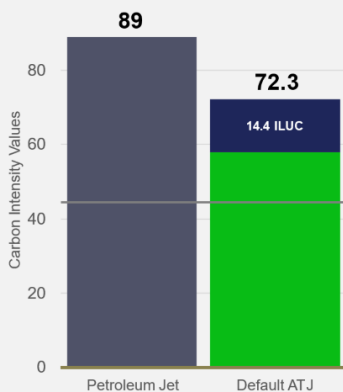
Corn Ethanol ATJ Default Emissions Profile				
	Carbon Intensity (gCO₂e/MJ)			
Farming	27.7			
Fertilizer Production	8.2			
N2O Emissions	13.2			
CO ₂ Emissions from Urea	2.5			
Energy Use	3.8			
		Ethanol Production and Farming Emission Reductions		
		Climate Smart Ag Practices	-10.0	Reduction applies only for % of CSA corn used
		Carbon Capture and Sequestration	-33.4	Assumes 100% capture
Ethanol Production (Dry Mill Only)	13.9			
Materials Use	1.8	RNG (Landfill only)	-15.8	
Energy Use	24.0	Wind Electricity (100%)	-3.6	
DDGS Impacts	-11.9			
Total Ethanol Feedstock CI	41.6			
SAF Production				
	16.2	SAF Production Emissions Reductions		
Natural Gas Use	6.9	Clean Hydrogen	-4.2	
Electricity Use	6.1	RNG (landfill only)	-9.1	
Hydrogen Use	3.1	Wind Electricity (100%)	-2.4	
Transportation/Distribution	3.2			
Total Direct Emissions	61.0			
Indirect Emissions	11.1			
Indirect Land Use Change (ILUC)	9.0			
Non-Feedstock Crops	3.8			
Livestock	-1.4			
Rice Methane	-0.3			
Total Corn ATJ Emissions (Default)	72.1			

What We Like:

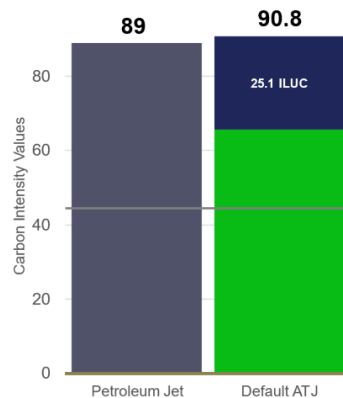
- Overall, this guidance and the underlying 40B GREET carbon model are positive steps forward in advance of the upcoming 45Z rulemaking.
 - This is the first carbon model to recognize farming practices as a means of reducing CI, despite broader challenges with the climate smart agriculture (CSA) provisions.
 - This is the first time GREET will be used to calculate emissions values in federal tax policy.
 - 40B GREET treats corn bioethanol largely the same as 2023 GREET, with their CI values being within .2 CI of each other.
 - The model includes a workable iLUC score, with corn ethanol ATJ's CI under 40B GREET being 19 CI lower than under the ICAO model.
 - Corn ethanol ATJ iLUC appears consistent with or even below 2023 GREET.
 - We are still working to clarify the SAF conversion factor used so we can try to decipher the non-SAF/LDV iLUC value.
 - Limited increase in CI due to “additional indirect emissions”
 - Corn ethanol ATJ qualifies for 40B with CCS.
 - Good first step as we move to 45Z.

Carbon Intensity Reduction Comparison of U.S. Corn Bioethanol in Jet Fuel

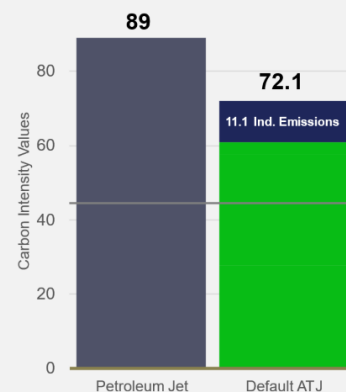
 **2023 DOE R+D GREET**



 **ICAO CORSIA**



 **2024 40B GREET**



What We Need to Improve in 45Z:

- All-or-nothing CSA provisions will be difficult to utilize.
 - It is very important to allow for individualized CSA, as combining practices limits pathways to get carbon reductions from agriculture.

- Tracking and verification requirements for the bundled CSA practices are onerous and do not conform with existing standards for verification or tracking of farming practices.
- The 10-point total CI reduction for the three specified CSA pathways is lower than Argonne GREET values, limiting the CI reductions from these practices.
- The default list of emissions reducing technologies at the plant needs to be expanded.
 - We have members that plan to utilize biomass power, combined heat and power, mechanical vapor recompression, wet DDGS, nuclear/geothermal/hydroelectricity, advanced yeasts and enzymes, and energy storage, among others, that are not listed in the default carbon reducing technologies.
- 45Z needs to recognize all bioethanol plants and feedstocks, including:
 - Wet mills
 - Sorghum
 - Corn kernel fiber

40B SAF GREET Model – Summary Points

- Establishes baseline conventional petroleum jet fuel at 89 grams CO₂e/MJ; Therefore, the 40B SAF threshold is 44.5 CI.
- Includes 7 SAF default pathways:
 1. US Soybean HEFA
 2. US and Canadian Canola/Rapeseed HEFA
 3. Tallow HEFA (any source)
 4. UCO HEFA (any source)
 5. US Distillers Corn Oil HEFA – lowest CI at 12.2 g/MJ
 6. US Corn Alcohol to Jet (ATJ) – Only Ethanol from Dry Mills; no sorghum
 7. Brazilian sugarcane ATJ-Ethanol – Already qualifies for the 40B credit through ICAO or the RFS; Does not qualify through the updated GREET 40B model.
- Includes “additional indirect effects” to ensure that GREET is consistent with the greenhouse gas definition from the RFS. These items are non-feedstock crop indirect emissions, livestock emissions, and rice paddy methane. This hit was higher for soybeans than for corn (See accompanying table).
 - Corn ethanol ATJ iLUC is 9.0
 - Adds 2.1 new “additional indirect effects” to our current iLUC score

Table 3b. Adjusted indirect effects for the SAF pathways in 40BSAF-GREET (estimated in g CO₂e per MJ SAF using sample yields for each pathway)

	SAF Pathway (g CO ₂ e per MJ SAF)			
	Soy Oil	Canola Oil	Corn	Brazilian Sugarcane
	HEFA	HEFA	ATJ-Ethanol	ATJ-Ethanol
ILUC	12.2	18.1	9.0	10.6
Non-Feedstock Crops (Excluding Rice Paddy Methane)	3.5	5.9	3.8	-3.0
Livestock	1.4	0.1	-1.4	-1.6
Rice Paddy Methane	-0.8	-0.3	-0.3	-0.1
Total	16.2	23.7	11.1	5.9

Indirect Values Comparison

	Corn Start Ethanol (LDV Fuel)	Corn Starch ATJ (SAF/Aviation Fuel)
2023 R&D GREET	8.6 g/MJ	14.1 g/MJ
40B GREET	N/A	11.1 g/MJ

Ethanol Emissions Reductions:

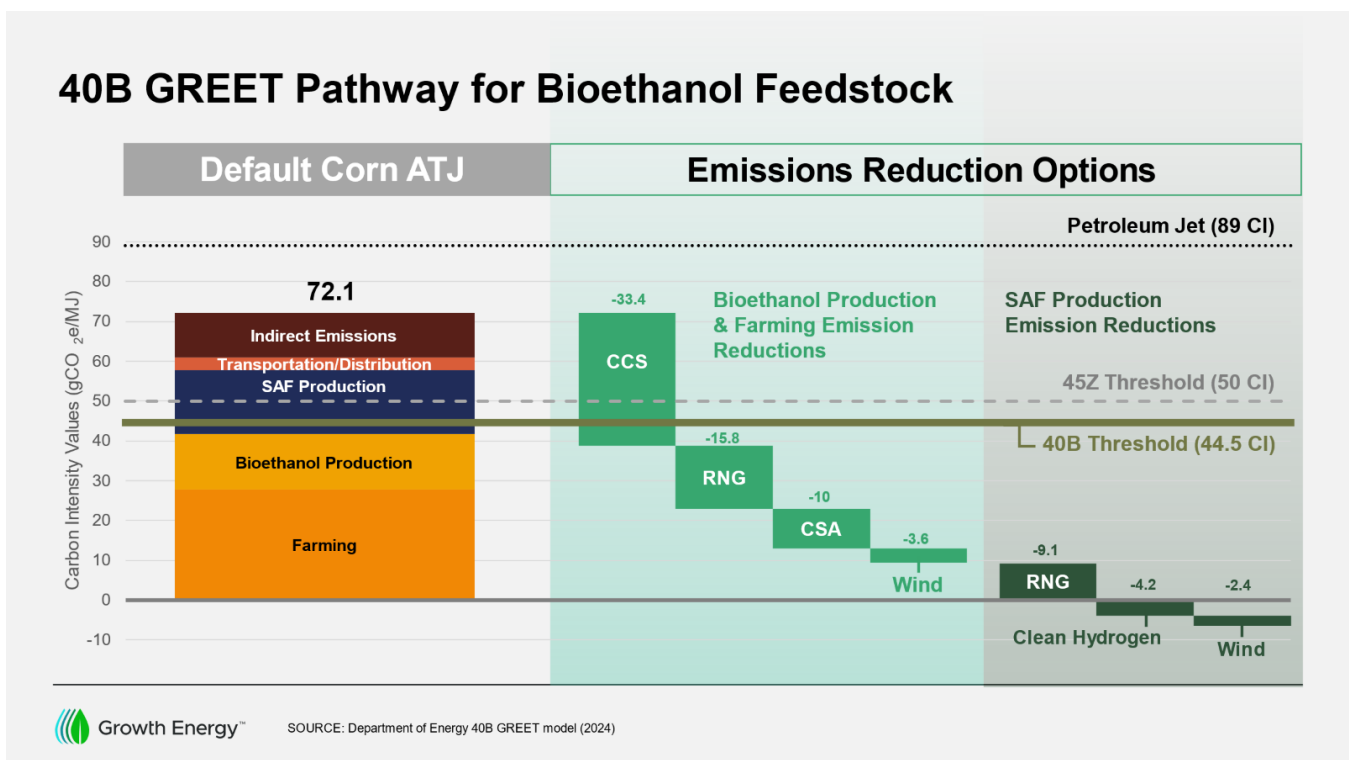
- *Carbon Capture and Sequestration (-33.4 CI)* – Permitted for intermediate ethanol producers, but for permanent sequestration only.
- *Renewable Natural Gas (-15.8 CI)* – Only from landfill gas which is directly connected and whose first productive use of the gas is for the facility, citing consistency with the proposed rules under the 45V hydrogen production credit.
- *Climate Smart Agriculture (-10 CI for corn)* – covered in the next section.
- *100% Wind Electricity (-3.6 CI)* – In order to claim the use of renewable electricity, the generator must have been placed in service within 36 months, consistent with the proposed rules under the 45V hydrogen credit. Allows three options to identify electricity sources at SAF and ethanol facilities – grid average, using eGRID subregions; electricity supplied to the facility from certain zero carbon intensity generators through the purchase of RECs; or behind-the-meter (BTM) electricity supplied and consumed onsite.

SAF Emissions Reductions:

- *Renewable Natural Gas (-9.1 CI)* – Only from landfill gas which is directly connected and whose first productive use of the gas is for the facility, citing consistency with the proposed rules under the 45V hydrogen production credit.

- *Clean Hydrogen (-4.2 CI)* – Specific reference to hydrogen produced under the 45V tax incentive.
- *100% Wind Electricity (-2.4 CI)* – In order to claim the use of renewable electricity, the generator must have been placed in service within 36 months, consistent with the proposed rules under the 45V hydrogen credit. Allows three options to identify electricity sources at SAF and ethanol facilities – grid average, using eGRID subregions; electricity supplied to the facility from certain zero carbon intensity generators through the purchase of RECs; or behind-the-meter (BTM) electricity supplied and consumed onsite.

CARB LCFS Safe Harbor for Certification – Treasury will allow a SAF producer to comply with the CORSIA supply chain traceability requirements if the producer is verified under the California LCFS (CARB certification).



Climate-Smart Agriculture (CSA) Provisions

- For the first time, a the 40B GREET model includes a provision that allows for feedstock growing practices to reduce the CI of a finished biofuel.
- Unfortunately, the guidance only recognizes three climate smart agriculture practices for corn: cover crops, no till, enhanced efficiency fertilizer. For a producer to receive the tax credit the corn for ethanol must be grown using all three practices. If a farmer uses only one or two for corn, it doesn't count. The provision will be incredibly difficult to utilize as includes only three out of more than 200 farming practices from USDA's climate smart agriculture list.

- Growers are required to bundle two practices on the same acreage for soybeans (cover crops and no till) to qualify.
- Provides a 10 CI reduction for corn and 5 CI for soybeans if all practices are used on the same acreage.
- Permits a production facility to use mass balance tracking techniques for CSA crops, meaning there is no need for separation/segregation of feedstock.
- Requires separate “batching” at production for SAF produced with CSA crops and separate tracking documentation.
 - This means that SAF batches made with CSA crops will have a lower CI than those made with non-CSA crops.
- Extensive requirements for tracking and certification for both growers and production facilities for cover crops, no till, and enhanced efficiency nitrogen fertilizer.
 - Significant pushback from grower groups on the feasibility of not only doing these practices on the same acreage, but also doing the required tracking and certification.
- Important data points:
 - In the 2022 agriculture census, more than 105 million acres of cropland used the no-till practice.
 - In the same 2022 census, only 18 million acres of cropland had cover crops.
 - Planting a cover crop after you harvest corn is very difficult in the northern corn belt.
 - Enhanced efficiency nitrogen fertilizer is available in limited quantities and is not the standard product for nitrogen fertilizer.

Treatment of Brazilian Ethanol

- Brazilian sugarcane ethanol already qualifies for 40B incentive under the original RFS pathway laid out in the December 40B guidance.
- Brazilian sugarcane does not qualify under 40B GREET as a default pathway, but it could apply for a “provisional emissions rate,” but that appears unlikely because of the existing RFS pathway.
- Brazilian corn ethanol qualifies under a low land use change risk pathway under ICAO-CORSIA, but to date does not have a RFS pathway.
- While cane ethanol qualifies under the RFS model and Brazilian corn qualifies under the ICAO model, Brazilian sugarcane ethanol falls well short of the 40B threshold for qualifying under the 40B GREET model.
- Brazilian ethanol (corn or cane) is not eligible for a CCS, renewable energy certificates (RECs), or climate smart ag pathways under 40B GREET due to the inability to certify ag practices, renewable electricity sources, or carbon sequestration permanency.

	Corn Ethanol ATJ	Sugarcane ATJ
Direct CI	61.0	54.3
Total Indirect Effects	11.1	5.9
iLUC	9.0	10.6
Additional Indirect Effects	2.1	-4.7
Total CI	72.1	60.2
Jet A Reduction (89 CI)	19%	32%

Media Engagement

Growth Energy released a [statement](#) following the guidance, which prioritized the forward momentum on iLUC while expounding on concerns around bundling. Our response was less positive than RFA's—hewing closer to [Soy](#), as well as [U.S. Rep. Angie Craig](#) (D-Minn.), [U.S. Senator Joni Ernst](#) (R-Iowa), [U.S. Senator Chuck Grassley](#) (R-Iowa) in expounding on concerns about the restrictive all-or-nothing approach to recognize the value of smart agriculture practices. Growth Energy also worked with beltway media pre- and post-announcement offering perspective on the most immediate need to address some of the shortcomings in the upcoming 45Z rulemaking.

Additional Materials

The following list of additional materials that may be helpful in understanding the 40B guidance:

- 40B Treasury Guidance: [Notice 2024-37 \(irs.gov\)](#)
- DoE GREET Page (Click on 40B GREET SAF button): [GREET | Department of Energy](#)
- 40B GREET SAF User Manual: [Guidelines to Determine Life Cycle Greenhouse Gas Emissions of Sustainable Aviation Fuel Production Pathways using 40BSAF-GREET 2024 \(energy.gov\)](#)
- 40B GREET SAF model FAQ: [40BSAF-GREET Frequently Asked Questions \(energy.gov\)](#)
- 40B GREET Technical Document (dense but incredibly helpful document): <https://greet.anl.gov/files/greet-2023rev1-summary>