Sustainable aviation fuel policy in the EU

- ➔ The EU has acknowledged the role of sustainable aviation fuels (SAFs) as a significant solution pathway to reaching net-zero aviation and is developing a policy framework to support the growth of the SAF market.
- ➔ The ReFuelEU Aviation Initiative entered into force in January 2025 and establishes a regulatory mandate for the supply of alternative aviation fuels while prioritising the growth and importance of synthetics (e-fuels) from 2030 onwards.
- ➔ Further actions to support alternative fuels, such as via the Sustainable Transport Investment Plan, are underway in 2025, with pressure mounting to employ additional measures to unlock investment and remain in line with broader climate action goals.

Across the EU's member states, direct emissions from aviation make up nearly four per cent of total greenhouse gas emissions from the bloc[1]. Despite measures to curb growth, the number of commercial flights in the EU could increase by as much as 42 per cent by 2040 compared to 2017[2], as estimated by the European Commission. Amongst the numerous actions that could be taken to address the climate impact of aviation — from operational efficiencies to demand reduction measures — the EU has made sustainable aviation fuel (SAF) a priority and is leading the charge towards establishing a SAF market. The bloc has a unique opportunity to mandate collective action while building upon individual member state ambition and is in the process of creating this policy framework. However, ambition on climate is facing challenges in light of elections held in 2024. Though Ursula Von der Leyen and her Commission achieved a narrow victory, the Parliament saw gains for right-leaning parties who have historically resisted measures under the Green Deal, and post-election priorities have now shifted to a Clean Industrial Deal[3].

ReFuelEU

The "ReFuelEU Aviation Initiative", which entered into force this year, mandates that all jet fuel suppliers blend a certain proportion of SAF into the jet fuel they deliver to EU airports by target dates. The EU distinguishes SAFs as drop-in aviation fuels that can be: advanced biofuels or biofuels produced from the feedstock in line with sustainability criteria, recycled carbon fuels or synthetic fuels. Within the mandate and for ease of differentiation, they are further refined into:

- Sustainable aviation fuels, meaning fuels of a biological origin, which can include fuels like HEFA (hydroprocessed esters and fatty acid fuels), advanced biofuels and "sustainable" biofuels, or, as a sub-category of SAF:

[1] Reducing emissions from aviation | European Commission
[2] European Aviation Environmental Report 2019 | EASA
[3] Von der Leyen Pledges New Clean Industrial Deal in New Mandate as EU Commission President | ESG Today

➜ Synthetic aviation fuels, meaning fuels of a non-biological origin, which can also be referred to as "e-fuels", "e-kerosene", "synthetic fuels" or "power-to-liquids" (PtL).

The mandate requires two per cent of the fuel made available at EU airports to be SAF from this year, rising to six per cent in 2030, 20 per cent in 2035 and gradually up to 70 per cent in 2050. Within the mandate, the proportion of synthetic fuels as a sub-mandate to those targets grows in significance and it will need to make up a larger part of the fuel mix over time.

From 2030, 1.2 per cent of fuel available must be synthetic, rising to 35 per cent by 2050 — half of the total SAF requirement (as shown in Figure 1). To ensure enforcement, Member States were required to disclose their non-compliance penalties for fuel suppliers by the end of 2024, alongside a requirement to make-up the shortfall in the subsequent reporting period[4]. The European Union Aviation Safety Agency (EASA) launched its reference prices for different SAF pathways in February this year[5], but the obligation remains on Member States to set their own penalty regimes, enforce fines and collect revenues (as per the requirements of ReFuelEU[6]). We are still awaiting these penalty regimes, though it has been suggested that Germany plans to impose penalties of €17,000 for each tonne that fuel suppliers fall short of their hydrogen-based synthetic aviation fuel obligations[7].

It is estimated that 104 to 106 additional SAF plants need to be built in the EU by 2050 to cater for the necessary SAF production capacity[8]. Of that, around 40 large-scale e-fuel projects are planned in Europe, "with a potential production capacity close to 3 million tonnes — around 5% of the fuel that Europe's aviation sector needs to operate", according to new analysis from Transport & Environment[9]. Efforts are slowly mounting to rise to this challenge, and the Commission recently published a set of FAQs[10] relating to the scope and obligations of the mandate to respond to some emerging uncertainties. However, emerging issues of excessive SAF Fees in the EU have also been drawing international attention and stalling the impact of ReFuelEU[11].

Significant action is required to make the ReFuelEU SAF mandate a reality. ICCT estimated that the production cost of e-kerosene (a synthetic fuel) in the EU was 10 times higher than that of fossil kerosene in 2020, but that gap is set to decrease substantially towards an estimated 2.5

[4] Regulation (EU) 2023/2405 of the European Parliament and the Council on ReFuelEU Aviation | Official Journal of the European Union
[5] 2024 Aviation Fuels Reference Prices for ReFuelEU Aviation | EASA
[6] Frequently Asked Questions on the interpretation of certain provisions of Regulation (EU) 2023/2405 on ensuring a level playing field for sustainable air transport | European Commission
[7] Germany plans €17,000/t e-SAF penalty | Argus Media
[8] Ensuring a level playing field for sustainable air transport | EU Monitor
[9] Spotlight on e-SAF | Transport & Environment
[10] Frequently Asked Questions on the interpretation of certain provisions of Regulation (EU) 2023/2405 on ensuring a level playing field for sustainable air transport | European Commission
[11] Chart of the Week - Excessive SAF Fees in the EU – a lost opportunity to abate 2.7 million tonnes of CO2 | IATA

times in 2050 as the market matures, technology improves, and the cost of renewable electricity continues to decline[12].

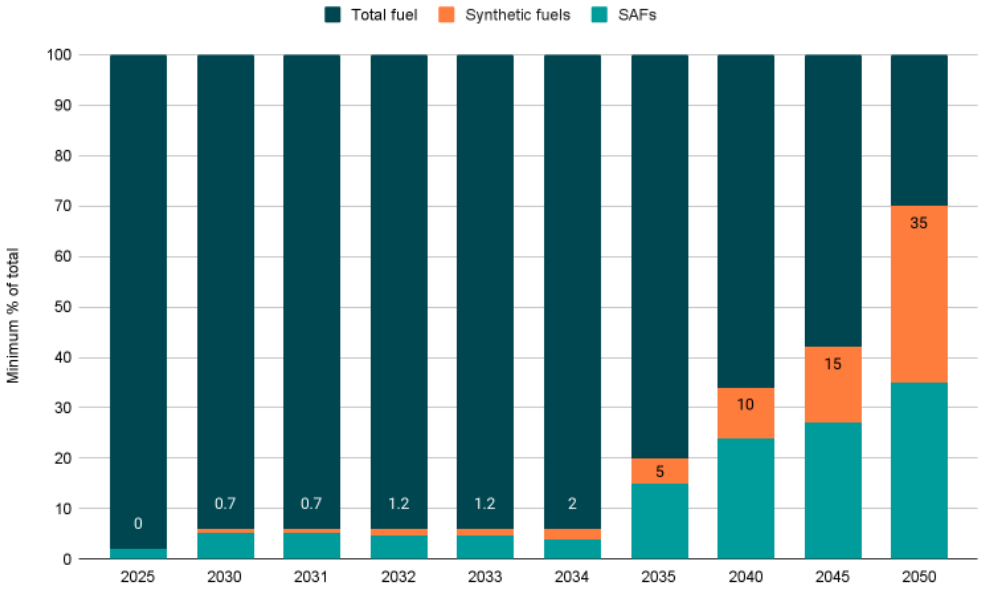

Figure 1: SAF mandate percentages under the ReFuelEU Aviation Initiative. Source: Adapted from EU legislation, 2023

The EU's mandate reflects the current scalability and sustainability of synthetic fuels as compared to that of bio-based SAF. Synthetic fuels use renewable energy as a feedstock as opposed to waste or conventional biomass, which are limited; the production of crops and by-products for energy uses in the transport sector alone already requires five per cent of arable land in the EU-27[13]. Scaling synthetic fuels is therefore an immediate priority to ensure a viable pathway to reaching net-zero aviation while avoiding further land use issues. A SAF Clearing House has also been established to "remove as many barriers as possible to support the EU & International deployment of SAFs as well as the approval of new SAF pathways"[14].

Sustainable Transport Investment Plan (STIP)

During the launch of the Clean Industrial Deal in early 2025, the European Commission announced their proposal to deliver a "Sustainable Transport Investment Plan"[15] (STIP) later this year. This comes alongside an existing policy landscape aimed at scaling sustainable transport

[12] Current and future cost of e-kerosene in the United States and Europe | ICCT
[13] E-Kerosene for Commercial Aviation: From Green Hydrogen and CO2 from Direct Air Capture – Volumes, Cost, Area Demand and Renewable Energy Competition in the United States and Europe from 2030 to 2050 | German Energy Agency
[14] EASA supporting scale up of sustainable aviation fuels through EU Clearing House | EASA
[15] Sustainable Transport Investment Plan In "A new plan for Europe's sustainable prosperity and competitiveness" | European Parliament

fuels for heavy emitting transport sectors like aviation through the allocation of EU Emissions Trading System (ETS) fuels eligible for allowances and ReFuelEU.

While ReFuelEU is helping to create a strong demand signal for these alternative fuels, none of the 41 large-scale e-fuel projects under development in Europe — which would have the capacity to produce nearly three million tonnes of fuel — have reached final investment decision (FID)[16].

The Commission's Director for Aviation, Filip Cornelis, has stated that the STIP will "propose a framework of ideas and measures to stimulate e-SAF production by de-risking investments and facilitating offtakes in the longer term" and that their "focus is to have the right financing mechanisms in the EU, support the banking sector to go into this domain and transform today's first-mover disadvantage into a first-mover advantage."[17]

The STIP offers an opportunity to unlock the full potential of e-fuels by addressing this market failure and providing revenue certainty. The STIP is due to be launched in the third quarter of 2025 and expected to include a set of proposed activities and measures for mobilising both private and public investment, with the aim of mitigating risks for private investment into e-fuel plants and the €1–2 billion investment per plant typically required[18].

EU Taxonomy

The EU Taxonomy Regulation[19] provides a classification system for sustainable activities designed to direct investments to those which are most needed for the net-zero transition. There are several activities in the EU Taxonomy that are relevant to aviation such as aircraft manufacturing and leasing (zero emission aircraft and fleet renewal), passenger and freight air transport and the manufacture of feedstocks for fuels such as hydrogen (including e-fuels), biogas and biofuels, and renewable energy[20]. These activities must do no significant harm to objectives including climate change mitigation and adaptation, water resources, circular economy, pollution prevention and biodiversity, while complying with minimum social safeguards.

Under current EU Taxonomy rules, planes are afforded a "green" label as long as they produce lower CO_2 emissions than limits set by the International Civil Aviation Organization (ICAO), a classification justified on the basis that no commercial zero-emission aircraft exist yet[21]. This move has drawn legal challenges from NGOs which claim the rulebook enables greenwashing, in

[16] Spotlight on e-SAF | Transport & Environment
[17] ReFuelEU SAF mandate is here to stay, pledges Commission's aviation chief | GreenAir News
[18] Unlocking e-SAF's potential for the EU competitiveness and energy independence | Transport & Environment
[19] Regulation (EU) 2020/852 of the European Parliament and the Council on sustainable investment | EUR-Lex
[20] Aviation and Green Taxonomy | ICAO
[21] EU Taxonomy Regulation and aviation: A transition to sustainability | Norton Rose Fulbright

that high amounts of pollution would be permitted under the bar set by ICAO[22]. It also stipulates that, from 2030, passenger and freight flights must run on a 15 per cent SAF blend, a proportion which will rise by two per cent annually thereafter[23]. Aircraft produced for private or commercial business are excluded from the regulation.

EU Emissions Trading Scheme

The EU Emissions Trading Scheme (EU ETS) is a "cap and trade" system designed to bring down the emissions associated with certain economic activities over time by issuing decreasing numbers of tradeable emission allowances to polluters in specific sectors. Aviation has been covered by the ETS since 2012; the number of free allowances for aircraft operators was reduced by 25 per cent in 2024, and will be further reduced by 50 per cent in 2025, to be completely eliminated in 2026[24]. That means that by 2026, aircraft operators must pay for their own emissions, incentivising them to pursue activities that reduce their emissions, such as using SAF.

In a bid to accelerate SAF usage and mitigate the cost of removing free allowances, a dedicated SAF allowance mechanism has been established, allocating 20 million allowances for Fuels Eligible for ETS (FEETS) — with an estimated value of €1.6 billion[25] — until 2030 for aircraft operators, based on the amount of SAF they use[26]. This means that airlines and other purchasers of SAF will be able to reclaim the price premium between conventional jet fuel and SAF based on its environmental integrity, with the separate prices for each fuel category. The Commission published prices for the ETS support in relation to the price differences from fossil fuels in 2024 in spring[27] and will adopt a Decision indicating the allocation of allowances per commercial airline that applied for this support mechanism later this year. These prices equated to:

- Conventional Aviation Fuel: €734 per tonne (approximately $763.8/tonne)
- Sustainable Aviation Fuel: €2,085 per tonne (approximately $2,169/tonne)
- Synthetic Aviation Fuel (e-fuel): €7,695 per tonne (approximately $8,007/tonne

The EU ETS operates separately from the Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA)[28], a global market-based measure established by ICAO to address carbon emissions from international aviation. However, their coexistence presents challenges in applying climate policy, as the two systems overlap in scope for international flights within the European Economic Area (EEA). The EU ETS imposes a more ambitious climate protection target, with stricter rules and procedures and greater predictability regarding its future evolution, whereas CORSIA remains subject to the uncertainties of international

[22] EU hit with lawsuit over green labelling of aviation and shipping investments | Climate Home News
[23] Sustainable aviation fuels (SAF) in Europe | Deloitte
[24] Reducing emissions from aviation | European Commission
[25] Reducing emissions from aviation | European Commission
[26] Sustainable Aviation Fuels | EASA
[27] Publication of fuel price calculation details to implement the EU ETS support system and accelerate the use of eligible aviation fuels
[28] Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA) | ICAO

agreements. In 2026, the Commission will assess whether CORSIA is effectively meeting the goals of the Paris Agreement and could potentially propose extending the scope of the ETS to include more international flights if CORSIA is deemed insufficient.

Net-Zero Industry Act

In early 2024, the EU deemed SAF a strategic technology and acknowledged that it "needs to ensure that the regulatory environment and support framework for producers of sustainable aviation and maritime alternative fuels technologies enables them to increase their production capacities"[29]. This is alongside other strategic net-zero solutions such as hydrogen and battery technologies, renewables like solar photovoltaics and wind turbines, and heat pumps, the manufacture of which now has a target of meeting "at least 40 per cent of the EU's annual deployment needs by 2030"[30].

One thing the EU's Net-Zero Industry Act (NZIA) does is facilitate this production through expedited permitting and administrative support amongst other measures that aim to break down barriers to scaling SAF along the fuel value chain[31]. Four new pieces of secondary legislation and a communication were published by the Commission in May 2025 relevant to manufacturing, renewable energy auctions, net-zero technology criteria and EU supply, with "specific guidance on certain selection criteria such as those centered around 'first-of-a-kind'"[32].

Clean Industrial Deal

On 26 February 2025, the Commission launched its Clean Industrial Deal (CID), outlining proposed measures to decarbonise energy-intensive industries while seeking to assure their competitiveness. The CID was expected to include a proposal to enshrine the EU's emissions-reduction goal for 2040, but this was delayed at the last minute. As such, the proposed initiatives within the CID do not signify a fundamental shift in the Commission's approach to the European Green Deal but rather a development to the existing framework, structured to address common issues currently faced by industry.

The "European competitiveness compass" launched 30 January outlined the Commission's intent behind the Clean Industrial Deal initiative, "aimed at securing the EU as an attractive location for manufacturing, including for energy intensive industries, and promoting clean tech and new circular business models, in order to meet its agreed decarbonisation objectives". Noting the stalling investment in green hydrogen and the risk to existing EU targets, the following measures were proposed:

[29] General approach to the NZIA | Council of the European Union
[30] Net-Zero Industry Act | European Commission
[31] SAF gets 'strategic' tag in EU's plan to cut carbon emissions | SAF Investor
[32] Net-Zero Industry Act to further accelerate decarbonisation technologies manufacturing in the EU | European Commission

- Low Carbon Hydrogen Delegated Act: The Commission has committed to publishing this delayed piece of legislation in early 2025, setting the EU's definition of low-carbon hydrogen.

- Hydrogen Mechanism under the European Hydrogen Bank: This measure will aim to connect hydrogen offtakers and suppliers to one another and facilitate demand aggregation. A third tender under the EU Hydrogen Bank was also announced, with a budget of €1 billion.

- Pilot programme for corporate Power Purchase Agreements (PPAs): Establishment of a European Investment Bank counter-guarantee pilot programme for corporate PPAs to help de-risk the purchase of long-term renewable electricity. This aims to help projects (including green hydrogen production) reach FID by de-risking offtakes of PPAs.

- Assessment of the RFNBO Delegated Act: To assess the effectiveness of the hydrogen framework, including identifying barriers to scaling renewable hydrogen.

- Industrial Decarbonisation Bank: To strengthen EU-level funding, the Commission proposes the development of an "Industrial Decarbonisation Bank", aiming to collate €100 billion through ETS revenues, the EU Innovation Fund and InvestEU. A pilot tender of €1 billion is scheduled to be launched in 2025.

- Reform of State Aid rules: This will include a dedicated framework to de-risk private investments in renewable energy, infrastructure and clean manufacturing through targeted and conditional state aid. This is expected to be published in the second quarter of 2025.

Funding

The EU has allocated significant, but currently insufficient funds to support the required scale-up of the SAF market. The investment need is in line with the scale of that of other sector transitions; SAF producers estimate they will need €72 billion over the period from 2011 to 2050[33], though on a just and equitable pathway it is essential that the industry itself pays towards this transition. EU funding mechanisms target activities across Technology Readiness Levels (TRLs), from the innovation stage through to demonstration. The table below provides a snapshot of funding available as of July 2025.

Table 1: EU funding mechanisms relevant to sustainable aviation fuel (for a mapping that includes national funding mechanisms, see our website)

[33] Ensuring a level playing field for sustainable air transport | EU monitor

Fund name	Organisation(s)	Description	Total fund
Clean Aviation Joint Undertaking	• European Commission • European aviation sector	A public-private partnership funding R&D across three themes driving the energy efficiency and the emissions reduction of future aircraft: hybrid electric regional aircraft, ultra-efficient short and short-medium range aircraft, and disruptive technologies to enable hydrogen-powered aircraft.	Budget of €4.1 billion divided into €1.7 billion in EU funding and no less than €2.4 billion in private funding
Alternative Fuels Infrastructure Facility (AFIF)	DG Move	To support alternative fuels infrastructure for road, maritime, inland waterway and air transport. In addition to the support to high power electricity recharging stations and hydrogen refuelling stations, the following new funding opportunities will be available: 1) Support to Megawatt recharging stations for Heavy Duty Vehicles, 2) Support to electricity and hydrogen supply at airports, 3) Support to electricity supply and ammonia and methanol bunkering facilities in ports.	€1 billion
EU Innovation Fund (EUIF)	• European Commission • European Climate, Infrastructure and Environment Executive Agency	Funding via EU ETS. Innovation Fund projects cover a wide range of innovative technologies in areas such as energy-intensive industries, with allocation assessed on the following criteria: effectiveness of GHG avoidance, degree of innovation, project maturity, replicability and cost efficiency.	€40 billion
Horizon Europe	European Commission	Horizon Europe is the EU's key funding programme for research and innovation. It tackles climate change and boosts the EU's competitiveness and growth. It provides support to researchers and innovators to drive systemic changes to ensure a green, healthy and resilient EU.	~€95.5 billion

Fuels Eligible for EU ETS (FEETS)	European Commission	From 2026, airlines and other SAF purchasers will be able to reclaim the price difference between fossil-based jet fuel and SAF used between 2024-2030.	~€1.6 billion
InvestEU	European Commission	The InvestEU Fund supports private and public investments in four policy areas which represent important priorities for the Union and bring high EU added value: sustainable infrastructure; research, innovation and digitisation; small and medium-sized businesses; and social investment and skills.	€26.2 billion

Possible EU interventions

There are still several policy areas and interventions that the EU may explore to address the growing inequity and climate impacts of the aviation sector:

- Updates to ReFuelEU: Under Article 15 of ReFuelEU, the Commission is legally obliged to assess possible additional measures to support the SAF market during its first review in 2027. This includes "setting up or recognising a system of tradability of SAF to enable fuel supply in the Union", suggesting that incorporating elements of a book and claim scheme "could enable aircraft operators or fuel suppliers, or both, to purchase SAF through contractual arrangements with aviation fuel suppliers and to claim the use of SAF at Union airports"[34]. A report was published in March 2025[35] calling for additional research on the political feasibility of various flexibility mechanisms.

- Further changes to the EU Emissions Trading Scheme (ETS):

    - Expansion: If the ETS were extended to all departing flights as of 2027 — rather than only flights within the EU/EEA and departing flights to Switzerland and the UK — the total revenue could reach €72 billion by 2030[36].

    - Non-CO_2 emissions: Monitoring rules are being put in place to "create a new system for airlines to monitor, report and verify non-CO_2 emissions and climate effects of aviation"[37]. Beyond conventional jet fuel, SAFs also produce non-CO_2

[34] ReFuelEU Aviation | European Parliament
[35] Assessment of the production and supply of SAF in Union airports and study on the feasibility of the creation of a system of tradability of SAF in the EU | European Commission
[36] The challenges of scaling up e-kerosene production in Europe | Transport & Environment
[37] European Green Deal: new rules agreed on applying the EU emissions trading system in the aviation sector | European Commission

emissions at varying levels and potential impacts[38], which are likely to impact purchase decisions.

- Taxation: Currently, the Energy Taxation Directive provides mandatory tax exemptions for certain energy products like maritime and aviation fuels[39]. There are proposals for a stronger price signal though revision of the Energy Taxation Directive providing a preferential treatment to SAF compared to fossil kerosene and to address the price delta between them. Discussions on the proposal are set to resume this year.

- Addressing feedstock barriers:

    - Renewable energy: Higher renewable electricity prices in the EU compared to places like the US means the average e-kerosene price is about 45 per cent more expensive than conventional jet fuel[40]. Policies such as REPowerEU aim to address this, but urgent action will be needed to reduce this cost gap, for the benefit of the SAF market and the EU's energy transition more broadly.

    - Green hydrogen: The EU Hydrogen Strategy[41], established in 2020, aims to promote the production and adoption of renewable hydrogen across key sectors. Binding targets for renewable hydrogen usage were introduced under the revised Renewable Energy Directive (RED)[42], requiring 42 per cent of the hydrogen used in industry from 2030 onward to come from renewable fuels of non-biological origin (RFNBOs). Additional policy support is required to rapidly scale the deployment of green hydrogen technologies and its role in the production of high-integrity SAF.

    - Carbon capture: Delegated Acts on RFNBOs set a cut-off date of 2036 for using fossil carbon and as such, open a policy opportunity for the EU to create meaningful incentives for more sustainable sources of carbon — such as from direct air capture (DAC) or other forms of carbon capture where it is preferable from a lifecycle sustainability perspective — for the production of high-integrity SAF[43].

- Carbon Border Adjustment Mechanism: The EU's taxation mechanism — which will apply a carbon tariff to imported goods to account for the carbon cost of producing them — is expected to undergo reform to simplify the current framework whilst expanding in scope when it enters into full force in 2026[44]. Whilst tariffs will apply to some synthetic fuel feedstocks (electricity, hydrogen), it is not expected to apply to SAF itself.

[38] Updated analysis of the non-CO2 effects of aviation | European Commission
[39] Revision of the Energy Taxation Directive: Fit for 55 package | Think Tank | Parlamento Europeo
[40] Current and future cost of e-kerosene in the United States and Europe | ICCT
[41] European Commission Communication (COM/2020/301) on a hydrogen Strategy for Europe | EUR-LEX
[42] Directive (EU) 2023/2413 of the European Parliament and Council regarding the promotion of energy from renewable sources | EUR-LEX
[43] The challenges of scaling up e-kerosene production in Europe | Transport & Environment
[44] Carbon Border Adjustment Mechanism - European Commission

The EU is putting the final building blocks in place for its policy framework to support the growth of the SAF market as part of a blossoming global industry. EU policy has set a trend in the SAF space, with the UK having delivered a similar mandate and several other countries, including China, India and Indonesia, considering similar policies. The US Inflation Reduction Act has also incentivised action on SAF, but through a tax-credit system as opposed to mandates. It is likely in the coming decade that many more countries will follow suit in order to achieve their own national net-zero targets and overall ICAO goals, seeing SAFs as a key step on the pathway to net-zero aviation.

Key recommendations

Though the EU has led the charge, there is still action needed:

1. The EU must continue to reinforce the long-term market predictability of the ReFuelEU framework, by recommitting to the e-fuel sub-target and clarifying that, within the ReFuelEU review in 2027, any proposal will focus on setting enabling conditions for e-fuel uptake.

2. Policymakers need to identify mechanisms to foster a dynamic and competitive alternative aviation fuel market by encouraging all market players, including incumbent fuel suppliers, to actively and fairly participate.

3. The EU ETS should be expanded to include international flights as CORSIA is currently not ambitious enough to see the sector meet its net-zero target.

4. The amount of ETS revenues the aviation sector is able to access (FEETS) should be capped and only the highest integrity be fuels able to receive funding, i.e. synthetic fuels made with green hydrogen, additional renewable energy and a sustainable source of CO_2 assessed on a project-by-project basis. HEFA fuels — alongside some other biofuels of weak environmental credibility — should not be eligible.

5. Within the Commission's "Sustainable Transport Investment Plan" due this year, e-fuels should be prioritised, and a dedicated market-intermediary, financed by recycled aviation ETS revenues, operating double-sided sided auctions to support e-fuel production and offtake could be established.

Activities from the public sector alone will not be enough to see this market take off, and we are working closely with the investor community to accelerate action. To find out more, visit our website or get in touch.