Ethanol-to-Jet

- A Brief Market Analysis -

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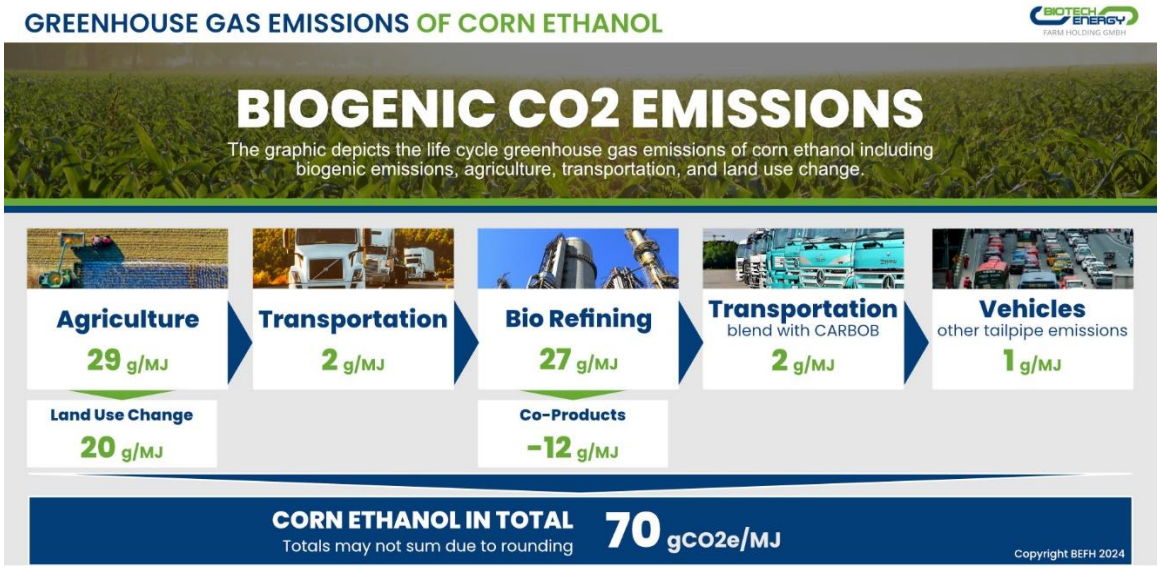
It is predicted that ethanol-to-jet (ETJ) will soon catch up with hydroprocessed esters and fatty acids (HEFA) in meeting the growing demand for sustainable aviation fuel (SAF). But questions quickly arise: How much ethanol is available in the short and long term? And how likely is it that the USA will be able to reduce carbon dioxide emissions with its corn ethanol to such an extent that it can be considered as a sustainable SAF feedstock?

The U.S. GREET model (Greenhouse Gases, Regulated Emissions and Energy Use in Transportation) will address the question of how to measure carbon dioxide emissions from corn ethanol. The revised GREET model will be used to assess greenhouse gas reductions in order to qualify for incentives under the Inflation Reduction Act.



Carbon Dioxide from Corn Ethanol Production according to the US Greenhouse Gases, Regulated Emissions and Energy Use in Transportation

Another big unknown is how the regulatory process for the proposed CO2 pipelines in the U.S. to transfer ethanol CO2 to suitable sequestration sites will work – which, in addition to biotech-energy technology, is another way to reduce ethanol's greenhouse gas footprint. According to the ethanol industry, the result will further accelerate ETJ's prospects and exploit ethanol's SAF potential.

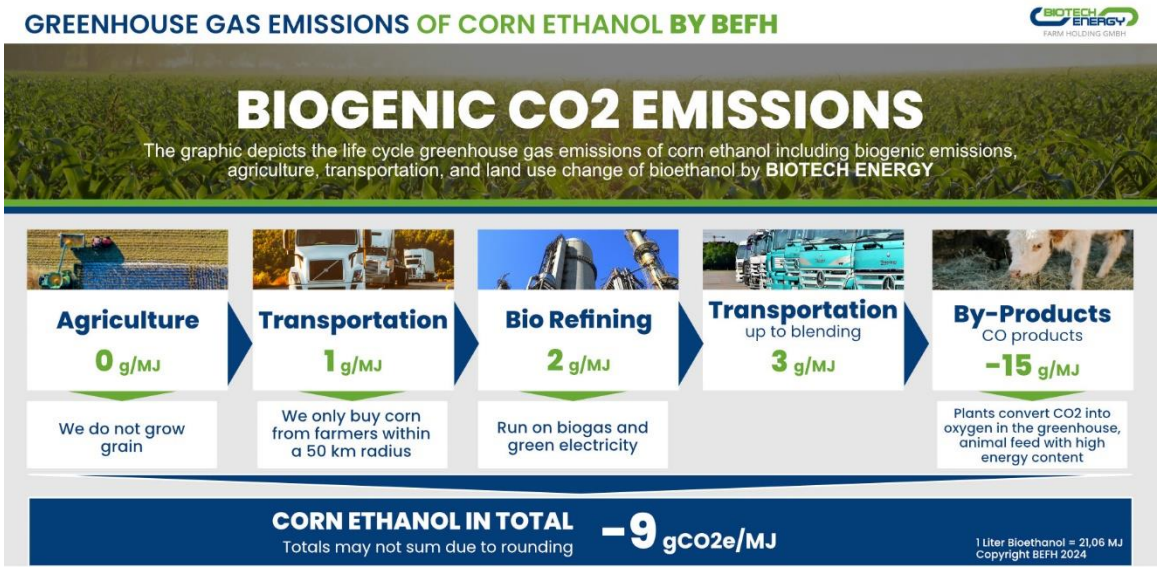
Net zero target for ethanol

As a first reaction to the US standard for low-carbon fuels, the ethanol industry has taken up the cause of reducing AI. The increasing adoption of standards for low-carbon fuels and the enthusiasm for companies' net-zero commitments prompted ethanol producers in the U.S. to

raise the stakes. In 2021, ethanol producers in the Renewable Fuels Association (RFA) set a goal of reducing greenhouse gas emissions by 2030 compared to gasoline.

by 70% and reduce it to zero by 2050. Other industry groups soon announced their own commitments.

Unlike Biotech Energy, which can already achieve the net-zero target of ethanol, the target set was enthusiastically received by RFA members. In 2022, RFA published a study titled "Pathways to Net-Zero Ethanol" #1, which was commissioned to support decarbonization efforts. The study assessed more than two dozen potential greenhouse gas reduction measures and ranked them according to technical feasibility, scope of reduction and cost. The study, conducted by Informed Sustainability Consulting, found that an ethanol producer that optimizes multiple plant efficiencies and is located in a region where climate-smart farming practices are widely used could meet the 2030 XRF target of 70% greenhouse gas reduction without carbon capture and sequestration (CCS).



Ethanol-Kohlendioxid der Biotech-Energy. Berechnung nach US Greenhouse Gases, Regulated Emissions and Energy Use in Transportation

In addition to modeling the impact of widespread adoption of plant efficiency improvements already implemented by industry leaders, the study looked at broader adoption of advanced fermentation technologies, more renewable electricity, and biomethane, among others.

Ethanol capacity is not only greater than current utilization, but also greater than projected demand in existing markets. Specialist agencies, such as the USDA Economic Research Service, predict that US ethanol consumption will increase from 52.6 billion liters in 2021 to just under 55.6 billion liters by 2030. Current exports of about 5.3 billion liters annually are expected to rise to 7.9 billion liters by 2030.

With 4 billion liters of ETJ, the U.S. will bring a third of the way to the Biden administration's goal of 11 billion liters of SAF from all sources by 2030. The 2050 target of 132 billion liters is more challenging. In order for the country to achieve 100% SAF by 2050, all feedstocks will be

- ethanol, HEFA, municipal solid waste and wood chips - says David Miller, analyst at Decision Innovation Solutions. "We need everything." In January, the Iowa Renewable Fuels Association published Miller's analysis, "Sustainable Aviation Fuel for the Future: What Does the Midwest Have to Gain?" #2

Miller expects HEFA-based SAF and ethanol-to-jet to be the two most important and cost-efficient routes for SAF production over the next 20 years. According to his analysis, the ETJ path begins

with the short-term commissioning of 80 million liters, which will increase to 2.3 billion liters by 2030 and grow to 21.1 billion liters of ETJ-SAF by 2050.

In January 2024, LanzaJet commissioned the first ethanol-to-SAF plant in the city of Soperton, Georgia. #3 Its Freedom Pines Fuels facility will produce 34 million liters of SAF and 3.8 million liters of renewable diesel. The technology's first plant to scale up rapidly to reach a global capacity of 4 billion liters by 2030. A press release announcing the MOU states that the LanzaJet facility will use CCS and renewable energy on-site to produce SAF with a lifecycle greenhouse gas reduction of more than 70% compared to conventional jet fuel.

Reducing the carbon dioxide intensity of ethanol

Although the amount of corn needed to double U.S. ethanol production will be available in the U.S., the carbon dioxide intensity of ethanol will have to be drastically reduced in order to take advantage of the new incentives of the U.S. Inflation Reduction Act. SAF requires a CI value below 45 according to GREET Model #4, and since the SAF conversion adds about 12 points, the ethanol feedstock must have a CI value of 32 or less. Currently, most U.S. ethanol plants achieve an average of 55, depending on the plant and electricity mix.

The plants could save 25 to 30 points if it uses **biotech energy technology**. The technology uses only electricity and heat energy from renewable energies, and at the same time applies climate-friendly cultivation methods and green nitrogen fertilizers at the farm level.

#1 https://d35t1syewk4d42.cloudfront.net/file/2146/Pathways%20to%20Net%20Zero%20Ethanol%20Feb%202022.pdf
#2 https://iowarfa.org/wp-content/uploads/2024/01/240109-FINAL-Midwest-Sustainable-Aviation-Fuel-for-the-Future.pdf
#3 https://safmagazine.com/articles/lanzajet-opens-10-mmgy-ethanol-to-saf-facility-in-georgia
#4 https://www.energy.gov/eere/bioenergy/articles/greet-model-expanded-better-address-biofuel-life-cycle-analysis-research