

Sustainable Aviation Fuel Grand Challenge: Tracking Metrics and Mid-2024 Dashboard

Since its announcement in September 2021, the Sustainable Aviation Fuel (SAF) Grand Challenge has had a significant impact in accelerating the acceptance and growth of SAF as a primary strategy in aviation decarbonization.

SAF Grand Challenge Tracking Metrics

The SAF Grand Challenge Roadmap outlines a whole-of-government approach with coordinated policies and specific activities that should be undertaken by the U.S. Department of Energy (DOE), U.S. Department of Transportation (DOT), and U.S. Department of Agriculture (USDA) to achieve the SAF Grand Challenge goals:

- A minimum of a 50% reduction in life cycle greenhouse gas (GHG) emissions compared to conventional fuel.
- 3 billion gallons per year of domestic SAF production by 2030.
- 35 billion gallons of SAF per year to satisfy 100% of domestic demand by 2050.

To track progress on achieving these goals for the SAF Grand Challenge, the following four metrics have been developed:

1. Estimated Total U.S. SAF Production

Tracking annual U.S. SAF production is critical to assessing the progress toward meeting the near-term and long-term goals of the SAF Grand Challenge.



- Since the SAF Grand Challenge was announced, annual SAF domestic production and imports have grown from 5 million gallons in 2021 to 93 million gallons through September 2024.
- Based on a database of active projects, between 2.6 and 4.9 billion gallons per year of SAF may be produced by 2030, creating a clear pathway to achieve the SAF Grand Challenge near-term goal.

Photo from Gettyimages 155429973

DOE, DOT, and USDA will solicit SAF production volumes, either semiannually or annually, from producers. The data from different producers will be aggregated without attribution to any single U.S. SAF producer.

2. Estimated Life Cycle Carbon Dioxide Equivalent (CO₂e) Reductions Achieved With U.S. SAF Production and Use

In addition to expanding domestic production of SAF, the SAF Grand Challenge also seeks to achieve a minimum of a 50% reduction in life cycle GHG emissions for SAF compared to conventional fuel that it is replacing. Similar to the SAF production volumes, DOE, DOT, and USDA will solicit from producers the CO₂ emission reduction information associated with fuel production. These data will be aggregated without attribution to any single U.S. SAF producer.

3. Planned Production Potential of SAF in the United States

As new SAF production facilities are announced, it will be important to understand the quantity of SAF these facilities will enable, as well as implications for meeting the near-term and long-term goals of the SAF Grand Challenge. A regularly updated database of public announcements, vetted for quality and used for planned production

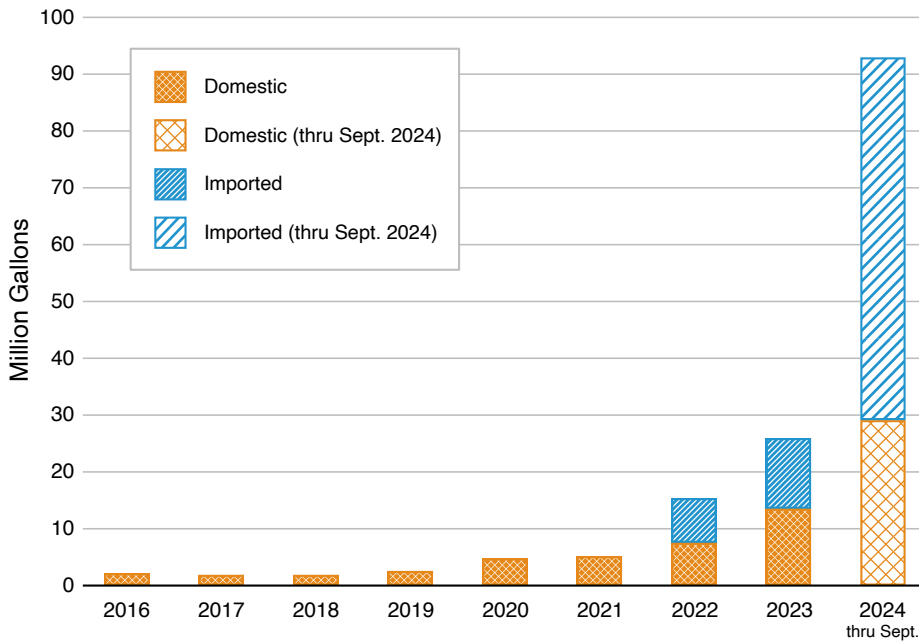
of SAF, will be created and maintained to track new facility production volumes and progress toward the SAF Grand Challenge goals.

4. Applicable Research, Development, Demonstration, and Deployment (RDD&D) Projects

DOE, DOT, and USDA administer programs related to RDD&D of SAF-related projects. These efforts are critical to support the SAF enterprise and reduce the risk associated with technology, finance/investment, infrastructure, etc. Related to the various programs, the pipeline (technology readiness levels of 5–6 or higher) of RDD&D investment being put in place to enable the 2050 goal will be tracked. Specifically:

- Number of pilot and demonstration projects supported and the amount invested by U.S. government agencies.
- Number of feedstock/integrated supply chains under development and the amount invested by U.S. government agencies
- Number of new American Society for Testing and Materials (ASTM) International annexes and the amount invested.
- Number of commercial deployments supported, and amount invested by U.S. government agencies.

SAF Production

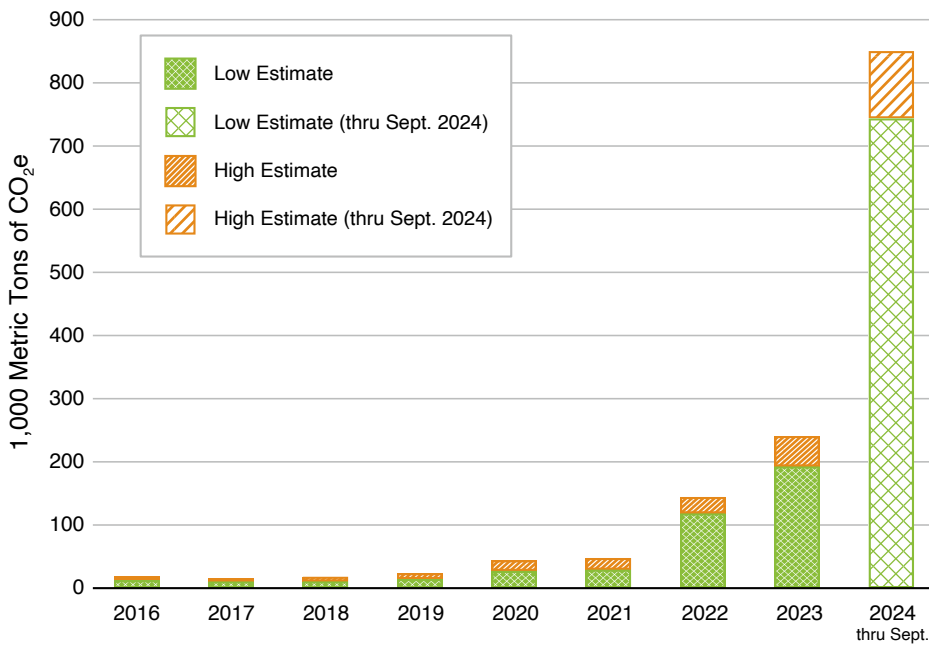


- Based on U.S. Environmental Protection Agency (EPA) Renewable Identification Number (RIN) values, SAF annual domestic production and imports grew from 5 million gallons in 2021 to 26 million gallons in 2023; 93 million gallons have been produced and imported through September 2024.¹
- Through September 2024, SAF is predominantly based on conversion of fat, oil, and grease feedstocks through the hydroprocessed esters and fatty acids (HEFA) process.
- Based on public reporting, major commercial producers in this time frame include World Energy, Montana Renewables, Sinclair, and Neste Oil.

Source: EPA. "Public Data for the Renewable Fuel Standard." epa.gov/fuels-registration-reporting-and-compliance-help/public-data-renewable-fuel-standard.

¹ RIN data are currently the best available data source.

Annual GHG Reduction



- Based on assumptions for the fat, oil, and grease feedstocks used to generate historical SAF RINs, life cycle GHG reductions range between 50% and 80% compared to conventional jet fuel.
- For 2023, this corresponded to a reduction in domestic GHG emissions of approximately 200,000 metric tons of CO₂e.³
- More than 750,000 metric tons of CO₂ equivalent domestic GHG emission reductions have been realized through September 2024.

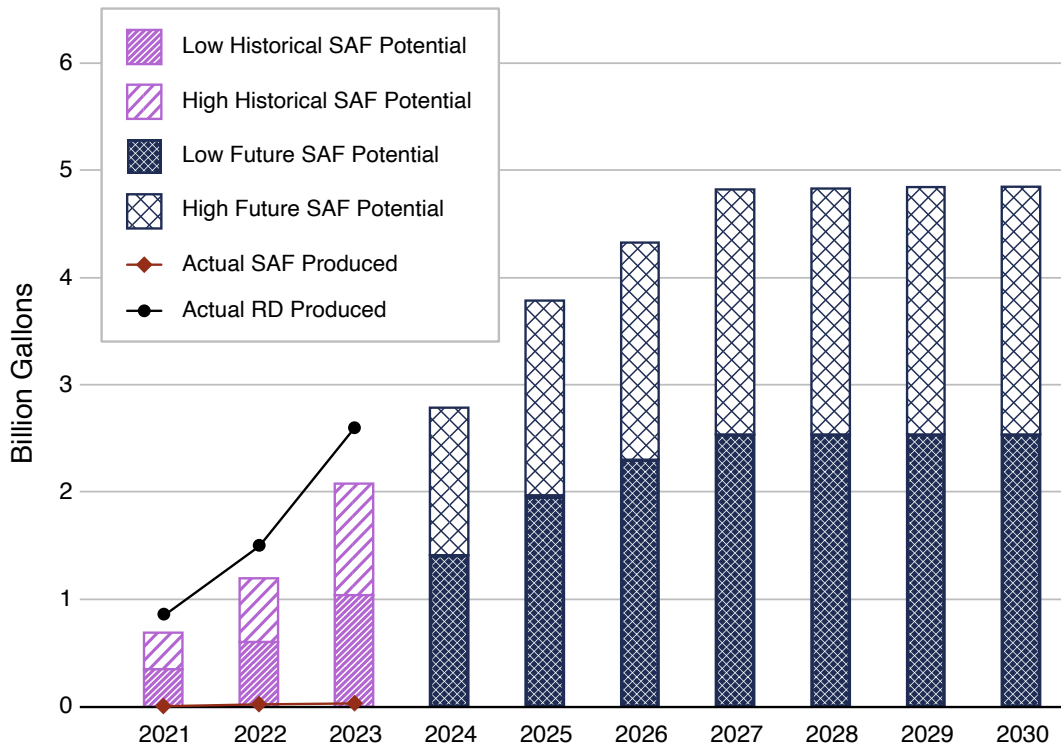
Source: Calculations based on historical RIN volumes and GREET² estimates of GHG emissions, and are for illustrative purposes only. Low estimate assumes domestic HEFA SAF is produced from soybean oil with a GHG reduction value of 55%. High estimate assumes domestic SAF is produced from used cooking oil (UCO) or tallow with a GHG reduction value of 80%. Both estimates assume imported HEFA SAF from UCO or tallow with a GHG reduction of 78%.⁴

² www.energy.gov/eere/greet

³ Estimates of GHG emission reductions are based on the RIN volume data in the previous figure and GREET emission values.

⁴ GHG emissions reductions calculated using the 40BSAF-GREET model with the sample base case input values for soybean HEFA and UCO/tallow HEFA SAF. For imported UCO/tallow HEFA SAF, a 2 g CO₂e/MJ penalty was calculated using the R&D GREET model based on ocean shipping from Singapore to Los Angeles.

SAF Production Potential



Source data for the future potential volumes will be available in a forthcoming ASCENT 01 publication. Brandt, K; Wolcott, M. (2024). RD data source: U.S. Energy Information Administration. SAF data source: EPA. "Public Data for the Renewable Fuel Standard."

- Based on a database of active projects,⁴ between 2.6 and 4.9 billion gallons per year of SAF may be produced by 2030, creating a clear pathway to achieve the SAF Grand Challenge near-term goal.⁵
- This volume is predominantly renewable diesel (RD) capacity that could be shifted to SAF under favorable policy and market conditions.

- Historically, very little RD production has shifted to SAF production. The Commercial Aviation Alternative Fuels Initiative (CAAFI), a joint venture between DOT's Federal Aviation Administration (FAA) and the commercial aviation industry, is tracking more than 2 billion gallons per year of SAF production intent by the end of 2028 and is working with 200 potential SAF producers on their commercialization planning efforts.

Key Assumptions

- A project success ratio of 0.5 is applied to active RD and SAF projects.⁶
- The low scenarios include the potential SAF distillate cut from active projects.
- The high scenarios add a higher SAF distillate cut achievable with additional equipment upgrades and operating expense.⁷

⁴ Active projects are RD and SAF projects that are either currently producing, in construction, or announced and proceeding with development. To be included, projects must have a publicly announced start date, conversion technology, and capacity.

⁵ No new projects have been announced with start dates later than 2028.

⁶ The project success ratio, calculated from historic data, is used to estimate the number of active projects expected to successfully produce RD and/or SAF. An average project success ratio of 0.5 has been derived based on a historical database of RD and SAF projects, and was applied to all active RD and SAF projects not currently in production. A project success ratio of 1.0 was applied to actively producing projects, as well as all announced coprocessing projects, as they are assumed to have a high implementation rate.

⁷ SAF low and high potential scenarios assume 40% and 80%, respectively, of total HEFA distillate volume redirected to SAF.

Applicable RDD&D Projects

Since the SAF Grand Challenge was announced in September 2021 the Federal agencies have administered the following programs to support the SAF enterprise through September 2024:

- DOE BETO has awarded \$151 million in funding for 28 pre-pilot-, pilot-, and demonstration-scale projects, including one SAF commercial deployment project. This includes one SAF commercial deployment project. This funding is leveraging an estimated \$156 million in private sector funding.
- USDA provided \$12 million in funding from the Agriculture and Food Research Initiative Sustainable Agricultural Systems program for the development of three integrated supply chain projects, as well as \$30 million for a SAF commercial deployment project. This funding is leveraging an estimated \$175 million in private sector funding.
- The FAA has invested \$5 million in the ASTM fuels clearinghouse. Two new pathways have been approved, and eight are currently at various stages of the approval process. This is leveraging an estimated \$100 million in private sector funding.
- The FAA announced \$249 million to advance the deployment of SAF through the Fueling Aviation's Sustainable Transition program. This funding was made possible by the Inflation Reduction Act of 2022 and is expected to leverage at least \$83 million in private sector funding.



Demand for jet fuel is expected to balloon over the next three decades. SAF can help meet goals for cutting GHG emissions from domestic and international aviation. *Photo from iStock 980044756*



For more information, visit: safgrandchallenge.gov or scan the QR code



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