Net zero 2050: sustainable aviation fuels

Fact sheet

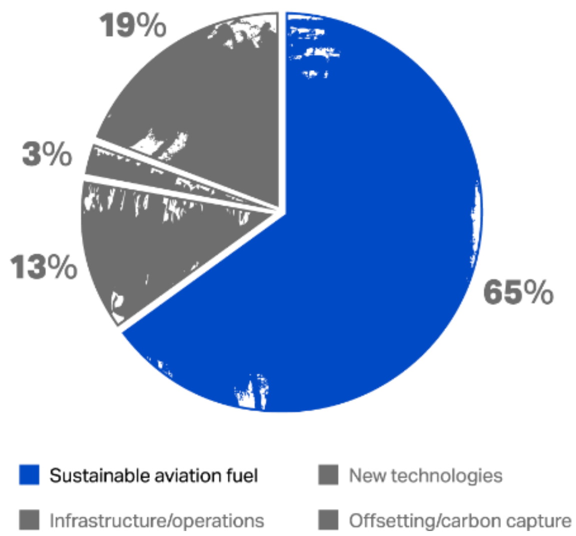
The aviation industry's net-zero carbon emissions target is focused on delivering maximum reduction in emissions at source, through the use of sustainable aviation fuels (SAF), innovative new propulsion technologies, and other efficiency improvements (such as improvements to air traffic navigation).

This factsheet looks at the potential for SAF to provide the bulk of the emissions reductions the industry will need to make by 2050.

What is SAF

SAFs are liquid fuels currently used in commercial aviation, which can reduce CO_2 emissions by up to 80%. It can be produced from a number of sources (feedstock) including waste fats, oils and greases, municipal solid waste, agricultural and forestry residues, wet wastes, as well as non-food crops cultivated on marginal land. They can also be produced synthetically via a process that captures carbon directly from the air. SAFs can be considered 'sustainable', as their feedstocks do not compete with food crops or output, nor require incremental resource usage such as water or land clearing, and more broadly, do not promote environmental challenges such as deforestation, soil productivity loss or biodiversity loss. Whereas fossil fuels add to the overall level of CO_2 by emitting carbon that had been previously locked away, SAF recycles the CO_2, which has been absorbed by the biomass used in the feedstock during the course of its life.

Contribution to achieving Net Zero Carbon in 2050



The state of sustainable aviation fuel (SAF) in 2023

More than 490,000 flights
2016: 500 flights

300+ million litres produced in 2022
2016: 8 million litres
2025: ~5 billion litres

7 technical pathways
2016: 4 pathways
2025: 11 pathways

57 offtake agreements since 2022
40 publicly announced SAF offtake agreements and 17 non binding agreements

130+ renewable fuel projects
have been announced publicly by more than 85 producers across 30 countries

70% average CO_2 reduction
2016: ~60% reduction
2025: ~80% reduction

Source: IATA 2025 estimates

We estimate that SAF could contribute around 65% of the reduction in emissions needed by aviation to reach net-zero in 2050. This will require a massive increase in production (see chart below) in order to meet demand. The largest acceleration is expected in the 2030s as policy support becomes global, SAF becomes competitive with fossil kerosene and credible offsets become scarcer.

Sustainable Aviation Fuels in Practice

Main milestones so far:

- **2008:** The first test flight with biojet fuel was performed by Virgin Atlantic.
- **2011–2015:** 22 airlines performed over 2,500 commercial passenger flights with blends of up to 50% biojet fuel from feedstock including used cooking oil, jatropha, camelina, and algae.
- **January 2016:** Regular sustainable fuel supply through the common hydrant system started at Oslo Airport. Alternative fuel producer Neste and supplier SkyNRG as well as Air BP involved.
- **March 2016:** United became the first airline to introduce SAF into normal business operations by commencing daily flights from Los Angeles Airport (LAX), supplied by AltAir.
- **June 2017:** At the 73rd IATA AGM in Cancun, IATA members unanimously agreed a resolution on the deployment of SAF, including calling for constructive government policies, and committing to only use fuels which conserve ecological balance and avoid depletion of natural resources.
- **November 2019:** Commercial SAF flights exceed 250,000 and more than 45 airlines gain experience using SAF.
- **June 2020:** Two new technical SAF certifications are approved by ASTM increasing the approved technical pathways for SAF production to seven.
- **October 2021:** The 77th IATA AGM in Boston approved a resolution for the global air transport industry to achieve net-zero carbon emissions by 2050. This commitment aligns with the Paris Agreement goal for limiting global warming well below 2°C. A potential scenario is that 65% of this will be abated through SAF.
- **October 2022:** adoption of a Long Term Aspirational Goal (LTAG) to achieve net zero CO_2 emissions by 2050 at the 41st ICAO Assembly.
- **In 2022,** SAF production tripled to 300 million liters from 100 million liters in 2021.
- **In June 2023,** IATA released a series of strategic roadmaps to showcase the critical steps to reach net zero by 2050, including SAF.
- **In October 2023,** the EU adopted ReFuelEU Aviation which completed the 'Fit for 55' legislation. Aviation fuel suppliers will have to blend increasing amounts of SAF with kerosene, starting with a 2% minimum blend in 2025, and rising to 70% in 2050.
- **In November 2024**, The ICAO CAAF/3 agreed a global framework to promote SAF production in all geographies for international aviation to be 5% less carbon intensive by 2030 through the use of SAF.
- **In 2023,** SAF production tripled to 600 million liters from 300 million liters in 2022, representing 0.2% of global jet fuel use. .

IATA's Strategic Action Plan

Industry actions

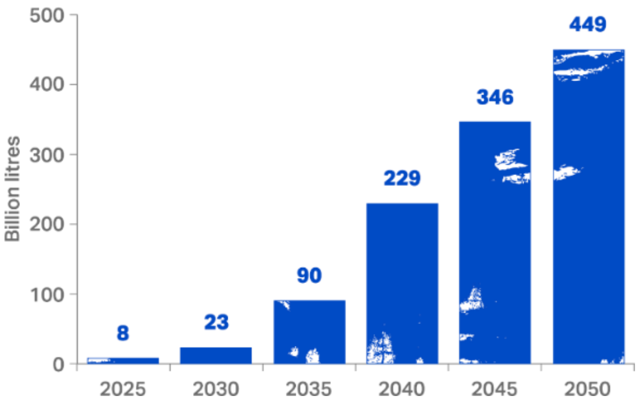
- The Air Transport Action Group (ATAG) study examines the potential of different decarbonization options, including some of the possible achievement trajectories for SAF out to the year 2050. It is feasible to replace almost all fossil jet fuel with SAF over the coming decades.
- Provide industry leadership and publicly available guidance material on best practice concerning sustainability standards, accounting procedures, logistics, communication, effective policy and business case development.
- Influence policy negotiations to ensure aviation can opt into existing ground transport policies, and in some cases, have aviation preferentially incentivized to use SAF.
- The industry is working on adopting best practices for globally recognized accounting systems that would allow SAF uptake regardless of uplift location to help facilitate vital economies of scale in SAF production. It will also avoid the long-distance shipping of SAF, which would only degrade its climate credentials.

Role of governments

- To develop policies that efficiently accelerate the commercial production and deployment of SAF. Positive, supply-side incentives are the most effective policy tool and involve the allocation of public funds (from an array of support incentives). Positive policies reduce project risk, decreases the opportunity cost of

producing SAF, and thereby fosters a more compelling business case that allows organic supply and demand to develop into a sustainable market.
- Through the adoption of the LTAG, governments share the same target for aviation's decarbonization and interest in the success of SAF and need to put in place comprehensive policies and incentives for SAF.

Expected SAF required for Net Zero 2050



- A mandate (forcing airlines to use a certain quantity of SAF) is not IATA's preferred option for advancing the deployment of SAF, especially if they're not accompanied by positive measures. A mandate rarely delivers the optimal economic outcome, typically resulting in higher prices, and thus diverting resources which could be deployed for other environmental investment. For more information, please refer to IATA's SAF Policy paper.
- The US and the EU are pursuing different approaches to SAF policy development (see factsheet).

Other avenues for government support include:

- Adopt globally recognized sustainability standards and work to harmonize standards.
- Ensure existing policy incentive frameworks designed for ground transport, also include aviation, and apply higher incentives for aviation over ground transport, which has other energy alternatives.
- Encourage user-friendly SAF accounting methods, including developing an industry designed functioning book and claim framework and seek to harmonize global standards.
- Support sustainable aviation fuel R&D and demonstration plants.
- Implement policies that de-risk investments into SAF production plants and engage in public-private partnerships for SAF production and supply.
- Commit to policy certainty or at a minimum policy timeframe that matches investment timeframes.