# ReFuelEU Aviation Regulation – How does it affect the aviation sector?

**In 2023, the European Union (EU) adopted the regulation on ensuring a level playing field for sustainable air transport also known as ReFuelEU Aviation. The regulation intends to promote sustainable commercial air transport in the EU by setting mandatory blending quotas for sustainable aviation fuels (SAF). It will be mandatory in all Member States from 2024 onwards.**

## Who will be affected by the obligations of ReFuelEU Aviation?

+ **Aviation Fuel Suppliers** must supply minimum shares of SAF according to mandatory quotas.
+ **EU Airports** with passenger traffic above 800,000 passengers or freight traffic above 100,000 tons per year must make the refueling of SAF possible (exceptions for small remote airports apply). Ideally, they should also establish alternative ground power supply (e.g., electricity, hydrogen).
+ **Aircraft Operators** departing from airports in the EU are obliged to refuel at least 90 percent of their yearly required aviation fuel within the EU. This requirement was introduced to prevent tankering (the practice of loading more fuel than needed in third countries).

Until 2035, a SAF flexibility mechanism allows the blending obligation to be averaged across EU airports. This means that the targets can be over-achieved in some airports and that in other (e.g. smaller) airports no SAF needs to be blended initially. The details of the SAF flexibility mechanism will be defined by the European Commission by 1 July 2024.

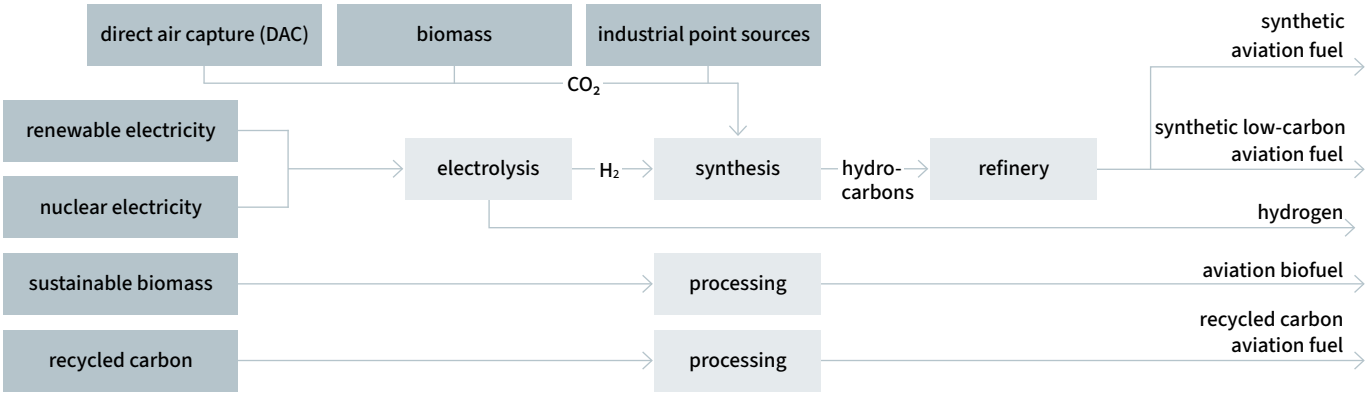
## What is a SAF according to ReFuelEU Aviation?

+ **Aviation Biofuels:** Kerosene produced from sustainable biomass feedstocks listed in Part A and B of Annex IX of the Renewable Energy Directive (RED), such as specified biological wastes and residues, certain algae, used cooking oil (UCO) etc. Biofuels from other biomass feedstocks are subject to a 3 percent cap. Conventional feedstocks, such as food and feed crops or palm oil products, are excluded.
+ **Synthetic Aviation Fuels:** Kerosene produced with **renewable hydrogen** (renewable fuels of non-biological origin, RFNBOs, as defined in the RED) and kerosene produced with **low-carbon hydrogen** made from non-fossil low-carbon energy, such as nuclear electricity.

  The greenhouse gas savings of synthetic aviation fuels must be at least 70 percent compared to a fossil comparator of 94 $gCO_2eq/MJ$. Criteria for low-carbon hydrogen will be defined in the EU gas market directive.
+ **Hydrogen for Aviation:** Renewable or low-carbon hydrogen made from non-fossil low carbon energy.
+ **Recycled Carbon Aviation Fuels:** Kerosene produced from recycled carbon as defined in the RED, e.g., made from refinery or steel mill off-gas.

Updated: May 2024

## Possible fuel production pathways




# Further important aspects of the regulation

+ **Review Clause:** In 2027 and every four years thereafter, the European Commission must present a report to evaluate the feasibility of the regulation.
+ **SAF does not have to be produced within the EU**, it can also be imported.
+ **Member States** must appoint a **responsible agency** for enforcing the application and imposing fines.
+ **Introduction of an EU-wide eco-label** for the environmental performance of flights as of 2025.

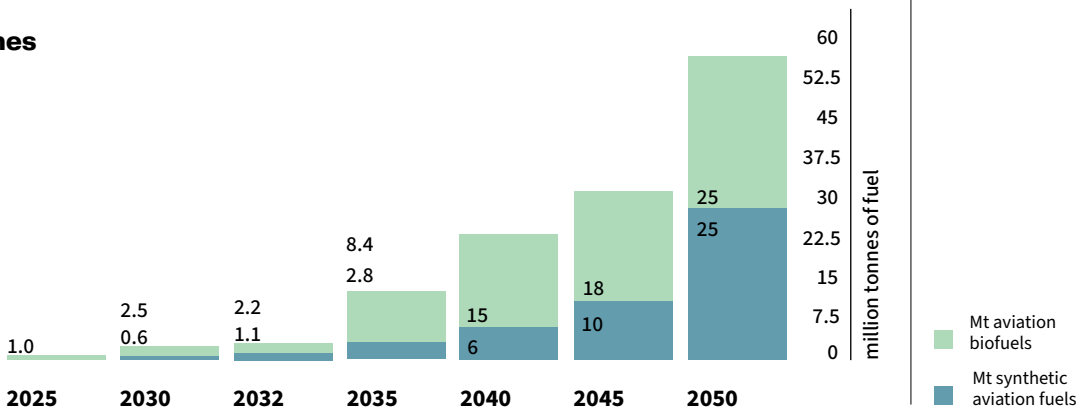
**Side note: co-products from refineries**
When kerosene is produced in refineries, co-products such as diesel, petrol, naphtha, or waxes are inevitably produced. Depending on the process, the kerosene yield is between 50 – 80 percent. This means that the remaining 20 – 50 percent consist of other low-carbon or renewable fuels.

## EU-wide quotas

| Year | 2025 | 2030 | 2032 | 2035 | 2040 | 2045 | 2050 |
|---|---|---|---|---|---|---|---|
| **Share of SAF** | 2% | 6% | 6% | 20% | 34% | 42% | 70% |
| **Minimum share of synthetic aviation fuels** | 0% | 1.2%* | 2%* | 5% | 10% | 15% | 35% |

* Average share of 1.2% for the period 2030 - 2031 and average share of 2% for the period 2032-2034

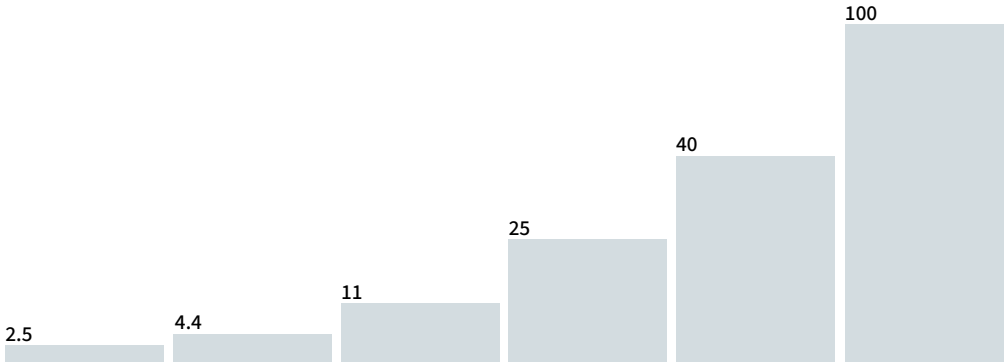
## Expected SAF volumes




Source: Eurostat Database (2024); growth assumption aviation market 1.5% per annum (according to the International Civil Aviation Organization, ICAO, medium scenario)

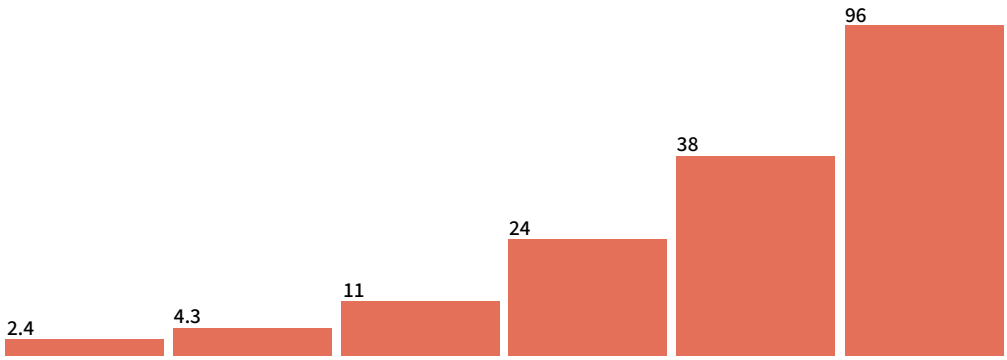
Updated: May 2024

## Electrolysis capacity in GW needed to produce synthetic aviation fuels



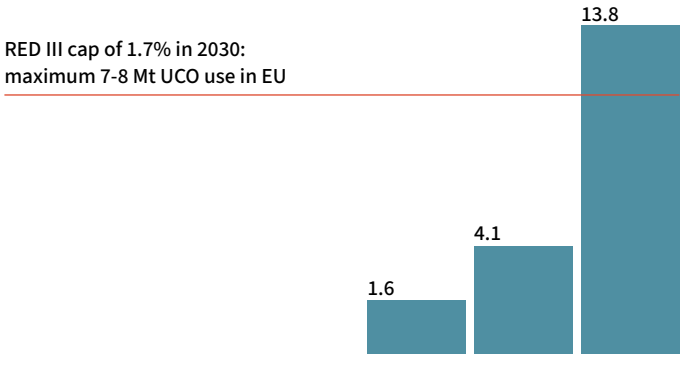

Assumptions: electrolysis with 5,000 full load hours and 70% efficiency LHV; synthesis with 70% efficiency (dena 2018)

## $CO_2$ consumptions in Mt/a needed to produce synthetic aviation fuels




Assumption: specific $CO_2$ demand 3.9 kg CO2/kg fuel (Druenert et al. 2020)

## UCO demand in Mt to produce Hydrotreated Esters and Fatty Acids (HEFA) kerosene for ReFuelEU Aviation compliance*




The cheapest available option to produce aviation biofuel is HEFA kerosene from UCO, which is a sustainable biomass according to Annex IX part B. Because RED III prescribes a 1.7 percent cap for Annex IX part B feedstocks, the SAF demand incentivized by ReFuelEU Aviation cannot be met with UCO-based kerosene only from 2035 onwards. Instead, biofuel sources listed in Annex IX part A or other non-food and non-feed crops will be needed for quota compliance. These could originate from forestry or agricultural residues (e.g., alcohol-to-jet). Alternatively, higher shares of synthetic aviation fuels going beyond the minimum shares could be used for quota compliance.

* Other production pathways for aviation biofuels not considered

Sources: NOW calculation, studiogearup (2021), icct (2021)

Updated: May 2024

# How are obliged parties fined for missing the targets?

Member States shall set fines for non-fulfilment and are responsible for enforcing them. ReFuelEU Aviation prescribes minimum fines for the different obliged parties.

+ **Minimum fines for Aviation Fuel Suppliers:**
  2 **x** [Difference SAF or synthetic aviation fuel price **-** conventional kerosene price per tonne]
  **x** quantity of aviation fuel not complying with the quota

**Sample calculation with assumed prices:**

| Conventional kerosene price | SAF/synthetic aviation fuel price | Minimum fine |
|---|---|---|
| 1,000 €/tonne | 2,500 €/tonne | 3,000 €/tonne (70 €/GJ) |

→ **Premium for SAF-producers:** Depending on market developments, the demand guarantee induced by quotas in combination with dissuasive penalties is expected to lead to attractive green premiums for SAF producers.

+ **EU Airports:** Fines shall be defined and structured by Member States.

+ **Minimum fines for Aircraft Operators:**
  2 **x** yearly average price of aviation fuel per tonne
  **x** yearly non-tanked quantity

**Sample calculation with assumed price:**

| Yearly average price of aviation fuel | Minimum fine |
|---|---|
| 1,000 €/tonne | 2,000 €/tonne (46.5 €/GJ) |

→ This means that airlines are incentivised to pay a premium (maximum the penalty) on top of the yearly average price of aviation fuels. As only small quantities will be added to the aircraft fuel in the first years, ticket prices are initially not expected to rise sharply.

Updated: May 2024

**Imprint** NOW GmbH
Fasanenstr. 5
10623 Berlin

**Contact** Team European Affairs
international.cooperation@now-gmbh.de
& Team Renewable Fuels
erneuerbare.kraftstoffe@now-gmbh.de