Final Report
February 2025

Mitigation for Fit-for-55 Legislation

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German Aviation Association / Bundesverband der Deutschen Luftverkehrswirtschaft (BDL) (supported by the French Aviation Association / Fédération Nationale de l’Aviation et de ses Métiers (FNAM))
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Mitigation for Fit-for-55 Legislation

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Glossary

Term	Meaning
AtJ	Alcohol-to-Jet, a type of bioSAF production pathway
bioSAF	SAF derived from biomass, such as used cooking oil, waste or forestry residues
CBAM	Carbon Border Adjustment Mechanism
SRC	SAF Rebalancing Charge – concept introduced in this report for a charge to level the playing field for airlines based in the EU vs elsewhere
eSAF	SAF derived from renewable energy sources (also known as 'renewable fuel of non-biological origin' or 'RFNBO') through the PtL process (see below)
ETS	The EU's Emissions Trading System. One carbon allowance under the ETS permits the emission of one tonne of CO2 equivalent.
FT	Fischer-Tropsch, a SAF production pathway which can be used on feedstock of biological origin, such as woodchip, hence a bioSAF production pathway
GCD	Great Circle Distance
HEFA	Hydro processed Esters and Fatty Acids, a type of bioSAF production pathway
MS	Member State (of the European Union)
OAG	Official Airline Guide – a global travel data provider
PtL	Power-to-Liquid, the eSAF production pathway
SAF	Sustainable Aviation Fuel

Executive Summary

Background

The ReFuelEU Aviation initiative was one of the measures developed as part of the European Green Deal, and specifically the “Fit for 55” package targeted at reducing the European Union's (EU) emissions by at least 55% by 2030 relative to 1990 levels.

The ReFuelEU Aviation legislation (Regulation (EU) 2023/2405) includes a requirement to uplift an increasing percentage of Sustainable Aviation Fuel (SAF) over time from Union airports (i.e. EU airports with over 800k annual passengers and not in the outermost regions). This can disadvantage EU airlines with respect to passengers on connecting itineraries to non-EU destinations due to the higher cost of SAF compared to conventional aviation fuel, because non-EU airlines may not need to uplift SAF when connecting passengers through their hubs outside the EU (whereas EU carriers must uplift SAF for the whole passenger journey).

The problems with encouraging uptake of sustainable fuels while avoiding competitive disadvantages being imposed on some transport operators have been widely recognised. Examples of schemes intended to manage similar concerns in other jurisdictions (and reviewed in this report) include:

- Singapore’s Sustainable Air Hub Blueprint; and
- the International Maritime Organization’s Green Balance Mechanism.

Study objectives

Steer was appointed by the German Aviation Association (Bundesverband der Deutschen Luftverkehrswirtschaft - BDL) (which was supported by the French Aviation Association (Fédération Nationale de l’Aviation et de ses Métiers – FNAM)) to explore options for the introduction of EU-level policies to mitigate the impact of the Fit for 55 / ReFuelEU Aviation SAF uplift requirements on competition between EU and non-EU airlines.

Solution options

Steer has identified two potential solutions to mitigate concerns about the competitive disadvantages for EU airlines arising the ReFuelEU Aviation legislation, namely:

- a “SAF Levy”; and
- a “SAF Rebalancing Charge”.

In addition, Steer reviewed the possibility of using ETS SAF allowances as a potential solution.

The **SAF Levy** would be a charge on all passengers departing EU airports, collected as a surcharge on passenger tickets, with funds used to subsidise the differential extra cost of SAF above conventional fuel on all flights departing EU airports. The charge would be based on the passenger’s full itinerary to his or her final destination, including those itineraries involving connections outside the EU.

The **SAF Rebalancing Charge** (SRC) would also be a charge collected as a surcharge on passenger tickets, but imposed only on passenger itineraries where a leg of the journey is not required to uplift SAF to the equivalent volumes as required under the ReFuelEU Aviation legislation (i.e. on flight sectors wholly outside the EU operated by non-EU airlines). The proceeds, much lower than those for the SAF Levy, would be used for general support for decarbonising EU aviation.

The approach underlying the collection and use of funds under both the “SAF Levy” and the “SAF Rebalancing Charge” scheme concepts are illustrated in Figure Exc.1 below, applied to a passenger itinerary between Madrid (MAD) and Hong Kong (HKG) in some future year, with the relevant SAF uplift mandate in place for that future year, as specified in the ReFuelEU Aviation legislation. In the illustration, the passenger could fly on an EU airline, connecting at Frankfurt (FRA), or alternatively, on a non-EU airline, connecting at Istanbul (IST).

It is assumed that, under the ReFuelEU Aviation legislation, both airlines would need to uplift the mandated percentage of SAF on the first flown sector (MAD-FRA for the EU airline, MAD-IST for the non-EU airline). However, on the second sector, while the EU airline, departing FRA, would need to uplift the mandated SAF amount to fly to HKG, the non-EU airline, departing IST and hence not subject to EU legislation, would not need to uplift SAF for the second sector (IST-HKG).

Figure Exc.1: Illustration of SAF Levy and SAF Rebalancing Charge scheme concepts

Impact on:	SAF Levy		SAF Rebalancing Charge (SRC)	
	EU airline	Non-EU airline	EU airline	Non-EU airline
Passenger	Passenger pays SAF Levy based on direct GCD routing between MAD and HKG: 10,524km (*or zonal equivalent – Zone 3*)		N/A	Passenger pays SRC based on GCD from IST-HKG only (8,019km)
Airline – revenue collection	Collects SAF Levy from passengers and remits to EU SAF Levy fund (used to support SAF subsidy, covering average cost differential between SAF and conventional aviation fuel)		N/A	Collects SRC from passengers and remits to EU or individual MS fund (used to support general aviation decarbonisation measures)
Airline – SAF cost support	Receives SAF subsidy for both legs of trip	Receives SAF subsidy for first leg of trip only	**No** SAF purchase support provided to airlines	

Source: Steer, gcmap.com

SAF Levy

The EU SAF Levy would have the following features:

- An EU body would be established to collect and dispense SAF Levy funds.
- Purchase of SAF would continue to be undertaken by individual airlines via commercial relationships with fuel suppliers.
- The EU body would provide a subsidy to cover the gap between the cost of SAF and conventional aviation fuel (separately for both eSAF and bioSAF). The level of subsidy would be based on forecast projections of the costs of SAF and conventional aviation fuel, with a reconciliation to the average actual costs of each feeding into next year's SAF subsidy. The level of subsidy would be based on average airline costs, not those of individual airlines, so the incentive for airlines to drive down SAF costs would remain.
- The SAF Levy would be raised as an additional charge on passenger air tickets, collected by airlines and remitted to the EU body. The structure of the levy would include variation by distance to the passenger's final destination (whether based on a zonal scheme or on the itinerary's great circle distance).
- In order to avoid step-changes in the levy resulting from the step-ups in the ReFuelEU Aviation legislation uplift requirements every five years, a smoothing mechanism would be instituted, with the levy rising gradually each year.
- A financing mechanism would be required to fund deficits or manage surpluses in individual years where SAF Levy funds collected do not match the amounts required to pay for the subsidies of SAF purchases.

The SAF Levy would be a significant development requiring primary EU legislation and the establishment of an EU body to manage the scheme.

SAF Rebalancing Charge

The SAF Rebalancing Charge (SRC) is an alternative mechanism to the SAF Levy. It would have the following features:

- The SRC would be charged to non-EU airlines which issued tickets for journeys from EU airports, where the passenger itinerary to his or her final destination involved sectors not requiring SAF uplift to the percentage level specified in the ReFuelEU Aviation legislation (i.e. journeys involving connections at the non-EU airline's hub outside the EU).
- As with the SAF Levy, the SRC would be a raised as an additional charge on passenger tickets, but to a much more limited extent.
- The SRC would be calculated based on the incremental cost per passenger km of the SAF that would have been uplifted on the sector departing the non-EU hub, if the ReFuelEU Aviation legislation uplift percentages had applied at that non-EU hub, compared to the SAF percentage actually uplifted. The SRC would not apply (or would be correspondingly reduced) if SAF was uplifted at the non-EU hub under local regulations. It would also not apply for relatively short flights (or any domestic flights) at the non-EU end of the journey.

- The SRC would therefore compensate for differential environmental costs between the EU and other jurisdictions, and is hence conceptually similar to the EU's Carbon Border Adjustment Mechanism (CBAM), but more appropriately tailored to the market dynamics of aviation.
- The proceeds from the SRC (significantly lower than those for the SAF Levy) would be used for general support for decarbonising EU aviation, as they would not be sufficient to support an EU-wide subsidy for SAF purchase.
- Hence, EU airlines would need to cover the full cost of SAF used from their own revenues, in contrast to the situation under the SAF Levy, where an EU body would subsidise the cost of SAF from the funds raised by the SAF Levy. However, in both cases, passengers would be the ultimate source of funds to cover the cost of SAF.

Use and limitations of ETS SAF allowances

In addition to the SAF Levy and SAF Rebalancing Charge, we reviewed as a possible third option the EU Emissions Trading System (ETS) SAF allowances to address the concerns over the competitive disadvantage to EU airlines resulting from the legislation.

Our analysis shows that the 20 million free SAF allowances which are being made available up to 2030 are insufficient to compensate airlines for the eligible additional cost of SAF on intra-EU flights (and are not available on extra-EU flights). Possible policy measures which could be considered to address the inadequacy of the free SAF allowances mechanism include:

- granting additional free allowances up to 2030, and/or extending the free allowances policy beyond 2030; and/or
- restricting the geographical scope of the ReFuelEU Aviation legislation to intra-EU flights only.

Granting additional free SAF allowances and/or extending their use beyond 2030 may be a feasible policy option to address the additional costs of SAF to airlines and the competitive distortion for EU airlines on itineraries to non-EU destinations.

However, we considered that restricting the geographical scope of the ReFuelEU legislation would be unlikely to be adopted as a policy option, because this would reduce the climate benefits of the Fit for 55 policies and would require changes in primary legislation, which may be difficult to enact. Therefore, we have not considered this option further.

1 Background

Problem overview

1.1 Under the ReFuelEU Aviation legislation,[1] beginning in 2025, flights departing from EU Member States are mandated to uplift a certain percentage of SAF. The initial mandate requires that in 2025, 2% of jet fuel on flights departing the EU is SAF, this rising in five-yearly increments reaching 70% by 2050, of which at least 35% must be eSAF (the remainder being bioSAF).

1.2 For flights within the EU, and for passenger journeys from the EU made on direct flights to their final destination, the impact of the ReFuelEU Aviation legislation is the same for all airlines, since the SAF uplift requirements apply to all flights departing from EU airports, regardless of airline or destination. However, for airlines offering connecting itineraries from the EU to non-EU destinations (i.e. passenger journeys requiring a connection at an intermediate airport), the ReFuelEU Aviation legislation is likely to disadvantage EU airlines compared with non-EU airlines. This is because SAF is significantly more expensive than conventional jet fuel, and the requirements to uplift SAF differ between EU and non-EU airlines for such itineraries.

1.3 Airlines which connect departing EU passengers over non-EU hubs[2] are not required to uplift SAF at their own hubs, and therefore only need to purchase SAF on the first leg of customers' journeys (i.e. from the EU to their hub). Conversely, EU airlines, which connect departing EU passengers over EU hubs,[3] are required to uplift SAF on both legs of customers' journeys, increasing their fuel costs relative to those airlines connecting departing EU passengers over non-EU hubs. Hence there is a competitive disadvantage for such connecting journeys for EU airlines.

[1] Regulation (EU) 2023/2405 on ensuring a level playing field for sustainable air transport (ReFuelEU Aviation), **https://eur-lex.europa.eu/eli/reg/2023/2405/oj**

[2] For example: Emirates in Dubai, Etihad Airways in Abu Dhabi, Qatar Airways in Doha, or Turkish Airlines in Istanbul.

[3] For example: Lufthansa in Frankfurt or Munich, Air France in Paris, or KLM in Amsterdam.

Objectives of the study

1.4 Steer was appointed by the German Aviation Association (Bundesverband der Deutschen Luftverkehrswirtschaft - BDL) (which was supported by the French Aviation Association (Fédération Nationale de l'Aviation et de ses Métiers – FNAM)) to explore options for the introduction of EU-level policies to mitigate the impact of the Fit for 55 / ReFuelEU Aviation SAF uplift requirements on competition between EU and non-EU airlines, in particular in relation to passenger itineraries involving passengers on connecting itineraries to non-EU destinations, where, as noted above, EU carriers may be at a competitive disadvantage relating to SAF uplift.

Mechanisms from other jurisdictions

1.5 The problems with encouraging uptake of sustainable fuels while avoiding competitive disadvantages being imposed on some transport operators have been widely recognised. Examples of schemes intended to manage similar concerns in other jurisdictions include:

- Singapore's Sustainable Air Hub Blueprint; and
- International Maritime Organization's Green Balance Mechanism.

1.6 These schemes are reviewed in the sections below. Both include features which can be considered relevant to any scheme focused on EU aviation decarbonisation, but also have some differences due to factors such as the geographical footprint and, in the case of the Green Balance Mechanism, the technical and regulatory differences between the aviation and maritime industries.

Singapore Sustainable Air Hub Blueprint

1.7 The Civil Aviation Authority of Singapore (CAAS) has proposed a set of measures to reduce aviation emissions (the 'Singapore Sustainable Air Hub Blueprint'). These include measures relating to SAF, as well as air traffic control and airport emissions. In relation to SAF, CAAS proposes:

- Mandatory targets for SAF uplift on flights departing from Singapore, starting at 1% in 2026 and rising to 3-5% by 2030.
- CAAS will enforce a SAF levy targeted at meeting the uplift percentage targets, based on SAF price projections.
- If realised SAF prices are different from assumptions, SAF volume targets will be adjusted (but levy rates will not change).
- SAF purchase will be centralised, and the procurement mechanism will be used for purchase of both mandatory SAF quotas and additional voluntary purchase of SAF by airlines.
- Singapore will encourage SAF production in Singapore and neighbouring countries.
- A feedstock neutral approach for SAF, so long as it meets CORSIA requirements.

1.8 The CAAS scheme overview includes indicative costs for economy passengers, based on a 1% SAF uplift requirement in 2026, for flights from Singapore (SIN) to Bangkok (BKK), Tokyo (TYO) and London (LON). These are shown in the table below. These charges can be compared with Steer's estimates for an EU SAF Levy in Figure 4.7.

Table 1.1: Example Singapore SAF Levy charges

Route	SIN-BKK	SIN-TYO	SIN-LON
Great Circle Distance (GCD) (km)	1,409	5,349	10,887
CAAS SAF levy (S$)	S$ 3.00	S$ 6.00	S$ 16.00
CAAS SAF levy (€)	€ 2.08	€ 4.17	€ 11.11

Source: CAAS

1.9 Some important features of this scheme are that the volume targets can vary, depending on the relative price of SAF and conventional fuel, a willingness to accept any SAF meeting CORSIA standards, and that the SAF purchase will be undertaken by the authority and not by the airlines.

1.10 We note that these features are unlikely to be fully compatible with any scheme within the EU because:

- The ReFuelEU Aviation legislation specifies fixed percentages of SAF to be uplifted, regardless of price;
- The EU only accepts certain types of bio-SAF and has a separate e-SAF mandate; and
- Unlike the CAAS, the EU is not an aviation-focused body and has no experience or expertise in the purchase or handling of aviation fuel.

International Maritime Organization - Green Balance Mechanism

1.11 The International Maritime Organisation (IMO) has proposed a 'Green Balance Mechanism' to incentivise the use of lower emission fuels. Key features include:

- A benchmark level of emissions intensity, the GHG-Fuel-Intensity (GFI) standard, defined in terms of gCO2e/MJ, which declines from a current level of 90 gCO2e/MJ to zero by 2050.
- Shipping companies with fuel emissions better than 65% below the GFI receive financial support ('Green Balance Allocation'); those with emissions worse than 65% below pay a fee ('Green Balance Fee').
- A 'Green Balance Fund' is to be established to handle associated payments – the fund is overseen by the IMO's Marine Environment Protection Committee.
- The legal basis for the mechanism is a proposed amendment to Annex VI of the International Convention for the Prevention of Pollution from Ships (short for "marine pollution", known as MARPOL 73/78) – Annex VI covers "Prevention of air pollution from ships". Most countries have ratified the treaty (but not yet the proposed amendment).
- Enforcement is by participating states, particularly the flag state of the ship.

1.12 While there are similarities between the decarbonisation objectives of the IMO with that of the aviation industry, the differences between the regulatory environments for aviation and maritime are significant, in addition to any technological differences. It is notable that the IMO scheme is global and, while there is a legal basis for the establishment of the Green Balance Fund, it is unclear how enforceable this is, particularly given the prevalence of "flags of convenience" for international shipping.

1.13 The Green Balance Mechanism depends on an emissions intensity metric, rather than specified uplift percentages of particular fuel types (as per the SAF mandates in ReFuelEU Aviation legislation). This is in principle a strong feature, but may lead to disputes about verification of performance.

2 Solution options

Options considered

2.1 Steer considered three options to resolve the competitive disadvantage problem arising from the application of the ReFuelEU Aviation legislation, in relation to connecting passenger itineraries, namely:

- a SAF Levy;
- a SAF Rebalancing Charge (SRC); and
- the use of EU Emissions Trading System (ETS) free SAF allowances combined with a reduction in the geographic scope of the ReFuelEU Aviation legislation.

2.2 These are discussed in further detail in the remainder of this report.

2.3 The approach underlying the collection and use of funds under both the “SAF Levy” and the “SAF Rebalancing Charge” scheme concepts are illustrated in Figure 2.1 below, applied to a passenger itinerary between Madrid (MAD) and Hong Kong (HKG) in some future year, with the relevant SAF uplift mandate in place for that future year, as specified in the ReFuelEU Aviation legislation. In the illustration, the passenger could fly on an EU airline, connecting at Frankfurt (FRA), or alternatively, on a non-EU airline, connecting at Istanbul (IST).

2.4 It is assumed that, under the ReFuelEU Aviation legislation, both airlines would need to uplift the mandated percentage of SAF on the first flown sector (MAD-FRA for the EU airline, MAD-IST for the non-EU airline). However, on the second sector, while the EU airline, departing FRA, would need to uplift the mandated SAF amount to fly to HKG, the non-EU airline, departing IST and hence not subject to EU legislation, would not need to uplift SAF for the second sector (IST-HKG).

2.5 Under the SAF Levy scheme concept, the passenger pays the levy based on the origin and destination (MAD to HKG), regardless of the airline or routing used. The levy fund supports payment of a subsidy for the additional cost of SAF over conventional aviation fuel on flights departing EU airports.

2.6 Under the SAF Rebalancing Charge scheme concept, the passenger pays the charge only on flights not uplifting the volume of SAF which would have been mandated by the ReFuelEU Aviation legislation if it had applied in the jurisdiction of the relevant departing airport, and only for the flown sector wholly outside the EU (which therefore only applies to the non-EU airline). There is no subsidy for SAF purchase, but the charges collected are used for general support of airline decarbonisation in the EU.

Figure 2.1: Illustration of SAF Levy and SAF Rebalancing Charge scheme concepts

Impact on:	SAF Levy		SAF Rebalancing Charge (SRC)	
	EU airline	Non-EU airline	EU airline	Non-EU airline
Passenger	Passenger pays SAF Levy based on direct GCD routing between MAD and HKG: 10,524km (*or zonal equivalent – Zone 3*)		N/A	Passenger pays SRC based on GCD from IST-HKG only (8,019km)
Airline – revenue collection	Collects SAF Levy from passengers and remits to EU SAF Levy fund (used to support SAF subsidy, covering average cost differential between SAF and conventional aviation fuel)		N/A	Collects SRC from passengers and remits to EU or individual MS fund (used to support general aviation decarbonisation measures)
Airline – SAF cost support	Receives SAF subsidy for both legs of trip	Receives SAF subsidy for first leg of trip only	**No** SAF purchase support provided to airlines	

Source: Steer, gcmap.com

SAF Levy

2.7 Under this option, SAF levies would be imposed on passengers at an EU-level covering departing passengers' full itineraries from EU airports. The SAF Levy would have the following features:

- An EU body would be established to collect and dispense SAF Levy funds.
- Purchase of SAF would continue to be undertaken by individual airlines via commercial relationships with fuel suppliers.
- The EU body would provide a subsidy to cover the gap between the cost of SAF and conventional aviation fuel (separately for both eSAF and bioSAF).
- The SAF Levy would be raised as an additional charge on passenger air tickets, collected by airlines and remitted to the EU body.

2.8 This approach requires a mechanism for purchasing SAF in increasing quantities over time as the mandated SAF uplift percentage increases, funded by the SAF Levy. The levy would be a fee added to passengers' air fares (shown separately from the base fare), collected by airlines and remitted to an EU body. The proposed mechanism for purchasing SAF is discussed in Chapter 3 below.

2.9 The SAF Levy system could be structured in numerous ways – e.g. by setting the SAF Levy based on each passenger's final destination based on either a 'zonal' system or on passenger distance flown (based on the GCD to the final destination). The SAF Levy revenues would be used to fund the increasing differential cost of SAF over conventional aviation fuel over time, as the mandated SAF uplift percentage increases through time. The proposed SAF Levy structure is discussed in Chapter 4.

2.10 A consequence of the mandated SAF uplift percentage increasing stepwise every five years is that the required SAF Levy would also jump every five years. We discuss how the SAF Levy could be smoothed in Chapter 5.

2.11 Under a system of smoothed SAF levies, financial mechanisms may be required to borrow and save funds over time. Options for establishing such a mechanism are discussed in Chapter 6.

2.12 Note that, while in principle a SAF Levy could be introduced at a Member State level, we did not focus on this as an option as it was considered that there was a risk of imbalances in the levies required between Member States, which would preferably be avoided.

SAF Rebalancing Charge

2.13 Under this option, a "SAF Rebalancing Charge" (SRC) would be introduced. This would be charged only to airlines with non-EU hubs which do not uplift at least the same amount of SAF at these hubs as would be required under the ReFuelEU Aviation legislation.

2.14 The SAF Rebalancing Charge (SRC) is an alternative mechanism to the SAF Levy. It would have the following features:

- The SRC would be charged to non-EU airlines which issued tickets for journeys from EU airports, where the passenger itinerary to his or her final destination involved sectors not requiring SAF uplift to the percentage level specified in the ReFuelEU Aviation legislation (i.e. journeys involving connections at the non-EU airline's hub outside the EU).

- As with the SAF Levy, the SRC would be a raised as an additional charge on passenger tickets, but to a much more limited extent.
- The SRC would be calculated based on the incremental cost per passenger km of the SAF that would have been uplifted on the sector departing the non-EU hub, if the ReFuelEU Aviation legislation uplift percentages had applied at that non-EU hub, compared to the SAF percentage actually uplifted. The SRC would not apply (or would be correspondingly reduced) if SAF was uplifted at the non-EU hub under local regulations. It would also not apply for relatively short flights (or any domestic flights) at the non-EU end of the journey.
- The proceeds from the SRC (significantly lower than those for the SAF Levy) would be used for general support for decarbonising EU aviation, as they would not be sufficient to support an EU-wide subsidy for SAF purchase.
- Hence, EU airlines would need to cover the full cost of SAF used from their own revenues, in contrast to the situation under the SAF Levy, where an EU body would subsidise the cost of SAF from the funds raised by the SAF Levy. However, in both cases, passengers would be the ultimate source of funds to cover the cost of SAF.

2.15 Such a system would be conceptually similar to the EU's Carbon Border Adjustment Mechanism (CBAM), but more appropriately tailored to the market dynamics of aviation, in that it compensates EU producers (airlines) vs producers (airlines) from outside the EU who are not subject to the same level of carbon costs under their own jurisdictions' legislation.

2.16 While a simpler scheme than the SAF Levy, there is a risk that non-EU airlines could consider this approach discriminatory and hence it might trigger retaliatory measures from other jurisdictions.

2.17 A mechanism to establish the SRC and the financial sums involved are discussed in Chapter 7.

Use of ETS SAF allowances combined with reduced geographic scope for ReFuelEU Aviation

2.18 A further option considered was to reduce the scope of the ReFuelEU Aviation legislation to apply only to intra-EU flights, rather than, as currently, covering all flights departing EU airlines regardless of destination. This change would automatically remove the competitive advantage enjoyed by those airlines which connect departing EU passengers over non-EU hubs, since only intra-EU flights would be required to uplift SAF. However, it would reduce the climate benefits of the legislation and would require a change to primary legislation.

2.19 The EU's Emissions Trading System has been adapted to offer 20 million free carbon allowances for the use of SAF up to 2030, applicable only to intra-EU flights. These free allowances (and the exemption for SAF usage from the ETS) can contribute to funding the additional costs of SAF compared with conventional fuel, within the relevant scope (i.e. on intra-EU flights). We discuss the use and limitations of these free ETS SAF allowances in Chapter 8.

3 SAF Levy – fuel purchasing mechanism

Options for SAF purchase

3.1 We have considered how to ensure effective purchasing of SAF across the EU, in a market where the future price cannot be accurately known and is liable to fluctuate. As the SAF Levy goes towards funding the differential cost of SAF over kerosene, the fluctuating price of kerosene must also be considered. There are at least two potential approaches for purchasing the mandated amounts of SAF (other approaches are likely to be variations on these themes):

- SAF could be purchased directly by an EU body and sold on to individual airlines, potentially at the price of conventional (fossil) aviation fuel, with a subsidy to cover the price differential with SAF; or
- SAF could be purchased by airlines directly from suppliers, with the SAF Levy helping to subsidise the differential cost over conventional aviation fuel.

3.2 We consider that it is preferable for airlines to purchase the SAF directly from suppliers, because:

- Airlines already have experience in purchasing conventional jet fuel and have a strong incentive to minimise costs; and
- It avoids a major administrative and financial burden for the EU to be directly involved in fuel purchase.

3.3 We envisage that airlines would collect the SAF Levy directly from passengers (as a surcharge on ticket prices), passing on the revenues to a centralised EU fund which would pool these funds to be used to subsidise airlines' purchases of SAF.

3.4 We also considered a scenario in which the EU was the purchaser of SAF, distributing SAF to airlines in the required proportions each year. While there would be a benefit in the form of the EU being the monopoly purchaser of SAF, which could help to exert downwards pressure on SAF prices, we considered that it made more sense for airlines to purchase SAF directly from suppliers, as:

- having the EU purchasing SAF would be administratively burdensome; and
- with the EU as the monopoly purchaser of SAF, it would likely have to set up complex mechanisms for the purchasing and supply of SAF, acting as an intermediary between SAF suppliers and airlines, which could involve complex pricing mechanisms (such as blind auctions, contracts for differences, long-term SAF purchase agreements / short-term SAF selling agreements) to ensure both: (i) an adequate supply of SAF; and (ii) downwards pressure on SAF prices over time.

Proposed SAF purchase mechanism

3.5 We propose the following mechanism to compensate airlines for the differential cost of SAF over kerosene:

1. At the beginning of each year, the EU sets a fixed subsidy per tonne of SAF (separately for both eSAF and bioSAF). This fixed subsidy should be based on the EU's projections for both SAF and kerosene prices over the following year. For example, based on our current estimates, the EU would set a 2025 bioSAF subsidy of €2,015 per tonne, based on 2025 price predictions of: (i) €2,756 / tonne for bioSAF; and (ii) € 741 / tonne for kerosene;
2. At the end of the year, the EU assesses what the subsidy should actually have been, based on the realised prices of kerosene and SAF throughout the year, *averaged across all airlines*. The difference between the fixed subsidy set at the beginning of the year, and the value the subsidy should have been set at, is then recycled into the subsidy in the following year. For example:
    i. If the subsidy were set at €800 in year 1, but the average difference across the year in realised SAF and kerosene prices was €700, the subsidy has been overestimated in year 1, and hence the subsidy will decrease by €100 in year 2, as airlines were overcompensated in year 1 (with a further adjustment to account for volume differential between years).
    ii. Conversely, if the average difference across the year in realised SAF and kerosene prices was €1,000, the subsidy has been underestimated in year 1, and hence the subsidy will increase by €200 in year 2 to compensate for the fact that airlines were undercompensated in year 1 (with a further adjustment to account for volume differential between years).

3.6 The benefit of this system is that, by having a fixed subsidy per tonne of SAF, airlines are incentivised to negotiate the lowest possible price with SAF suppliers, to keep their fuel costs down. Any reduced cost achieved by an individual airline through negotiation with its suppliers (compared to the fixed level of subsidy per tonne) is retained by the airline as a cost saving. This should help to place downwards pressure on SAF prices over time. This system is also easy to administer.

3.7 Although we consider that this scheme would be workable, we have identified two potential issues with this system which would need to be managed:

- By setting the price at the end of the year based on the average realised prices of kerosene and SAF throughout the year across all airlines, individual airlines may not be incentivised to keep SAF prices down, as a larger gap between realised SAF and kerosene prices (than predicted by the EU at the beginning of the year) in any given year will mean that the subsidy increases in the following year, through the subsidy recycling mechanism. However, this could be mitigated through a mechanism in which unreasonable levels of the cost differential between SAF and kerosene are not supported by the subsidy (e.g. if there was evidence of collusion by airlines).
- It could lead to working capital issues for airlines if there were large spikes in SAF prices during a year compared to what the EU had predicted at the beginning of the year. The impact of this could be mitigated if the fixed EU subsidy levels were set more frequently – e.g. quarterly.

4 SAF Levy – passenger charge structure

Introduction

4.1 This chapter sets out the structure (or structure options) we have identified for the structure of the SAF Levy. It covers the following aspects:

- Overview of the SAF Levy model;
- Zonal-based SAF levies;
- Great Circle Distance (GCD)-based SAF levies;
- The SAF mandates;
- SAF price assumptions;
- Passenger forecasts; and
- Our SAF Levy model results.

Overview of the SAF Levy model

4.2 In order to advise on the appropriate structure of the SAF Levy, Steer developed a spreadsheet model to analyse the impacts of different assumptions and to review financial and other implications.

4.3 Under our proposed SAF purchasing mechanism (as discussed in Chapter 3), the SAF Levy imposed on passengers is used to fund the SAF subsidy to airlines, which covers the differential cost of SAF over kerosene faced by airlines under the ReFuelEU Aviation Legislation.

4.4 Conceptually, the SAF Levy must therefore be set in each year such that it balances estimates of money in and money out of the scheme (though we relax this constraint in Chapter 5 where we propose that the SAF Levy imposed on passenger tickets is smoothed over time). The table below shows the key drivers of money in and money out of the scheme.

Table 4.1: Key drivers of money in and money out of the EU SAF Levy scheme

	Money in	Money out
Description	The revenues collected in from the **SAF Levy** imposed on passenger air fares	The money spent on the **SAF subsidy** to airlines, used to cover the differential cost of SAF over kerosene
Key drivers	• The **level of the levy charged to each passenger**, which could vary depending on the design of the levy, either zonal-based or GCD-based. • The **number of passengers paying the levy** (based on passenger forecasts)	• **Prices** of SAF and kerosene: – Kerosene price projections – SAF price projections, for both bioSAF and eSAF • **Volumes** of SAF and kerosene: – Kerosene volume projections (based on passenger forecasts and aircraft fuel efficiency assumptions) – SAF volume projections (based on the percentages mandated in the ReFuelEU Aviation legislation)

Source: Steer

4.5 The level of the levy paid by each passenger is the controllable factor in the table above, being set in each year to balance estimates of money in and money out. The other factors are based on various assumptions we have adopted, which are set out in the remainder of this chapter.

Zonal-based SAF levies

4.6 We have modelled our zonal-based system on a geographical worldwide three-zone system. Passenger data has been retrieved from the OAG database, to which Steer maintains a subscription. This database contains information on 220 countries, which have been split into the three zones as indicated in the table and map shown below.

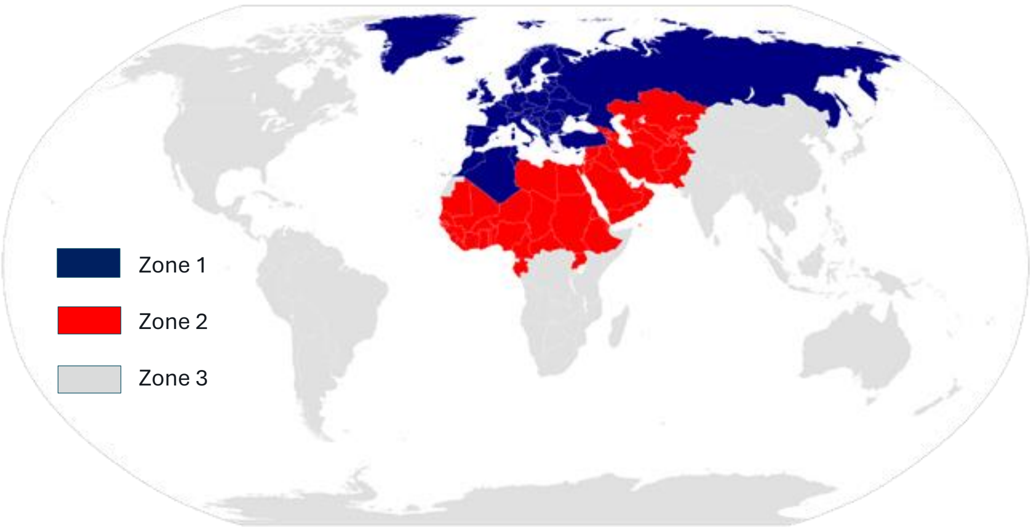
4.7 As shown in the 'levy multiplier' column in the table below, we have modelled the zonal-based SAF levies such that a Zone 2 levy is twice the value of a Zone 1 levy, and a Zone 3 levy is four times the value of a Zone 1 levy. Such a system penalises long-haul flights disproportionately more than short-haul flights. These assumptions can easily be modified for modelling purposes.

Table 4.2: Zones and multipliers used in assessing zonal-based SAF levies

Zone	Description	# of countries / territories	Levy multiplier
1	Europe + surrounding countries	49	**1**
2	North and West Africa, the Middle East, and Central Asia	50	**2**
3	All other countries	121	**4**

Source: BDL assumptions, Steer analysis

Figure 4.1: Map of zones used in assessing zonal-based SAF levies



Source: BDL

4.8 The advantage of the zonal system is simplicity and ease of understanding by the public. The disadvantage is that it less accurately reflects environmental costs (for example, Zone 3 contains a very wide range of distances flown, depending on the selection of airports within the zone).

GCD-based SAF levies

4.9 As an alternative to zonal-based SAF levies, we have also performed our analysis under the assumption of a Great Circle Distance (GCD) based levy. While in principle the GCD differs between every airport pair, for ease of calculation we have assumed that:

- for international flights, the levy calculated for each flight is directly proportional to the GCD between the capital city of the departing EU Member State and the capital city of the arriving country; while
- for domestic flights within EU Member States, where the method using capital cities does not work, we instead proxy the scale of distances for such flights on the square root of the area of the country concerned.

4.10 This calculation may in some cases lead to distortions – e.g., for passengers travelling from the EU to California, the levy is calculated as if the flight is only going as far as Washington DC, despite the GCD between California and Washington being c. 3,500km. In this case, the calculation understates the levy that should be imposed.

4.11 This calculation may also not reflect real world flight paths, which may deviate from the GCD routings for operational or other reasons. However, there is arguably a benefit in using a verifiable and objective measure such as GCD, rather than taking account of flight paths which can vary for a variety of reasons (including changes in the weather).

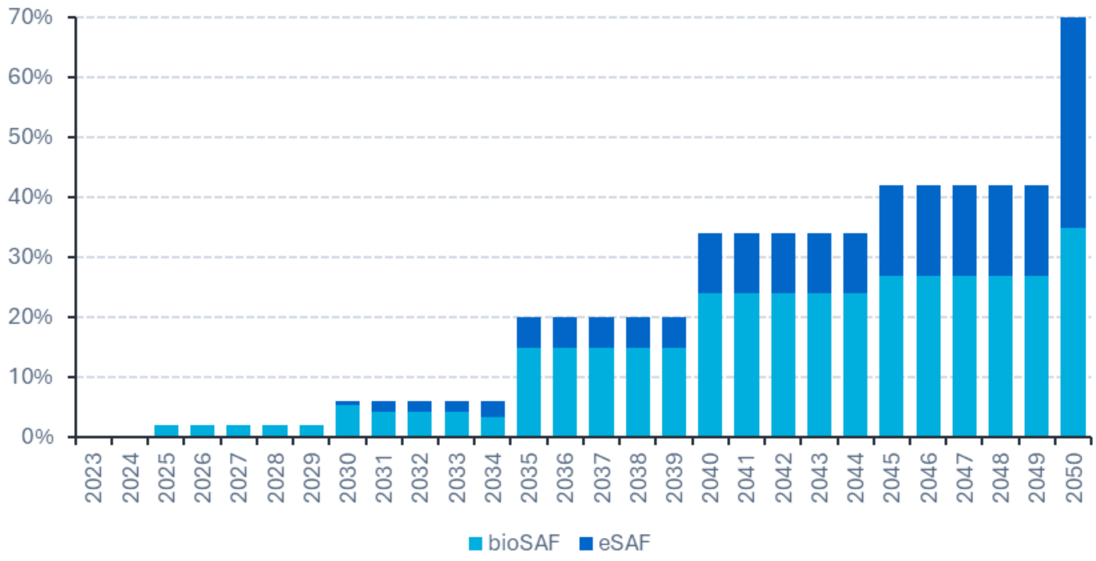
The SAF mandates

4.12 The SAF mandates established in the ReFuelEU Aviation legislation directly influence the amount of SAF that must be purchased by airlines in each year, and hence directly impact on the money sent out of the scheme in the form of the SAF subsidy.

4.13 The ReFuelEU Aviation legislation mandates that 2% of jet fuel is to be replaced by SAF in 2025, this rising to 70% by 2050. Under the legislation, the mandate increases every five years. Differentiated mandates for bioSAF and eSAF are introduced from 2030.[4]

4.14 The eSAF mandate starts at 0.7% in 2030, rising to 35% by 2050. The share of eSAF in the total SAF mandate increases from 11.7% in 2030 (0.7% out of a SAF total mandate of 6%) to 50% by 2050 (35% out of a SAF total mandate of 70%). The SAF mandates are illustrated in Figure 4.2 below.

Figure 4.2: SAF mandates under the ReFuelEU Aviation legislation



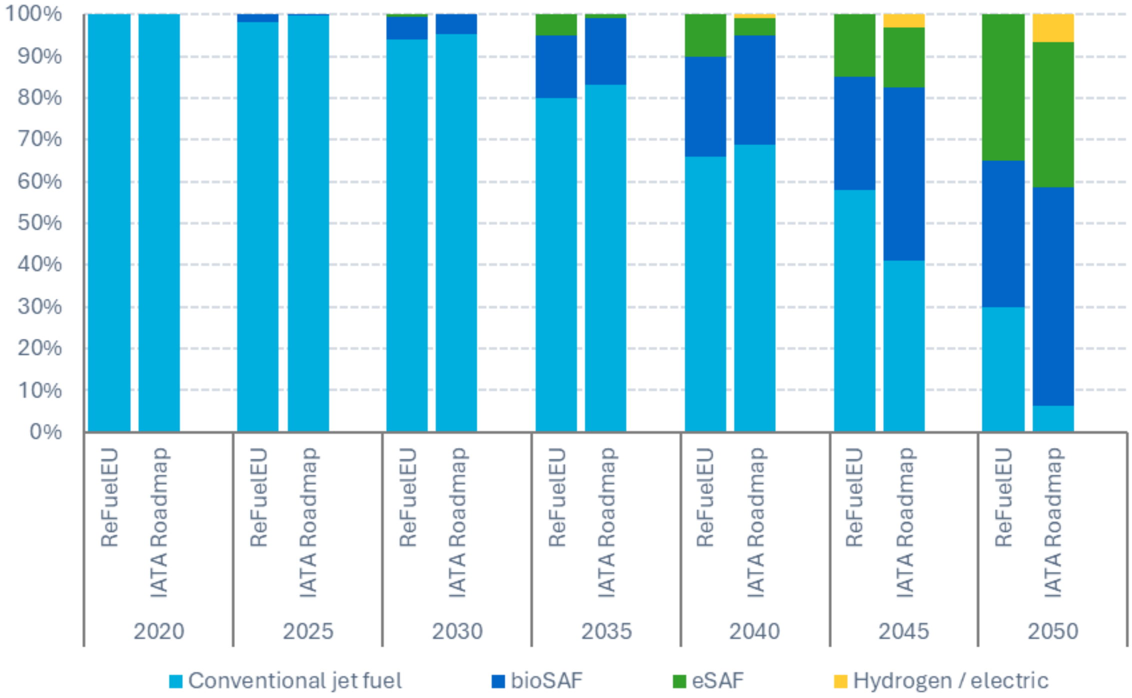
Source: ReFuelEU Aviation legislation, Steer analysis

4.15 Figure 4.3 below compares the SAF mandates under the ReFuelEU Aviation legislation with the projections in the IATA 'Net Zero CO_2 Emissions Roadmap',[5] which envisage a more aggressive uptake of SAF. However, the IATA Roadmap is a projection only, not a set of binding targets. Additionally, the ReFuelEU Aviation legislation does not consider hydrogen / electric, hence the EU SAF mandate figures may not be directly comparable with the IATA figures.

[4] The legislation is complex for the years 2030-2034. Under our reading of the legislation, we have modelled an eSAF mandate of 0.7% in 2030, 1.7% for 2031-2033, and 2.6% in 2034.

[5] IATA Sustainability and Economics – Finance: Net Zero CO_2 Emissions Roadmap – September 2024

Figure 4.3: Comparison of aviation fuel sources between ReFuelEU and the IATA Roadmap



Source: ReFuelEU Aviation legislation, IATA, Steer analysis

SAF price assumptions

4.16 The SAF price assumptions we use are a key input into our modelling, as the SAF Levy collected in from passengers is used to fund the price differential of bioSAF / eSAF over conventional jet fuel, through the SAF subsidy mechanism we have proposed in Chapter 3. We have used the following assumptions for SAF prices, based on a 2023 starting year and expressed in 2023 prices, which can be readily changed within our model:

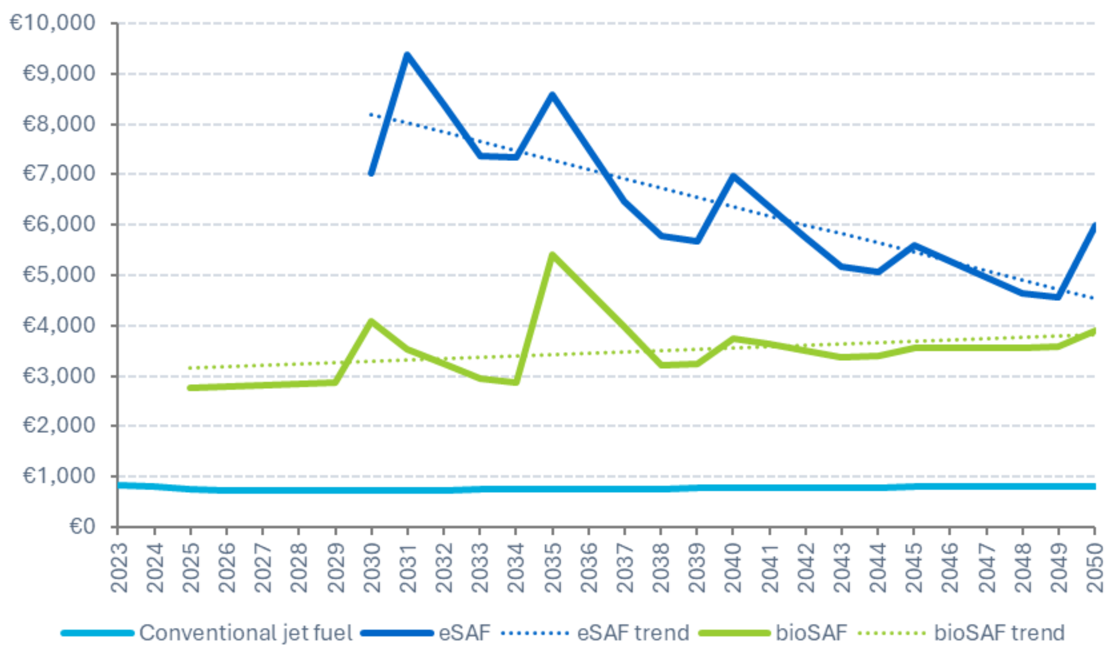
- An initial price for both types of SAF when the relevant mandates come into effect:
  - An initial price for bioSAF in 2023 of €2,675 / tonne, based on the average realised price in 2023 for "advanced aviation biofuels" in the 2024 EASA report.[6] We apply a 1% per year annual growth rate in this price (see below), giving a 2025 starting price for bioSAF in 2025 (when the bioSAF mandate commences) of €2,729 / tonne; and
  - An initial price for eSAF in 2023 of €8,250 / tonne, based on the average production cost estimate in 2023 for "synthetic aviation fuels" (in the same 2024 EASA report) of €7,500, with a 10% mark-up added to reflect a hypothetical realised market price. We apply a 2% per year annual reduction in this price (see below), giving a 2030 starting price for eSAF in 2030 (when the eSAF mandate commences) of €7,162 / tonne.
- Background annual changes in prices for both bioSAF and eSAF. We have assumed that prices for:

[6] EASA 2024 Report: State of the EU SAF market in 2023: Fuel reference prices, SAF capacity assessments, Table 2: 2023 market prices and production cost estimations for RFEUA aviation fuels

  - bioSAF will increase by 1% per year from 2023, as a limited supply of raw materials for bioSAF production pushes up prices; and
  - eSAF will decrease by 2% per year from 2023, as new technologies come online and economies of scale kick in, reducing production costs.
- Demand shocks at each 5-year interval when the EU SAF mandate increases, causing temporary increases in SAF prices. We assume that a 1% increase in the SAF mandate will lead to a 0.25% increase in SAF prices in the year the mandate increases, with this increase tailing off over three years as new supply comes online.
- Our estimates of forward jet fuel prices come from the US Energy Information Administration.

4.17 The figure below illustrates these assumptions.

Figure 4.4: EASA-based Steer projections for conventional jet fuel, eSAF and bioSAF (€ / tonne)



Source: EASA, US EIA, Steer analysis

4.18 To assess the reasonableness of our EASA-based SAF price projections, we have compared these with SAF price projections from the IATA Roadmap. The projections in the IATA roadmap are based on a 'Minimum Selling Price' (MSP) and *"Ultimately, airlines are most likely to pay a premium price for SAF on top of the MSPs, which is the product price of SAF."* [7] Hence, for consistency with our EASA-based SAF price projections, we have added a 10% mark-up to the IATA price projections to assess hypothetical realised market prices, as for the eSAF price projections in the EASA report.

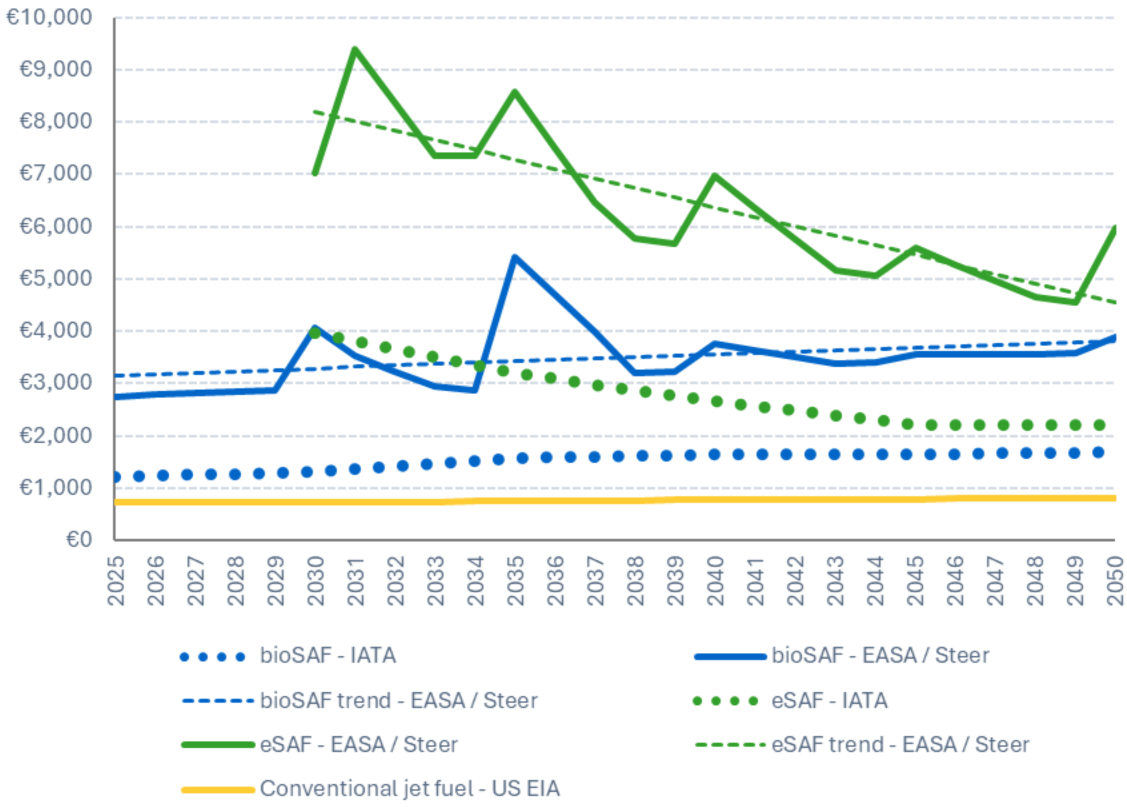
[7] IATA Sustainability and Economics – Finance: Net Zero CO_2 Emissions Roadmap – September 2024, pg. 8.

4.19 To ensure full comparability between the two sets of figures, we have also:

- taken a weighted average of the IATA price projections for the three main bio-SAF production pathways (HEFA, FT and AtJ),[8] to assess a single IATA price projection for bioSAF; and
- extended the IATA price projections forward from their end in 2045 to 2050, assuming prices remain constant during this period.

4.20 The figure below shows both Steer's and IATA's SAF price projections through to 2050.

Figure 4.5: IATA and EASA-based Steer SAF price projections (€ / tonne)



Source: IATA, EASA, US EIA, Steer analysis

4.21 While both the IATA and EASA-based Steer projections illustrate the same trends, with bioSAF prices rising over time and eSAF prices declining over time, the IATA projections for SAF prices (both for bioSAF and eSAF) are significantly lower than Steer's EASA-based projections. Additionally, the IATA projections do not show demand shock spikes every five years.

[8] HEFA: Hydro processed Esters and Fatty Acids, a type of bioSAF production pathway; FT: Fischer-Tropsch, a SAF production pathway which can be used on feedstock of biological origin, such as woodchip, hence a bioSAF production pathway; AtJ: Alcohol-to-Jet, a type of bioSAF production pathway.

Air passenger forecasts

4.22 Passenger forecasts are a key input to our model, as they impact both:

- The **money into** the scheme, as more passengers means that more passengers are paying the SAF Levy; and
- The **money paid out** of the scheme, as more passengers means more flights, increasing fuel demand, directly increasing demand for SAF, and hence also increasing the total level of SAF subsidy required to be paid to airlines.

4.23 As a starting point for our model, we have used the OAG Traffic Analyser database (which estimates passenger volumes based on airline bookings data) to assess the number of passengers departing from EU Member States to all countries worldwide in 2023. As these figures do not exactly align with Eurostat data, we have grossed up the OAG figures so that they match the Eurostat data. The OAG and Eurostat results are very close, requiring only a +0.65% adjustment to the OAG data to bring it in line with Eurostat.

4.24 We rely on the OAG data rather than the Eurostat data, as the OAG data provides us with the total number of passengers flying from each EU Member State to all countries worldwide, including information on those passengers travelling on connecting flights. As the SAF Levy to be paid is based on the passenger's final destination, this information is important, but it is not available from Eurostat.

4.25 For example, if a passenger were flying from Madrid to Auckland via Dubai, the OAG database would show this as a passenger travelling from Spain to New Zealand. The Eurostat data however would show this as a passenger travelling from Spain to the UAE. As the SAF Levy to be paid is based on the passenger's final destination (in this case New Zealand), we therefore rely on the OAG data, which we gross up to align with the Eurostat data at the total level.

4.26 We forecast air passenger flows in our model into the future using the EU's Reference Scenario 2020, specifically the "REG" scenario, which forecasts air traffic up to 2030.[9] After 2030, we rely on Airbus' 'Global Market Forecast' to project outbound European passenger flows up to 2043.[10] We also assume that the trend in Airbus' Global Market Forecast extends until 2050.

4.27 These forecasts are used to project passenger growth over time, directly influencing the money paid into the scheme. However, for our assumptions of fuel demand over time, which impact on the money paid out of the scheme, we also assume a 1% annual increase in aircraft fuel efficiency, to reflect technological improvements over time.

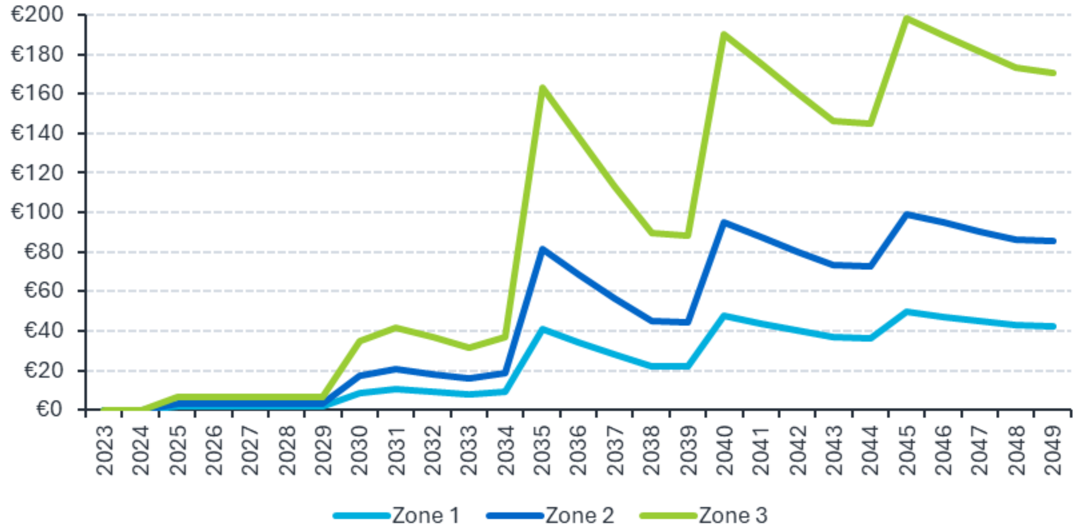
[9] https://energy.ec.europa.eu/data-and-analysis/energy-modelling/policy-scenarios-delivering-european-green-deal_en

[10] https://aircraft.airbus.com/en/global-services-forecast-gsf-2024-2043

SAF Levy model results

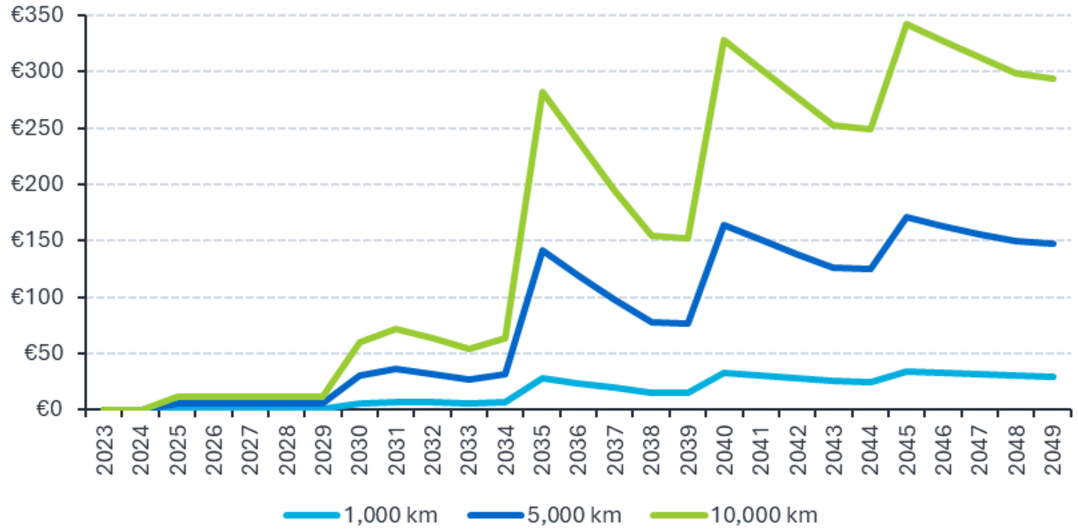
4.28 Taking into account the various assumptions outlined above, the two figures below – one for zonal-based levies and one for GCD-based levies – show the evolution over the period 2025 – 2050 of the SAF Levy required in each year in order to balance the money in and money out of the EU SAF Levy scheme.[11]

Figure 4.6: SAF levies (unsmoothed), € per departing flight (zonal-based levies)



Source: Steer analysis

Figure 4.7: SAF levies (unsmoothed), € per departing flight (GCD-based levies)



Source: Steer analysis

[11] 2050 is excluded from figures due to the very large jump in modelled SAF levies in this year, which distorts the trends in other years.

4.29 These figures illustrate a key issue with this analysis: calculated SAF levies (whether assessed under a GCD-based scheme or a zonal-based scheme) jump significantly every five years due to both: (i) the increase in the SAF mandates under the ReFuelEU Aviation legislation; and (ii) our assumption of SAF price demand shocks each time the SAF mandate increases. This is not an optimal outcome for consumers and hence we relax this assumption in the following chapter.

5 SAF Levy - smoothing mechanism

Introduction

5.1 We propose that the SAF Levy collected in from passengers will be used to subsidise airlines' SAF costs, as per the mechanism we have set out in Chapter 3. However, as demonstrated in Chapter 4, it is not optimal to set the SAF Levy in such a way that it balances the required SAF subsidy in each year, as the required level of the SAF subsidy will spike every five years, due to both:

- the increase in the EU SAF mandate percentage uplift every five years; and
- the increase in SAF prices that is expected to accompany the increase in the EU SAF mandate, due to the large increase in demand in a supply-constrained market.

5.2 We therefore propose that the SAF Levy is instead set in a smoother manner, increasing over time without spikes. This is the preferable policy choice for consumers. The result of this smoothing is that:

- in some years, the SAF Levy will not raise enough funds to cover the SAF subsidy – in which case funds will need to be borrowed to cover this shortfall; and
- in other years, the SAF Levy will collect in more than required to fund the SAF subsidy – in which case funds can be saved to cover future shortalls.

5.3 Mechanisms for this borrowing and saving are discussed in Chapter 6. The remainder of this chapter examines our proposed smoothing mechanism and the implications of this on the finances of the SAF Levy fund.

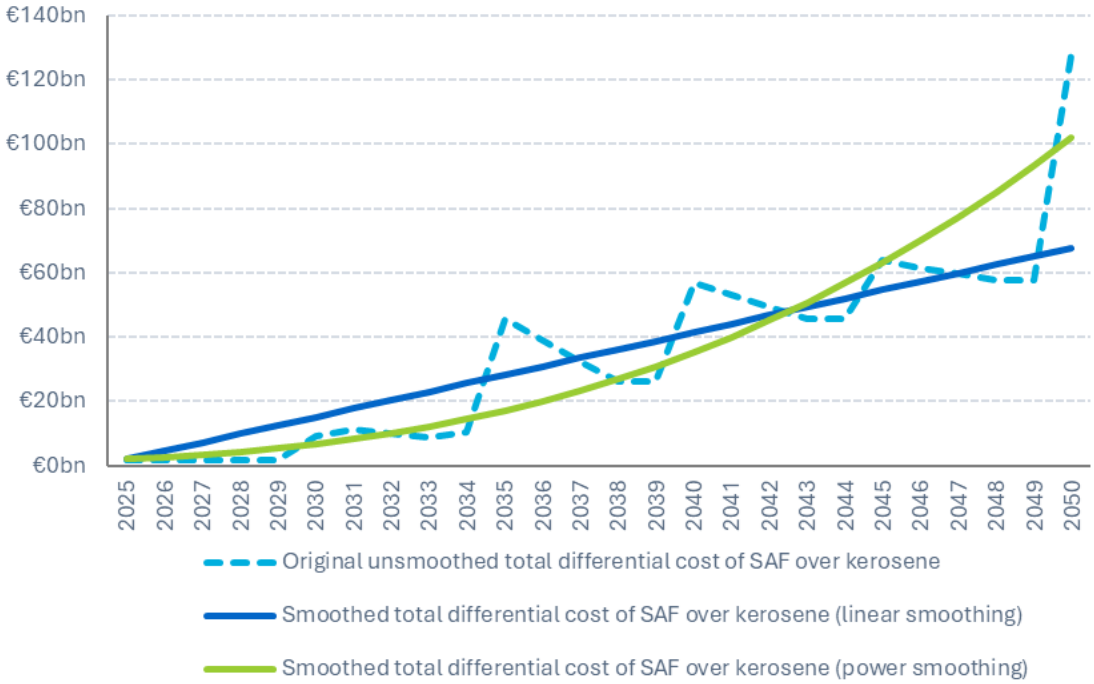
Proposed mechanisms

5.4 To avoid the SAF Levy having to spike every five years to fund the SAF subsidy, we suggest that the SAF Levy is based on smoothed projections for the differential cost of SAF over kerosene over time. This smoothing can either be:

- Linear, where the increase in the projected total differential cost of SAF over kerosene is the same in each year; or
- Power-based, where the increase in the projected total differential cost of SAF over kerosene increases in each year.

5.5 The figure below illustrates what this smoothing could look like, under both linear and power-smoothing.[12] In each case, the total sum from 2025 to 2050 of both the smoothed and unsmoothed total differential cost of SAF over kerosene is equal.

Figure 5.1: Smoothed and unsmoothed total differential cost of SAF over kerosene, €bn



Source: EASA SAF price base, EU Reference Scenario, Airbus Global Market Forecast, Steer analysis

5.6 This figure shows that:

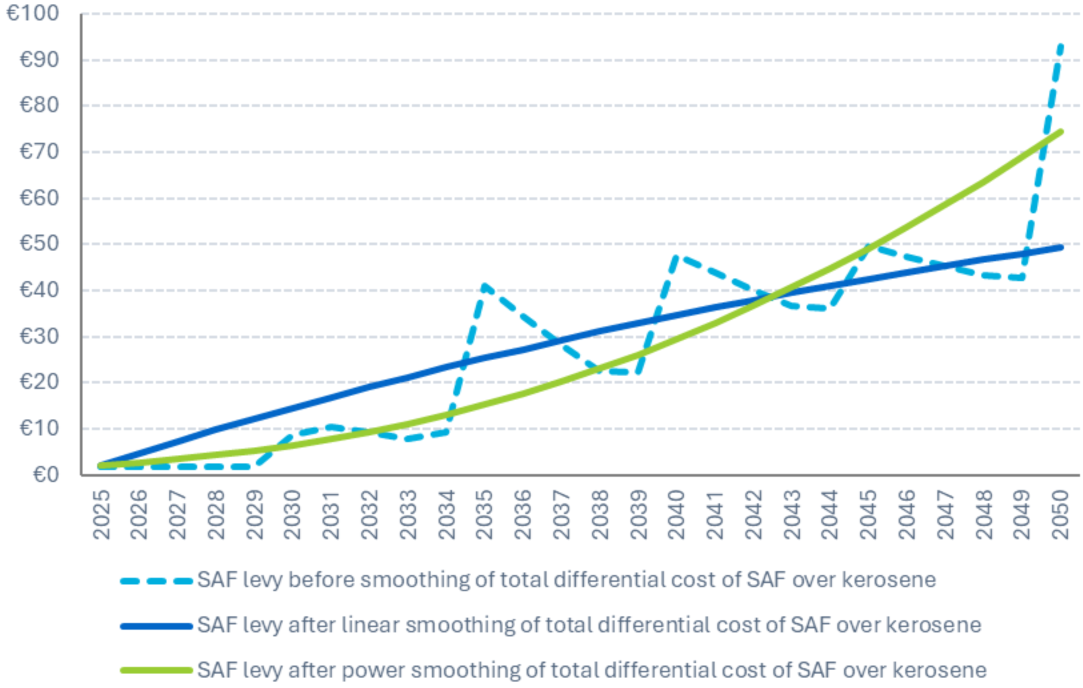
- Under linear smoothing, the smoothed differential cost of SAF over kerosene is greater than the unsmoothed differential cost of SAF over kerosene up to 2034; and
- Under power-based smoothing, the smoothed differential cost of SAF over kerosene is greater than the unsmoothed differential cost of SAF over kerosene up to only 2029.

5.7 Basing the SAF Levy on smoothed projections for the differential cost of SAF over kerosene over time means that the SAF Levy can follow a smoothed path over time, even as the total amount of SAF subsidy the EU pays airlines to cover the differential cost of SAF over kerosene jumps every five years. The impact of this on the path of the SAF levies over time is illustrated in the figure below, which shows the results for Zone 1 levies under a zonal-based SAF Levy scheme:[13]

[12] The power smoothing in this figure is based on a power smoothing parameter of 2.5. Larger smoothing parameters lead to steeper smoothed curves.

[13] The linear smoothing does not appear as a straight line on a per-passenger basis, due to increasing passenger volumes dividing the linearly-increasing gap in costs between SAF and conventional jet fuel.

Figure 5.2: Smoothed and unsmoothed Zone 1 SAF levies, € per departing flight



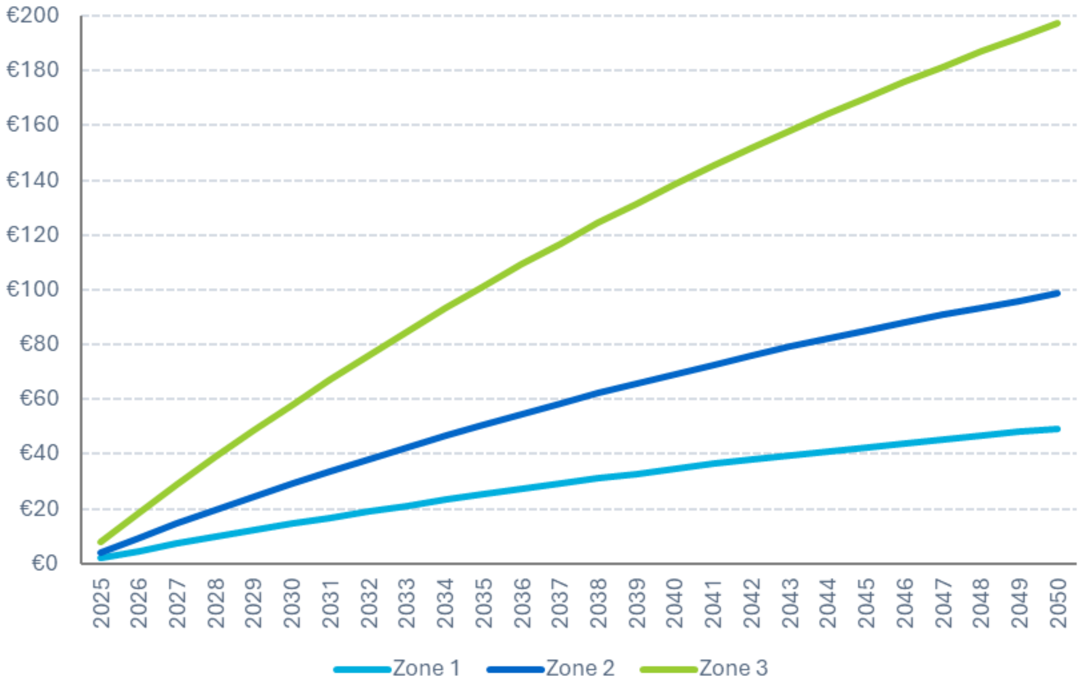
Source: Steer analysis

5.8 This figure shows that:

- Under linear smoothing of the differential cost of SAF over kerosene, the smoothed SAF Levy is greater than the unsmoothed SAF Levy up to 2034.
- Under power-based smoothing of the differential cost of SAF over kerosene, the smoothed SAF Levy is greater than the unsmoothed SAF Levy up to only 2029.

5.9 Figure 5.3 below shows the smoothed SAF levies over time for each zone, after the linear smoothing of the total differential cost of SAF over kerosene.

Figure 5.3: Smoothed zonal-based SAF levies, € per departing flight



Source: Steer analysis

Implications for the finances of the SAF Levy fund

5.10 Under our proposed design of the SAF Levy fund, in which the SAF Levy is used to fund the SAF subsidy, the smoothing of the SAF Levy may result in:

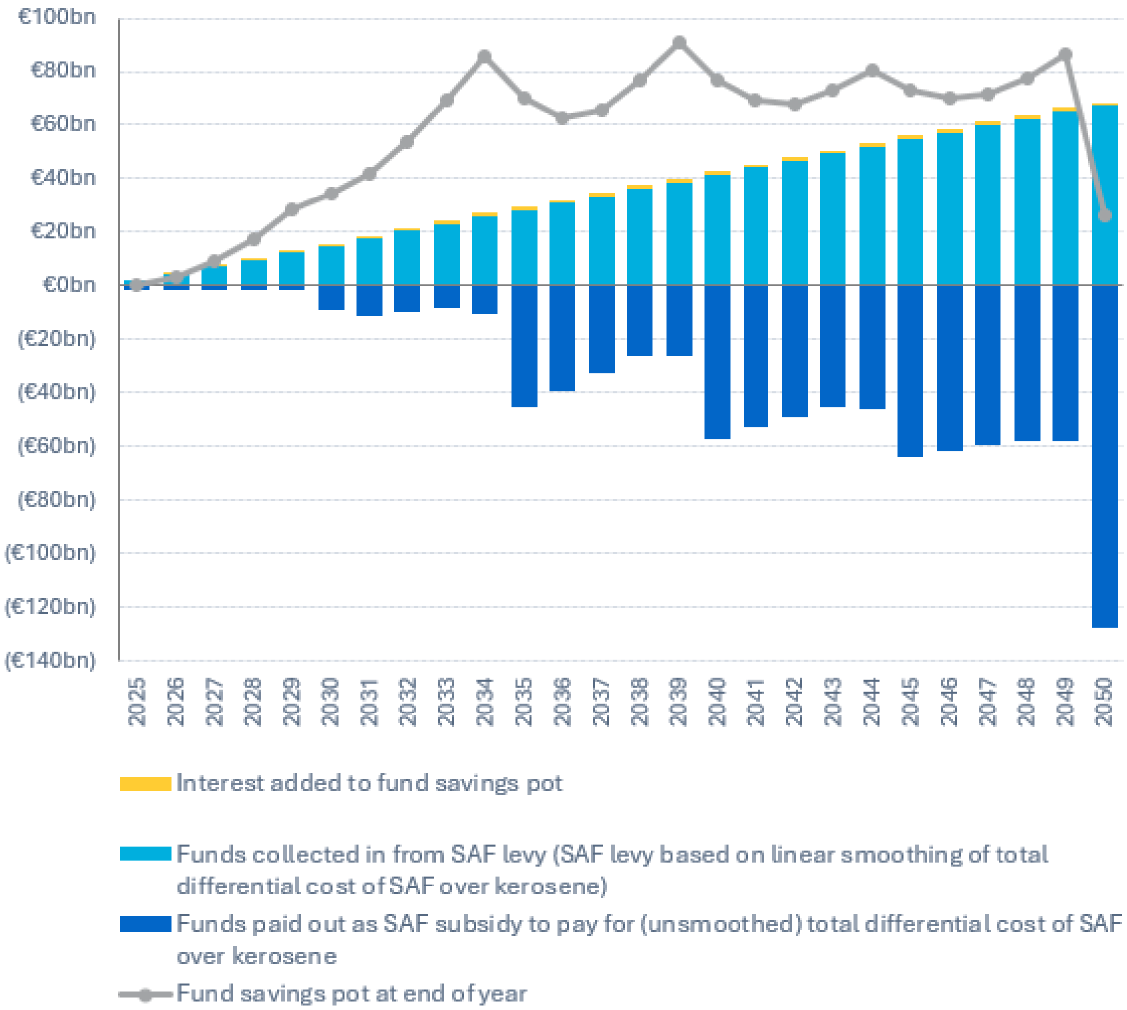
- Surpluses in some years, where the funds collected in from the (smoothed) SAF Levy exceed the funds paid out in the form of the (unsmoothed) SAF subsidy; and
- Shortfalls in other years, where the funds collected in from the (smoothed) SAF Levy fall short of the funds paid out in the form of the (unsmoothed) SAF subsidy.

5.11 The way in which the SAF Levy is smoothed over time has significant implications for the finances of the SAF Levy fund:

- Under linear smoothing, no borrowing is required for the SAF Levy fund, as enough surpluses are collected (with interest) up to 2034 to cover shortfalls in future years.
- Under power smoothing, substantial borrowing is required in certain years, as the surpluses collected (with interest) up to 2029 do not cover shortfalls in future years.

5.12 The figures below demonstrate an *indicative* flow of funds into and out of the SAF Levy fund, under both linear and power smoothing. These figures have been modelled under the assumptions of: (i) a savings interest rate of 2%; (ii) a borrowing interest rate of 3%; and (iii) a borrowing repayment term of 5 years.

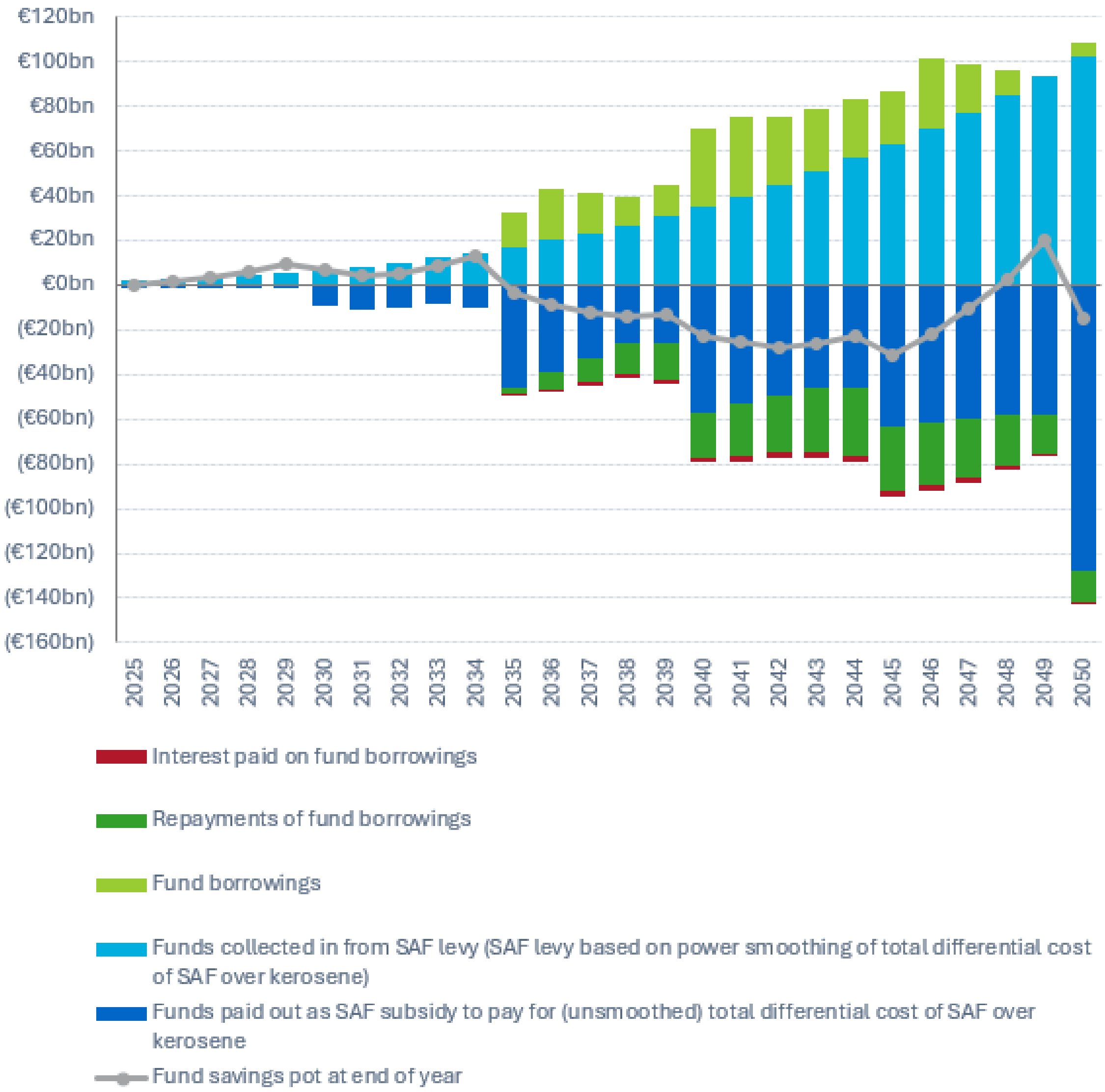
Figure 5.4: Indicative flow of funds into and out of the SAF Levy fund (SAF Levy based on linear smoothing of total differential cost of SAF over kerosene), €bn



Source: Steer analysis

5.13 As noted above, no significant borrowing is required under the illustrative linear smoothing mechanism shown in Figure 5.4 above.

Figure 5.5: Indicative flow of funds into and out of the SAF Levy fund (SAF Levy based on power smoothing of total differential cost of SAF over kerosene), €bn



Source: Steer analysis

5.14 Figure 5.5 above illustrates that large-scale borrowing may be required in some years depending on how the SAF Levy is smoothed, and in particular for the power smoothing example shown. In this case, Steer's analysis indicated that at least €20 billion of borrowing is required in nine of the years forecast, and over €30 billion of borrowing is required in two of these years. Any financial mechanism to support the required financing of the SAF Levy fund would therefore need to be capable of supporting this scale of borrowing.

6 SAF Levy - financing mechanisms

Overview

6.1 As demonstrated in Chapter 5, depending on how the SAF Levy is smoothed over time, substantial borrowing may be required in certain years to fund the SAF subsidy paid out to airlines to cover the differential cost of SAF over kerosene. Borrowing may also be required to fund the SAF subsidy recycling mechanism, if significant increases in the SAF subsidy are required following years in which the subsidy has been significantly underestimated.

6.2 We have investigated ways in which the EU could establish financial mechanisms to engage in the required borrowing. We have identified five financial mechanisms, which are discussed below.

Potential financing mechanisms

(1) EU ETS Innovation Fund

6.3 The EU Emissions Trading System (ETS) Innovation Fund is one of the largest EU funding programmes available for innovative low-carbon technologies. The Fund has an estimated budget of €40 billion, raised from auctioning allowances under the EU ETS. At least 50% of the Fund's budget must be used for climate and energy-related projects, such as renewable energy, energy efficiency, and just transition initiatives.

6.4 This fund is at an EU level and is grant funding (i.e. it does not need to be repaid).

(2) NextGenerationEU Green Bonds

6.5 NextGenerationEU (NGEU) Green Bonds are debt instruments issued by the European Commission to finance environmentally sustainable projects under the NextGenerationEU recovery programme, which was established to help mitigate the immediate economic and social damage brought about by the coronavirus pandemic.

6.6 The EU plans to issue up to €250 billion in NGEU Green Bonds by 2026, accounting for c. 30% of total NGEU funding. A 15-year bond issued in October 2021 raised €12 billion.

6.7 Unlike the EU ETS Innovation Fund, these bonds are a form of debt funding – i.e. the SAF Levy fund would need to pay back the debt principal plus interest.

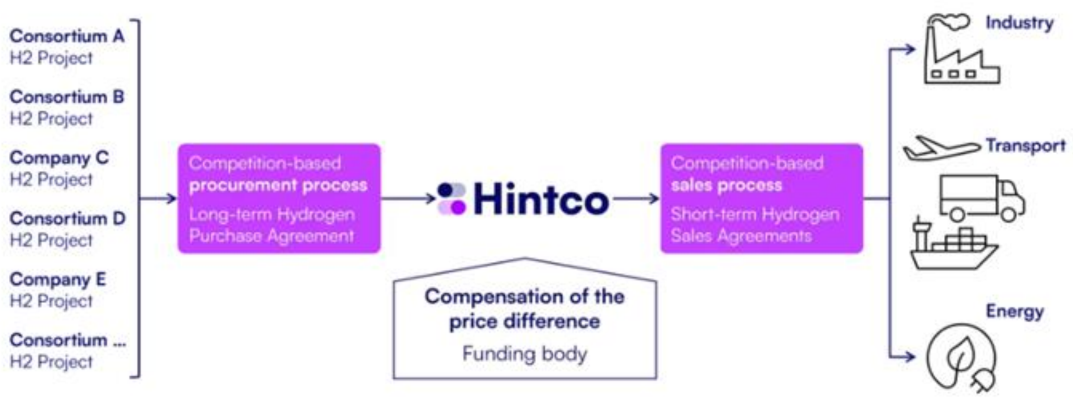
(3) Grants from EU Member States – akin to the H2 Global mechanism

6.8 The H2 Global mechanism is an innovative 'double-auctions model' designed to stimulate green hydrogen production by bridging the gap between the high hydrogen supply price and the low hydrogen demand price.

6.9 The H2 Global mechanism is established by an intermediary company known as Hintco, and functions as follows (see figure below for further details):

- Hintco is set up as a physical intermediary between hydrogen producers and hydrogen consumers;
- Hintco enters into long-term purchase agreements (Hydrogen Purchase Agreements or 'HPAs') with clean hydrogen producers through a competitive auction process;
- Hintco sells the purchased hydrogen to end consumers through short-term contracts (Hydrogen Sales Agreements or 'HSAs') via a separate auction;
- However, as clean hydrogen is typically more expensive than carbon-intensive alternatives, Hintco sells to end consumers at a lower price than it pays to stimulate demand.
- The difference between the higher purchase price and lower sales price is covered by public funding, initially €900 million coming from the German government.

Figure 6.1: H2 Global mechanism explanatory chart



Source: https://www.h2-global.org/the-h2global-instrument

(4) Recovery and Resilience Facility

6.10 The Recovery and Resilience Facility (RRF) is a financial instrument designed to help EU Member States deal with the effects of the coronavirus pandemic. It is a central piece of the NextGenerationEU recovery plan, discussed in (2) above.

6.11 The RRF has a total budget of €650 billion, of which €359 billion is in the form of grants, and €291 billion is in the form of loans. The purpose of the RRF is to finance reforms and investments, and the scheme runs from February 2020 to December 2026 (i.e. ending soon).

6.12 Under the RRF, EU Member States must submit national recovery and resilience plans, allocating at least 37% of their budget to green measures and 20% to digital measures. The loans disbursed under the RRF are to be repaid over 30 years from 2028 to 2058.

(5) Connecting Europe Facility

6.13 The Connecting Europe Facility (CEF) is an EU funding instrument that supports the development of high performing, sustainable and efficiently interconnected trans-European networks. The CEF was established in 2014 to enhance connectivity across Member States, focusing on the transport, energy, and digital sectors.

6.14 The total budget of the CEF, spread between 2021 and 2027, is €33.71 billion, of which €25.81 billion is earmarked for transport and €5.84 billion is earmarked for energy. The funds provided under the CEF are grant funds – i.e. they do not need to be repaid.

Summary

6.15 Table 6.1 below summarises the potential financing mechanisms outlined above.

Table 6.1: Summary of potential financing mechanisms for SAF Levy fund

	Type of funding	Expiry of funding	Commentary (pros / cons)
(1) EU ETS Innovation Fund	Grant	No expiry – funds are raised from auctioning allowances under the ETS	Pros: • Funding must be directed towards energy initiatives. • Grant funding does not need to be repaid. • Does not expire (as long as EU ETS is in operation) Cons: • May not be large enough in scale to support required borrowing (up to €40bn projected to be raised up to 2030 – c. €3.6bn per year).
(2) NGEU Green Bonds	Debt	2026	Pros: • Large scale (up to €250bn). • Funding must be directed towards financing environmentally sustainable projects. Cons: • Debt financing needs to be repaid with interest. • Bonds will not be issued post 2026, so scheme would need to be extended.
(3) Grants from EU Member States ***(similar to the H2 Global mechanism)***	Grant	N/A – mechanism not yet established	Pros: • Grant funding does not need to be repaid. • Directly tackles issue of high supply price and low demand price. Cons: • Requires EU Member States to provide required grant funding. • Complex to administer. • Currently set up for the hydrogen market, rather than the SAF market.

	Type of funding	Expiry of funding	Commentary (pros / cons)
(4) Recovery and Resilience Facility (RRF)	Hybrid (grants and loans)	2026	Pros: • Very large scale (up to €650bn). • Grant portion of funding (c. 55%) does not need to be repaid. Cons: • Not specifically designed for SAF (was established to help with recovery from the coronavirus pandemic) and only 37% of funds are allocated for green measures. • Loan portion of funding (45%) needs to be repaid with interest.
(5) Connecting Europe Facility (CEF)	Grant	2027	Pros: • 77% of funding is earmarked for transport, and 17% for energy. • Grant funding does not need to be repaid. Cons: • May not be large enough in scale to support required borrowing (budget of €33.7bn between 2021 and 2027 – c. €4.8bn per year).

Source: Steer analysis

7 SAF Rebalancing Charge

Approach

7.1 As an alternative to a SAF Levy, we have investigated the use of a SAF Rebalancing Charge (SRC). The SRC is an alternative way to help solve the competitive disadvantage problem facing those carriers whose passengers make connecting journeys through EU hubs. Under this system, there is no SAF Levy on flights where the level of SAF specified in the ReFuelEU Aviation legislation is uplifted by the carrier, and no subsidy is paid to carriers to support the purchasing of SAF.

7.2 Instead, the level of SAF which should be uplifted for the journey to a passenger's final destination is assessed, assuming the required SAF blending mandate in the ReFuelEU Aviation legislation. Given that SAF is paid on the first leg of the journey regardless of the carrier (EU or non-EU), the level of the SRC is based only on the GCD of the second leg of the itinerary, departing from the non-EU hub.

7.3 If a carrier transports passengers via a non-EU hub and uplifts less SAF than would be required under the ReFuelEU Aviation legislation (because local legislation at the carrier's hub does not require SAF to be uplifted, or requires less SAF to be uplifted that would be the case under the ReFuelEU Aviation legislation), a SAF Rebalancing Charge (SRC) is imposed on the airline, to be added to the passenger's fare for the itinerary.

7.4 The SRC is set at a level which would cover the additional cost to the carrier if it had been required to purchase SAF at its non-EU hub equivalent to that required under the ReFuelEU Aviation legislation. If SAF mandates are also in force at the non-EU hub, these are taken into account when assessing the level of the SRC: if the non-EU hub mandates the same level of SAF uplift as under ReFuelEU, then no SRC is levied; if the non-EU hub mandates SAF uplift at a lower level than under ReFuelEU, then the SRC is proportionately reduced.

7.5 Further, if the non-EU carrier voluntarily chooses to uplift SAF at its non-EU hub in line with the ReFuelEU mandate, or if the non-EU carrier is able to demonstrate that it has uplifted SAF across its whole fleet in line with ReFuelEU, then such flights would also be exempt from the SRC.

7.6 In addition, to reduce the bureaucratic burden of implementing the SRC and to only impact those flights where large competitive distortions arise, we also exclude from our calculations of the SRC:

- itineraries where the second leg of the journey only forms a small part of the overall journey. Specifically, we exclude itineraries where the GCD of the second leg of the journey accounts for 20% or less of the GCD of the total journey; and
- itineraries where the second leg of the journey is a domestic flight.

7.7 The funds raised from the SRC could be levied either at an EU-level or at an EU MS level, and would be used to support general aviation decarbonisation measures in the EU. This system is simpler to implement than the SAF Levy, as significantly fewer flights are affected, and no EU body is required to be established if the charge is collected at an EU MS level.

7.8 Such a system would be conceptually similar to the EU's Carbon Border Adjustment Mechanism (CBAM), but more appropriately tailored to the market dynamics of aviation, in that it compensates EU producers (airlines) vs producers (airlines) from outside the EU who are not subject to the same level of carbon costs under their own jurisdictions' legislation.

Calculation

7.9 To assess the level of the SRC to be imposed on those carriers which transport departing EU passengers to their final destination via a non-EU hub, we have:

1. Assessed the total differential cost of SAF over kerosene in each year in the EU, based on the mandated SAF uplift percentages in the ReFuelEU Aviation legislation;
2. Divided this cost by the total EU departing passenger km in each year, to assess a SAF differential cost per passenger km; and
3. Multiplied this SAF differential cost per passenger km by both: (i) the GCD of the second leg of passengers' itineraries (where the second leg is departing from a non-EU hub airport and is not exempted from the SRC by either being too short or being a domestic flight); and (ii) the number of passengers carried on this leg in each year.

7.10 As outlined above, SRCs are not levied on passenger itineraries which pass through non-EU hubs where SAF mandates in line with ReFuelEU are in place. We hence exclude from our calculations of the SRC itineraries which involve transiting in the UK or Switzerland, as these countries have similar SAF mandates in place to the EU.[14]

7.11 The results of our SRC calculation give a SAF differential cost that should be paid by airlines for carrying connecting EU passengers on the second leg of their journey without uplifting any SAF at their non-EU hub – i.e. the SAF Rebalancing Charge. This charge removes the competitive distortion arising due to the different requirements to uplift SAF for EU and non-EU airlines in respect of connecting passengers on journeys departing from the EU.

7.12 As there is no system of SAF levies and SAF subsidies, as under our core proposal, the amounts raised by the SRC are significantly smaller than those raised by the SAF Levy, as the SRC only affects non-EU airlines transiting departing EU passengers at their non-EU hubs, whereas the SAF Levy affects all EU departing passengers travelling on both EU and non-EU airlines.

[14] https://www.gov.uk/government/collections/sustainable-aviation-fuel-saf-mandate; https://www.bazl.admin.ch/bazl/en/home/themen/bazl_vorstellung/medien/Medienmitteilungen.msg-id-100108.html

Results

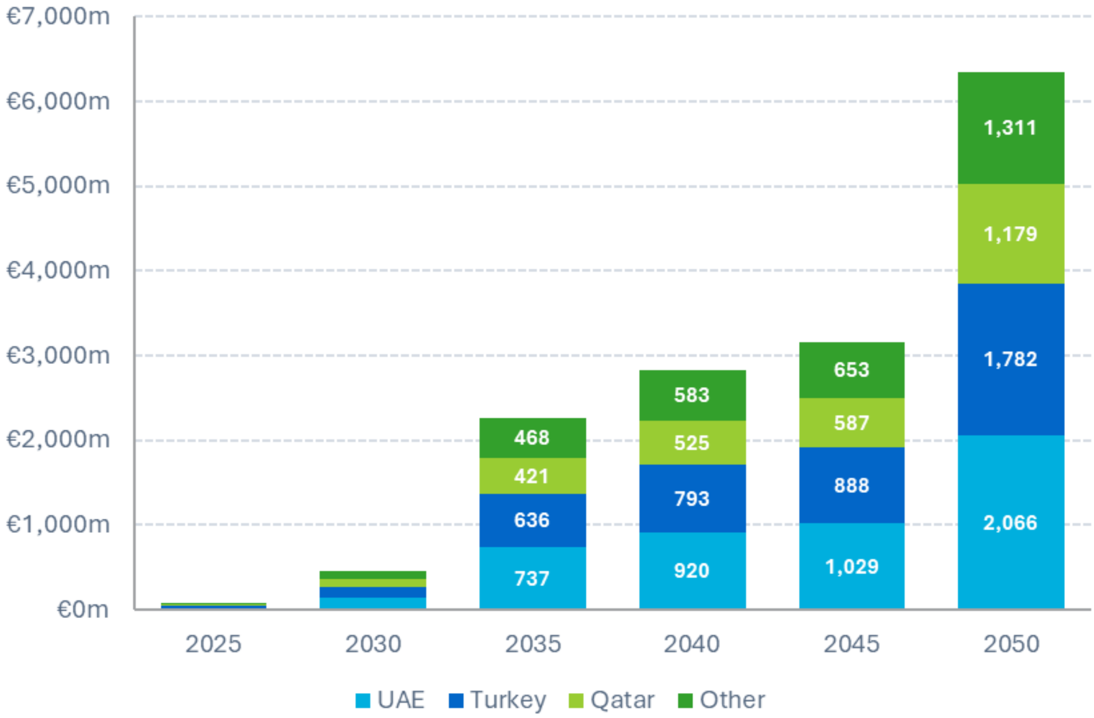
7.13 Under a SRC system, significant charges will be imposed on certain connecting countries with large hub carriers, primarily:

- The United Arab Emirates (UAE, base for both Emirates and Etihad Airways);
- Turkey (base for Turkish Airlines); and
- Qatar (base for Qatar Airways).

7.14 Based on our analysis, these three countries account for c. 79% of cumulative SRC charges raised under this system. As shown in the figure below, charges due under an SRC system reach over €2.0 billion for the UAE by 2050, exceed €1.7billion for Turkey, and exceed €1.1 billion for Qatar. This is shown in Figure 7.1 below.

7.15 Since the purpose of the SRC is to rebalance the costs of SAF experienced by EU and non-EU airlines, the aggregate funds collected by the SRC can be considered to be equal to the level of market distortion which would occur if the SRC were not in place (or, equivalently, an alternative mechanism such as the SAF Levy). The aggregate value of the SRC funds collected to 2050 is €21 billion in NPV terms at 2023 prices,[15] indicating that the market distortion would be significant in the absence of either mechanism.

Figure 7.1: Total SAF Rebalancing Charges to be paid by non-EU countries, €m



Source: Steer analysis

7.16 We note that it may be politically difficult to force airlines from these countries to pay these SRC charges, with a risk of retaliatory measures from their host countries being imposed.

[15] Using the standard EU discount rate of 4%.

8 Use and limitations of ETS SAF allowances

Introduction to the ETS

8.1 The EU Emissions Trading System (ETS)[16] is a 'cap and trade' scheme launched in 2005 as the world's first carbon market, requiring polluters in the EU to pay for their greenhouse gas (GHG) emissions. The aim of the ETS is to reduce EU GHG emissions while also generating revenues to finance the EU's green transition.

8.2 The EU ETS covers emissions from: (i) electricity and heat generation; (ii) industrial manufacturing; (iii) aviation; and (as of 2024) (iv) maritime transport, sectors which account for c. 40% of total EU GHG emissions. The aviation sector entered the EU ETS in 2012, and only intra-EEA flights are covered by the scheme. Following an evaluation of the scheme due in 2026, the scope could be widened from 2027 to cover all departing EU flights.[17]

8.3 The 'cap' under the EU ETS is reduced annually in line with the EU's climate targets, to ensure that EU GHG emissions decrease over time. By 2023, the EU ETS had already helped reduce emissions from EU power and industry plants by c. 47% compared to 2005 levels.

8.4 The EU ETS cap is expressed in terms of emission allowances, with one allowance giving the owner the right to emit one tonne of CO_2 equivalent. Allowances are sold in auctions and may be traded. As the cap decreases over time, so does the supply of allowances in the EU ETS market. Companies which do not purchase enough allowances to cover their GHG emissions face heavy fines.

8.5 Allowances under the EU ETS are predominantly sold in auctions, though some companies receive a 'free allocation' of allowances. The EU aviation industry has received free allowances since 2012, but these do not cover the full emissions of the industry.

[16] **https://climate.ec.europa.eu/eu-action/eu-emissions-trading-system-eu-ets/what-eu-ets_en**

[17] **https://carbonmarketwatch.org/2023/12/22/faq-the-eu-ets-for-aviation-explained/**

8.6 In 2023, the EU aviation industry faced a cap under the ETS of 26.9 million allowances, of which 21.5 million were allocated for free, and the remaining 5.4 million were auctioned. As the EU aviation industry in 2023 emitted 52.2 million tonnes of CO_2 equivalent on in-scope flights (i.e. on intra-EU flights only), the remaining 25.3 million allowances were purchased on the open market.[18]

8.7 Free allowances for the aviation sector will be phased out by 2026, with free allowances declining by 25% in 2024 and 50% in 2025.[19] Hence, by 2026, operators in the aviation sector will need to purchase all their ETS allowances at auction.

ETS and SAF allowances

8.8 In order to incentivise uptake of SAF and reduce the burden on the aviation industry from the reduction of free EU ETS allowances already specified under changes to the ETS introduced in 2024, 20 million 'SAF allowances' have been made available from 2025 to 2030 (with a possible extension to 2034), which airlines can use to cover between 50% and 100% (depending on the SAF production pathway used) of the differential cost between SAF and kerosene.[20]

8.9 Specifically, the 20 million free SAF allowances can be used to cover the following proportions of the price differential between SAF and kerosene:[21]

- Advanced biofuels and renewable hydrogen: **70%**
- Renewable fuels of non-biological origin (RFNBOs): **95%**
- SAF used at airports that are not classified as Union airports in the context of ReFuelEU or airports on remote islands: **100%**
- Other eligible SAF (e.g. SAF made from UCO or animal fats): **50%**

8.10 While the free SAF allowances cover a proportion of the price differential between SAF and kerosene, conferring a direct cost-saving benefit to airlines, the use of SAF itself confers an additional benefit to airlines in that it is 'zero-rated' under the EU ETS scheme, and therefore no ETS allowances need to be purchased to cover the GHG emissions from the burning of SAF.

8.11 We have modelled the impact up to 2030 of these 20 million free SAF allowances. The results are shown in Figure 8.1 below. We have used the following simplifying assumptions in our modelling:

- For all types of bioSAF, 50% of the price differential over kerosene is eligible to be covered by the free SAF allowances;
- For eSAF, 95% of the price differential over kerosene is eligible to be covered by the free SAF allowances; and
- ETS allowances cost €80 per allowance in each year from 2025-2030.

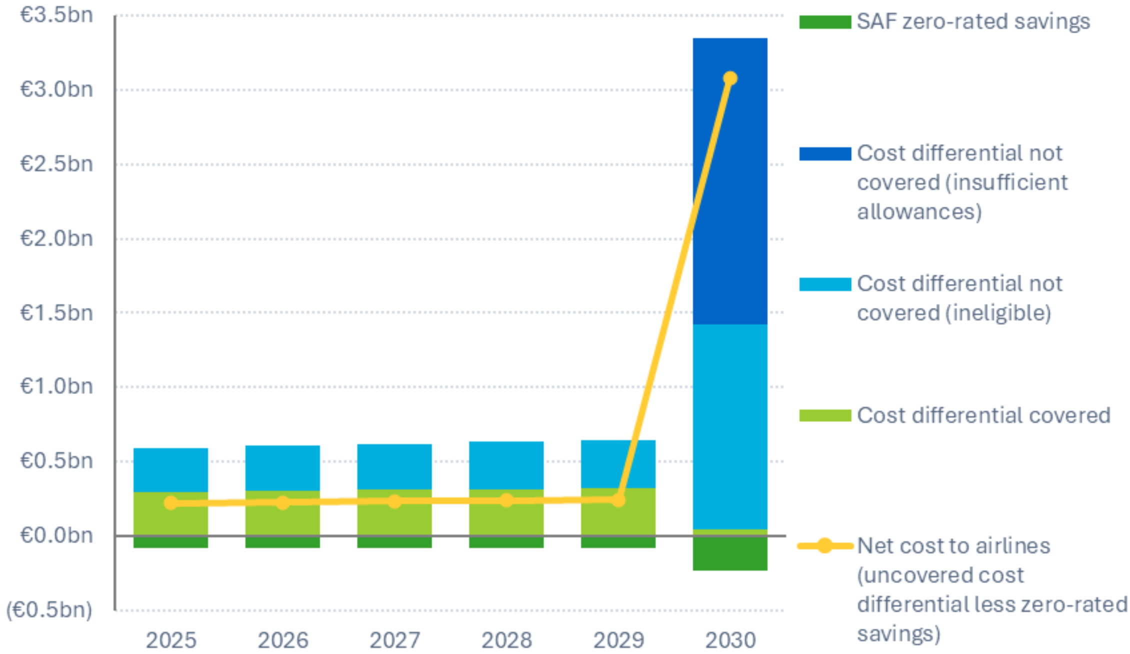
[18] https://www.eea.europa.eu/en/analysis/maps-and-charts/emissions-trading-viewer-1-dashboards

[19] https://climate.ec.europa.eu/eu-action/eu-emissions-trading-system-eu-ets/free-allocation_en

[20] https://theicct.org/revisions-to-the-eu-ets-set-a-global-model-for-saf-investment-apr24/

[21] https://skynrg.com/refueleu-how-it-will-shape-the-saf-market/

Figure 8.1: Benefits of 20m free intra-EU SAF allowances to airlines



Source: Steer analysis

8.12 Under the assumptions we have used, the 20 million free SAF allowances do not cover the full eligible cost differential of SAF over conventional jet fuel up to 2030. While the full differential cost is covered by the free allowances in each year from 2025 – 2029, only 2% of the eligible differential cost is covered in 2030, when the free allowances run out.

8.13 Even when accounting for the zero-rated savings from using SAF, airlines still face bills to uplift SAF on their intra-EU flights up to 2029, before the free allowances run out, as only 50% of the bioSAF cost differential over conventional aviation fuel is eligible to be covered by the SAF allowances (there is no eSAF mandate prior to 2030). In addition, airlines will still be required to purchase ETS allowances on the open market, as the EU aviation industry produces more emissions than permitted under its ETS cap, while the ETS cap also decreases over time.

8.14 The net cost to airlines for uplifting SAF is particularly large in 2030, reaching over €3.0 billion, as this is when the SAF mandate increases and the separate sub-mandate for more expensive eSAF is introduced (even though a higher proportion - 95% - of the price differential of eSAF over conventional jet fuel is eligible to be covered by the allowances than for bioSAF - 50%).

Implications

8.15 While these free SAF allowances may help to ease the burden on airlines of complying with the ReFuelEU SAF mandates, there are significant problems with this mechanism:

- Only a certain proportion of the differential SAF cost over conventional jet fuel can be covered by the free allowances;
- Based on Steer's analysis, the free allowances are insufficient to cover the eligible differential SAF cost over conventional jet fuel by 2030, while SAF costs will increase substantially after this date, as the EU SAF mandate percentages increase; and

- The free allowances can only be used on intra-EU flights, and therefore cannot be used for SAF purchases on long-haul flights.

8.16 The 20 million ETS SAF allowances are thus insufficient to cover the eligible differential cost of SAF over conventional jet fuel for intra-EU flights.

8.17 Possible policy measures which could be considered to address the inadequacy of the free allowances mechanism include:

- extending the free allowances policy beyond 2030, though this would require additional free SAF allowances to be granted, given that they run out in 2030; and/or
- restricting the geographical scope of the ReFuelEU Aviation legislation to intra-EU flights only.

8.18 Extending the free allowances policy beyond 2030 would mean that the partial relief provided on intra-EU flights would continue. However, to provide effective relief for the additional costs of SAF, even for intra-EU flights, the number of free allowances available would need to be increased considerably beyond the current 20 million free allowances. Just to cover the eligible cost differential in 2030 would require an additional 24.1 million allowances – i.e. more than doubling the 20 million currently available, while even more allowances would be required in subsequent years, if the scheme were extended.

8.19 Restricting the geographical scope of the ReFuelEU Aviation legislation to intra-EU flights only would mean that the competitive distortions identified on non-EU flights would be removed. However, we note that this would likely be considered unattractive because:

- it would reduce the climate benefits arising from the legislation;
- it would require a change to primary EU legislation; and
- it runs against the long-term intention to widen the scope of the EU ETS to all destinations worldwide.

8.20 While it could be a relatively straightforward process to grant additional free SAF allowances to cover the shortfall up to 2030, and/or to extend the SAF allowances beyond 2030, assuming the necessary changes in legislation and policy, a reduction in the scope of the ReFuelEU aviation legislation appears to be an unattractive policy option, and hence we have not explored this further.

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