RENEWABLE FUELS ASSOCIATION

Renewable Fuels Association Position on, and Recommendations for, the *Sustainable Skies Act*

The *Sustainable Skies Act* would establish a tax credit of $1.50-$2.00 per gallon for sustainable aviation fuel (SAF). The Act presents a potential opportunity for renewable fuel producers, as biomass-derived liquid aviation fuels that achieve at least a 50% lifecycle GHG emissions reduction (vs. petroleum-based jet fuel) would qualify for the credit, in turn stimulating increased production of low-carbon SAFs.

However, the current bill includes provisions that require the use of flawed and outdated methodologies to assess the lifecycle GHG emissions associated with potential SAF sources.

Unless changes are made to the language regarding lifecycle assessment methods, the Renewable Fuels Association cannot support the bill as currently constructed.

Our concerns with the current bill language are explained below.

1. Lifecycle GHG Assessment Methodology

To qualify for the tax credit, the bill requires that SAF achieves at least a 50% lifecycle GHG emissions reduction compared to petroleum-based jet fuel. This requirement by itself is not problematic. However, the bill specifies two methods—each with its own shortcomings—that may be used to assess lifecycle GHG emissions associated with the fuel production pathway (i.e., to determine whether the 50% threshold is met). Both methods require the inclusion of "attributional core lifecycle emissions" *and* "the positive induced land use change values…" (a "consequential" effect) in the assessment of lifecycle GHG emissions. Beyond the concerns associated with attempting to combine attributional and consequential lifecycle analyses (with different system boundaries) into one single assessment of a fuel pathway's carbon intensity[1], the two options for lifecycle assessment in the *Sustainable Skies Act* suffer from obvious data flaws and methodological problems.

a. The "ICAO Methodology" Approach

The first lifecycle method included in the Act requires the use of an approach adopted by the International Civil Aviation Organization (ICAO). Unfortunately, the ICAO methodology is relatively opaque and relies on outdated information, obsolete model versions, and antiquated data to estimate the lifecycle GHG emissions of certain fuel production pathways. As a result, the carbon intensity estimates for certain potential SAF sources are grossly exaggerated and inaccurate.

For example, the ICAO methodology for assessing lifecycle GHG emissions for alcohol-to-jet (ATJ) fuel made from corn grain ethanol is based on just two sources of information, both of which are badly outdated: 1) a 2014 MIT study that used a 2012 version of the DOE GREET.Net model and other data

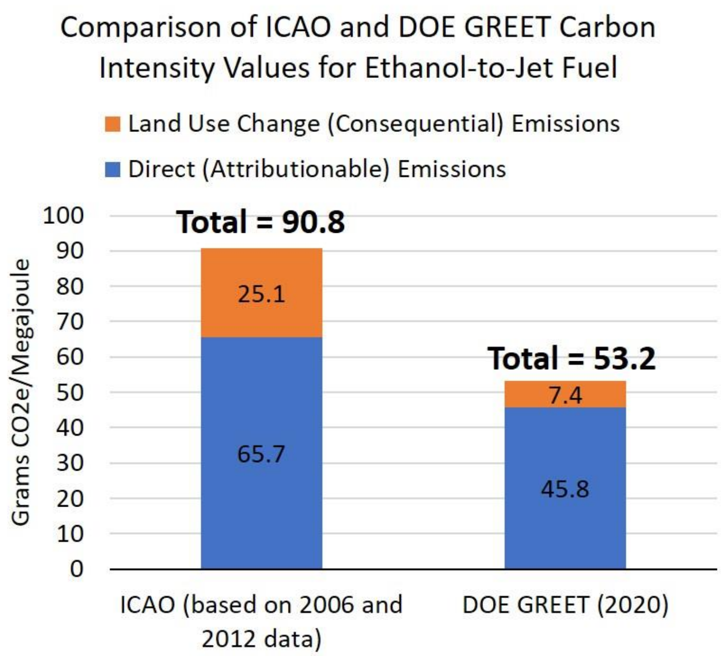
[1] See ISO 14040:2006 "Environmental management-Life cycle assessment-Principles and framework"

from studies published in 2007 2011, and 2012[2], and 2) a European Commission Joint Research Council study using 2006-era data from a private data set known as the "E3 database."[3]

The ICAO methodology results in an estimate of direct ("attributional") GHG emissions of **65.7** grams CO2e/megajoule (g/MJ) for ethanol-to-jet fuel. This compares to **45.8** g/MJ for the direct emissions associated with the production and use of ethanol-to-jet fuel estimated by the GREET2020.Net software. Thus, ICAO's value for attributional emissions is almost 20 g/MJ higher (43%) than the current DOE GREET default value.

Then, the *Sustainable Skies Act* requires "positive induced land use change values…" to be added to the "attributional core" emissions. Using outdated versions of popular general equilibrium (GTAP-BIO) and partial equilibrium (GLOBIOM) economic models (and questionable input assumptions), ICAO estimates land use change emissions for ethanol-to-jet fuel at **25.1** g/MJ. This is more than three times higher than the land use change estimate of **7.4 g/MJ** from GREET2020.Net, which is based on a methodology that uses the most current version of Purdue University's GTAP-BIO model.

Thus, ICAO's total lifecycle emissions estimate for ethanol-to-jet fuel of **90.8 g/MJ** is **71% higher (nearly 40 g/MJ)** than the total emissions estimate of **53.2 g/MJ** from the most recent DOE GREET modeling framework.



Because ICAO relies on data and methodologies that are nine to 15 years old, their results significantly overstate the current carbon footprint of ATJ made from corn-based ethanol. Indeed, a recent study published by scientists at DOE's Argonne National Laboratory (using the newest version of the GREET model), found the carbon intensity of corn-based ethanol fell 23% between 2005 and 2019. Yet, these

[2] Staples, M. D., Malina, R., Local, H., Pearls on, M. N., Hileman, J. I., Bowies, A., & Barrett, S. R. (2014). Lifecycle greenhouse gas footprint and minimum selling price of renewable diesel and jet fuel from fermentation and advanced fermentation production technologies. Energy & Environmental Science, 7(5), 1545-1554. ICAO says it "updated" the ethanol-to-jet pathway found in Staples et al. using a 2017 version of GREET, but it isn't clear what changes ICAO made.

[3] Ludwig-Bulow Systemtechnik GMBH. (2006). *E3 Database*. Retrieved May 15, 2017, from http://www.e3database.com/

improvements are ignored by ICAO, which still relies upon data from the beginning of that time period (e.g., JRC's analysis using 2006 data from the E3 database). In addition, at least five newer versions of the GREET model have been released since the MIT paper, which serves as one of the primary sources for ICAO's analysis, was published in 2014.

The ICAO methodology and results should not be used to determine lifecycle GHG emissions for ethanol-to-jet, or any other SAF sources, for the purposes of determining eligibility for the Sustainable Skies Act SAF tax credit.

b. The "Another Methodology" Approach

The *Sustainable Skies Act* also includes an alternative approach for determining lifecycle GHG emissions and, in turn, eligibility for the tax credit. Under this second approach, the lifecycle GHG emissions of the SAF production pathway may be determined using "another methodology" that the Treasury Secretary, in consultation with the Administrator of the EPA, determines is "reflective of the latest scientific understanding of lifecycle greenhouse gas emissions, and as stringent as the [ICAO] requirement…"

Under any reasonable evaluation, the DOE's Argonne National Laboratory current GREET model version would certainly qualify as "another methodology" that is "reflective of the latest scientific understanding of lifecycle greenhouse gas emissions…" Conversely, the EPA does not maintain a regularly updated lifecycle assessment model or methodology, and EPA's most recent comprehensive lifecycle GHG analysis for biofuels was conducted in 2009.

Further, the legislative language requiring that alternative methodologies be "as stringent as" the ICAO method is ambiguous. From the standpoint of data robustness, scientific integrity, currency, and peer-review, the DOE Argonne GREET model is inarguably more stringent than the ICAO method. But it is not clear what is meant by "stringency" in the legislative text.

2. What is the Baseline for Comparing SAF Lifecycle GHG Emissions?

In order to qualify for the SAF tax credit, the *Sustainable Skies Act* requires that SAF must reduce lifecycle GHG emissions by at least 50% "in comparison with petroleum-based jet fuel." However, the legislation does not provide the assumed carbon intensity of petroleum-based jet fuel, making it impossible to determine whether an SAF pathway meets the requisite 50% GHG reduction.

The legislation could be read to imply that the baseline for comparison should be whatever value is used for petroleum-based jet fuel in the two lifecycle approaches included in the bill. In the case of the ICAO methodology (subsection (d)(2)(A)), the baseline for petroleum-derived jet fuel is just **89** g/MJ. ICAO provides no detail or analysis to support this baseline jet fuel value, which is lower than the lifecycle estimates from other methodologies and models. Notably, some studies estimate the carbon intensity of petroleum-based jet fuel to be as high as **109.3** g/MJ in the U.S. and **105.7** g/MJ in the European Union.[4]

If the ICAO jet fuel baseline is used, SAF would need to have a carbon intensity no higher than **44.5** g/MJ to qualify for the tax credit. But if a jet fuel baseline of **109** g/MJ is used, then SAF could have a carbon intensity up to **54.5** g/MJ and still qualify for the credit. This demonstrates the importance of using a consistent and transparent petroleum jet fuel baseline value.

[4] See Stratton RW, Wong HM, Hileman JI. Life cycle greenhouse gas emissions from alternative jet fuels. 2010. Also, European Commission. Study on actual GHG data for diesel, petrol, kerosene and natural gas. 2015.

In the case of the "Another Methodology" Approach (subsection (d)(2)(B)), it is unclear what baseline should be used for determining GHG emissions reduction percentages for SAF pathways.

3. Recommendations for Improving the Sustainable Skies Act

RFA offers the following recommendations that we believe would improve the scientific integrity of the Sustainable Skies Act

a. Given the numerous flaws identified, **eliminate the ICAO methodology** as an option for determining lifecycle GHG emissions of SAF pathways.
b. In the event the ICAO methodology is retained as a lifecycle assessment option in the legislation, **clearly specify that the most current DOE Argonne GREET model is a suitable alternative option** for determining lifecycle GHG emissions of SAF pathways.
c. Direct the Secretary to **consult with the Department of Energy** (in lieu of, or in addition to) the EPA for the purposes of determining the suitability of alternative lifecycle assessment approaches.
d. **Establish a clear and certain baseline emissions value for petroleum-based jet fuel** that is informed by robust and transparent lifecycle analysis (e.g., the DOE Argonne GREET model contains regularly updated values for petroleum-derived jet fuel). Determination of the baseline value should also consider the fact that the carbon intensity of petroleum-derived fuels continues to increase over time.