



Department
for Transport

Sustainable aviation fuels mandate

Summary of consultation
responses and government
response

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Department for Transport
Great Minster House
33 Horseferry Road
London
SW1P 4DR



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Foreword from the Secretary of State for Transport



Following the unprecedented circumstances of the past two and a half years, I fully commend the collective effort of the UK aviation industry to embrace a greener path to recovery. I believe that the government and industry are fully aligned in our ambition to build back better by reducing the climate impact of aviation. Through the Jet Zero Council, we are working together to drive the development of zero emission flight and deliver sustainable aviation fuels (SAF) in this country.

In tandem with other decarbonisation technologies, SAF will play a critical role in reducing aviation greenhouse gas emissions. To inspire and direct the efforts needed to scale up SAF, a year ago we launched a SAF mandate consultation and later in 2021 our Net Zero Strategy announced our ambition to see at least 10% SAF blended in the UK jet fuel mix by 2030.

Through these commitments we wanted to signal our key aims: driving carbon savings and building a UK SAF industry. These are the principles that have steered the development of the government response to the SAF mandate consultation, launched today alongside the Jet Zero Strategy.

The UK's SAF programme is already one of the most comprehensive in the world and supports our vision to set the UK up to be a global leader in the development, production and use of SAF, allowing us to achieve net zero flying, and creating thousands of green jobs.

We will continue to do this by:

- **creating secure and growing UK SAF demand.** We are introducing a SAF mandate requiring at least 10% (c.1.2 million tonnes) of jet fuel to be made from sustainable sources by 2030, with increasing proportions of SAF being blended from 2025. We will consult further on the trajectory of this mandate out to 2050.
- **kick starting a domestic SAF industry.** Since the mandate consultation was first published in July 2021, the UK Government has already made substantial steps to kickstart the UK SAF industry. We have invested in 8 UK SAF plants through our £15m Green Fuels, Green Skies competition and we have today launched the £165 million Advanced Fuels Fund, delivering a key commitment in our Net Zero Strategy. This funding will help us achieve our commitment of having at least five commercial-scale plants under construction in the UK by 2025. Coupled with the £400 million UK Government partnership with Breakthrough Energy Catalyst, we will see many more SAF plants develop through to production in the period to 2030. This will create thousands of green jobs and improve fuel security. We are also breaking new ground by committing £12 million to establish a SAF clearing house to deliver early-stage aviation fuel testing, and researching SAF use in what will be the first net zero transatlantic flight running on 100% SAF.
- **working in partnership with industry and investors to build long term supply.** We are actively looking at how to create the long-term conditions for investable projects in the UK. We are looking for evidence from industry to support this work, including understanding the interactions with existing policy, potential unintended consequences, and possible market failures in more detail. We also want to improve evidence on further potential measures and commitments that might be needed, from both industry and government, beyond demonstrating technology that works at scale, ensuring demand via the mandate, and looking at an overarching strategy for sustainable feedstocks and sources – this will be supported through our developing Low Carbon Fuels Strategy. We would like to reach a preferred government position on how to further stimulate investment in a UK SAF industry by the end of the year. Together we can unlock the capital needed to scale up the UK SAF industry and ensure existing and future SAF policy remains effective at driving investment in the UK.

I recognise there will still be challenges ahead. We will continue to strengthen the UK's SAF programme further through our continued partnerships with industry, academia, NGOs and the public. Through this synergy we are preparing the UK to develop a world-leading SAF sector and paving the way to reach Jet Zero.

Rt Hon Grant Shapps MP

Secretary of State for Transport

Executive summary

The role of SAF in net zero

The UK Government is committed to achieving net zero aviation – or Jet Zero – by 2050, as set out in the Transport Decarbonisation Plan and Jet Zero Strategy, published alongside this document. We are already taking bold action: we are working with industry through the Jet Zero Council and we continue to support the sector with new policy and funding. Nevertheless, more action is needed to make net zero aviation possible.

The Jet Zero Strategy is the strategic framework that will guide our approach to 2050, and our five-year delivery plan policies will ensure we are on the right path to meet our commitment. Sustainable aviation fuels (SAF) are one of the key technologies available to government and industry to accelerate the transition to net zero aviation. SAF are drop-in fuels, meaning they can be blended into fossil-based aviation fuel and used in existing aircraft, engine and infrastructure without modification. These advanced fuels, obtained from sustainable feedstocks, can achieve lifecycle emissions savings of over 70% compared with conventional jet fuel, when fully replacing kerosene. Therefore, SAF could deliver both short- and long-term CO₂ emissions savings, and early research shows the non-CO₂ impacts of flying could be possibly reduced too. Many experts view SAF as the only alternative for long-haul flights up to 2050, which are the flights with the biggest climate impact.

In recent years the UK Government has introduced a world-leading programme of interventions that aims to support commercialisation of the domestic SAF industry, deliver carbon savings and maximise the industrial opportunities for the UK. Taking into consideration the latest round of funding announced in October 2021, we have made available over £200 million for the early development of advanced fuels plants through grant funding competitions as well as further financial support through the Renewable Transport Fuel Obligation (RTFO) and the UK Emissions Trading Scheme (ETS).

Supported by this policy and funding, advanced fuels plants have been developing and the first few batches of SAF have been recently produced in the UK or delivered to the country, including during COP26 in November 2021 as a result of government-industry collaboration through the Jet Zero Council. To accelerate SAF deployment and truly capture the environmental benefits and green jobs the sector can deliver, last year we consulted on the high-level ambition and design of a proposed SAF mandate, as announced in the UK

Government's Ten Point Plan in November 2020.¹ It was anticipated that a long-term mandate would generate demand for SAF, provide an incentive to SAF producers (in the form of a tradable credit) and signal to investors the vital role the government believes the technology will play in the UK.

Consultation proposals and government decisions

The consultation ran between 23 July and 19 September 2021, seeking views across the policy areas summarised below.

We received 79 responses from a range of organisations and individuals concerning the government's proposals. We would like to thank all stakeholders for their time and contribution in responding to the consultation. In developing the government response and policy proposals for the SAF mandate, we have carefully considered all responses and the evidence provided.

Our vision

We have considered many aspects needed to generate demand and supply of SAF within the UK, benefitting from industry advice through the consultation and invaluable engagement opportunities over the past few months. This input has helped shape our vision to set the UK up to be a global leader in the development, production and use of SAF.

To do this, we will focus on three main areas: creating secure and growing UK SAF demand; kickstarting a domestic SAF industry; and working in partnership with industry and investors to build long term supply.

Guided by these principles, this document contains firm commitments on a number of key proposals, setting out the direction we are taking to secure demand in the UK through a SAF mandate.

Principal mechanisms

This response confirms that the Government will mandate SAF supply in the UK by introducing a bespoke SAF mandate, separate from the Renewable Transport Fuel Obligation (RTFO). In line with our original consultation proposals, the mandate will obligate aviation fuel suppliers to reduce the greenhouse gas (GHG) emissions intensity of jet fuel delivered to the UK. They will be able to achieve this by blending an increasing proportion of SAF into their jet fuel supply and will receive an incentive to do so in the form of a number of credits, proportional to the GHG emissions saved by the SAF supplied. These credits can then be sold or bought to meet the obligation.

¹ <https://www.gov.uk/government/publications/the-ten-point-plan-for-a-green-industrial-revolution>

Fuel eligibility and sustainability criteria

The Government would like the SAF mandate to deliver fuels with the highest sustainability credentials while maintaining appropriate safety standards. Therefore, as proposed in the original consultation, to receive credits under the mandate SAF will be required to:

- meet the requirements set out in the DEF STAN 91-091 specification;
- be waste-derived biofuels, power-to-liquid (PtL) or recycled carbon fuels (RCFs), where PtL fuels must use either renewable or nuclear energy sources;
- comply with the waste hierarchy when derived from wastes;
- achieve at least a 50% GHG saving compared to a fossil fuel comparator of 89 gCO_{2e}/MJ
- meet land criteria when derived from agricultural wastes and meet forestry criteria when derived from forestry wastes; and
- use low carbon hydrogen where hydrogen is used as an input which contributes to fuel's energy content.

Overarching trajectory

We would like to introduce a SAF mandate that is world leading and as ambitious as possible. To that end, we can confirm that the obligation on suppliers to reduce the carbon intensity of jet fuel will start in 2025 and will grow to reach the equivalent of at least 10% SAF use by 2030. Our expectation is that this will deliver emission reductions in the order of 3 MtCO_{2e} in 2030.

Further analysis is required to ensure we set yearly targets before and after 2030 at an appropriate level to avoid creating any unintended consequences. We will consult further on our yearly mandate targets in the second consultation and review our SAF trajectory to 2050 within the first five-year review of the Jet Zero Strategy in 2027.

To achieve our ambition and mandate targets, the Government recognises the importance of having a diverse portfolio of SAF in the fuel mix. To drive the commercialisation of less developed SAF production pathways, we will place a cap on the amount of hydroprocessed esters and fatty acids (HEFA) that can be claimed under the mandate and introduce a PtL subtarget. We will also continue to explore how best to scale up pathways other than HEFA and PtL.

Interactions with other domestic and international policy

It is important that this mandate interacts smoothly with existing and future policy such as the RTFO and UK ETS. We will ensure we avoid the double counting of GHG emissions reductions between schemes. In addition, aviation fuel will no longer be eligible to receive certificates under the RTFO once the mandate is in place. RTFO certificates will continue to remain available for SAF supplied before 1 Jan 2025, at which point the SAF mandate comes into effect and suppliers will need to claim under the new scheme.

Kickstarting a UK market

In the consultation we sought views on whether additional measures beyond the mandate were needed to kickstart and scale up domestic SAF production. Since the consultation was published, the UK Government has provided further support to the SAF industry. For example:

- the £165 million Advanced Fuel Fund to support the development of advanced fuels plants in the UK for financial years 2022-25;
- £12 million to support fuel testing, including funding to establish a SAF clearing house for financial years 2022-25 and up to £1m to support the delivery of the first net zero transatlantic flight fuelled on 100% SAF; and
- the £400 million partnership with Breakthrough Energy Catalyst to drive investment into the next generation of clean energy technologies, including SAF.

These are vital actions that will stimulate the production of SAF in the UK and would complement the SAF mandate, which will ensure demand for SAF here in the UK. It is because of this that we are also announcing our commitment to see at least five commercial-scale plants under construction in the UK by 2025.

Working in partnership with industry and investors

The UK's SAF programme is one of the most comprehensive in the world. We are confident that this framework of measures puts the UK in a leading position to reduce aviation emissions and kickstart a UK SAF industry.

We recognise that there remain calls for us to go further given the scale of the challenge, to accelerate the pace at which the UK SAF market grows to deliver a UK SAF industry. To strengthen our SAF programme even further and given our ambition, we have established a core team working in partnership with industry and investors. This includes working with airlines, SAF producers, UK Infrastructure Bank, and NGOs to gather key evidence and determine what further actions industry or government could take to help the growth of a UK SAF industry.

Over summer 2022 we will continue to work with all these stakeholders on how to create the long-term conditions for investable projects in the UK through a series of workshops and bilateral meetings, followed by a call for evidence this year if necessary. This evidence will inform where the market failures are in the SAF investment lifecycle, the best timing and form of any further action from industry or government, possible unintended consequences, and interactions with UK SAF policy. We would like to reach a preferred government position on how to further stimulate investment in a UK SAF industry by the end of the year.

Delivering SAF to the market

Despite these government interventions, we recognise that unexpected external circumstances could mean fuel suppliers may not be able to fully fulfil their obligation. Therefore, we will introduce a buy-out mechanism to ensure compliance if market factors mean SAF cannot be supplied at a high enough quantity.

Scheme practicalities

The scheme practicalities will be largely set out in more detail in the second consultation. Nevertheless, this response confirms a number of proposals set out in the consultation, many of which align with existing rules under the RTFO. This includes permitting mass balance as the only chain of custody, introducing an annual reporting requirement for suppliers, subjecting claims to compliance and verification steps and publishing statistical reports.

Next steps

We intend to continue collecting evidence, conducting analysis and collaborating with other government departments to refine proposals and resolve outstanding policy questions around the detail and trajectory of the mandate in more detail. Specifically, we will consult further on the long-term SAF trajectory from 2025 up to 2050 and address the practicalities of the scheme, including the administrative process for obligated parties and how the mandate interacts with other policy. We will present a final set of policy proposals in a second consultation alongside comprehensive analysis exploring the climate and economic impacts of a SAF mandate. We intend on consulting in Autumn 2022.

We will introduce the SAF mandate by secondary legislation made under powers in the Energy Act 2004. We will make these changes as soon as possible following the second consultation, around mid-2023, in time for the mandate to commence in 2025.

Responses received

A total of 79 responses were received from a range of organisations and individuals concerning the government's proposals. The summary contained in this document describes the key themes set out in responses. For the sake of brevity, it does not repeat the full details contained in every response. The full summary of consultation responses can be found [here](#).

The following table provides a breakdown of those who responded.

Stakeholder group	Number of respondents
Airline	7
Airport	4
Consultancy	3
Fuel producer or supplier	21
Fuel technology licensor or supplier	2
Government body	2
Individual	6
Infrastructure and logistics provider	2
Non-governmental organisation (NGO)	5
Original equipment manufacturer (OEM)	5
Trade association	8
Other	14
Total	79

1. A greenhouse gas emissions scheme to reduce the carbon intensity of jet fuel

The need for a SAF mandate outside the RTFO

Consultation proposal

The Government recognised the need for SAF usage in the short, medium and long term to contribute to delivering net zero and the UK's carbon budgets. We were therefore keen to support the development of the nascent SAF industry with a mandate as our preferred option for doing so. A mandate could deliver a number of outcomes which would likely not be achieved through more dispersed interventions from government and industry.

SAF is currently rewarded, but not mandated, under the RTFO. There is a risk that without an obligation, only small volumes of the cheapest forms of SAF may be used in the UK. In the consultation we proposed the obligation would be implemented as a standalone SAF mandate, outside RTFO.

Question 1

Do you agree or disagree that a SAF mandate should be introduced in the UK?

Summary of responses

Total	Agree	Neither agree nor disagree	Disagree	Don't know
74	64	5	4	1

Most respondents agreed that a SAF mandate should be introduced in the UK, with the predominant arguments for the introduction of a SAF mandate being that it would:

- generate demand for SAF;
- stimulate the domestic economy;
- deliver emissions savings; and

- help increase investor confidence.

Stakeholders felt that a mandate was a step in the right direction. However, they highlighted that the UK SAF industry will need multiple support mechanisms to ramp up production in alignment with the targets set out in the consultation and to close the price gap between SAF and traditional kerosene (see **Question 30**).

Respondents who agreed that a mandate should be introduced also highlighted the importance of SAF for difficult to decarbonise long-haul aviation, but underlined that multiple routes to aviation decarbonisation should be incentivised to give the UK the best chance of reaching net zero by 2050.

Many stakeholders suggested that while a mandate could be effective in generating demand, additional policy mechanisms would be needed for the UK to foster a domestic SAF sector. Similarly, a small number of respondents were concerned that limited production and high cost of SAF would hinder the effectiveness of a SAF mandate.

A very small number of respondents disagreed that a SAF mandate should be introduced in the UK. The reasons for this included:

- the scaling of SAF too quickly may lead to lack of sustainability of the resultant fuel;
- the focus should instead be on placing a cap on total aviation fuel consumption before any mandate is put in place;
- a mandate risks competitive market distortion; and
- the UK is not yet ready for a mandate due to the current high cost and low production of SAF.

Government response

We are pleased that most respondents agreed with the reasoning outlined in the consultation to introduce a SAF mandate. There is overwhelming support across the industry, including from fuel suppliers, airlines, airports and NGOs; therefore, we can confirm that the Government will implement a SAF mandate in the UK.

Government decision: we will create secure and growing SAF demand by introducing a mandate to supply SAF in the UK.

We believe that a mandate will support the nascent SAF industry, deliver significant GHG savings and potentially generate economic opportunities within the UK. The mandate will not prescribe where SAF should come from, but we are setting one of the most ambitious mandate targets in the world (see **Question 20**) to send a strong signal to investors and producers and reaffirm the UK Government's commitment in this space.

We recognise that other policy instruments may also have advantages in supporting domestic SAF production. The Government will continue to ensure that the UK SAF sector can be world-leading and can contribute effectively to delivering net zero aviation by 2050: we are currently working to understand the market issues preventing investment and what, if anything, beyond the mandate may be needed to address them (see **Question 31**).

We recognise that aviation decarbonisation solutions exist outside SAF and should be adopted where appropriate. The Jet Zero Strategy, published alongside this document, sets out the carbon emissions reduction target through to 2050 and considers the interplay between SAF, zero-emission flight, system efficiencies as well as markets and removals to achieve this.

We would like to reassure those that expressed concern that a mandate can introduce competitive distortions for airlines that SAF policy is not only a UK-Government-pursuit but it is being considered globally. For instance, the European Commission introduced its ReFuelEU² proposal in July 2021, which proposes a mandate on aviation fuel suppliers to supply SAF at EU airports beginning in 2025. Similarly, the US has launched a government-wide SAF Grand Challenge³ to reduce the cost, enhance the sustainability, and expand the production and use of SAF to meet a goal of supplying sufficient SAF to meet 100% of aviation fuel demand by 2050. If the UK implements a SAF mandate, both airlines that fly predominantly within the UK and airlines that fly internationally will likely blend increasing proportions of SAF, either in the UK or abroad, as a result of different forms of SAF mandates being introduced in the coming decade. We envisage this will limit the likelihood of competitive distortions or disproportionate impact on certain carriers.

We share stakeholders' desire for SAF to maintain sustainability standards and the mandate should not incentivise fuels that could lead to negative environmental consequences. Sustainability and eligibility criteria are discussed in **Chapter 2**.

Question 2

Do you agree or disagree that an obligation to supply SAF in the UK should sit outside the RTFO?

Summary of responses

Total	Agree	Neither agree nor disagree	Disagree	Don't know
60	48	7	3	2

Most respondents agreed that an obligation to supply SAF in the UK should sit outside the RTFO. The main arguments offered to support this view were that it would:

- provide an incentive to produce SAF;
- help to avoid passing SAF costs on to road fuel users;
- avoid administrative confusion and simplify the reporting process for SAF producers;
- allow for the expansion of feedstock eligibility beyond what is currently included in the RTFO;
- enable the introduction of a mandate that is not centred on fuel volumes; and
- ensure minimal competitive distortions in the fuel market.

² <https://ec.europa.eu/info/law/better-regulation/have-your-say/initiatives/12303-ReFuelEU-Aviation-Sustainable-Aviation-Fuels>

³ <https://www.whitehouse.gov/briefing-room/statements-releases/2021/09/09/fact-sheet-biden-administration-advances-the-future-of-sustainable-fuels-in-american-aviation/>

Several stakeholders (including fuel producers, NGOs and government bodies) that agreed an obligation to supply SAF should sit outside the RTFO felt that the mandate should complement or align with the RTFO to make it simpler for users to understand.

A small number of stakeholders suggested that support for SAF under the RTFO should only be removed once a SAF mandate is in place (see **Question 28**).

One respondent who disagreed that a mandate should sit outside of the RTFO proposed that SAF should initially be doubly incentivised through both the RTFO and the SAF mandate to help kickstart the UK SAF industry.

Government response

We are pleased that 80% of respondents agreed with the proposal to introduce a bespoke SAF mandate outside of the existing RTFO, in line with the recommendation of the Climate Change Committee. The Government believes that a standalone mandate will be most effective in accelerating the uptake of SAF because a bespoke policy will provide greater certainty to potential investors in SAF and will better adhere to the polluter pays principle so that the obligation falls on the jet fuel supply chain rather than the road fuel supply chain.

Government decision: we will implement a SAF mandate as a standalone instrument sitting outside the RTFO.

Although we will implement a standalone SAF mandate, it is evident that stakeholders are keen to see the SAF mandate maintain some degree of consistency with the RTFO to facilitate compliance and understanding. The Government recognises the importance of ensuring the two schemes are cohesive given that many fuel producers are expected to claim credits under both. Further detail on the support for SAF under both the RTFO and the SAF mandate is provided in **Chapter 6**.

We will consider and set out the practicalities of having a separate SAF mandate and RTFO and how they can complement each other in the second consultation.

Prioritising carbon savings rather than SAF volumes

Consultation proposal

The Government proposed the introduction of a SAF mandate in the form of a GHG emissions reduction scheme. Under the proposed mechanism, jet fuel with a GHG emissions intensity below the target and which meets the proposed eligibility criteria would be awarded a number of credits proportional to the amount of CO₂e saved. Jet fuel with a GHG emissions intensity above the target or SAF which does not meet the proposed eligibility criteria would incur an obligation. This mechanism should encourage supply of SAF with the lowest possible GHG emissions. It is proposed that the SAF mandate would entail a tradable credit scheme which would allow obligated parties to meet the obligation in a flexible and cost-effective way.

Question 3

Do you agree or disagree that a GHG emissions scheme based on tradable credits should be preferable to a fuel volume scheme when designing a SAF mandate?

Summary of responses

Total	Agree	Neither agree nor disagree	Disagree	Don't know
64	45	6	12	1

Most respondents agreed that a GHG emissions scheme based on tradable certificates would be preferable to a fuel volume scheme when designing a SAF mandate. The main arguments offered to support this view were that a greenhouse gas emissions scheme based on tradable certificates would:

- incentivise sustainable fuel;
- be technology agnostic;
- align with the UK's decarbonisation goals;
- align with other schemes such as UK ETS and CORSIA; and
- reduce the need for greenhouse gas thresholds and positive-feedstock lists for qualifying fuels.

Several of the respondents that preferred a greenhouse gas emissions scheme cited evidence of this approach being successful in other schemes, such as the California Low Carbon Fuels Standard (LCFS)⁴.

A small number of respondents preferred a volume-based scheme claiming it would be simpler to regulate, while several stakeholders disagreed with a scheme based on tradable certificates claiming that it could encourage organisations to avoid carbon reduction processes by buying their way out of the obligation and tradeable credit schemes are more likely to be subject to fraud.

Government response

Government decision: we will implement a GHG emission scheme based on tradeable credits.

The consultation responses evidence broad support across industry for our proposal with 70% of respondents in agreement. We are encouraged that most respondents expressed that a scheme based on GHG emissions will result in the use of fuels with high sustainability credentials. Evidence from existing schemes, such as the LCFS, demonstrate that significant GHG savings can be achieved.

It is assumed that the GHG emissions reductions achieved will be greater as a result of GHG emissions-based mandate versus a volume mandate. A volume mandate would most likely lead to the cheapest SAF pathways which are eligible under the sustainability criteria and

⁴ <https://ww2.arb.ca.gov/our-work/programs/low-carbon-fuel-standard>

are already being produced at scale. A GHG emissions-based mandate would instead incentivise SAF with the lowest production cost per tonne of CO2 saved.

The graph below compares forecasted GHG emissions savings from SAF pathways against their forecasted costs, taken from a wide range of published papers⁵. Under a volume-based mandate, suppliers would likely be predominately supplying HEFA initially as evidence suggests this is currently the cheapest type of SAF to produce. However, the graph also shows that other types of SAF, including Fischer-Tropsch and PtL, also have the potential to be produced at lower cost and result in higher carbon savings. As the cost of producing these types of SAF falls over time, the GHG emissions-based mandate will incentivise the production of SAF which has the lowest £/tCO2 saved. The graph also shows that a GHG emissions-based mandate would not necessarily lead to significantly higher overall costs than a volume-based mandate.

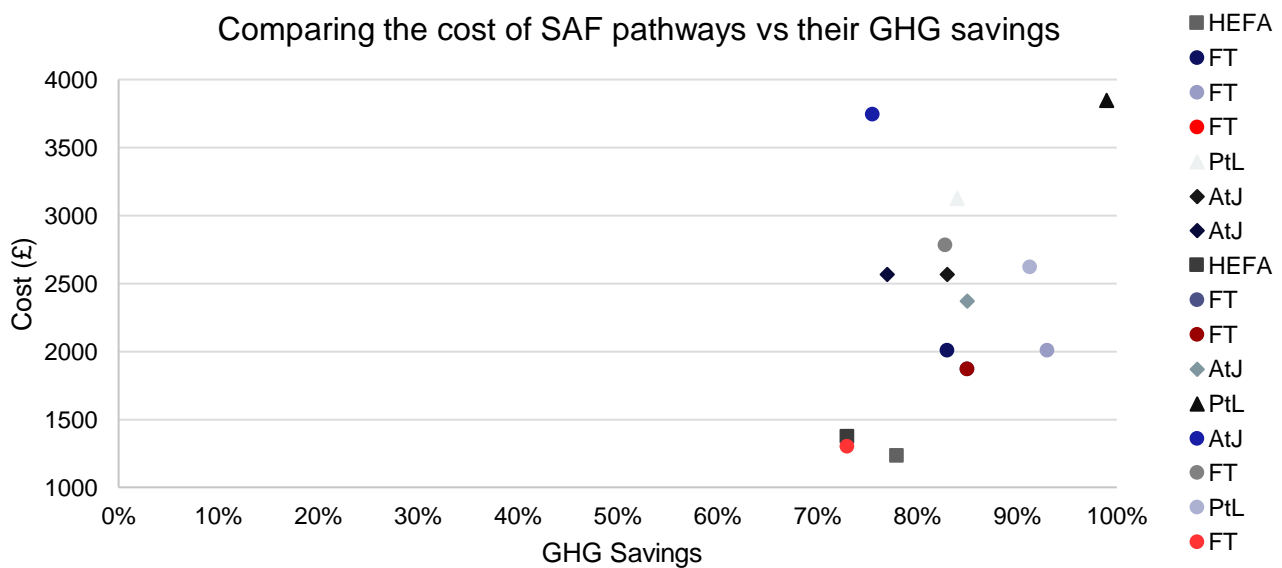


Figure 1: Cost of SAF and associated GHG savings for select pathways

Response to points raised by stakeholders

A small number of stakeholders suggested that a mandate set on a volume-basis would be simpler to administer and regulate. We recognise that there could potentially be additional administrative burden placed on obligated parties, the wider supply chain and regulatory bodies as a result of the mandate. However, we anticipate the administrative burden to be the same regardless of whether the mandate rewards fuel supply on a GHG emissions or volume basis. This is because the same information would need to be provided by obligated parties whether the mandate is volume based or GHG based. This information includes fossil fuel and SAF fuel volumes, carbon intensities, and sustainability characteristics of SAF.

⁵ <https://theicct.org/publication/assessing-the-sustainability-implications-of-alternative-aviation-fuels/>

GHG emissions-based schemes have been effective in other settings such as in the case of the Carbon Offsetting and Reduction Scheme for International Aviation (CORSA), LCFS, and the US Renewable Fuel Standard (RFS).

Additionally, DfT already has a unit in place that has experience of operating two types of mandate. In 2019 and 2020 DfT's RTFO Unit operated both the volume-based RTFO, in place since 2008, and the GHG-based Motor Fuel (Road Vehicle and Mobile Machinery) Greenhouse Gas Emissions Reporting Regulations, a scheme which set GHG reduction targets for suppliers of fuel to road transport and non-road mobile machinery. The RTFO Unit therefore has a wealth of knowledge and expertise on how to run a sustainable fuel scheme based on tradable certificates. This knowledge and expertise, as well as lessons learned through the operation of these two schemes, should help in minimising the administrative burden of a mandate, for suppliers of both road and aviation fuel.

It was suggested that obligated parties would be more likely to buy their way out of the obligation if a tradeable credit scheme is in place. There is no evidence to suggest that a tradeable credit scheme leads to lower compliance. The purpose of a tradeable credit scheme is to allow suppliers to fulfil the obligation in a flexible and cost-effective manner and to encourage suppliers to go beyond their obligation. Credits are only generated once GHG savings have been achieved thereby creating a finite number of credits proportionate to the GHG savings achieved. Therefore, suppliers purchasing credits generated by other suppliers will not result in a loss of GHG savings as that will be independent from the number of parties that will claim those credits under the scheme. Our approach to buy-out is set out in Chapter 5.

Stakeholders also expressed concern that a scheme based on tradeable credits would be more likely subject to fraud. There is no evidence showing a causative link between tradeable certificates and fraudulent supply of fuel in UK policy. In fact, no fraud has been found under the RTFO in the 14 years that the obligation has been in operation. Nevertheless, the Government is keen to ensure that genuine GHG savings are delivered and will continue to work with stakeholders as well as drawing on the expertise of our RTFO Unit to understand how fraudulent supply of SAF can be avoided and disincentivised.

An obligation on suppliers of avtur to the UK

Consultation proposal

The Government wanted the proposed SAF mandate to fall on suppliers of jet fuel to the UK, where jet fuel refers to aviation turbine fuel (avtur) used in jet and turboprop aircraft. It was proposed that the obligation would not apply to aviation gasoline (avgas). It was also proposed that all avtur supplied to the UK would incur an obligation.

The consultation also welcomed views on whether a threshold should be introduced, in each reporting year, below which the avtur supplied is not obligated, and whether this threshold should distinguish between dutiable and non-dutiable fuel so that fuel supplied for certain operations (e.g. emergency services) would not be mandated.

For aviation fuel subject to fuel duty, it was proposed that the owner of the fuel at the duty point would be responsible for meeting the obligation, in line with the RTFO. For fuels which are not typically subject to excise duty, an alternative 'assessment point' would need to be

introduced. The term ‘assessment point’ refers to the point in the supply chain where fuels are deemed as obligated under the mandate. This is also the point where fuel volumes are determined and where it must be demonstrated that the fuel complies with sustainability and eligibility criteria. The consultation welcomed views on where the assessment point under the proposed SAF mandate should be placed to ensure only those who are supplying jet fuel and SAF to the UK incur an obligation and can claim credits effectively.

Question 4

Do you agree or disagree that the proposed SAF mandate obligation should be placed on fuel suppliers that supply aviation fuel (avtur) to the UK?

Summary of responses

Total	Agree	Neither agree nor disagree	Disagree	Don't know
52	41	6	5	0

Most respondents agreed that the proposed mandate should be placed on fuel suppliers that supply aviation fuel (avtur) to the UK. The main argument was that it would be consistent with other schemes in place, which would simplify the process for industry and limit the potential for conflicts with CORSIA which affects airlines. Another key argument was that governing a mandate on suppliers would be easier due to fewer obligated parties and simpler logistics ensuring all fuel is mandated rather than potentially introducing exemptions for certain routes or types of airline. Furthermore, it would not increase the administrative burden on airlines already complying with UK ETS and CORSIA.

However, a few fuel producers noted that an obligation on suppliers may increase the risk of tankering (see **Question 29**). Some airlines also disagreed with the proposal as they believe it could introduce competitive distortions. Thus, they proposed that a mandate is placed on airlines with exemptions on the scope of flights included.

A fuel producer also highlighted that the fuel supplier cannot always guarantee the end purpose for which the fuel is utilised, as dual-purpose kerosene could be used as aviation fuel or for domestic heating.

Government response

Government decision: fuel suppliers that supply aviation fuel (avtur) in the UK will be required to blend an increasing proportion of SAF into their jet fuel supply.

We are pleased to see that almost 80% of respondents agree with the proposal. A number of respondents noted that the proposal will bring other benefits in addition to those set out in the consultation. An obligation on jet fuel suppliers would be consistent with other schemes, such as the RTFO, which will mean that suppliers already have systems in place to supply renewable fuel to road and non-road mobile machinery, which can be extended to jet fuel and SAF and facilitate compliance with the scheme.

As noted above, a few airlines suggested that an obligation on airlines would be preferred so that certain routes could be exempt to avoid competitive distortions. We recognise that domestic airlines would have a greater proportion of their fuel subject to a UK mandate obligation compared to international airlines. The Government wants to ensure an even playing field and believes that all fuel supplied in the UK should be obligated to contribute to our net zero goals. The best way to ensure this is the case for aviation is by requiring all avtur to be subject to the mandate obligation. This would reduce the risk that certain routes or operators are disproportionately impacted, especially short haul flights, for which other decarbonisation options may be more appropriate in the long-term. Furthermore, as previously stated, we expect the usage of SAF to increase globally with the introduction of other international policies, including ReFuelEU and current and proposed support in US SAF production, including the SAF Grand Challenge, LCFS and tax credits for SAF.

Without an obligation on airlines, however, we recognise that some respondents felt there may be greater risk of carbon leakage through tankering. We have set out our approach to this potential risk in **Chapter 4**.

We recognise that dual-purpose kerosene could potentially be used for aviation fuel or domestic heating. However, typically supply chains are set up such that the end destination for the kerosene is defined at the offset. Similarly, as set out in **Question 7** below, we are minded to place the assessment point (i.e. the point at which fuel is tracked and reported on) at the blending and certification point for fuel produced in the UK and at the point of import otherwise. At both of these points in the supply chain, the fuel in question should have been deemed as suitable for use in aviation and therefore either eligible for support or obligated under the mandate. Additionally, in order to claim certificates for the SAF, obligated parties will need to prove that the fuel will be used in aviation. Further information on this can be found in our answer to **Question 35** on the chain of custody.

Question 5

Should the obligation apply to all avtur supplied into the UK, regardless of whether this is subject to fuel duty or not?

Summary of responses

Total	Yes	No	Don't know
48	41	3	4

Most respondents prefer the obligation to apply to all avtur supplied in the UK regardless of its dutiable status. It was suggested that all aviation sectors should contribute to decarbonisation efforts and that differentiating between dutiable status would limit the impact of the mandate in terms of GHG emissions savings and market signal. In particular, respondents felt that general aviation is a profitable market and some of the smallest fuel customers may be best placed to cope with the increase in fuel costs that SAF will likely generate. Several respondents thought that an obligation on all avtur would be easier to implement, reduce administrative burden and reduce the opportunity for potential loopholes to be exploited.

At the same time, several respondents identified specific use cases that should be exempt from the obligation including humanitarian flights, emergency services, military use, public service obligation (PSO) routes and flights for testing or research purposes. However, according to others, the element of fuel duty is not known to fuel suppliers and the supply chain for different end uses can be the same. Therefore, exempting specific use cases may be challenging.

Government response

We have considered the responses to questions five and six together - see government response below.

Question 6

If the obligation applies to all avtur supplied into the UK, should there be a threshold below which fuel is not obligated, in a certain obligated period? Should this threshold distinguish between dutiable and non-dutiable fuel?

Summary of responses

Question	Total	Yes	No	Don't know
Threshold	44	6	30	8
Distinguish by duty	38	3	27	8

Most respondents thought that all fuel should be mandated with no threshold, to maximise GHG savings. Respondents also felt exemptions introduce unnecessary complexity.

Those in favour argued that a threshold would protect small-scale suppliers, especially if the administrative burden is excessive compared to the amount of fuel used. This in turn would keep the market competitive. It was felt that without a threshold there may be greater risk of tankering due to higher costs of fuel across all uses.

Alternative views offered were: that such distinctions risk creating perverse incentives; that the trading scheme can allow small suppliers to meet targets flexibly to avoid any excessive administrative burden; and that many variables contribute to a supply cost increase and these may not be passed onto the customer.

Most respondents did not think a threshold should distinguish between dutiable status for the same reasons as described in **Question 5**.

Government response

Government decision on fuel duty: we can confirm that the obligation will not distinguish by dutiable status.

We recognise that there is broad consensus to apply the mandate to as wide a scope as possible with no exceptions. 85% of respondents support an obligation on all aviation fuel supplied to the UK, regardless of whether this is subject to duty or not, and 68% of respondents do not think a threshold below which fuel is not obligated should be introduced. The Government is keen to maximise the GHG savings achieved through the mandate and ensure that both commercial and private aviation sectors contribute towards reaching net zero. Therefore, the obligation will not distinguish by dutiable status. This means that end uses where fuel is not subject to duty, such as fuel used domestically as a transportation service, fuel used on customs, police and fire-fighting operations and fuel used on PSO routes, will be subject to the mandate.

Government decision on applying a minimum threshold for the obligation: we are minded to introduce a minimum threshold and will consult further on what level it should be set at.

We recognise that stakeholders would generally prefer all fuel supplied to the market to be subject to the obligation. The Government shares the view that aviation fuel should decarbonise across all aviation sectors as quickly as is reasonably possible. However, the purpose of a proposed threshold is to safeguard small volumes of fuel supplied often for particular end uses such as research and testing, for which it would be disproportionate to apply an obligation. This approach works well in the RTFO, where only 7.7% of all renewable fuel for road and non-road mobile machinery (NRMM) falls beneath this threshold, or 0.8% of all road and NRMM fuel (based on 2020 figures). We will continue to refine our analysis as well as take into account the evidence provided in the consultation in order to finalise the proposal regarding a threshold. This proposal, along with supporting analysis, will be presented in the second consultation. We would like to emphasise that the intention of a threshold would be to exempt minimal volumes that could be considered negligible.

Question 7

Where do you think the assessment point should be placed for jet fuel not subject to fuel duty, and how is this going to affect the definition of the proposed obligated party (aviation fuel suppliers to the UK)?

Summary of responses

A third of respondents – including fuel producers, trade associations and airlines – believed that the assessment point (i.e. the point at which jet fuel incurs an obligation) should be at the blending and certification point. This is the last point at which the fuel batch is identified as SAF and it is assessed for compliance with the requirements of fuel standards and is consistent with the RTFO. Several of these respondents proposed that, where SAF is manufactured or blended outside the UK, assessment should be at the point of import where independent inspectors can be appointed to verify fuel volumes and submit reports to be used in verification audits.

However, one fuel producer argued that the blending and certification point is not suitable as the assessment point. Fuel suppliers may purchase fuel from a competitor, in which case sensitive chain of custody information will have to be disclosed leading to an anti-competitive situation.

Several respondents proposed the point of fuel delivery to the airport as the assessment point. This would allow assessment at each airport and provide a standard reference point regardless of whether SAF is blended with fossil kerosene or provided as 100% SAF. A further proposal was to set the assessment point at pre-airfield jet supply terminals where jet fuel is stored in co-mingled tanks. Other suggestions included using the compulsory stock obligation (CSO) model, which would address concerns of sharing sensitive information, or the last point of quality certification to ensure that the destination of dual-purpose kerosene (DPK) is avtur rather than kerosene for home heating.

Government response

Government decision on the assessment point: the Government is minded to place the assessment point at the blending and certification point and will take a final decision following a further discussion with industry through the Jet Zero Council SAF DG Mandate Subgroup.

We are grateful for the proposals provided by stakeholders. Although no one proposal was favoured by a majority, a third of respondents agreed that the blending and certification point should be the assessment point.

Using the blending and certification point as the assessment point aligns with the treatment of avtur under the RTFO. This point was deemed most appropriate as this is the point in the chain of custody where we know that the fuel is fit for use in aviation, where renewable fuel is blended with fossil fuel and certified to meet the appropriate finished aviation fuel specification, and where a refinery certificate of quality (RCQ) is issued. Blending and certification of avtur occurs at a point between when the fuel is owned by the producer and the supplier. Under the RTFO, the supplier is obligated at this point.

Under the RTFO, avtur which is subject to fuel duty is subject to the same assessment point as non-dutiable fuel, as the operation of two different assessment times for the same fuel could lead to the possibility of multiple claims for RTFCs. For the mandate, we are minded to align with the RTFO to avoid separate assessment points under the mandate based on the dutiable status of avtur.

Response to points raised by stakeholders

Several respondents suggested that the point of import could be a suitable assessment point for imported fuel. Imported fuel is recertified upon entering the UK where it is tested to ensure that the fuel is fit for use in aviation. However, the obligated party at the point of import could differ depending on how the fuel is transported and who owns the fuel when it enters the UK, which could potentially cause administrative issues. Similarly, we would like to avoid having more than one assessment point where possible to ensure policy clarity and clear rules for compliance.

The point of delivery of avtur to the airport or at pre-airfield jet supply terminals was also suggested as the assessment point by some respondents. Placing the assessment point here could cause difficulty in verifying the chain of custody of the fuel, as voluntary schemes for aviation fuel generally do not cover the chain of custody past the fuel production plant. This could in turn lead to additional administrative burden on suppliers.

Taking the above information into account, in order to make a definitive decision on the assessment point for UK produced and imported avtur under the mandate we need to further consider:

- data on avtur imports and who generally owns the fuel throughout the supply chain;
- data on who owns avtur at the blending and certification point;
- how the blending and certification point could be used without compromising sensitive chain of custody information;
- how the blending and certification point could be used for fuel that has been blended outside of the UK and then imported; and
- if the assessment point could be placed later in the supply chain without causing difficulty in verifying the chain of custody, and as a result, undue administrative burden.

We will hold a Jet Zero Council SAF DG Mandate Subgroup meeting to discuss these considerations in more detail with industry and stakeholders before finalising a proposal to be shared in the second consultation.

2. Fuel eligibility and sustainability criteria

Technical eligibility criteria for incentives under the mandate

Consultation proposals

To count towards the obligation, it was proposed that the SAF supplied in the UK meets the DEF STAN 91-091 specification, as this is the recognised jet fuel specification for the UK. As the DEF STAN 91-091 refers to ASTM de facto we expect this requirement means that, to be eligible under the SAF mandate, SAF would need to be produced through one of the pathways listed in the relevant D7566 Annex.

As SAF production pathways under certification and potentially new pathways become certified as safe to use in aircraft in the future, or if SAF blend limits are revised upwards, referring to existing DEF STAN 91-091 specification would ensure any changes are automatically included into the eligibility criteria for the UK SAF mandate.

Question 8

Do you agree or disagree that only certified SAF that meets the DEF STAN 91-091 specification should be eligible under the proposed SAF mandate?

Summary of responses

Total	Agree	Neither agree nor disagree	Disagree	Don't know
54	42	4	5	3

Most respondents agreed that only certified SAF that meets the DEF STAN 91-091 specification should be eligible under the mandate. The most common argument put forward was that both DEF STAN 91-091 and ASTM D7566 and D1655 are current industry standards so their use would retain standard jet fuel quality, global interoperability and air safety. Further considerations raised were that aviation equipment and co-mingled logistics systems are certified to use this standard and competitive market distortions would be avoided.

Several fuel producers encouraged the government to ensure the mandate policy wording is aligned with wider industry guidelines, such as the definition from IATA⁶ or Aviation Fuel Quality Requirements for Jointly Operated Systems (AFQRJOS). Specifically, a synthetic blending component (SBC) needs to be consistent with both the pathways permitted and the characteristics specified by ASTM D7566. SBC is then blended with fossil kerosene (up to a pathway-specific limit) into synthetic aviation turbine fuel (SATF) which, when meeting the DEF STAN 91-091 specification, is classed as Jet A-1

Of those that agreed SAF should be compliant with DEF STAN 91-091, some suggested changes should be made to the standards, although this is out of scope for this question. This included upwards revision of the maximum blending limit to support long-term SAF targets and exclusion of the lipid co-processing pathway. However, a few respondents highlighted that revising the specifications is a lengthy and costly process and could be streamlined.

Some respondents disagreed with the proposal, stating that the mandate should also apply to avgas, 100% blends will require a new specification, innovation for alternative pathways will be restricted and important sustainable fuels are excluded.

Government response

Government decision: when replacing avtur, only certified SAF that meets the DEF STAN 91-091 and ASTM D7566 specification will be eligible for incentives under the SAF mandate and count towards the mandate obligation.

The Government must not compromise safety standards when introducing new decarbonisation technologies and we are pleased that the majority of respondents share this view by agreeing with the proposal.

The government is further considering the possibility of other alternative fuels, such as hydrogen and low carbon drop-in replacements for avgas, being eligible for incentives under the mandate but without obligating them in the same way as avtur.

The technological development in alternative aviation fuels is progressing at pace and potential solutions are undergoing significant research and development. However, avgas and hydrogen are not in scope for DEF STAN 91-091 or ASTM D7566 and we risk missing out on potential GHG savings by excluding them from receiving support under the mandate. Furthermore, both of these fuels are currently supported under the RTFO and it would be appropriate for one scheme to provide support to all aviation alternative fuels.

Hydrogen aircraft are expected to contribute to aviation decarbonisation goals as set out in the Jet Zero Strategy. We acknowledge that the adoption of this novel technology will require the production of low carbon hydrogen at scale. The Government is already providing

⁶ “To be acceptable to Civil Aviation Authorities aviation turbine fuel must meet strict chemical and physical criteria. There exist several specifications that authorities refer to when describing acceptable conventional jet fuel such as ASTM D1655 and Def Stan 91-91. At the time of issue of this document, different types of blends have been found to be acceptable for use under these specifications, but must first be certified under ASTM D7566. Once the blend has demonstrated compliance with the relevant product specifications, it may be regarded as equivalent to conventional jet fuel certified under ASTM D1655.”

support for the production of low carbon hydrogen and in the Energy Security Strategy set out an ambition of 10GW of UK production capacity by 2030.

Including hydrogen and low carbon replacements for avgas as eligible for incentives under the mandate could accelerate their development by creating additional revenue streams for producers. While there is potential benefit in scaling up these alternative fuels, further consideration needs to be given to whether the mandate is the best policy to promote their use and how these can be practically integrated into a mandate. Therefore, we can confirm that, *when replacing avtur*, only certified SAF that meets the DEF STAN 91-091 and ASTM D7566 specification will be eligible to contribute towards the obligation under the proposed SAF mandate. We feel that explicit reference to ASTM specification is important to ensure the SAF component adheres to the pathways permitted.

The Government will continue to engage with industry on the development of hydrogen aircraft including through a Zero Emission Flight Delivery Group of the Jet Zero Council which was recently established.

Response to points raised by stakeholders

A couple of respondents highlighted that 100% SAF will likely lead to a new standard specification. We will continue to work closely with the MOD and ASTM to monitor progress of 100% SAF certification and will revise the fuel standards permitted in the SAF mandate to accommodate any new developments, if necessary. It is not anticipated to be a barrier for the introduction of the mandate in the short term.

A couple of respondents expressed concern that introducing a requirement for SAF to be produced via one of the ASTM approved routes would stifle innovation or that some sustainable fuels would be excluded. Indeed, innovative fuels may have the potential to bring significant GHG savings. However, these fuels must be subject to the full certification process to ensure the high level of safety standards continues to be implemented.

The Government has announced £12m for a SAF clearing house to deliver early-stage aviation fuel testing, funding, and expert advice for producers of new fuels hoping to enter testing at all certification stages/pathways. We anticipate a domestic clearing house would build on and further develop existing UK expertise to help reduce uncertainty, cost, and time barriers to SAF development which in turn will broaden the scope of eligible fuels without sacrificing safety. It is our ambition to establish the UK clearing house by the end of 2022 and start providing funding for fuel testing thereafter. When new fuels are approved in line with ASTM specification, they will simultaneously become eligible to count towards the obligation under the mandate. The Government will collaborate with ASTM and international clearing houses to share best practice with the aim of broadening the scope of approved pathways as quickly as possible.

Feedstock requirements

Consultation proposals

The Government was keen to introduce a SAF mandate which delivers fuels with the highest sustainability credentials. To receive credits under the proposed mandate, SAF will therefore

need to adhere to strict sustainability criteria. These will ensure significant GHG emissions savings are delivered and will prevent negative environmental consequences such as the loss of biodiversity, deforestation and the clearance of land with high carbon stock (e.g. dry peatland) that could be associated with the cultivation of raw materials used in certain SAF production.

The consultation proposed the following mandatory sustainability criteria:

- fuels must achieve a minimum GHG emissions saving on a lifecycle basis;
- fuels must be made from sustainable wastes or residues, RCFs, PtL using renewable or nuclear electricity (SAF produced from food or feed crops will not be allowed);
- waste use must comply with the waste hierarchy;
- feedstocks, including residues, should not be obtained from land with high biodiversity value or land with high carbon stocks in or after January 2008;
- SAF production must not direct renewable electricity away from existing applications; and
- where hydrogen is used as a feedstock, the hydrogen must be low carbon.

For clarity, RFNBOs are renewable transport fuels for which none of the energy content of the fuel comes from biological sources. These fuels are considered renewable where the energy content of the fuel comes from renewable energy sources but excluding bioenergy sources. Where the energy content of the fuel comes from nuclear energy sources, we refer to this as SAF from nuclear energy. RFNBOs and SAF from nuclear energy are collectively known as PtL.

Question 9

Do you agree or disagree with the sustainability criteria set out here? If you do not agree, what alternative or additional criteria would you recommend?

Summary of responses

Total	Agree	Neither agree nor disagree	Disagree	Don't know
58	37	8	11	2

Many respondents fully agreed with the sustainability criteria and 12 indicated broad agreement, with some amendments to be made. Several respondents – including fuel producers, airlines and airports – made reference to other sustainability frameworks, suggesting that the UK either adopts or considers these existing frameworks. This included the Roundtable of Sustainable Biomaterials (RSB), the International Sustainability and Carbon Certification (ISCC), CORSIA and ISO 14044:2006 for nuclear energy use.

The remaining comments are presented for each sustainability criterion presented in the consultation document.

Waste-derived biofuels

The inclusion of waste-derived biofuels was broadly accepted, although an NGO warned that 2G biofuels (derived from non-food biomass) will only be able to replace a small percentage of fossil fuel. Many respondents agreed with the exclusion of food and feed crops as they have greater risk of negative environmental and social impacts. However, a few stakeholders suggested that the Government should reconsider this position as inclusion of food and feed crops, particularly if a minimum GHG savings threshold is introduced, as they may allow existing plants in the UK to be repurposed quickly, avoid an increased price for waste by increasing supply of eligible feedstock, absorb excess yields into SAF markets and exploit marginal lands. Further, it was queried why such feedstocks should be excluded from the SAF mandate but would continue to remain eligible under the RTFO.

Renewable fuels of non-biological origin (RFNBOs)

Of those respondents that specifically mentioned RFNBOs, all were positive about their inclusion. It was also noted that the ISCC is currently developing a guidance document for RFNBO certification.

Several respondents recognised the importance of the requirement that renewable electricity is additional to ensure electricity is not diverted away from existing applications which can cause significant indirect GHG emissions. It was suggested by some that this condition may need to be reconsidered in later years as the grid decarbonises further.

In terms of how this condition is implemented, there was consensus among three respondents – an NGO, fuel producer and airline – that power purchase agreements (PPAs) should be used as evidence. This is because it is more likely that this power is genuinely additional, it is the most cost-effective solution as it does not require co-location of SAF and renewable power production and it is more likely to incentivise new renewable electricity production than alternative approaches e.g. Guarantees of Origin (GOs).

RCFs

While there was general support from stakeholders for the inclusion of RCFs, a couple of respondents provided caveats including the use of suitable counterfactuals to ensure their value is proportionate to the carbon savings offered, mitigating the risk of creating a business case for production using carbon waste and ensuring compliance with globally agreed sustainability criteria.

Waste hierarchy

Some SAF producers and NGOs noted the importance of including compliance with the waste hierarchy as a requirement. It was emphasised that SAF should not encourage more waste by creating markets and feedstocks should only be unavoidable waste. The diversion of feedstocks away from existing uses can in some cases generate indirect emissions, wherein displaced materials are replaced by substitute products. To avoid this, it was proposed that suppliers must demonstrate that the feedstock used is a true waste or residue.

Land criteria

While several respondents agreed that there is no need to include land criteria when considering only wastes and residues, there was some minor disagreement with introducing land criteria only for crop and forestry residues.

SAF from nuclear

There were no arguments made against the inclusion of fuel produced using nuclear power. However, some respondents emphasised that the same rules of additionality should apply to nuclear energy. One respondent highlighted the potential using small modular reactors (SMRs) as an alternative to renewable energy in PtL production.

Low carbon hydrogen

Several respondents requested that the government provides more clarity on what is meant by the requirement for hydrogen to be low carbon and whether or not this includes blue hydrogen (natural gas with steam methane forming). A few respondents underlined the need for consistency with the UK Low Carbon Hydrogen Standard (LCHS)⁷.

However, some NGOs explicitly stated disagreement with the use of low carbon hydrogen and prefer only renewable hydrogen to be eligible as a feedstock so as to limit the GHG emissions during the production lifecycle. Conversely, a small number of fuel producers explicitly expressed support for the use of blue hydrogen as an interim whilst industry scales and the grid decarbonises, with the eventual goal of full implementation of green hydrogen.

Some respondents suggested that this criterion should be removed entirely because low carbon hydrogen is not likely to be in widespread use until towards the end of the decade, which could limit the availability of SAF in the UK. It was suggested a phased approach dependent on the availability of low carbon hydrogen would be better or simply that a GHG emissions-based mandate should be enough to incentivise low carbon hydrogen use.

Minimum GHG threshold

Several respondents commented, both in favour and against, on the inclusion of a minimum GHG threshold in the sustainability criteria - this is explained in more detail in **Question 12**.

Consideration of non-CO2 impacts

A couple of respondents noted the importance of assessing non-CO2 impacts, including contrails and pollutant and particulate emissions, because they can cause significant warming.

Counterfactuals

Several respondents urged the Government to consider how to treat the counterfactuals of potential SAF feedstocks, although did not specify which. It was argued that counterfactuals

⁷ In April 2022 BEIS published the [GHG and sustainability criteria for low carbon hydrogen](#) that defines what constitutes low carbon hydrogen at the point of production. Note that this is not a fixed standard and will be subject to regular change.

should consider that some feedstocks are 'locking' the carbon in landfill sites, potentially acting as a carbon removal system, and so turning them into aviation fuel could significantly decrease the expected CO2 savings compared to leaving them underground. They called for the Government to exclude feedstocks that are found to act as carbon sinks.

Government response

We are pleased that the majority of respondents broadly agreed with the high level sustainability criteria proposed, and we note that in instances where respondents disagreed with the criteria the disagreement tended to relate to a specific element(s) of the criteria rather than the high level principles suggested. We will now present the government decision for each sustainability criterion presented in the consultation document in turn.

Waste-derived biofuels

Government decision: biofuel eligibility under the mandate will be limited to waste-derived biofuels.

Whilst we recognise the position that crops currently used to create the bioethanol blended into petrol could be repurposed into aviation fuel, we consider it important that the long term trajectory for the SAF mandate (and low carbon fuels more broadly) focuses on those fuels that deliver the best greenhouse gas savings and have the least indirect impacts. Consequently, we plan to take forward our proposal to limit support for biofuels under the mandate to those derived from wastes.

RFNBOs

Government decision: RFNBOs which meet the sustainability criteria (to be determined) will be eligible for support under the SAF mandate.

As RFNBOs are an important pathway that can contribute to significant GHG savings, we can confirm their inclusion in the mandate. However, there was less consensus on the specific additionality rules that should be applied to RFNBOs. It is proposed that the eligibility criteria applied to RFNBOs and specifically the rules concerning additionality will be the same as those established in the RTFO, but this will be subject to further consultation prior to the introduction of the mandate noting the feedback from respondents on this topic.

RCFs and counterfactuals

Government decision: RCFs will be eligible for support under the mandate subject to meeting the sustainability criteria which will be finalised in advance of the launch of the scheme.

The Government is committed to establishing sustainability requirements for RCFs which accurately represent the greenhouse gas savings the fuels deliver. In line with this vision, a number of respondents to the consultation stated that their support for RCFs was contingent on the GHG savings attributed to the final fuels accurately reflecting real world savings, and the policy not creating an incentive to produce waste. The UK is expected to be one of the first countries in the world to introduce support for RCFs and has launched a further targeted

consultation which proposes a refined greenhouse gas methodology and sustainability criteria specific to RCFs. The RCF consultation includes proposals on the appropriate counterfactuals to apply to RCFs and provides further detail on the rationale for the counterfactuals proposed. Subject to the results of this consultation, it is anticipated that the same baseline criteria will be applied to RCF fuels supported under either the RTFO or the SAF mandate.

Waste hierarchy / waste assessment

Government decision: a waste assessment will be conducted at feedstock level to determine whether or not a feedstock is eligible for support under the SAF mandate; this assessment will be informed by the waste hierarchy and alternative end uses.

Confidence that SAF production does not lead to unintended negative consequences is a critical component in securing support for its production and use. The waste hierarchy will ensure that the mandate only supports true wastes i.e. those which cannot be prevented, reused or recycled, and those wastes for which the use of biofuel represents the 'best environmental outcome arising from that waste'.

Before a waste can be deemed eligible for support via the SAF mandate the scheme Administrator⁸ will first consider whether or not the material in question meets the definition of a waste. That is, a waste is any substance or object which the holder discards, intends to, or is required to discard, excluding substances that have been intentionally modified or contaminated for the purpose of transforming them into a waste.

It is then proposed that the Administrator would consider the following factors to determine whether the potential feedstock is eligible for support. These are the same factors currently considered for biogenic wastes under the RTFO (as set out in the [Energy Act 2004](#)):

- carbon emissions
- agriculture
- other economic activities
- sustainable development
- the environment generally

Land criteria

Government decision: biofuels derived from agricultural wastes will be subject to the land criteria, biofuels derived from forestry wastes will be subject to the forestry criteria.

Where biofuels are produced from wastes such as agricultural or forestry wastes and residues, we consider it important that any land use impacts resulting from the harvesting of the principal crop and or collection of the resultant waste are appropriately managed.

We will include the same land criteria as the RTFO with respect to protection for land with high carbon stock and or high biodiversity. These criteria define land categories on which feedstocks for biofuels cannot be grown at all. Land with high carbon stocks are natural

⁸ The Administrator is responsible for validating supplier claims and issuing certificates. In the RTFO, the role of Administrator is fulfilled by Department for Transport officials.

carbon stores and sinks - which if destroyed or damaged can release carbon and contribute to climate change. Similar criteria exist for biofuels made from forestry.

If not appropriately managed, the collection of agricultural residues can also have negative impacts on soil carbon and quality. We will require suppliers of biofuels produced from agricultural residues to measure and monitor the impacts of their fuel on the soil quality and carbon at the source site, in line with the 2021 amendments to the RTFO introduced soil carbon criteria for agricultural wastes and residues.

SAF from nuclear energy

Government decision: SAF produced from nuclear power which meets the sustainability criteria (to be determined) will be eligible for support under the SAF mandate subject to legal powers.

The Government believes that nuclear power will be an important power source in SAF production, particularly with advent of novel solutions such as SMRs. In recognition of the negative environmental impacts that could arise from redirecting nuclear energy already utilised for another function to SAF production, we are minded to include an 'additionality' requirement where nuclear power is used to produce SAF, although we acknowledge there may be challenges with implementing this. This requirement will be subject to further consultation prior to the introduction of the mandate noting the feedback from respondents on this topic, the importance of ensuring that this position complements the UK's wider nuclear energy strategy, and the practicality of implementing such a requirement.

Low carbon hydrogen

Government decision: where hydrogen is used as a feedstock, it must be low carbon. Hydrogen eligibility will be contingent on the final fuel meeting the GHG threshold set out in the mandate. Further consultation will follow which will consider if and how other eligibility criteria should apply to different hydrogen production processes.

The requirements surrounding hydrogen are complicated by the fact that hydrogen can potentially be used in a number of different ways to produce SAF, including as a feedstock or as a process input in fuel production.

For the purpose of the SAF mandate we are clear that the determination of whether or not a fuel meets the GHG requirements set out in the response to **Question 13** will be based on the carbon intensity of the final fuel, and that this will be calculated on a lifecycle assessment basis, consistent with the approach described in response to **Question 16**. Consequently, if hydrogen is a precursor in fuel production, the emissions resulting from the production of the hydrogen should be factored into the final GHG emissions value and not attributed to a different sector of the economy.

With regards to the wider sustainability criteria (for example renewability) that should apply to hydrogen when used as a feedstock, the views of respondents were less consistent. Some felt that hydrogen support should be limited to renewable or 'green hydrogen' whilst others suggested the requirements should be consistent with the recently published UK Low Carbon Hydrogen Standard (LCHS) which considers fossil (with CCUS) and nuclear derived hydrogen where the GHG intensity is below 20g CO₂e/MJ at point of production - importantly, it is not a well-to-wake mechanism. While there are advantages in aligning our sustainability

criteria with the UK LCHS, the sustainability criteria will be adapted for different funding mechanisms whereas the SAF mandate will require fixed sustainability requirements for hydrogen. We intend to consult further on the specific sustainability criteria that should be applied to hydrogen feedstock supported under the SAF mandate in advance of the introduction of the mandate.

Minimum GHG threshold

Question 12 and **Question 13** address this in more detail - see government response below.

Consideration of non-CO2 impacts

Government decision: we recognise that aviation fuels do have non-CO2 impacts and we are committed to considering these in the design of the SAF mandate. We will include any proposal that is developed in the second consultation.

We recognise that aviation fuels, and indeed fuels more generally have environmental impacts which extend beyond simply CO2 emissions. However, we are also aware that evidence on the non-CO2 climate and environmental impacts of aviation fuels is less developed than that of CO2, and that very little research has been done to understand how the non-CO2 impacts of SAF compare to those resulting from fossil aviation fuel and how these can be accurately accounted for.

It is also important to note that non-CO2 impacts are not directly comparable with CO2 impacts due to the localisation of the impact and the relatively short time frame for which the impacts exist.

Nevertheless, DfT is committed to considering the emerging evidence on non-CO2 emissions and will consider developing criteria to address these impacts and factor them into the design of the SAF mandate. This may require DfT to commission research to develop a body of evidence that is robust enough to inform policy and include in the second consultation to identify and propose measures to address non-CO2 impacts.

Question 10

Do you agree or disagree with the feedstocks set out here and listed in Annex B? If you do not agree, what alternative or additional feedstock(s) would you recommend?

Summary of responses

Total	Agree	Neither agree nor disagree	Disagree	Don't know
55	29	7	19	3

Several respondents felt that setting out a list of eligible feedstocks is premature, prescriptive and unnecessary. They consider there is a risk it would stifle innovation and risk investment and production volumes going abroad. Such an approach would not be in line with a technology and feedstock-neutral position. Rather, respondents believed that by introducing

robust sustainability criteria and rewarding SAF proportionately to the carbon savings achieved, feedstocks with high carbon intensity will be excluded or disadvantaged.

A few respondents suggested alignment with other schemes, such as EU RED II and CORSIA, in order to create consistency for stakeholders and facilitate the development of a global SAF market.

Waste-derived biofuels

A few fuel producers suggested that cellulosic corn fibre (more generally C5-C6 hemi-cellulosic waste) should be included as a source of ethanol. This material has no food value and is currently used for high protein animal feed where it has a negative effect as it reduces its nutritional content. It has been approved as a crop residue in the US and demonstrated to have high carbon savings in the LCFS.

A few airlines and NGOs did not agree with the inclusion of any palm products in the feedstock list, in particular PFAD and empty palm fruit bunches. There is a risk that these products, if considered a waste under the SAF mandate⁹, would increase the economic incentive for growing palm fruits leading to greater deforestation.

A few respondents emphasised that segregated oils and fats (SOFs) should be removed as eligible feedstocks so that the mandate would support higher investments for novel technologies and avoid the diversion of SOFs from the road transport.

Some NGOs suggested that domestic green waste should be included for production of SAF as the alternative is composting, which releases heat and carbon dioxide. Other comments warned that waste-based fuels are problematic since some release CO₂ that would otherwise remain inert and others use carbon that was captured historically. In addition, some wastes, specifically farmed salmon oil, tallow and waste-wood, are subject to risk of overproduction and harmful practices to meet the increased demand.

RFNBOs

A couple of respondents underlined that the feedstocks used in RFNBO production will become increasingly important; no other comments were made.

RCFs

Several respondents, largely fuel producers, explicitly noted their agreement with the inclusion of feedstocks for RCFs. These feedstocks were underlined as an important contributor to SAF production volumes that can diversify the fuel mix beyond biomass, although a couple of respondents noted that depending on how counterfactuals are accounted and RCF rewarded, certain SAF plants may or may not be financially viable. However, there was disagreement amongst respondents on the scope of RCF feedstocks included.

One respondent suggested that the scope of feedstocks eligible for support to produce RCFs include any fuel made from genuine waste. Similarly, another respondent proposed

⁹ PFAD is not currently considered a waste under the RTFO.

that all non-biogenic waste streams that cannot be recycled should be eligible. As an example, non-recyclable plastic waste, the non-biomass portion of organic municipal waste and the oil derived element of recycled tyres should be eligible. Finally, industrial waste process gases are acceptable if they would otherwise be incinerated or vented to atmosphere.

A couple of NGOs argued that fossil carbon feedstocks should be excluded as they are not compatible with carbon neutrality, unlike carbon captured in biomass or directly from the atmosphere. Furthermore, subsidising fossil carbon feedstocks may reduce the incentive to implement other solutions, such as DAC, which will could be well developed by 2030.

Energy crops

There was broad agreement that fuels should be limited to wastes and residues to ensure feedstocks do not displace or compete with food crops (see **Question 9**). A few fuel producers argued that some food or feed crops can produce biofuels with GHG savings in a cost-effective way, ILUC and biodiversity impacts can be properly managed, they already exist at scale and mitigate potential delays in development of SAF technologies.

More specifically, it was recommended that cover crops such as poplar, miscanthus, switchgrass, carinata and pennycress should be listed as potentially eligible feedstocks as these have been evaluated by other bodies and deemed to achieve significant GHG savings even when accounting for ILUC impacts.

Specific feedstocks to be added

In addition to those described above, a few respondents suggested that algae should be added, albeit not a residue. A couple of respondents suggested that many feedstocks should be removed including bracken; cashew nut liquid; rapeseed residue; sugar beet residue and tops, tails, chips; waste wood; bagasse; and straw as these could cause one or more of several negative impacts like increasing waste production and impacting food chains.

Government response

Government decision: the Government will not publish an exhaustive list of feedstocks at this point but will instead evaluate feedstocks on an individual basis.

The Government is keen to utilise all available feedstocks, including novel feedstocks, providing they meet the sustainability criteria set out in **Question 9**. By assessing feedstocks on an individual basis, rather than publishing an exhaustive list, we will increase the pool of eligible feedstocks and diversify the fuel mix. These feedstocks will be evaluated in line with the requirements set out in **Question 9** i.e. biofuels will be limited to those derived from wastes, with eligibility based on a waste assessment; PtL feedstocks must be either water or carbon; and RCF feedstock eligibility will be informed by and consistent with the approach taken under the RTFO.

In response to the concerns around empty palm fruit brunches and PFAD, we would like to clarify that we do not propose to support the use of PFAD in the mandate. For the purpose of the RTFO the department considers PFAD to be a co-product from palm production due

to its use in chemicals, soap and sometimes as animal feeds. We will take a consistent approach in the SAF mandate.

Some of these respondents extended the argument that creating a market for wastes has wider impacts on the production of agricultural wastes and residues more broadly. We recognise that the concerns of creating a market for wastes exist, and in recognition of these risks we propose (as set out in **Question 9** above) to assess waste feedstocks on a case by case basis; this assessment will consider the alternative uses of wastes, and follow the established waste hierarchy principles. A key criterion will be that the classification of the feedstock as eligible does not create an incentive to produce waste

We have explained our rationale for not including energy crops in **Question 9**. This is consistent with our long-term policy and aligned with the introduction of the development fuels target in the RTFO in 2018.

Minimum carbon savings

Consultation proposals

A fuel's GHG emissions intensity is a measure of the GHG emissions generated per unit of energy contained in the fuel, expressed in gCO₂e/MJ. It was proposed 89 gCO₂e/MJ is used as the baseline lifecycle GHG emissions intensity to represent jet fuel under the SAF mandate. This figure is accepted on an international level¹⁰ and accurately represents real world GHG emissions.

It was proposed that SAF meets a minimum GHG saving threshold to be eligible to contribute to the proposed SAF mandate obligation. We anticipated that the minimum GHG saving threshold all SAF would need to meet should be at least 60%. We welcomed views on what the threshold should be and how this should change to reflect the expected improvements in carbon intensity over time as a result of carbon capture technologies.

Question 11

Do you agree or disagree that the baseline lifecycle GHG emissions intensity for aviation fuels for reporting purposes under a UK SAF mandate should be 89 gCO₂e/MJ? If you do not agree, what should the baseline emission be and/or how should it be calculated?

Summary of responses

Total	Agree	Neither agree nor disagree	Disagree	Don't know
51	40	5	3	3

¹⁰ ICAO adopted the baseline carbon intensity of 89gCO₂e/MJ in Annex 16, Volume IV of CORSIA which has been agreed upon by all participating states and came into effect in October 2018.

Most respondents agreed with setting the baseline lifecycle GHG emissions intensity for aviation fuels for reporting purposes at 89 gCO₂e/MJ as this aligns with the ICAO standards¹¹ used for CORSIA (or other schemes such as the California LCFS), creating standardisation internationally. Using another figure could overcomplicate claiming fuel under CORSIA or possibly disadvantage the UK.

A couple of respondents supported 89 gCO₂e/MJ on the basis that it accurately reflects aviation fuel carbon intensity and referenced an ICCT paper in which a range of carbon intensities align with this figure. Going forward, an NGO and government body suggested that this figure would need to be revised over time. For example, recent analysis by Lee et al. (2021)¹² estimates that, in 2018, the overall climate impact of flying was about three times that of CO₂ alone and in the future could be accounted for in the baseline carbon intensity.

Several respondents - predominantly fuel producers - were uncertain or disagreed with 89 gCO₂e/MJ on the basis that it does not align with other schemes such as the RTFO, GFGS and RED II and would introduce unnecessary complexity.

Government response

Government decision: the baseline lifecycle GHG emissions intensity for aviation fuels for reporting purposes will be 89 gCO₂e/MJ.

Most respondents agree with the proposal as it aligns with predominant international schemes and accurately reflects aviation fuel carbon intensity. We do not anticipate that a different baseline carbon intensity to the RTFO will introduce complexity for fuel producers claiming under both schemes. This is because suppliers will report on carbon intensity, rather than percentage reduction, as is currently required in the RTFO. Therefore, we can confirm that we will proceed with the proposal as set out in the consultation.

Question 12

What should the minimum carbon intensity reduction SAF will need to meet be (subject to the final GHG methodology used)?

Summary of responses

Total	0% or 10% ¹³	40%	50%	60%	65% ¹⁴	70%
43	10	2	7	9	13	2

Many respondents indicated that it would be ideal if the minimum threshold aligned with other domestic and/or international policies as harmonisation makes it easier for SAF

¹¹ <https://elibrary.icao.int/home/product-details/229739>

¹² Lee et al., "The contribution of global aviation to anthropogenic climate forcing for 2000 to 2018," Atmospheric Environment, Volume 224, (2021), <https://doi.org/10.1016/j.atmosenv.2020.117834>

¹³ Includes respondents that stated a preference for aligning with CORSIA

¹⁴ Includes respondents that stated a preference for aligning with RTFO, UK ETS or the EU RED framework

producers and airlines to operate under more than one scheme. However, there was no real consensus among stakeholders as to which scheme the mandate should be consistent with:

- Several airlines and SAF producers suggested aligning with the RTFO to simplify the process for UK SAF producers operating under both schemes.
- A few respondents recommended that the SAF mandate should be consistent with CORSIA as it has a low threshold of 10% so provides flexibility to the market and provides a broad range of fuels to be used in the UK. However, a couple of respondents felt that the 10% is far too low for a minimum threshold.
- A few airlines underlined that the threshold should be 65% in alignment with UK ETS to enable airlines to claim SAF under this scheme.
- A few respondents preferred aligning with the EU RED framework, as it would facilitate EU SAF producers to locate new plants in the UK and open the UK up for imports.

In addition, several respondents indicated preference for a given threshold without mention of aligning to other schemes. Those that provided justification for their response cited:

- A 'de minimis' threshold of 10% could avoid the administrative burden for fuels with small GHG savings and to account for uncertainty in the GHG savings calculation methodology.
- A threshold at 40% would give producers a wider opportunity to produce eligible SAF and reduce the risk of non-compliance for producers struggling with technical difficulties, while still sending a strong signal to the market.
- Any threshold higher than 60% could make it difficult for FOAK projects to meet the GHG saving requirement without CCUS while a threshold below this may not incentivise innovation in decarbonisation technologies.
- Two respondents suggested that a threshold of 70% should be used as this will drive technological development towards net zero and is already being achieved in biofuel production according to DfT's data.

Several respondents – predominantly fuel producers and airlines – indicated that a minimum threshold is unnecessary under a GHG emissions-based scheme on the basis that the use of most sustainable fuels will already be incentivised (see **Question 3**). Among the respondents, there were concerns that implementing a threshold could introduce the risk of distortion, inadvertently incentivise specific fuels or hinder the development of new pathways. A further advantage of not implementing a threshold is that it lets the market deliver the GHG savings at the lowest cost while the proposed sustainability criteria are already likely to deliver SAF with significant GHG savings.

There was some concern that a minimum threshold would render RCFs ineligible. A few respondents underlined that the GHG calculations methodology, including counterfactuals, needs to be established prior to setting a minimum threshold (see **Question 15**) as the combination of a threshold and a counterfactual could lead to RCFs not being able to meet the criteria. Meanwhile, one respondent suggested a lower threshold of 10% could be set for RCFs only until CCUS technologies are more readily available.

Government response

We have considered the responses to questions 12 and 13 together - see government response below.

Question 13

Are there any land use (direct or indirect) or other implications associated with the feedstocks set out earlier that we should reflect in the eligibility criteria and minimum GHG emissions threshold?

Summary of responses

Several respondents, including fuel producers, NGOs and an individual underlined that there is no need to account for land impacts (direct or indirect) when using wastes or residues because no land is affected. Given there are no dedicated energy crops in the proposed eligibility criteria, for which there are land use implications, the introduction of minimum GHG emissions threshold was perceived as unnecessary. In any case, a robust GHG emissions methodology should already take into account land use impacts.

However, others urged the Government to consider how other schemes treat implications on land use. In particular, consideration should be given to apply the CORSIA Land Management Practices and report GHG emissions reduction accounting both with and without ILUC for clarity and transparency. Others suggested using land use criteria that are part of approved certification schemes or recognised standards, such as RSB.

Specific considerations proposed to be accounted for in land criteria included biodiversity, water, land use, and soil health impacts. A respondent suggested that 'land' use needs to be defined and include hydroponic, aquaponic, littoral and seabed use with maritime biowaste and feedstocks included as options. Others suggested that feedstocks grown on contaminated, degraded and unused land should be allowed and biofuels should use only plant species already existing in UK, assuming that the UK is self-sufficient in feedstock.

Additional comments on specific feedstocks were:

- As discussed in **Question 10**, a few respondents were concerned about the use of waste and residue products of certain types of feedstocks, notably palm fruits (PFAD and empty palm fruit bunches) and soy, due to their land use implications. Thus, excluding certain feedstocks from the mandate will be necessary to ensure the highest sustainability credentials if land use criteria are not applied. It should be noted that CORSIA does not apply ILUC values to waste products.
- One respondent stated that given the reliance on HEFA and UCO anticipated by industry, it would be appropriate to check the end-of-life fate of these feedstocks when placed in landfills (e.g. the rate of decay into GHG), to ensure they will achieve the expected GHG savings.

Expanding the scope of the question beyond feedstocks, one respondent suggested there should be sustainability criteria regulating the construction of SAF production plants given this can have a potential impact on biodiversity and land-use change.

Government response

Government decision: We will introduce a requirement that SAF must achieve a reduction in carbon intensity. We are minded to set this minimum GHG savings threshold at 50% compared to fossil kerosene, meaning that the maximum carbon intensity of SAF permitted in the mandate would be 44.5 gCO₂e/MJ.

The Government believes that a minimum GHG savings threshold is necessary to avoid the fuels market being saturated with SAF that has limited GHG savings, even if a GHG emissions scheme inherently carries less risk of this compared to a volume-based scheme.

We are minded to set this threshold at 50% because:

- it aligns with the proposed maximum carbon intensity of RCFs in the RTFO, addressing a key ask from industry to align with an existing scheme;
- it considers feedback from the GFGS competition, which indicated that a too stringent threshold may discourage plant developers from locating in the UK. This threshold is deemed flexible enough to ensure a broad scope of existing SAF is eligible and allows potential for innovative fuels and feedstocks to be used. This in turn maximises SAF volumes available to the market and will likely lead to a diverse fuel mix; and
- a common threshold across all types of SAF ensures a level playing field.

As noted by respondents, (direct and indirect) land use impacts are not typically associated with wastes or residues. Indeed, this is recognised by existing schemes including the RTFO, RED, CORSIA and sustainability certification bodies. Where these land use and wider sustainability impacts are observed, we have proposed criteria that will prohibit certain feedstocks from being utilised. While we believe that these criteria should be sufficient to mitigate negative environmental impacts, a minimum GHG savings threshold is a safeguard against unexpected developments related to environmental impacts of feedstocks.

For those projects that are not able to meet the threshold, there will be a possibility of retrofitting CCUS technology into the plant. The integration of CCUS into SAF production plants is discussed in **Question 14**.

The table below presents a comparison of the preferred maximum carbon intensity in the mandate and in existing schemes. Our preferred minimum GHG savings threshold would ensure that SAF produced under all other schemes will be eligible under the mandate, providing all other sustainability criteria are met. The exception to this is CORSIA which prescribes a GHG savings threshold of 10% and presents a different GHG methodology that takes ILUC into consideration (see **Question 16**).

Scheme	Maximum CI
SAF mandate (preferred)	44.5 gCO₂e/MJ
RTFO biofuels/RFNBOs (from 2021)	32.9 gCO ₂ e/MJ
RTFO RCFs (proposed introduction date)	42.3 gCO ₂ e/MJ
RTFO RCFs (proposed 2032)	32.9 gCO ₂ e/MJ
EU RED II (from 2021)	32.9 gCO ₂ e/MJ
UK ETS	32.9 gCO ₂ e/MJ
CORSIA	80.1 gCO ₂ e/MJ

Before making a final commitment on exact minimum GHG savings threshold, we will consider the minimum GHG savings threshold introduced for RCFs under the RTFO following the conclusion of the recently published consultation.

Question 14

As more CCUS becomes available and the GHG emissions intensity of fuels can decrease further, should the envisaged minimum GHG emissions intensity threshold be raised up over time?

Summary of responses

Total	Yes	No	Don't know
52	24	22	6

There was no consensus among respondents on this proposal. The main argument in favour of increasing the threshold is that it would help the transition to better quality SAF and set the pathway to ultimately achieving net zero aviation through the use of carbon neutral fuels, in particular PtL obtained from DAC.

Several respondents agreed that the threshold should increase over time, given that production efficiency will increase as scale increases, technical optimisation improves and fuel sources are varied. By initially setting the threshold low and increasing over time, SAF producers have a more realistic goal of producing eligible SAF in the early years and more plants are likely to develop. Furthermore, an increasing threshold could set the path towards net zero aviation and incentivise SAF producers to invest in the most carbon efficient technologies. Several respondents stated that if the threshold is to increase, this should be decided at a later date, ideally in the planned regular reviews (see **Question 21**), to allow time for carbon capture and storage infrastructure to develop given the nascent status of CCUS. Some respondents urged the Government to use technological development of SAF pathways to inform the threshold. This could be used to mitigate the risk of over or understating the emissions intensity threshold, which could potentially result in stifling development of certain pathways or impacting SAF prices if certain pathways are less commercially available.

Several respondents expressed concern that increasing the threshold would risk causing uncertainty for investors if there is no guarantee that their product will be eligible in the long-term. This could in turn impact the availability and cost of SAF for users. Some respondents proposed that any increases to the threshold should be established well in advance using a transparent process agreed with industry. Several others suggested that minimum threshold increases should only apply to new production plants to ensure future regulatory uncertainty does not undermine the investment signal of the proposed mandate.

Of those who disagreed, the most common argument was that a GHG emissions scheme awarding credits proportionate to the carbon savings will already incentivise the most

sustainable fuels. A trade association added that if it becomes clear that there is scope for the mandate to deliver higher GHG savings then that is an argument in favour of increasing the overall ambition of the mandate rather than the minimum required savings.

A few others think it is premature to establish such an approach given the uncertainty of the development of CCUS technologies. Respondents noted that the development of CCUS infrastructure is dependent on other factors such as effective carbon pricing and government support. Other concerns with the use of CCUS were that it is only applicable to some SAF production pathways or geographical locations leading to advantages for select fuel producers, it could cause credit prices to drop or it diverts resources away from other decarbonisation measures such as zero-emission flight.

A couple of respondents disagreed with the proposal because they viewed CCUS as a mitigating technology to help processes and industries which cannot change. There is a risk that SAF would be tied to the development of CCUS projects and the Government should ensure that pathways to SAF production are not stifled. Furthermore, there is a risk that this proposal could become an overly restrictive demand suppression measure on aviation in the UK compared to aviation outside the UK.

Finally, a few respondents noted the interactions between the different policy mechanisms are unclear, but it will be essential to provide a business case and fiscal support to enable SAF production and CCUS together.

Government response

We would like to thank stakeholders for the detailed responses and evidence they have provided in response to this question. Although it was widely recognised that CCUS can introduce significant environmental benefit into SAF production, some respondents expressed caution in placing a dependency on the technological and commercial development of CCUS. **The Government recognises CCUS as a key driver for emissions savings in the UK in the long-term. However, we are not yet in a position to confirm the optimum approach for scaling up CCUS facilities in SAF production and whether additional mechanisms, including an increasing threshold, will be necessary.**

DfT will continue to review evidence, conduct analysis and collaborate with BEIS (which CCUS policy falls within) to refine policy proposals. Stakeholders will have an opportunity to comment on final policy proposals in the second consultation.

Greenhouse gas emissions methodology

Consultation proposals

Fuel suppliers must be able to demonstrate that their fuel achieves the minimum level of GHG emissions savings through an assessment of the carbon intensities of feedstock cultivation, fuel processing and/or transport. To ensure that suppliers are able to calculate GHG emissions savings in an accurate and consistent manner, a SAF mandate requires these savings to be calculated with a prescribed GHG emissions calculation methodology. We welcomed views on what methodology should be used.

Question 15

What GHG methodology should be used to calculate the carbon intensity of fuel?

Summary of responses

Existing approach to be adopted in the SAF mandate

Many respondents, including fuel producers, airlines and airports, highlighted that it is preferable for the methodology to align with an existing methodology to reduce administrative complexity. As well as being embedded into third party sustainability certification schemes, this would minimise the risk of SAF accounting differences for global airlines or the risk of placing UK SAF producers at a competitive disadvantage.

11 respondents stated that the GHG methodology should align with CORSIA as it would create a level playing field given the international nature of the aviation industry and supply chains. Other reasons included that CORSIA could become the regulatory benchmark, better facilitate imports and exports and is specifically designed for SAF.

Nine respondents stated that the SAF mandate GHG methodology should align with that of the RTFO. The UK market is familiar with the methodology and it would reduce administrative burden for suppliers applying for credits under both schemes. A few of these respondents provided specific alterations to better represent the lifecycle emissions of fuel. This included accounting for direct and indirect land use change in line with the EU RED framework, recognising additional GHG benefits of biogenic CO₂ streams in comparison to other recycled carbon sources, excluding CO₂ from fossil sources where this is not from fossil wastes and including bioenergy as a suitable power source.

There was some support for using an alternative methodology to either RTFO or CORSIA. A small number suggested the use of the EU RED framework methodology as it already forms the basis of the RTFO, is widely used for SAF traded in Europe, and the EU is considering methodologies for RFNBOs and RCFs which would benefit from consistency with UK. Other than this, two respondents suggested the use of the GHG model known as GREET or best practices provided by RSB and ISCC.

Considerations for methodology

Some respondents highlighted specific considerations that the methodology should account for. In particular, many stakeholders underlined the importance of accounting for the full lifecycle of emissions. One respondent suggested that a robust lifecycle GHG methodology removes the need for additional provisions like feedstock lists and minimum thresholds. Apart from this, respondents suggested accounting for non-CO₂ emissions and considering differences between specific hydrogen routes.

Government response

We have considered the responses to questions 15 and 16 together - see government response below.

Question 16

How should the GHG methodology vary to take into consideration the different fuels, feedstocks, power sources and production pathways?

Summary of responses

Several respondents felt that maintaining a technology neutral approach is important and the scope of the GHG methodology should not change for specific technologies or pathways. A few highlighted that there is no need to vary the methodology when it is based upon a well audited lifecycle emission framework and called for a standardised lifecycle emissions tool such as the GREET model.

However, several respondents – mainly airlines – underlined that the GHG methodology should seek to capture the differences in GHG emissions between fuels, feedstocks, power sources and production pathways as accurately as possible. Where gaps currently exist, respondents urged the Government to work with industry to identify suitable solutions and to ensure changes are made as quickly as possible.

Some respondents also commented specifically on how fuels, feedstocks, power sources and production pathways should be treated, as described below.

Fuels

With respect to different fuel types, all comments concerned how RCFs are treated. Several fuel producers identified the need for further clarity on the RCF methodology and noted that the Government should await the outcome of the upcoming RCF consultation. The lack of distinction between GHG methodologies for waste-derived biofuels and RCFs in CORSIA was identified as an issue as it is difficult to meet the minimum threshold using this methodology without the use of CCUS technologies. One airline added that it is important to enable the use of residual emissions to reduce the net climate impact of these feedstocks.

Feedstocks

One respondent suggested that the carbon intensity values¹⁵ should be as consistent with CORSIA as possible, where improved values for waste feedstocks are included, thereby incentivising waste derived SAF. It was suggested that the UK should adopt these default values from 2025. This would not include negative values for some dedicated energy crops that have been used during the pilot phase, ending in 2023.

Power sources

A small number of fuel producers noted there are outstanding concerns relating to the treatment of input electricity for RFNBOs. This included how the grid electricity counterfactual is treated and emissions arising from the impact of not putting that green power into the grid (i.e. is not additional). An individual also suggested that hydropower should not be used since it is stored energy and can be used to effectively balance grids.

¹⁵ Grams of CO₂ required to produce one megajoule of SAF from specific feedstock and production pathway

Government response

Government decision: The Government is minded to adopt the RTFO methodology. However, we recognise that the methodology may need to be adapted to accommodate differences in the mandate and RTFO sustainability criteria and as RCF policy develops.

The Government is committed to ensuring that the GHG savings resulting from the use of sustainable fuels are accurately calculated. It is evident that there are benefits to aligning with an existing methodology. Indeed, this is the preference of stakeholders and there is no evidence to suggest that alternative methodologies could capture LCA emissions more accurately.

The RTFO methodology is known to UK fuel suppliers (many of which will be applying for credits under the mandate), voluntary schemes carrying out audits and consultancies that may carry out calculations on behalf of suppliers. Adopting the RTFO methodology will therefore facilitate compliance and understanding for many UK suppliers submitting claims under the SAF mandate.

The RTFO methodology resembles the methodology set out under the RED framework almost in its entirety. While there may be differences in definition of wastes, GHG thresholds and sustainability criteria (e.g. additionality rules), the life cycle assessment is the same. Adopting the RTFO methodology will therefore facilitate SAF imports from EU suppliers as well as potentially allowing auditing of UK and EU SAF mandates to take place under the same voluntary scheme as currently happens with the RTFO and RED. This is discussed further in **Question 40**.

Furthermore, the Government is currently amending the RTFO methodology to introduce life cycle assessment that better accounts for the emissions of specific fuels; namely, RFNBOs and RCFs. The RED framework is currently developing an RCF methodology separate to the UK Government. However, there is uncertainty surrounding the shape the methodology will take and timescales for implementation. We recognise the urgency in introducing a mandate and we believe that adopting the RCF methodology currently being developed under the RTFO will be the quickest way to do so.

In consideration of the CORSIA methodology developed by ICAO, there are several key differences to that of the RTFO. This includes its definition of wastes, minimum GHG savings threshold, ILUC assessment and recognition of CCUS. While adopting the CORSIA methodology may be advantageous for airlines, UK suppliers would face increased complexity when claiming credits under both the RTFO and the SAF mandate or CORSIA due to being subject to two different accounting methodologies. This has been recognised by ICAO and led to an emphasis on using default values for submitting claims, while the RTFO and RED largely use calculated values. Furthermore, the scrutiny to which ILUC is held is not deemed to be necessary for wastes or residues, which are the only feedstocks we propose to allow under the SAF mandate. We also see the lack of accounting of CCUS as an issue on the basis that it leads to inaccuracies and will likely lead to lack of CCUS integration in SAF production plants.

We recognise that the chosen methodology will have implications on the interactions with other schemes, such as the UK ETS and CORSIA. Our objective is to introduce a methodology that maximises coherence between different schemes while also upholding

sustainability credentials and accuracy. We understand that adopting a different methodology to these schemes may lead to more than one GHG methodology being used for a single batch of SAF produced. However, we plan to work with voluntary schemes to facilitate compliance under more than one scheme. The interactions of the SAF mandate with other domestic and international policy is discussed in **Chapter 4**.

Differences in substantiality criteria between the SAF mandate and RTFO may require some small amendments or additions to the methodology, for example on how nuclear power is assessed. Further consideration also needs to be given to how default values are determined and how they may be aggregated under the methodology. We will set out in more detail how the RTFO methodology may be adapted to meet the needs of the SAF mandate at a later stage and provide an opportunity for stakeholders to comment on our final policy proposal in the second consultation.

SAF that does not meet proposed eligibility and sustainability criteria

Consultation proposal

It was proposed that SAF that does not meet the feedstocks, carbon and sustainability criteria proposed above is treated in the same way as conventional jet fuel. Such fuel would therefore become subject to an obligation under the proposed scheme. This should minimise the risk that such fuels may be supplied in the UK and result in increased emissions.

Question 17

Do you agree or disagree that SAF that does not meet the proposed eligibility and sustainability criteria should incur an obligation?

Summary of responses

Total	Agree	Neither agree nor disagree	Disagree	Don't know
50	39	6	4	1

Most of the respondents, from all stakeholder groups, agreed that SAF that does not meet the proposed eligibility and sustainability criteria should incur an obligation. One respondent noted this would ensure companies adhere to the criteria laid out and limit the use of alternative feedstocks that do not meet the eligibility criteria. Reasons for disagreeing included a proposal for a mechanism whereby fuels that do not meet the threshold should not incur an obligation as long as they provide a climate benefit.

Government response

Government decision: SAF that does not meet the proposed eligibility and sustainability criteria will incur an obligation.

We are pleased that the majority of respondents agreed with our proposal. In **Question 13** we set out a preferred approach for minimum GHG savings threshold. We believe that this threshold is not overly stringent and provides industry with sufficient flexibility to meet the eligibility criteria. We also believe that subjecting any fuel that does not meet this threshold is not overly punitive. We are keen to deter the use of any SAF that falls below this threshold or does not meet any of the other required sustainability criteria as this will lead to a relative increase in emissions. Therefore, we can confirm that we will implement the proposal as set out in the consultation.

3. Overarching trajectory

Views on preferred scenario and SAF growth over time

Consultation proposal

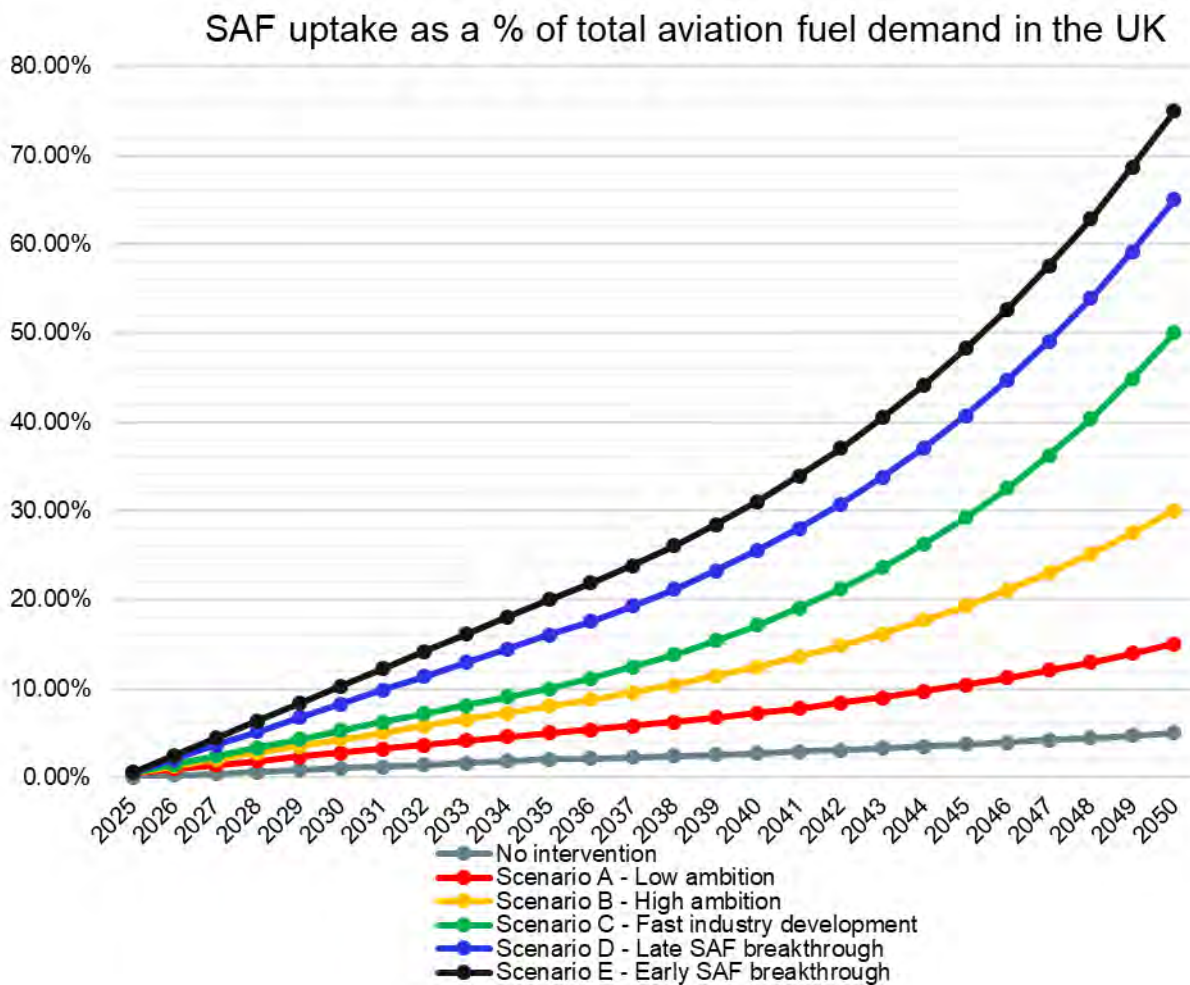
In the consultation, high-level scenarios for SAF uptake in the short- and long-term were presented, representing the ambition we believe could be possible for SAF uptake under certain market, technology and policy conditions. The consultation also proposed the introduction of a mandate in 2025, and all of the below uptake scenarios have used 2025 as their starting point.

- **no additional intervention scenario:** in this scenario it is unlikely that all the existing SAF plants in the UK will develop to commercialisation nor will the existing policy framework secure additional SAF plants in the UK
- **scenario A – low ambition:** this assumes a low uptake of SAF in both the short and long term. Under this scenario, fuel production would be primarily optimised for road transport and the contribution of HEFA will likely be marginal in both short and long terms
- **scenario B – high ambition:** assumes approximately 30% SAF uptake in the long-term. It is expected all the (non-HEFA) SAF plants currently developing in the UK will become operational by 2030 and will continue to expand. More HEFA should become available at that point, as competing demand for feedstocks for renewable road transport fuel will reduce with higher uptake rates of electric vehicles, although HEFA availability in the long term will likely be limited by feedstock constraints
- **scenario C – fast industry development:** half of the UK aviation fuel demand in 2050 is met through SAF. This assumes a very high increase of plants post-2025, with approximately 6 to 8% of total 2035 fuel demand met by domestically produced (non-HEFA) SAF, and approximately a further 2 to 4% from HEFA. After 2035, total domestic supply of SAF could increase by approximately 11% per annum and could mean up to approximately 85 large-scale plants will be operational in the UK by 2050
- **scenario D – late SAF breakthrough:** this assumes a very high number of plants will develop post-2025 with a high success rate, with domestically produced (non-HEFA) SAF reaching approximately 8 to 10% of total aviation fuel in 2035 and an additional approximately 2 to 4% of aviation fuel demand to be met through HEFA. After 2035, it is expected that domestic SAF supply could increase by approximately

9% per annum, reflecting high growth rates seen in previous sectors and could mean over 100 large-scale plants will be operational in the UK by 2050

- scenario E – early SAF breakthrough:** assumes a very high number of plants beginning to develop before 2025 with a very high success rate, with up to 20 large-scale plants already operational by 2030 and achieving up to 125 large-scale plants in 2050. Beyond 2035, supply across all pathways could increase by approximately 9% per annum. Under this scenario, SAF breakthroughs will primarily happen in the short term

Across all scenarios, the SAF uptake trajectory grew linearly from 2025 to 2035, to take into account the gradual commissioning of SAF plants and the gradual progress to name-plate capacity after a few years from the plant becoming operational. Once the market is more mature, it was expected more plants will be able to reach nameplate capacity more quickly and as SAF costs are also expected to come down, it was assumed an exponential trajectory from 2035 to 2050 could be more realistic at that stage.



These scenarios for SAF ambition were translated into equivalent GHG emissions reduction trajectories, which represent the target aviation fuel suppliers would need to meet.

The Government was keen to introduce a carbon intensity target which is as ambitious as possible and that could deliver a world-leading UK industry. Stakeholders were asked to

provide evidence on what SAF uptake trajectory can convey this ambition and what market, policy and technology circumstances will unlock such ambition.

Question 18

Do you agree or disagree that a SAF mandate should start in 2025?

Summary of responses

Total	Agree	Neither agree nor disagree	Disagree	Don't know
64	37	14	12	1

Most respondents agreed that the proposed SAF mandate should start in 2025 because this allows sufficient time for the fuel industry to prepare, while still recognising that there is urgent need to decarbonise the aviation sector

However, many respondents – including airlines, fuel producers, NGOs and OEMs – underlined that a mandate should only be introduced in 2025 provided the Government introduces additional policy to support UK plants, such as a price support mechanism or capital grant funding, within the next two years. Some felt it was not possible to comment on the start date given that the nature of the policy support will determine the timing of the mandate that is feasible. A few respondents simply emphasised the need to ensure SAF is available in the UK, highlighting that the start date should align with fuel suppliers' capability and ability to ramp up SAF production.

Although agreeing with this start date, three respondents emphasised that this is the latest date for which a mandate should be introduced and suggested that the Government considers mandating smaller volumes at an earlier date, such as 2023, to allow more time to reach the climate targets for aviation. Similarly, a few respondents (mainly NGOs) stated that 2025 is too late for a mandate to be introduced. The key arguments were the immediate need for the aviation sector to reduce carbon emissions and that an earlier start date will ensure production plants are supported more urgently. One respondent added that by mandating small volumes early on, it allows SAF suppliers and airlines to begin implementing processes and supply chains ensuring the industry meets the first major target in 2025. Only one respondent – a trade association - was inclined to suggest that a start date of 2025 may be premature.

Government response

Government decision: the SAF mandate obligation will start in 2025.

In line with responses and taking into account current and expected global SAF market developments, the Government believes that 2025 is the earliest a mandate could be introduced. This should allow the first large-scale SAF plants, including those we want to see built in the UK to become operational before an obligation is in place and ensure that production and supply chains are sufficiently established to meet the needs of an obligation.

We recognise the need to introduce the mandate through secondary legislation as soon as possible. To do so, we will need to prepare legislation and lay it before Parliament for approval. The process of drafting legislation and undergoing the necessary parliamentary scrutiny takes time. However, we aim to provide clarity on many of the key proposals ahead of this date, including through this government response and through the future consultation, to support industry preparation.

We acknowledge some stakeholders are asking for the mandate to start earlier. We believe mandating SAF volumes too early will be challenging for industry to comply with, given current constraints in SAF production domestically and globally, but we acknowledge the need to continue to encourage SAF supply to the UK before the mandate is in place. Until the SAF mandate is introduced, SAF supplied to the UK that meets the eligibility criteria of the RTFO will continue to be eligible for reward under that scheme.

We also acknowledge some respondents' ask for additional policy support alongside the mandate, and the impact this additional policy may have on the potential start date of a mandate. We have considered our approach to setting out an additional policy framework in **Chapter 5**.

Question 19

Do you agree or disagree that the targets should assume a linear growth up to 2035 and an exponential growth after 2035?

Summary of responses

Growth	Total	Agree	Neither agree nor disagree	Disagree	Don't know
Linear (2025-2035)	52	29	4	12	7
Exponential (2035-2050)	51	26	4	13	8

Most respondents agreed that the targets should assume a linear growth up to 2035 and an exponential growth after 2035, but many also disagreed on the basis that there are too many uncertainties at this stage.

Most comments concerned how the fuel mix will evolve over time and the influence this has on the trajectory. In general, those that agreed highlighted that in early stages, when there are fewer commercially available pathways, a linear trajectory is most appropriate due to slower development. The deployment of SAF is likely to be constrained in this decade due to the time lag associated with designing, constructing and ramping up production from facilities using novel and emerging fuel conversion technologies. In the initial years, the mandate is likely to be fulfilled using the HEFA pathway.

However, once advanced pathways, such as PtL, become viable at scale, uptake will be accelerated. These pathways have more short-term barriers with respect to cost and plant construction but have less dependency on feedstock availability. Some respondents

highlighted that if technology and cost reductions accelerate earlier than expected, an exponential trajectory should be adopted earlier. One respondent underlined that their detailed assessment of feedstock availability showed that in principle there is sufficient feedstock to support an exponential trajectory.

However, a small number of respondents – including fuel producers, an airline and an NGO - suggested that the availability of such feedstocks is still uncertain. This combined with uncertainties on the sustainability criteria, ability to import fuel and the costs, mean that it is not currently possible for these respondents to provide a definitive answer. In a similar manner, some respondents underlined that it is not possible to provide an answer as it is dependent on the regulatory and fiscal support given to industry (see **Question 30**).

Other comments made by a small number of respondents included aligning with international policies such as CORSIA or the EU mandate, which use a linear growth.

Government response

We have considered the responses to questions 19 and 20 together - see government response below.

Question 20

What scenario do you think represents the best trade-off between ambition and deliverability? What evidence can you provide to support your position?

Summary of responses

Total	Scenario A	Scenario B	Scenario C	Scenario D	Scenario E	Don't know/other
65	0	2	7	3	16	37

Most qualitative responses to this question either did not know which scenario to select, did not provide a clear indication of what their preferred scenario is or that none of the listed scenarios present a good trade-off between ambition and deliverability. This was largely down to too many uncertain factors in the SAF market.

Comments on specific ambition levels

Scenario A

No respondents believed that Scenario A presents the best trade-off between ambition and deliverability. Comments implied that Scenario A is deliverable but more ambitious scenarios can also be achieved.

Scenario B

Two respondents stated that Scenario B presents the best trade-off between ambition and deliverability. Both underlined that it was comparable to other projections, specifically it is slightly more ambitious than that of the CCC's Carbon Budget 6 balanced pathway and roughly in line with Sustainable Aviation's roadmap. A consultancy carried out high-level analysis of the long-term deliverability to support their decision based on assumed growth in aviation demand and UK SAF production. It was estimated that by 2050 the UK production capacity would be approximately 29% of fuel volumes, which best aligns with Scenario B.

Scenario C

Those that preferred Scenario C generally did this on the basis that it seems the most realistic pathway based on production potential. Respondents reached this conclusion through a number of mechanisms including their own modelling, discussions in the Jet Zero Council SAF Delivery Group and the impact assessment from the European Commission's proposal, which all suggest that a 5% volume target in 2030 is deliverable. It was further highlighted that the expected production capabilities in the EU are likely to be similar to those in the UK.

A consultancy assessed the deliverability of the three scenarios (Scenarios A, C, and E) by estimating the number of production plants required, cost, volume of feedstock and land required on both a 2035 and 2050 timescale. Scenario C was deemed to be the scenario with the best trade-off between ambition and deliverability based on feedstock requirements and investment.

Scenario D

Three respondents believed that Scenario D was the most realistic pathway up to 2030. Respondents suggested it is reasonable to estimate that the domestic production capacity would equal 5% of fuel volumes as this gives time for each of the first set of plants to add another of the same type, as well as some additional first-of-a-kind plants to be constructed. Allowing for some imports on top of this, Scenario D could be deliverable. However, the fuel producer emphasised that this will only be possible if the Government ensures that feedstock is directed to SAF plants instead of conventional incineration, as the amount of residual waste in the UK market is decreasing due to the continual on-streaming of large energy from waste projects.

Scenario E

The most common argument for those that showed preference for Scenario E was that setting a high level of ambition will build investor confidence in the UK SAF sector and provide long-term certainty that is needed to support investment decisions. Respondents emphasised how critical it is that the UK at least match international ambition to ensure that investment is not directed to alternative locations. Some respondents underlined that ambition is not independent of deliverability: by setting a high ambition and attracting greater investment, production will increase more rapidly than other scenarios and in turn fuel costs will come down more quickly.

An NGO presented their analysis of UK feedstock availability for SAF production and concluded that by 2030 the SAF fuel volume share could reach 7.5%, excluding PtL. With strong incentives for PtL, an additional 2.7% of 2030 demand could be met, bringing the total to 10.2%. However, this assumed that waste oils currently used in the road sector are

diverted in their entirety to aviation. However, while it may be achievable, the short-term diversion of these feedstocks from the road sector has a limited net impact on the climate and could increase risk of fraud in imports.

Another key argument was that Scenario E is the only scenario that will truly lead to net zero aviation by 2050. Some fuel producers referred to the IPCC report reiterating the urgency for ambitious climate action, while an airport cited the ETC analysis which indicates 10% by 2030 is ambitious but deliverable. Several airlines also highlighted that Scenario E is in line with their own ambition.

In terms of deliverability, one fuel producer urged the Government not to dismiss the importance of imports, stating that the likelihood of meeting Scenario E purely with domestic production is unrealistic.

Alternative scenarios

Several respondents, particularly airlines, advocated for aligning the UK level of ambition with that of the EU set out in their Fit for 55 proposal. One reason being that if the UK sets a lower ambition, investors will look to the EU, as noted in the comments on Scenario E above. The other major argument is that aligning the proposals would avoid carbon leakage and competitive distortions. Aligning with the EU would require the UK's ambition to increase from 0.5% to 2% in 2025. Similarly, other respondents recognised the need to increase the 2025 figure to avoid a dramatic and potentially undeliverable increase from 0.5% in 2025 to 10% in 2030 (in the case of Scenario E).

A small number of respondents suggested that, in the long term, even more ambitious scenarios than those set out in the consultation should be explored. This included a scenario that reaches 100% SAF by 2050, mirroring the 'High Ambition with breakthrough on SAF' scenario in the [Jet Zero Further Technical Consultation](#).

Instead of setting a trajectory at all, one respondent suggested that a price support mechanism should be established as a priority. It was recommended to match the mandate roughly to the expected growth in production from output volumes of CfD projects.

Common positions across all scenarios

Uncertainty in long term trajectory due to feedstock availability and production capacity

Several respondents expressed uncertainty of trajectory after 2030 on the basis that aviation fuel demand, feedstock availability, including prioritisation over other sectors, international competition, availability of EPC providers and SAF production capacity are determining factors, but their long-term development is unknown.

Achievable provided additional policy interventions are introduced

Several respondents – including fuel producers, airlines and NGOs – that preferred higher ambition scenarios (Scenarios C-E) underlined that these are only achievable providing the Government introduces additional policy interventions alongside the mandate to support the SAF sector. While a few respondents mentioned tax credits or kerosene tax, several respondents urged the Government to consider a price support mechanism, specifically a CfD (see **Question 31**). Respondents emphasised that a high ambition scenario must avoid

creating high demand from industry to meet the uptake trajectory, but limited supply of SAF. If this is the case, it may create significant SAF price inflation, which in turn would inevitably be passed through to consumers.

More analysis to be done

In light of the above uncertainties, some respondents urged DfT to conduct further analysis to inform industry and other stakeholders, which could take the form of an impact assessment which considers the cost effectiveness of SAF and its economic impact on consumers and industry, including a comparison with other decarbonisation solutions. Analysis would help understand the implications of each trajectory on energy requirements, economic viability of airline routes and ensure that costs should be proportionate and manageable for passengers.

Interaction with wider aviation decarbonisation strategy

A few respondents underlined that the level of ambition should be set within the wider aviation decarbonisation strategy to achieve net zero. This would allow scope to compensate for underperformance in one element of the strategy by using alternative measures to keep the strategy on track. Clarity would also be needed on the interplay of each of the proposed scenarios with the wider net zero aviation ambition and strategy. Specifically, respondents wanted to know how the proposed scenarios would impact other aviation decarbonisation solutions and whether any of them would hinder the development of such solutions. Some respondents view SAF as a bridge technology and that it will not be needed in the long-term once there has been widespread adoption of zero emission flight.

Government response

Government decision: the Government's mandate target in 2030 is for SAF uptake to reach at least 10% of jet fuel demand (to be converted into a GHG emissions savings target)

We have already confirmed in the Net Zero Strategy published in October 2021 that the Government's ambition is for at least 10% of the UK jet fuel demand to come from SAF, and we are now committing to a target of at least 10% SAF by 2030.

We recognise that this target is ambitious given the nascent status of the industry, however we believe this will make the UK an attractive location for plant development and investment. In deciding this ambition level, we have taken into consideration a review of the latest evidence, industry views and increased SAF ambition globally. Alongside other policy interventions, such as the capital grant funding distributed via our advanced fuels innovation competitions, our hope is that a target of at least 10% for 2030 will accelerate domestic production capacity at a faster rate than other scenarios and therefore maximise GHG savings. While we have a key ambition to kickstart the UK SAF market and produce significant volumes of SAF in the UK, as signalled by our commitment to see at least five plants under construction by 2025, the number of plants expected to come online globally is believed to be sufficient to fulfil any targets that domestic production cannot reach through imported SAF.

At the same time, we understand some respondents' concern with setting an ambitious target given the uncertainties associated with the near-term technical and commercial development of SAF. We will continue to explore how the level of obligation can accommodate a potential slow development of the SAF industry and will engage with stakeholders as well as proposing a long-term trajectory in the second consultation.

The at least 10% SAF uptake will be translated into an equivalent GHG emissions reduction, which represents the target aviation fuel suppliers will need to meet. This will be calculated based on the expected carbon savings eligible SAF could bring about and an approximate mix of SAF production pathways that could be expected in the UK. The department will continue to refine analysis to establish the GHG emissions reduction target taking into account global and domestic industry trends and independent external analysis.

What will we do in the long-term?

While the mandate target for 2030 has been set, in order to set the annual mandate targets from 2025 to 2050 and thus our long-term trajectory, we have a number of wider issues to consider including:

- forecasts and evidence on jet fuel demand, fuel efficiency improvements, SAF uptake and zero emission technology uptake;
- the **potential for the use of mechanisms such as a ratchet mechanism** to set out future targets. This type of mechanism would automatically increase SAF targets based on a set of pre-agreed factors relevant to the industry's development. This was preliminarily discussed at the JZC SAF DG mandate subgroup meeting in March 2022, but no real consensus was reached and it was agreed that more detailed proposals would need to be presented for stakeholders to consider the proposal fully;
- **current and future feedstock availability**. Our trajectory will need to take into account which feedstocks are likely to be available both globally and domestically for SAF production. We continue to work with DEFRA to understand how the waste hierarchy will impact the availability of SAF feedstocks and with BEIS as part of their Biomass Strategy to ensure sectors which rely on biomass and have limited options to decarbonise, such as aviation, can access biomass. We are also conducting further research on current and potential future feedstock availability for low carbon transport fuels for the development of our Low Carbon Fuels Strategy;
- **global developments in SAF policy**. SAF exists within a global fuel market and it is therefore important to understand what policies other countries have set out and to consider how these may interact with or impact on our domestic policies;
- **the responses to the Developing the UK Emissions Trading Scheme (UK ETS) consultation**. Currently when an aircraft operator reports use of eligible SAF on UK ETS routes, they are not obliged to surrender UK ETS allowances. The consultation considers the long term treatment of SAF under UK ETS and seeks evidence on whether the scheme should be re-calibrated to reflect emissions savings from the use of SAF more accurately to incentivise uptake of low emissions SAF rather than treating all equally. An alternative option is to maintain the current reductions to obligations with the introduction of a SAF mandate; and
- **during which timeframe is it suitable to have a linear or exponential increase targets**.

Increasing the target at future review points

Consultation proposal

It was the Government's ambition to go further and faster and develop a strong SAF sector in the UK as quickly as possible. Thus, we were open to raise the target in the future should the market and the technology develop quickly and SAF costs and carbon abatement costs come down significantly. The Government was therefore minded to introduce several review points in the next decades when a higher SAF uptake ambition will be considered. The review points were proposed to be introduced in 2030, for post-2035 uptake, in 2035 for post-2040 uptake and in 2040, for post-2045 uptake, including beyond 2050.

Question 21

Do you agree or disagree that we should include review points in 2030, 2035 and 2040, depending on initial mandate levels?

Summary of responses

Total	Agree	Neither agree nor disagree	Disagree	Don't know
59	44	3	9	3

Most respondents agreed that review points in 2030, 2035 and 2040 should be included in the proposed mandate and there was broad agreement with the benefits of review points as laid out in the consultation document. In particular, it was highlighted that frequent review points allow the Government to increase mandates as the market and technology develop, economies of scale are realised, and cost comes down the cost curve. In addition to this, a small number of fuel producers recognised the importance of review points in maintaining investor confidence. A few fuel producers went on further to propose that review points should only allow for increase in mandate targets and exclude downward revisions to avoid regulatory uncertainty that negatively impacts investment and offtake.

Several respondents called for earlier (before 2030) and later (post 2040) review dates. Those urging for earlier review points underlined that all the uncertainties concerning SAF could cause the technology and market landscape to change dramatically in the next decade. In general, respondents asked for an initial review to be carried out in 2025 to ensure that policy proposal is still relevant and provide an early indication of any 'warning signs' and to consider the publication of multiple government reviews and strategies. Those that suggested review points after 2040 provided no justification for their response.

In addition, several respondents, mainly NGOs, urged the Government to carry out more frequent reviews. The main argument given was to ensure that industry is delivering as required and to converge on the best possible policy framework as soon as possible. It would also allow other policy frameworks, such as the wider Jet Zero Strategy, to reflect on developments in the SAF sector. Most proposed reviews on an annual basis, while one respondent suggested a review every three years.

As an alternative to setting dates for review points, a small number of respondents explained that, if a contract for difference support scheme is run alongside the mandate, each round of allocation is effectively an opportunity to review progress and to structure the round accordingly.

Government response

Government decision: we will include a regular review process within the SAF mandate

Most respondents agree that regular review points should be included within the SAF mandate, with broad agreement with the benefits, as laid out in the consultation. Respondents did however diverge in their opinions on the timing and frequency of review points. Review points were also recently discussed with stakeholders at a Jet Zero Council SAF Delivery Group Mandate Subgroup meeting, and again the consensus was that review points should be introduced without broad agreement on timing or frequency. Within the mandate consultation we suggested review points every five years (2030, 2035, 2040, etc.) which aligns with the approach suggested in the [Jet Zero Consultation](#) for the Jet Zero Strategy (which we will review in 2027, 2032, 2037 etc.). We are minded to continue with this review timeline (i.e. review points every five years in 2030, 2035, 2040, etc.) but recognise that reviews may need to happen more frequently than this depending on how we set the trajectory of mandate targets past 2030. In addition, we will need to consider how these review points interact with carbon budgets. We will further consider the structure of a review process and the timing of reviews before making a final decision on this point.

Delivering this ambition and promoting innovation

Consultation proposals

A SAF mandate, in the short term, could drive an increased supply of HEFA. Relying on this fuel could divert used cooking oil (the primary feedstock) away from renewable diesel. Thus, the consultation welcomed views on whether HEFA should be capped and how this potential cap should evolve over time.

We were keen to capitalise on the opportunities that innovative fuels, such as power-to-liquid, can bring to the UK. Given the costs are significantly higher than the cost of SAF produced through any other pathway and that the production of these fuels is not expected to be widespread until the late 2030s, the consultation welcomed views on how to accelerate technological and commercial development of power-to-liquid fuels specifically. We were also keen to understand how the SAF mandate more in general can foster the development of SAF with the lowest greenhouse gas emissions intensity across all technologies.

Question 22

Should the amount of HEFA that can be claimed under the SAF mandate be capped over time? If this is the case, how could the cap work in practice, given the scheme will be based on GHG emissions savings? How should the cap be calculated?

Summary of responses

Total	Yes	Neither	No	Don't know
54	20	7	22	5

Respondents were fairly evenly divided in their views on the introduction of a HEFA cap, though there was broad agreement among all respondents that an excessive reliance of HEFA is detrimental to the environment and feedstock competition for other uses.

Respondents identified the principal issue that, beyond HEFA, no other pathway has been commercialised that can produce SAF in significant quantities. Moreover, the global supply of waste oil is limited and there is competition with other sectors, such as animal feed and road transport biofuels (biodiesel). Several fuel producers argued that the use of these feedstocks is better suited to the production of biodiesel as the conversion process is more efficient, therefore having greater environmental and economic benefits than the aviation counterpart. Thus, a few respondents underlined that scaling HEFA would only result in shifting of emissions savings from one sector to another, whilst reducing total emissions saved and increasing costs. Some underlined that if HEFA is diverted away from road transport, it could be detrimental to suppliers fulfilling their obligation under the RTFO.

The main argument put forward by those that agreed with a HEFA cap is that it allows other SAF pathways to be developed. Introducing a HEFA cap would stimulate investment in other pathways which have potential for greater feedstock availability and GHG emissions reductions, diversifying the fuel mix. A further advantage is that a HEFA cap would be an appropriate measure to stop fraud and address illegal imports.

At the same time, several respondents identified HEFA as an important pathway to achieve GHG emissions reductions, particularly in short term. Therefore, a number of respondents expressed concern that introducing a HEFA cap could simply limit the amount of eligible SAF available to the market, particularly if the development of other pathways is slower than anticipated. This in turn could limit emissions reductions while increasing demand and price for other pathways, outweighing the benefits of a HEFA cap. These respondents argued that its use under the mandate should not be capped as long as it achieves the minimum GHG threshold and other eligibility criteria. A small number of respondents noted that as PtL fuels are scaled up, HEFA should have a diminishing role. It was suggested that it may not be necessary to introduce a cap at this stage, but the measure could be re-considered once there is more clarity on the development and availability of other SAF pathways. Other arguments provided against a HEFA cap were that it would introduce unnecessary complexity, promotes certain pathways over others and could have unintended consequences.

Several respondents – including airlines, fuel producers and NGOs – argued that the introduction of a CfD scheme would mitigate the need for a HEFA cap. This is achieved by matching the mandate obligation to UK production outputs supported by a CfD. In practice, output from projects receiving CfD support (using novel SAF production pathways) would fill the mandate initially, as it would be the cheapest fuel available on the market. Fuel suppliers would then obtain any remaining credits required to meet their obligation from the purchase of other fuel, which would most likely be HEFA. Effectively, the volume difference between the mandate obligation and CfD projects' output will be equal to the volume of HEFA.

In terms of how a cap may work in practice, three respondents – a consultancy, NGO and fuel producer – stated that there should not be any issue with setting a cap in percentage volume terms, even if the basis of the mandate is GHG emissions intensity. The fuel producer suggested that it could be introduced as a carbon savings percentage but, in any case, the cap should include an absolute cap (i.e. no more than X% of volume) and a relative cap (i.e. no more than X% of the mandate obligation).

Of those that underlined how the cap could be set, there was no real consensus between stakeholders. Suggestions included calculating the cap by assessing the feedstock requirements for other uses and setting it at a level so as to not divert away from these uses, removing the cap over time as the need for feedstocks in road transport decreases or making the cap more restrictive over time so as to eventually phase HEFA out. In terms of absolute figures provided, one respondent suggested proposed that the cap should be set at 0.8% of 2030 UK jet fuel demand (or 0.1 million tonnes), which is equivalent to the UK domestic waste oil availability, to avoid driving the demand for additional waste oil imports. Other respondents proposed a cap of 5.5%, based on the volume of European demand that can be met through HEFA, and 3%, but this had no justification.

Government response

Government decision: we will introduce a HEFA cap under the mandate.

There was no consensus among responses to this question and limited clarity on how a cap could work in practice or how it should be calculated. Therefore, the Jet Zero Council SAF DG convened in March 2021 to revisit the questions concerning the need for a HEFA cap and to explore further if, how and when a potential cap could be set. During the meeting there were a range of opinions and no real consensus (as with the consultation responses), which is reflective of the complexity and uncertainty in the evolution of the SAF and more widely feedstock market.

The Government believes it is imperative that introducing a SAF mandate does not divert feedstock away from existing uses nor does it raise concerns over sustainability by increasing demand for certain feedstocks. In particular, we are conscious of the possibility that high levels of HEFA use in aviation could lead to diversion of feedstocks that could be used in a more efficient manner to produce biodiesel for difficult to decarbonise road transport modes. The potential remains for this to happen under a UK SAF mandate if no specific provisions are put in place to address it.

A cap would also allow the UK to diversify its SAF portfolio, mitigating the risks of feedstock competition, sustainability impacts and supply chain disruptions or bottlenecks that could happen when relying on one specific feedstock or production pathway. This cap could in turn favour the development of domestic supply chains and accelerate the deployment of non-HEFA technologies, especially those least developed to date.

For these reasons the Government can confirm we will introduce a HEFA cap under the mandate. We will continue to analyse domestic and global feedstock availability, demand for waste oils and fats from other sectors and how the level of reward under the SAF mandate could impact commercial decisions. We will continue to engage with stakeholders to support the development process and any proposal on how the cap will be set will be shared in the second consultation.

Question 23

How can the innovation and roll-out of power-to-liquid fuels be accelerated? Should a subtarget and/or a multiplier be introduced?

Summary of responses

Some respondents selected more than one of the options, stating that either of the mechanisms could be introduced as an incentive.

Incentive	Total	Yes	No	Don't know
Subtarget	55	21	33	1
Multiplier	55	8	46	1
Other	55	22	32	1

The key issue identified with PtL fuels is that they are substantially more expensive than other pathways due to the cost of electrolysers and supply of additional energy and captured carbon. Despite this, they have long-term potential on account of their feedstock availability and GHG emissions reductions. Therefore, respondents felt that a separate incentive within the mandate may be necessary in the near and mid-term (i.e. through 2035) to support their development and plant construction.

Subtarget

The main argument for a subtarget over a multiplier is that it would help scale up the production capacity by guaranteeing a certain volume of PtL is produced, which a multiplier would not do. Some respondents highlighted that the EU has proposed the introduction of a subtarget and, if the UK decides to introduce one, the target should be aligned (0.7% in 2030). Other advantages of a subtarget over a multiplier according to respondents are that it has a lower risk of inappropriate carbon accounting and double rewards, greater encouragement to invest in green hydrogen and DAC and causes less confusion to industry and wider stakeholders.

A few respondents, mainly fuel producers, urged the Government to take careful consideration when designing the subtarget to ensure the correct balance between incentive and cost-effectiveness is met. This included ensuring any subtarget is introduced at the right time, setting the buy-out price at a level that facilitates investment into PtL and linking with the UK hydrogen strategy as it will assist in both sectors scaling up with joined investor efficiency, end to end pathways established and less chances of stranded assets being developed.

Multiplier

There were no specific arguments put forward for multipliers over subtargets. However, some respondents noted the same advantages as a subtarget. Specifically, a multiplier in revenue streams for developers of PtL fuel plants would accelerate the scaling of PtL production capacity.

However, several respondents – including fuel producers, trade associations, NGOs and a Government body – raised concerns with introducing multipliers, claiming that there is a risk that innovation will not be promoted. Rather, sub-optimal technologies could be rolled out to take advantage of the subsidy provided by these multipliers. Another concern is that multipliers introduce complexity when trying to communicate policy aims.

Other incentivisation mechanisms

Many respondents stated that targeted price support for PtL projects would be a more effective and cost-efficient tool than either a subtarget or multiplier. As well as bringing confidence to investors, a price support mechanism promotes domestic production and removes the risk of creating competitive distortion from setting the level of reward. Outside of dedicated price support mechanisms for PtL, a small number of respondents proposed tax credits or reductions, appropriate carbon pricing and a kerosene tax as preferred policy levers to promote the uptake and development of PtL.

Several respondents underlined that more direct funding to the construction of production plants could be the best method to accelerate the development of PtL to reduce capital costs of plant construction. Respondents suggested grant programmes and loan guarantees for FOAK facilities. Alternatively, several of the respondents proposed that funding should be directed towards research and development (R&D) activities as the mandate itself will not be sufficient to promote technological development. Finally, a small number of respondents underlined that funding should be directed towards renewable energy production, including nuclear power.

The importance of carbon capture technologies, in particular DAC, for the scaling up of PtL was highlighted by some respondents who urged the Government to provide sufficient support in this area. Long term funding should be directed towards DAC to de-risk this technology for capital investment and accelerate its development. One respondent suggested that the mandate should legislate a minimum percentage of PtL to be produced using DAC and for it to be increased over time, which could drive DAC and commercialisation of the relevant carbon management technologies.

Finally, a couple of respondents underlined the role that a UK Clearing House could have in supporting PtL fuels, stating that with a comprehensive package of support for fuels testing over multiple years, a number of carbon capture and use applications could be assisted through what can potentially be a multi-year process to have a new fuel approved.

No incentivisation mechanisms

Some respondents proposed that no incentives should be introduced as the Government should take a technology agnostic view. It was argued that PtL fuels will face similar innovation and investment challenges to other SAF production methods, so the Government should create a level playing field by having the same support mechanisms in place. Some fuel producers, airlines and trade associations argued that, given the mandate will incentivise pathways through providing credits related to GHG emissions reductions, there is no need to introduce any additional interventions. It is expected the market will drive the use of PtL given the high GHG savings.

Government response

Government decision: we will include a PtL subtarget in the SAF mandate.

We recognise that PtL fuels have long-term potential due to their feedstock availability and high GHG emissions reductions and therefore view them as a key technology within our aviation decarbonisation approach.

It is evident from the consultation responses that most respondents did not think the use of a multiplier would accelerate the commercial and technological development of PtL. It was argued that multipliers may promote sub-optimal technologies, introduce complexity and market distortion and that other mechanisms could be more effective. Therefore, a PtL multiplier is not our preferred mechanism.

As demonstrated in the summary of responses, there was no consensus among stakeholders on which tool would be most effective in accelerating the roll-out of PtL. However, several respondents highlighted the importance of capital grant funding for PtL plants. To this end, the Advanced Fuel Fund, launched in July, allocated a sub-pot to prioritise UK projects that source the majority of their fuel carbon from CO₂ (point source or direct air capture).

Given the mixed views among stakeholders in the consultation, the Jet Zero Council SAF Delivery Group convened in March 2021 to revisit the questions concerning the best mechanism for promoting PtL and to explore further how a potential subtarget could be set. A clear outcome was the agreement that without any other mechanisms, a PtL subtarget would encourage investment into the UK. It was however also suggested that if other support was introduced such as a CfD or other form of price support, there could be a reduced need for implementing subtargets as scale up would already be supported. Despite this, some stakeholders queried whether a CfD would be able to support pathways still requiring technology development. Our approach to additional policy support is set out in **Chapter 5** and states our intention to work in partnership with industry and investors on the need for additional action from industry or government to accelerate the pace of investment in the UK market and these emerging technologies. We will need to further consider how potential interventions could interact with a mandate and whether they would provide adequate support for developing pathways such as PtL.

Taking all of this current information into account, the Government can confirm that a PtL subtarget will be included in the SAF mandate. A subtarget still appears to be the most suitable mechanism to accelerate the commercial and technological advancement of PtL and is being considered in other settings such as the EU. Building on the additional evidence received in this consultation, we will continue to refine analysis on PtL, in particular the requirements for additional renewable energy and hydrogen, the impact on the electricity grid and how the uptake of PtL technology interacts with zero emission flight and the wider aviation decarbonisation strategy. The Government will revert with a finalised policy proposal at a later date and provide an opportunity for stakeholders to comment in the second consultation.

Question 24

How can SAF produced through pathways other than HEFA and power-to-liquid be accelerated?

Summary of responses

Several respondents highlighted that the same incentives described for accelerating the development of PtL fuels are applicable to other pathways. In particular, the use of price support mechanisms.

As with PtL, several respondents from all stakeholder groups suggested that funding the development of FOAK plants is the best way of accelerating other pathways. The funding mechanisms put forward by respondents included loan guarantees from the UK Infrastructure Bank, as well as generic grants or favourable term loans. A fuel producer and consultancy suggested that funding would be necessary to invest in skills to ensure the longevity of the industry, including chemical engineering and aviation fuel specification training. However, a different fuel producer warned against the funding of technologies such as MSW/FT-SPK because the levelised cost of production of SAF is too high.

Several respondents recommended that rewards for specific feedstocks would be beneficial. This is because, typically, waste based SAF (e.g. non-recyclable wastes and MSW feedstocks) have higher CAPEX requirement due to the complex nature of preparing the waste. Therefore, policy could provide some level of reward proportionate to the cost of an alternative low carbon end of life fate for these waste feedstocks. One respondent called for the use of crop-based feedstocks in the production of ATJ as this would accelerate the commercialisation of their plant; otherwise, the scale up of the ATJ industry would be entirely dependent on the simultaneous establishment of a new ethanol industry or the development of fully integrated plants.

Others urged the Government to adopt technology- and feedstock-agnostic policies that do not stop new technologies or pathways from contributing or being eligible for credits.

A small number of respondents recommended that funding is directed towards R&D to develop low TRL projects. This included areas of research in feedstocks, process and economics, infrastructure and technical specifications.

A few respondents identified a UK Clearing House as a useful tool to support other pathways, which is discussed in more detail in **Question 31**.

A small number of respondents emphasised the importance of collaboration between government departments due to crossover in policy areas such as low carbon hydrogen and nuclear power and a collaborative approach will support addressing the competing demand requirements of feedstocks from different sectors. Furthermore, many SAF pathways will produce non-fuel products that can be utilised in other sectors including chemicals and materials. A final advantage is that the multiple use of fuels or by-products helps to de-risk the development of production plants and in turn attract investment.

Government response

We see the importance in supporting multiple pathways to producing SAF as a diverse portfolio could:

- ensure more SAF is brought to the market;
- lessen the risk of feedstock competition between sectors;
- help to avoid sustainability impacts of relying on one feedstock;
- increase fuel security; and
- mitigate the potential for supply chain disruptions.

Respondents from all sectors suggested that providing capital funding for the development of plants was the best way to accelerate other pathways. The Government sees great value in capital grant funding for advanced fuels, and that, coupled with our commitment to kickstart a UK SAF industry is why in the Net Zero Strategy we announced that £180m will be made available to support SAF production in the UK, building on the progress made through the Advanced Biofuel Demonstration Competition (ABDC), Future Fuels for Flight and Freight Competition (F4C) and the GFGS competition. As part of this, we have launched the Advanced Fuels Fund which will provide £165m of capital grant funding to support FOAK commercial and demonstration plants, helping leverage private investment and de-risk future investment.

The Government has also provided £12m for a SAF clearing house. The clearing house will deliver early-stage aviation fuel testing, funding, and expert advice for producers of new fuels hoping to enter testing at all certification stages/pathways. A domestic clearing house would build on and further develop existing UK expertise to help reduce uncertainty, cost, and time barriers to SAF development without sacrificing safety. In light of these new SAF policy and funding announcements, launched since the SAF mandate consultation closed, **we will need to review how effective these mechanisms will be in supporting new SAF pathways and technologies and whether further support is necessary.** We will use evidence gathered from our engagement with industry and investors on potential need for additional intervention from industry or Government. Further detail on our approach to this is set out in **Chapter 5**.

4. Interactions with other domestic and international policy

Double counting and double claiming under multiple schemes

Consultation proposals

The Government proposed to require that any SAF supplied to meet the proposed standalone SAF mandate cannot be claimed under the RTFO, and the other way around. This is to ensure carbon emissions reductions are only accounted for once. It was proposed that any emissions reductions claimed under a SAF mandate cannot also be claimed under another GHG scheme to avoid the double counting of emissions: the consultation therefore welcomed views on how the UK ETS, CORSIA and the proposed SAF mandate could be used together to continue to incentivise SAF uptake, while preventing double counting of emissions reductions.

It was also proposed that any SAF produced from plants who have benefitted from government support for R&D, feasibility studies, front end engineering design (FEED) and construction of commercial plants, either in the UK or abroad, can count towards the proposed SAF mandate obligation. This would mean that fuels supported through the GFGS competition or fuel produced by clusters receiving funding under the GHG removals or hydrogen from bioenergy with CCUS programmes run by the Department for Business, Energy and Industrial Strategy, for instance, would continue to remain eligible under the proposed SAF mandate.

Question 25

Do you agree or disagree that SAF GHG emissions reductions should be claimed only once under different schemes?

Summary of responses

Total	Agree	Neither agree nor disagree	Disagree	Don't know
62	56	3	0	3

Most respondents agreed that SAF GHG emissions reductions should be claimed only once under different schemes. The main arguments to support this view were:

- there is a need to prevent double counting of emissions reductions, particularly as this undermines the credibility of climate change policies;
- only allowing emissions to be claimed once is the simplest approach; and
- the robust accounting of emissions is key to the success of any mandate incentive.

Several stakeholders (including NGOs, OEMs, fuel producers and airlines) who agreed that GHG emissions should be claimed only once under difference schemes felt it was important that the UK was consistent with other existing global and EU rules on GHG accounting. In this case, they suggested that producers should be able to obtain tradable certificates at the point of delivery of SAF into the system, but airlines should still be able to claim emissions benefits under CORSIA or the UK ETS, whilst only counting the emissions reductions once.

However, a few stakeholders proposed that in the same way that GHG emissions should only be claimed once under different schemes, they should also only be obligated once i.e. a tonne of carbon should only be paid for once under one policy.

Other stakeholders argued that the answer to this question depends on how 'scheme' is defined. A trade association proposed that foreign programmes such as the Californian LCFS and the Canadian Clean Fuel Standard should not be considered as GHG schemes for the purposes of policy on double counting.

Government response

We have considered the responses to questions 25 and 26 together - see government response below.

Question 26

How could the UK ETS, CORSIA and proposed SAF mandate be used together to continue to incentivise uptake, while preventing double counting of emissions reductions?

Summary of responses

Many respondents (OEMs, fuel producers, airlines, airports) suggested that in order to use the UK ETS, CORSIA and SAF mandate together to incentivise uptake whilst preventing double counting, the UK should align with EU, international and domestic policy solutions that are already in use. In particular, respondents pointed to using the same emission calculation methodologies used to prevent double counting in the EU ETS and CORSIA to prevent double counting through the mandate. Furthermore, many of these respondents suggested adopting the approach used by EUROCONTROL to reconcile the EU ETS and CORSIA, by using one monitoring, verification and reporting tool.

A few respondents felt that the UK should not only be engaging with the EU on incentivising SAF uptake and preventing double counting, but that we should be taking a more global approach to avoid competitive distortion and carbon leakage. Some solutions offered were the creation of a SAF coordination platform similar to the Jet Zero Council but open to stakeholders globally, working at ICAO to develop a common standard SAF mandate to achieve maximum consistency across borders, and the use of a global register of SAF claims to ensure double counting is prevented.

A small number of respondents felt it was not possible to reconcile these policies whilst preventing double counting of emissions. In particular, one fuel producer respondent suggested that the UK ETS, CORSIA and proposed SAF mandate are three overlapping policies targeting the same objective, and that this creates an unnecessary level of complexity. Additionally, one respondent felt it was premature to address this question without a draft framework of the UK SAF mandate and while the EU is still in the process of implementing their SAF mandate. They suggested that the impact of ReFuelEU is assessed alongside UK ETS and CORSIA developments to avoid competitive distortion and carbon leakage.

Government response

Government decision: to avoid double counting, i) GHG emissions reductions claimed under other emissions schemes cannot be claimed under the mandate and ii) GHG emissions reductions claimed under the mandate cannot be claimed under other emissions schemes.

By 'claim' we do not necessarily mean that a batch of fuel rewarded under the mandate cannot be used to meet an obligation under another GHG emissions scheme. Instead, we mean that emissions reductions from the use of this batch of fuel should not be accounted for more than once.

90% of respondents agreed that GHG emissions reductions should be claimed only once under different schemes, while many stakeholders provided detailed examples of how the UK ETS, CORSIA and proposed SAF mandate could be used together to incentivise uptake, while preventing double counting.

Our wider approach to emissions calculations under the mandate is set out in **Chapter 2**.

The Government acknowledges that more consideration will need to be taken to understand how the prevention of double counting of emissions reductions will work in practice, given

that emissions reductions from SAF can already be claimed under both the UK ETS and CORSIA. We will review the additional evidence and reasoning provided by respondents and carry out further analysis of the potential interactions between the mandate and these closely related schemes. In particular, we will take into account responses to the Developing the UK Emissions Trading Scheme (UK ETS) ¹⁶consultation, which asked specific questions on how emissions savings from SAF can be best accounted for under multiple schemes whilst only being counted once. The consultation also elicited views on whether the reduction in UK ETS obligations to incentivise the use of SAF should more accurately reflect the GHG savings of the type of SAF used. Furthermore, we will take into consideration findings from the Environment Agency’s UK ETS SAF pilot for the 2021 scheme year. This pilot is being run for aircraft operators wishing to make an emissions reduction claim from the purchase of SAF.

Any future proposal on the issue of double counting will be discussed with stakeholders and shared in the second consultation before a final decision will be made.

Question 27

Do you agree or disagree that SAF that has been produced on the back of industrial plants or clusters which have received competition funding from government can be claimed under the proposed UK SAF mandate?

Summary of responses

Total	Agree	Neither agree nor disagree	Disagree	Don't know
49	44	2	1	2

The key argument for those in support was that, although competition funding will help overcome risk, production plants need the long-term certainty of economic operation provided by the mandate to attract sufficient investment. Thus, it is unlikely that these plants will reach commercialisation if they are ineligible under the mandate. Second to this, several respondents argued that these plants will be a critical source of domestic SAF production, particularly in the near future, without which SAF supply and uptake will be constrained.

In addition, several airlines and fuel producers highlighted that this approach would be consistent with what is seen internationally, in particular the US and the EU. If the UK does not follow suit, then there is a risk that fuel producers will look elsewhere to locate. Generally, respondents did not raise any concerns about double subsidies.

However, a couple of fuel producers emphasised that the Government needs to ensure a level playing field by making the support available to all market players and expressed concern that the approach outlined may damage investment for newly constructed facilities that have not benefitted from government competition funding. One respondent disagreed due to perceived ambiguity in the question.

¹⁶ [Developing the UK Emissions Trading Scheme \(UK ETS\)](#)

Government response

Government decision: SAF that has been produced on the back of industrial plants or clusters which have received competition funding from government will be eligible for support under the proposed UK SAF mandate.

The vast majority of respondents agree that SAF produced at plants or industrial clusters which have received grant funding from government can be claimed under the UK SAF mandate. Respondents to the consultation as well as stakeholders in the Jet Zero Council SAF Delivery Group have outlined that capital support in the form of grant funding is required to help offset the scale-up risk of plants.

The Government has recently supported eight SAF projects through the GFGS capital grant funding competition and has just launched the Advanced Fuels Fund, a new £165m grant funding competition for the development of UK SAF plants. These competitions aim to aid in the development of first of a kind commercial SAF plants in the UK, helping to kick-start a UK SAF industry and, along with the introduction of the mandate, allow us to achieve our commitment of having at least five commercial-scale plants under construction by 2025. A mandate which excluded SAF developed at facilities that received government funding would likely lead to the importing of SAF from abroad and the exporting of SAF from UK grant funded facilities, which would in turn reduce overall GHG emissions savings and supply chain efficiency,

It is of course important to ensure that this proposal can work in both practical and legal terms, so we will continue to explore how to maximise the benefits of government support whilst avoiding overcompensation.

Aviation fuels under the RTFO

Consultation proposals

The Government proposed to make aviation fuel ineligible to receive certificates under the RTFO once a SAF mandate is in place, likely in 2025, meaning that the SAF mandate would become the only scheme under which fuel suppliers would be able to claim SAF use and receive a reward, in the form of a credit, in the UK. The envisaged time lag before this change comes into force should allow industry to transition towards the new scheme without significant complexities.

Question 28

Do you agree or disagree that SAF should no longer be rewarded under the RTFO when and if a SAF mandate is in place?

Summary of responses

Total	Agree	Neither agree nor disagree	Disagree	Don't know
58	45	3	7	3

Generally, respondents felt that no fuel type should be incentivised under more than one scheme to avoid any double counting and mitigate confusion for obligated parties. However, a couple of respondents noted that this will not avoid double counting the same CO2 reduction with the rest of the economy.

Several respondents highlighted that the current support for SAF in the RTFO has sent a strong market signal and should continue to be in place until the SAF mandate has been implemented, to mitigate any uncertainty and continue to attract investment in SAF production in the years leading to the start date of the mandate and beyond. Thus, the Government should provide reassurance that any transition will be managed well without any period where SAF is not supported. A few fuel producers proposed a transition period whereby fuel producers can continue to claim credits under the RTFO. A couple of fuel producers added that, prior to the introduction of the mandate, the RTFO should continue to be amended to include additional SAF pathways and feedstocks such as RCFs and emphasised that these changes should not be delayed until the SAF mandate.

Several respondents highlighted that many production plants will produce fuel for road transport and aviation concurrently, therefore claiming credits under both the RTFO and the SAF mandate. Thus, the RTFO and mandate should maintain some level of consistency. If the value of the development RTFCs provided to renewable diesel is greater than the value of the certificates provided through the SAF mandate, suppliers may be inclined to use the buy out in the mandate rather than to supply SAF. Some went on further to say the reward given under the mandate should be greater than the RTFO to incentivise SAF production over diesel production.

However, a few respondents disagreed with the proposal. It was suggested that SAF claimed under the mandate should not be supported under the RTFO but any additional (voluntary) SAF supply should be rewarded with RTFCs should it provide a greater revenue stream to suppliers. Alternatively, it was also proposed that claiming under the RTFO should remain an option for all SAF to maximise benefits given to fuel producers.

Government response

Government decision: we can confirm that SAF will no longer be eligible for incentives under the RTFO when a SAF mandate is in place.

There is wide support for the proposal to no longer reward SAF under the RTFO when a SAF mandate is in place, with 78% of respondents agreeing with the proposal. The Government acknowledges that support for SAF under the RTFO sends a strong market signal and we therefore need to manage the transition from the RTFO to the SAF mandate carefully. For this reason, RTFO certificates will continue to remain available for SAF that meets RTFO sustainability criteria until the SAF mandate comes into effect, at which point suppliers will need to claim under the new scheme. Given the RTFO operates on a calendar year basis, this means that any aviation fuel supplied on 1 Jan 2025 and thereafter will be required to submit claims under the SAF mandate. This will ensure there will be no gap in support for the supply of SAF in the UK. We acknowledge the need for consistency between schemes and will take into consideration the level of support under the mandate and review how this may interact with the value of development RTFCs under the RTFO. Additionally, we have considered consistency with the RTFO's sustainability criteria and GHG emissions methodology in **Chapter 2**.

We will continue to develop the RTFO, including by introducing support for RCFs. We intend to legislate to introduce support for RCFs under the RTFO scheme and the RCFs measure is expected to be part of the forthcoming Transport Bill. A focused consultation on supporting RCFs through the RTFO was published in July 2022.

Interactions with international mandates and tankering

Consultation proposals

It is essential that any potential SAF mandate introduced in the UK or elsewhere does not result in an increase in carbon emissions outside the region where a SAF mandate is implemented. In particular, airlines may decide to take on additional fuel on inbound trips to the UK to cover the outbound trip from the UK by refuelling elsewhere – this is known as ‘tankering’ which can result in carbon leakage, even when taking into consideration the carbon emissions saved through SAF use.

Question 29

What provisions should the UK SAF mandate include to reduce the risk of tankering even further?

Summary of responses

Many respondents (including OEMs, NGOs, fuel producers and suppliers, airlines and trade associations) suggested that in order to reduce the risk of tankering further, the mandate should align with EU mandate provisions, particularly the uplift provision mentioned in the EU Fit for 55 document. This would require that a certain proportion of uplifted fuel come from UK airports. A few respondents went further than this and suggested that, in order to truly address the risk of tankering, coordination needs to happen at an international level to ensure the mandate is compatible with other globally agreed schemes or enforceable mandates.

Several respondents mentioned that airlines often have legitimate reasons to tanker fuel, such as operational safety reasons, lack of availability of fuel at destination airports, quality issues and regional price differences. These respondents therefore felt it would not be possible to limit tankering entirely and that attempts could be difficult to regulate. Despite this perceived difficulty, a few respondents did suggest that one way to reduce tankering could be to pre-estimate the fuel required for certain types of flights from the UK and determine for each flight if the fuel uplift is within a certain tolerance of this estimate. Respondents admitted that this would not be a straightforward task and would need to take into account variables such as aircraft type, en-route conditions, diversionary airports etc.

A few airlines displayed disagreement on whether the mandate should cover both international and domestic or just domestic flights. One respondent suggested international coverage would likely increase tankering as airlines would seek minimum cost solutions to

achieve compliance, whereas another proposed that the risk of carbon leakage is best avoided by applying the same rules to all flights departing from UK airports.

Furthermore, a few respondents felt that tankering is likely to be a minimal risk as a result of the mandate and therefore does not require specific provisions. It was suggested by some of these respondents that some further research should be conducted on the risk of tankering before implementing policy to reduce it.

Government response

We would like to thank stakeholders for the detailed feedback and evidence they have provided in response to this question. As set out in the Jet Zero Strategy, to reduce this risk of tankering, we will consider whether a mechanism is needed (voluntary or mandatory) for all airlines to avoid tankering where there is no practical reason to carry additional fuel, such as immovable turnaround times or fuel supply issues. In the SAF mandate consultation, the Government welcomed views on whether some additional provisions under the proposed SAF mandate may be needed to decrease the risk of tankering.

We will carry out analysis utilising the additional evidence and reasoning provided by respondents, to assess the potential impact that the SAF mandate may have on the likelihood of tankering, and whether a mandatory uplift agreement will be required. This will determine whether we need to introduce a mechanism to restrict tankering separately from the mandate. Further details will be provided in the second SAF mandate consultation later this year.

5. Delivering SAF to the market

Building a strong UK industry

Consultation proposals

We were keen to understand how we can build investor confidence in UK plants and secure investment, allowing the UK to develop a world-leading domestic SAF sector and deliver thousands of green jobs. The consultation therefore welcomed views on what, if any, additional interventions may be needed to provide more certainty for developers and investors considering building plants in the UK.

Question 30

Do you consider a more comprehensive policy framework beyond a SAF mandate is required to build a successful UK SAF sector?

Summary of responses

Total	Agree	Neither agree nor disagree	Disagree	Don't know
66	56	6	1	3

Most respondents agreed that a more comprehensive policy framework beyond a SAF mandate is required to build a successful UK SAF sector. While the mandate will help deliver our at least 10% SAF ambition by 2030 from both domestic and imported fuels, the majority of respondents stated the SAF mandate is not considered sufficient to drive domestic supply and scale investment in UK SAF plants. The predominant argument given is that while a SAF mandate will provide an important investment signal and provides some level of revenue support to SAF producers, additional complementary policies are needed to provide long-term price certainty and stability to help scale the industry in the UK.

A few NGOs suggested that it is difficult to make a strong case for public investment in risky initiatives such as SAF when there are other sectors that could more effectively address the decarbonisation challenge. Only one respondent, disagreed, claiming that a well-designed SAF mandate providing strong, stable signals to the market is sufficient.

A few respondents urged the Government to set out a comprehensive SAF policy framework over the next 12 months, which they argue could strongly signal the direction of travel.

Government response

We have considered the responses to questions 30 and 31 together - see government response below.

Question 31

If you believe this is the case, how can this policy framework be designed? Please provide any evidence you may have available to support your answers.

Summary of responses

Total	CfD	Loans and guarantees	Grants	Tax credits	Clearing House
58	32	26	23	7	12

Respondents identified a wide range of commercial and other considerations that should be considered when designing a policy framework for SAF. Many called for a holistic and comprehensive framework or strategy that addresses the scale up of SAF production in the UK. Many added that there would be a need for DfT to engage with other government departments including BEIS and HM Treasury, and for the framework to be considered alongside other frameworks in which SAF plants overlap such as the hydrogen and CCUS frameworks. A few airports, airlines and NGOs proposed that the comprehensive framework should be complemented with international engagement through ICAO and with the EU, to maximise policy alignment and minimise the risk of carbon leakage and disadvantage to UK industry.

Many respondents across organisation type encouraged the Government to emulate the approach being taken by the US, which entails a proposed incentive mechanism in the form of a performance based SAF tax credit, \$4.3 billion in SAF funding opportunities, including grants and up to \$3 billion in loan guarantees. This is in addition to federal incentives applicable to SAF under the federal Renewable Fuel Standard and state low carbon fuel standards like the California LCFS.

We consider specific initiatives proposed below in order of stakeholder preference.

Contracts for Difference (CfD) or other price support mechanisms

Most respondents, across organisation type, identified a CfD or another price support/revenue stabilisation mechanism as being essential to drive a UK SAF industry. Their reasons included that it would give price certainty to SAF producers, which they argue would be a key contributor to making projects financeable and would provide a significant boost to the incentive for investment into the UK SAF industry. They argued price stability will help lower the barriers to entry for SAF production and could lower the costs to

consumers of SAF (depending on how it is funded). Several respondents, including NGOs, airlines and OEMs, noted that in the absence of a CfD or similar approach the UK SAF mandate would largely be delivered through imported fuel. Finally, a few respondents commented on the potential for funding a CfD scheme through the hypothecation of funds from the UK ETS scheme.

Many respondents also made the point that a CfD should be consistent with and progressed in parallel with a SAF mandate. A few respondents proposed that volumes supported through CfDs could be deducted from the volumes obliged under the mandate; alternatively they may fall within a mandate, but this is likely to reduce the contractual payments required while increasing the total cost of a mandate, thus affecting the reference price for any CfD.

While many respondents focussed on a CfD, several pointed out that the benefits of contractual support can be realised by a variety of types of contract design and need not necessarily be a CfD. For example, the US does not have a CfD for SAF, but the combination of incentives, a liquid and well-established market in the tradable certificates, and other benefits serve to enable investment.

Loans, guarantees and equity

Many respondents identified government loans or guarantees as being another essential element of an effective policy framework, with many also adding government equity to this list. These respondents specifically identified the UK Infrastructure Bank or its predecessor, the UK Guarantees Scheme, as being explicitly designed to de-risk the large capital cost of infrastructure projects. Some added that without such support, it is unlikely that the gap between debt and equity can be bridged to deliver the first UK SAF plants by 2025.

There was a focus from many respondents, particularly fuel producers and suppliers, on emergent SAF technologies and FOAK projects being particularly suited to this type of support. It was noted that conventional bank debt is usually not available for these projects, or if it is available it is offered at prohibitively high cost. Several respondents added that loan guarantees that are tailored to meet the needs of emerging SAF technologies, covering a proportion of the total capital required, would unlock private finance to fund the first few commercial scale facilities.

Grants for investment

Most respondents, across organisation type, identified grants for investment as being another essential element of an effective policy framework, with many suggesting that grants could be used alongside the debt, guarantees and equity discussed above to help reduce the private financing required to meet the upfront cost of new facilities.

Several respondents noted that the competitions such as GFGS were welcome but that they should be extended, and those that mentioned a value suggested a further £50m in grants for the development of SAF production across the UK.

Many respondents proposed that direct government support could be focussed towards research or projects in the earlier technology readiness level (TRL) stages, with several commenting that continued R&D and demonstration funding programmes were attractive, and would be an important complementary tool to a mandate to support the commercialisation of low TRL technologies. A few NGOs felt that direct financial support

should only be provided for projects using novel or emerging technologies, or which use high-performing and abundant feedstocks, including waste and residue gasification, and PtL.

Tax credits or other fiscal measures

Some respondents, particularly fuel producers/suppliers and NGOs, made specific requests for tax credits or other fiscal measures such as accelerated depreciation to be awarded to SAF plants. Examples provided included a performance-orientated production tax credit lasting the project's lifetime to give certainty to investors. Some respondents referred to the example of the US, where tax credits have supported the production of renewable fuel.

Other suggestions included a tax on conventional kerosene or linking excise duty to carbon intensity. One respondent proposed that there should be incentives for airlines to go over and above a mandate similar to the LCFS. This could reward credits for any fuel used by airlines above a mandated obligation which could help to increase and reward airlines with ambition, incentivise producers to increase production which in turn could lower to cost of overall production.

UK clearing house

Many respondents called for the SAF policy framework to include the development of a UK clearing house as critical to expedite a UK SAF industry. Several respondents welcomed the Government's initial proposal for a UK clearing house but highlighted that this investment was only for one year and no funding has yet been provided to fuel developers. The Government needs to ensure the longevity of a testing programme to truly realise the SAF ambition. They called for a multi-year approach to the testing programme.

One respondent suggested that a clearing house would not make a significant difference to the speed of adoption of SAF given that only one (HEFA) of eight approved production pathways is in production today, and none in the UK. On the other hand, the Clearing House could help support efforts to certify 100% blends.

Offtake agreements

A few respondents suggested that fuel off taking agreements between airlines and fuel producers should specify that a minimum amount (%) of any SAF supplied to an airline is manufactured in the UK, which they believe would reduce the carbon footprint of shipping fuel. These respondents accept that not every aircraft fuelling can be controlled to such a level, however they consider that each fuel supplier should at least be required to account for the origin of its offtakes over a fixed time period.

Government response

The Government acknowledges and understands that most respondents to the consultation feel that additional support should form a key part of any comprehensive policy framework to build a UK SAF sector. The UK's SAF programme is one of the most comprehensive in the world and supports our vision to set the UK up to be a global leader in the development, production and use of SAF, allowing us to achieve net zero flying, and creating thousands of green jobs. To do this, we will focus on three main areas: creating secure and growing

UK demand; kickstarting a domestic SAF industry; and working in partnership with industry and investors to build long term supply.

Since the mandate consultation was first published in July 2021, the Government has already made substantial steps to kickstart the UK SAF industry. Alongside the publication of the Net Zero Strategy in October 2021 we announced:

- a £165 million Advanced Fuel Fund to support the development of advanced fuels plants in the UK for financial years 2022-25;
- £12 million for the operation of a SAF clearing house for financial years 2022-25; and
- a £400 million partnership with Breakthrough Energy Catalyst to drive investment into the next generation of clean energy technologies, including SAF.

The Government acknowledges the investment risks of producing SAF compared to fossil jet fuel and the ask for additional support to develop a UK industry, including loans and guarantees. Any further intervention must have the potential to reduce the cost of finance for SAF developers as well as reduce overall costs to government and would need further careful consideration given the potential costs and unintended consequences. It is important to note that unlike in the US, the UK does not have a history of using tax credits to commercialise emerging low-carbon technologies. In addition, tax credits could be a complex mechanism for incentivising SAF and may not benefit all businesses. This could mean they are difficult to deliver in the short term, but the Government keeps all tax reliefs under review and regularly receives proposals for changes to tax reliefs. When considering changes, HM Treasury must ensure they provide support to businesses across the economy in a fair way and represent good value for money for the taxpayer.

We will work in partnership with the financial community, including the UK Infrastructure Bank, industry and investors, as well as through our existing partnerships within the Jet Zero Council and with Breakthrough Energy Catalyst, to understand the possible market failures and how any potential interventions – by industry or the Government – should be targeted. We will engage with these stakeholders through summer 2022 to build an evidence base for potential complementary support to build a UK SAF industry, conducting a call for evidence this year, if necessary. This evidence will inform where the market failures are in the SAF investment lifecycle, the best timing and form of any potential complementary support, possible unintended consequences, and interactions with UK SAF policy. We would like to reach a preferred government position on how to further stimulate investment in a UK SAF industry by the end of the year.

Noncompliance and buy-out mechanism

Consultation proposals

The Government acknowledged future market developments or other external circumstances could mean fuel suppliers may not be able to produce sustainable fuel or buy credits, thus failing to meet (part of) their proposed obligation. It may be necessary for suppliers to pay a fixed sum for each litre of fuel for which they wish to ‘buy-out’ of their obligation. Should suppliers fail to produce SAF, an equivalent buy-out under the SAF mandate would allow them to fulfil their obligation, but this would result in a loss of additional carbon emissions savings. The consultation welcomed views on what measures or penalties should be in place to deter suppliers from falling short of the proposed carbon intensity targets and whether buy-out should be allowed.

Question 32

Should buy-out be allowed? If so, how should the buy-out price be set to encourage actual supply of SAF and delivery of GHG emissions savings? How should the buy-out evolve over time?

Summary of responses

Total	Yes	No	Don't know
53	31	13	9

Most respondents were in favour of the introduction a buy-out mechanism under the proposed SAF mandate. Respondents claimed the mechanism would help jet fuel suppliers discharge their obligation in the absence of sufficient SAF supply, for example due to a temporary shortage of feedstocks or delays in both domestic and imported SAF production or supply. As fuel and feedstock disruptions could increase SAF prices, many stakeholders agreed a buy-out would prevent potentially high prices from being passed on to passengers and preserve the competitiveness of the UK aviation industry.

Despite being in favour, only two respondents acknowledged the use of a buy-out would not result in GHG emissions savings and should therefore be used under exceptional circumstances. To avoid this risk, several respondents suggested the buy-out price should be higher than the price of SAF, so that the mechanism encourages SAF supply, does not make non-compliance purposely cheaper for fuel suppliers and drives up the value of the mandate credits, with potential benefits to the UK market. The buy-out price should, however, be low enough to protect passengers from spikes in prices and not to distort the market.

Setting the buy-out price

There were multiple views on how the buy-out should be set and what factors should be considered when defining its price:

- Two fuel producers stated the buy-out price should be at least equal to the cost of road fuel to discourage competition between transport modes, with one highlighting the cost of the development fuel buy-out under the RTFO.
- Two respondents suggested the buy-out price should be, at minimum, equal to or slightly higher than the market price of SAF; a third respondent specified the buy-out should be at least equal to the minimum selling price for SAF, regardless of its technology; conversely, a fourth response suggested the average price of SAF should be used as a reference while a fifth respondent proposed to use the difference between fossil jet and the most expensive SAF available in the market.
- Two responses stressed the buy-out price could include not only the cost of the SAF not delivered to the market, but also the additional cost of the carbon externality which has not been avoided, in the form of the average carbon price for the year.

Regardless of what proxy the buy-out price is based on, one respondent suggested this should be at least equal to £300/tonne of CO₂e, while another one suggested at least 3,000€/tonne, which is in line with the proposed non-compliance penalty proposed by

Germany for its power-to-liquid fuels mandate (€70/Gigajoule). Overall, fuel producers suggested the buy-out level needs to effectively provide the price support for SAF projects or that the level of buy-out should allow for an appropriate return on investment.

Buy-out price over time

Respondents in favour of a buy-out mechanism were split on whether this should be a temporary or permanent feature of the SAF mandate, on whether the price should increase or decrease over time and how often it should do so.

Many of those in favour of a buy-out advocated for directing the revenue gained through the potential buy-out scheme to support new plant builds and programmes that foster SAF development and supply chains.

Restrictions, penalties and practicalities

A couple of respondents proposed that safeguards should be introduced to ensure that SAF offered at the buy-out price is purchased, the mechanism does not result in a loss of carbon savings and persistent non-compliance is not encouraged. These could include additional monetary penalties for fuel suppliers if they fail to deliver SAF, restrictions on volumes allowed or caps on the percentage of fuel subject to buy-out. One NGO which advocated for penalties, including for non-compliance, suggested these could be set as a percentage of a fuel supplier's turnover.

Interactions with CfDs

A couple of respondents highlighted that if a price stability mechanism is introduced to support UK production, a buy-out should only be introduced for SAF not covered by such a mechanism. One NGO suggested that the buy-out price could be lower if a CfD is in place, as fuel suppliers would be less reliant on mandate certificate prices to drive the deployment of new capacity.

No buy-out

One respondent was not supportive of a buy-out, while another respondent stressed that a buy-out should only be allowed if SAF is not available in the market, claiming the cellulosic biofuel mandate in the US has not operated as intended due to the possibility for obligated parties to buy out of their obligation. One respondent preferred an approach aligned to the EU (penalties) to ensure consistency with other jurisdictions and avoid the risk that UK suppliers would primarily supply SAF somewhere else and buy out of their obligation in the UK. Individuals, a government body and a couple of organisations opposed a buy-out claiming it would allow the aviation sector to comply with its obligations without deliver carbon savings.

Government response

Government decision: we can confirm that a buy-out mechanism will be included in the SAF mandate.

We are thankful to respondents for putting across their suggestions on whether a buy-out should be implemented and if so, how it could be designed. Although the majority of respondents are in favour of a buy-out mechanism, there was no consensus on how it should

be set and consequently evolve over time. Questions on buy-out were discussed at a Jet Zero Council SAF DG Mandate Subgroup meeting in March 2022 alongside questions on the ambition and trajectory of the mandate. Subgroup members seemed to mostly agree with the need for a buy-out mechanism but there was no agreement on how this should be set, how the buy-out price may need to change if mandate targets are not met over a sustained period of time, and how the buy-out price could link with the RTFO buy-out price.

Although there was a lack of consensus on the detail of implementing a buy-out, there was broad agreement by respondents to the consultation that a buy-out mechanism should be included in the mandate. A buy-out has been proven to work within the RTFO and has been used to protect motorists from spikes in renewable fuel prices. A buy-out can be used as a fall-back option to ensure compliance when/if market factors mean SAF cannot be produced at a high enough quantity.

In order to make a firm commitment on the design of this buy-out mechanism, we will carry out analysis on:

- **What factors should be considered to set the price of a buy-out mechanism.** In the JZC SAF DG Mandate Subgroup meeting mentioned above, members suggested we consider diversion of renewable feedstocks/fuel from one end use to another, what is being done globally, social factors such as public perception of a buy-out mechanism, and whether or not price support will be available and the impact this could have on the market.
- **How the SAF mandate buy-out price could link with the RTFO buy-out price.** We acknowledge that developing and prospective projects may produce a variety of fuels, including renewable diesel and SAF. As stated in **Chapter 4**, we envisage these products will be covered by two schemes, the RTFO and the SAF mandate, respectively. The values of the certificates and the buy-out prices under these schemes may therefore affect the operational and financial decisions of advanced fuel facilities. Some JZC Mandate Subgroup members felt it would be beneficial to ensure the two buy-out prices were linked to create a level playing field. Other members pointed out that aviation fuel is more costly to produce than road fuel, hence setting an equal price is probably not the answer.
- **How the buy-out price may need to change if mandate targets are not met over a sustained period of time.** Some JZC Mandate Subgroup members suggested that buy-outs should only be used in exceptional circumstances, and rules should be in place to ensure the buy-out mechanism is not used regularly by suppliers to meet their obligation. Others suggested if there is a regular need for buy-outs then the mandate is not working as it should be and would need to be reviewed. One member also highlighted that changing the buy-out price under the RTFO is time consuming as it requires full consultation and suggested the mandate should allow for alterations of the buy-out price without full consultation.
- **Whether or not the buy-out should be a permanent feature of the mandate.** JZC Mandate Subgroup members were divided on whether the buy-out mechanism should be a permanent feature of the mandate, but it was agreed that a buy-out will be more useful and necessary in the early years of the obligation.

We will take these points into consideration and share a final buy-out proposal in the second consultation.

Question 33

What penalties should be introduced in addition/alternatively to a buy-out to ensure sustainable SAF, that meets the proposed criteria, is supplied?

Summary of responses

Many respondents stated that it is not necessary to introduce any additional penalties if a well-designed buy-out mechanism is implemented. In their view, the buy-out mechanism will already provide a safety net should SAF supply fall short of the obligation and further penalties risk being passed onto the consumer or incentivising imports over domestic SAF.

However, several respondents suggested that the Government considers financial penalties greater than the price difference between fossil kerosene and SAF where money generated from penalties could be redistributed to support production plants. A couple of respondents suggested that limitation on the number of times or frequency that a supplier can opt for a buy-out should be implemented to avoid excessive reliance on buy-outs. Other suggestions for penalties included enforcing suppliers to fulfil the shortfall the following year in addition to their usual obligation or publishing information on compliance which may cause adverse publicity. Several respondents simply stated that the mandate should align with the approach currently adopted in the RTFO.

Government response

We recognise that many respondents do not see additional penalties as necessary providing a well-designed buy-out mechanism is implemented. Given that the design of a buy-out mechanism requires further development, we are not yet in a position to make a commitment on whether additional penalties are necessary. **We will assess the implications of a buy-out mechanism once it is finalised and will share our final policy proposal in the second consultation.**

6. Scheme practicalities, reporting and verification

Mass balance and chain of custody

Consultation proposals

We proposed that a mass balance approach should be the only chain of custody system permitted as part of the SAF mandate. Such a system ensures that, for each unit of SAF claimed, an equivalent amount of feedstocks with the same sustainability characteristics of the final SAF has been effectively used in the fuel market, even if those feedstocks have not been physically separated during the production process. To allow sustainability data to be verified, credible and adequate evidence must be in place at each stage of the supply chain.

Question 34

Do you agree or disagree that a mass balance approach should be the only chain of custody system permitted under the proposed SAF mandate?

Summary of responses

Total	Agree	Neither agree nor disagree	Disagree	Don't know
46	28	5	7	6

Most respondents agreed that mass balance should be the only chain of custody permitted with the main reason being that this is the approach that other similar schemes, particularly the RTFO, have adopted. Thus, it is seen to be a standardised and proven method of accounting. Some respondents added that it is more efficient than alternative approaches as it avoids excessive cost and administrative burden of segregation while still providing a link between all stages of custody. Several respondents indicated that mass balance is also effective given the co-mingled supply of avtur in the UK and the use of the pipeline system.

However, some fuel producers highlighted that, while mass balance may be effective for pathways such as HEFA, there may be some complexity with other feedstocks and pathways such as MSW or RFNBOs.

A few airlines and trade associations prefer a book and claim approach over mass balance. According to these respondents, this system would provide verifiable data, reduced costs and standardised transactions and SAF would not have to be tracked onto the aircraft. A couple of respondents suggested that after initially adopting a mass balance approach, the UK could ultimately move towards a book and claim approach for consistency with CORSIA. However, a trade association argued against a book and claim approach stating that it could lead to greater compliance risks and potentially loss of credibility with stakeholders.

Some respondents suggested that more than one chain of custody could be adopted. Proposals included using mass balance up until a prescribed point such as the blending point, after which book and claim could be used or simply allowing airlines to choose between either mass balance or book and claim.

Other comments included making the applicable definition of mass balance clearer and operating mass balance via blockchain technology to allow visibility to the customers of the source of their SAF.

Government response

We have considered the responses to questions 34 and 35 together - see government response below.

Question 35

Where do you think the chain of custody will need to end? Please refer to any evidence to support your position.

Summary of responses

Many respondents stated that the chain of custody should end at the blending point since it is not possible to distinguish SAF molecules from fossil kerosene at this point and mass balance relies on tracking individual molecules. At the same time, many respondents proposed that the chain of custody should end at the point in which the fuel is held in co-mingled storage. This could be an airport storage system should the fuel have been delivered by road or rail or ingress into a pipeline system that is physically connected to the airport.

Several respondents proposed that the chain of custody should extend to delivery into the aircraft, however there were no statements on how this would work in practice. Conversely, many respondents stated that it would not be possible to track the molecules into the aircraft.

One respondent suggested that the chain of custody should end at the fuel terminal from which individual airports are served, adding that any further stages of custody downstream of the terminal to the airport should be based and verified on transaction documentation such as logistics contracts or invoices.

Government response

Government decision: a mass balance will be the only chain of custody permitted in the mandate. We are minded to end the chain of custody at the point the fuel is held in co-mingled storage.

Mass balance has been deemed the most appropriate chain of custody model for use under the mandate as it will provide the fuel with robust proof of sustainability and compliance with the mandate that can be directly traced back from the final fuel to the start of the chain of custody. As noted by respondents, a physical segregation approach is not considered suitable for the mandate because it can be prohibitively expensive and administratively time consuming.

Some airlines expressed a preference for a 'book and claim' approach but did not elaborate on what that would practically entail - we interpreted this as a mechanism for airlines to flexibly choose where to use SAF within the UK. The mandate will already allow that. However, for the chain of custody, the Government does not believe a book and claim model would be appropriate because this approach allows the separation of sustainability characteristics from the fuel itself and does not allow for full traceability of the supply chain. Furthermore, some respondents also proposed that a combination of chains of custodies could be adopted in the SAF mandate. We believe that this would introduce unnecessary complexity and administrative burden.

With regards to where the chain of custody should end, many respondents suggested that this should be at the blending point. The Government does not believe this is the most suitable end for the chain of custody: although at this stage the fuel will be verified as suitable for use in aviation, there is no way to evidence that the fuel will eventually be used in aviation in the UK.

Several respondents proposed that the chain of custody should extend to delivery of fuel into the aircraft, however as SAF has already been co-mingled with other batches of conventional jet fuel at that stage, this approach is likely to be difficult to evidence and create additional administrative burden for the obligated party.

At the point that fuel is held in co-mingled storage at the airport it will not be used for any purpose other than aviation and the obligated party should be able to evidence that fuel has reached this point. The Government recognises that further consideration will need to be taken to understand how best this could work depending on existing and future supply chain and infrastructure developments. These topics will be explored in more detail as part of the forthcoming DfT's Low Carbon Fuels Strategy. Alongside this, we will carry out a detailed examination of alternative options which could potentially work more effectively. Any future proposal on this issue will be discussed with stakeholders and consulted on in the second consultation before a final decision is made.

Annual reporting

Consultation proposals

It was proposed a reporting requirement on all aviation fuel (SAF and conventional) would need to be introduced so that the obligation on aviation fuel suppliers can be calculated

accurately. It was the Government's intention to ensure any additional reporting requirements minimise administrative burdens on aviation fuel suppliers, while ensuring information is collected timely so to allow a smooth and effective running of the scheme. The consultation welcomed views on what information should be reported on and what the reporting calendar should look like under the SAF mandate.

Question 36

Do you agree or disagree that obligated suppliers will need to report annually information on the aviation fuel supplied to the Department for Transport, regardless of whether they claim SAF credits?

Summary of responses

Total	Agree	Neither agree nor disagree	Disagree	Don't know
45	37	2	1	5

Those that agreed were supportive of increasing transparency as this would help to secure confidence in the scheme. It was noted that trust between industry and communities is often undermined by questionable accounting practices. Furthermore, the data reported could be valuable in monitoring policy implementation and development of the SAF market which in turn can be used to inform future policy decisions. Several airlines suggested that the information reported should be shared with end users (i.e. aircraft operators) to facilitate their claims for ETS, CORSIA and any other relevant international schemes and to show that the SAF has been consumed. It would also allow airlines to choose between suppliers based on quality of fuel. One airline noted that in other mandated markets it has been extremely difficult for airlines to obtain the correct sustainability data to enable the airlines to fully account for the SAF used.

A few respondents added that the reporting system is clear and minimises administrative burden on fuel suppliers. In particular, using a blockchain solution was outlined as a viable option. In practice, each unit of fuel produced can have a GHG tag attached to it which can share information automatically to DfT. If the date that the fuel is blended counts towards SAF credits rather than the date it is sold, it would remove unnecessary bureaucracy from holders of small volumes of fuel.

Finally, a trade association highlighted that alternative transport fuel volumes and densities are already reported to BEIS and HMRC.

Government response

We have considered the responses to questions 36 and 37 together - see government response below.

Question 37

Do you have views on what information obligated fuel suppliers should report?

Summary of responses

A third of respondents stated that the lifecycle carbon intensity (as agreed per the calculation methodology) and/or the volume of SAF should be reported on. For the volume of SAF, a few respondents suggested that suppliers should report on both SAF and conventional kerosene and a small number of respondents further suggested that this should be reported at each airport or pipeline location. Many respondents also stated that the origin of SAF and/or feedstocks used should be reported on. This could include the company, country and the supply chain delivering the feedstock. Other suggestions made by one or a small number of respondents included the point of delivery of SAF into the existing fuel infrastructure, technical standard that the SAF complies to, energy content, non-CO₂ emissions and lower heating value.

Several respondents recommended that a similar design to the RTFO reporting mechanism would be suitable, with a couple of respondents suggesting an aviation fuel equivalent of the GHG Reporting Regulations¹⁷. One fuel producer suggested harmonising the reporting mechanism with CORSIA.

Government response

Government decision: obligated suppliers will need to report annually information on the aviation fuel supplied to the Department for Transport, regardless of whether they claim SAF credits under the mandate

The majority of respondents agreed that obligated suppliers should report to the Department for Transport regardless of whether they claim SAF credits under the mandate. There was support from across industry including fuel producers, mirroring the requirements of the GHG Reporting Regulations. This includes reporting information on all fossil, renewable or partially renewable fuels that are covered by the SAF mandate.

The Government agrees that the reporting process should capture all relevant information while also ensuring that any administrative burden placed on suppliers is limited. Indeed, a reporting process similar to that of the RTFO could achieve this objective. With this in mind, our preferred information to be reported on is lifecycle carbon intensity, volume of fossil fuel and SAF, feedstock origin and duty information. However, we recognise that requiring suppliers to report on the same metrics as other schemes could facilitate compliance and ensure a smooth flow of information between parties. Therefore, we are keen to understand how best we can streamline the reporting process between the SAF mandate, UK ETS and CORSIA. We will reflect on upcoming discussions and evidence provided through the UK ETS SAF Pilot, Jet Zero Council SAF Delivery Group and the outcome of the ETS

¹⁷ The Motor Fuel (Road Vehicle and Mobile Machinery Greenhouse Gas Emissions Reporting Regulations 2012, also known as GHG Reporting Regulations requires suppliers of road transport fuel to submit information to the Department for Transport on the volume of all fossil, renewable or partially renewable fuels, including those covered by the RTFO Order.

consultation. We will revert with a final policy proposal and provide an opportunity for stakeholders to comment in the second consultation.

Question 38

Do you have views on the reporting calendar?

Summary of responses

Half of respondents stated that either suppliers should report on a monthly basis or the reporting timeline should align with that of the RTFO. A few of these suggested that it should be on a calendar year basis. Other suggestions were for reporting on a quarterly or annual basis but had limited support. One respondent recommended using blockchain to report on a real-time basis. Another respondent suggested that the reporting calendar should be in line with the Government financial year.

Many respondents suggested that the reporting timeline should consider the guidance claiming SAF under the UK ETS and CORSIA, which should allow for appropriate and timely verification and minimise administrative burden.

Government response

Government decision: the SAF mandate will operate on a calendar year basis.

We recognise the advantage in aligning the reporting calendar with that of another scheme to minimise the administrative burden on obligated parties. Indeed, the RTFO requires obligated suppliers to report on monthly basis to coincide with duty reporting. As discussed in **Question 5**, duty is not always applicable to aviation fuel and therefore opens the opportunity to greater flexibility in the reporting calendar. The Government will operate on a calendar year basis, in line with the RTFO, to ensure that the transition of submitting claims between schemes on 1 January 2025 is supported. We are minded to require obligated suppliers to report at least annually to the Department for Transport. We will revert with more detail on the reporting timeline in the second consultation.

Submitting claims

Consultation proposals

Data to meet the proposed annual reporting obligations would be collected on top of the information SAF suppliers would need to submit to DfT to claim credits under the proposed SAF mandate. In most cases, it was expected that aviation fuel suppliers that supply SAF would meet the proposed reporting requirements through the information supplied in their applications for credits throughout the year, without the need to submit a separate annual report.

It was proposed that aviation fuel suppliers can apply for credits how often they choose, at any time within the given reporting period. In line with the RTFO, it was proposed this information would need to be provided per administrative consignment. Once data is

complete for one or more administrative consignments, SAF suppliers would be able to choose to apply for credits or hold data for a future application. Credits would be issued by DfT on a monthly cycle and it is expected a cut-off date could be in place.

Question 39

Do you have views on what the timescale for submitting claims and the information/evidence required by this process should be?

Summary of responses

Most respondents stated that there should be alignment with the RTFO in terms of the timescale for submitting claims and the information required. Similarly, a couple of respondents – a fuel producer and airline - suggested that submitting claims should be compatible with UK ETS, CORSIA or EU RED.

Excluding those that proposed alignment with other schemes, suggestions for the timescale for submitting claims included monthly, quarterly and five or six months after the compliance period ends. An NGO stated that claims should be submitted at the same time as SAF is supplied past the duty point. Only seven respondents provided comment on the timescale and there was no real consensus between them.

On the information required, the only comments concerned using independent verification or certification via CORSIA recognised voluntary schemes.

Government response

Government decision: we are minded to issue credits on a monthly cycle.

As noted in the consultation, it is expected that aviation fuel suppliers that supply SAF would meet the proposed reporting requirements through the information supplied in their applications for credits throughout the year, without the need to submit a separate annual report. In terms of timeline, it is anticipated that credits will be issued by DfT on a monthly cycle and it is expected a cut-off date could be in place, beyond which applications will be processed the following month. We will revert with more detail on the timescales for submitting claims in the second consultation but expect that the scheme will operate in a way similar to the RTFO.

Voluntary schemes

Consultation proposals

It was proposed that obligated fuel suppliers would need to show that the SAF supplied meets the proposed SAF sustainability standards and would need to have their claim data independently verified before submitting an application for credits. The Government is minded to allow certifications from voluntary schemes that show the SAF supplied meets its prescribed sustainability criteria, following the feedstock or biofuel along the chain of custody.

It was not proposed that reliance on voluntary schemes would be mandatory, so that fuel producers can have flexibility to bring their preferred evidence to show compliance with the sustainability criteria. It would, however, be the SAF supplier's responsibility to provide adequate information that can confirm the sustainability criteria have been met as deemed satisfactory by DfT.

Question 40

Should certification provided by voluntary schemes count as evidence of compliance with the sustainability criteria of the SAF mandate? If so, do you think this step should or should not be mandatory?

Summary of responses

Criteria	Total	Yes	No	Don't know
Count as evidence	46	31	4	11
Mandatory	30	12	14	4

Most respondents were in favour of using voluntary schemes as one method of providing evidence of compliance. The main support for voluntary schemes was that they serve as useful evidence for the impacts of land use and feedstocks on the environment and have been effective at demonstrating compliance in RTFO and EU RED. Other benefits noted by respondents included giving suppliers more certainty of compliance, enhanced transparency and increasing consumer awareness. One respondent suggested that independent certification schemes may help to address traceability challenges arising from the international aspect of aviation.

It was emphasised by several respondents that a list of voluntary schemes approved for use by DfT (or industry) should be specified and audited regularly. It was suggested that voluntary schemes should be assessed on their alignment with the mass balance approach, technical standard and reliability. Given that other schemes already use voluntary schemes, allowing the use of existing voluntary schemes could help to reduce complexity for SAF producers and ensure the availability of the SAF volumes for the UK market. Several respondents referred to RSB voluntary standards and one trade association suggested ISCC.

Those that were against the use of voluntary schemes as evidence of compliance expressed caution of industry certification and suggested that an authorised central scheme provider that regulates all activity should be used instead.

In terms of whether this step should be mandatory, responses were more divided. Those in favour of making this step mandatory – mostly fuel producers – argued that it provides full transparency, verification of traceability and assists in end-to-end auditing. Those that did not think voluntary schemes should be mandatory included trade associations, fuel producers and an airline. They felt that fuel producers should be given the opportunity to submit evidence via alternative methods should they choose to, providing it is adequately robust and auditable. One trade association noted that, in their experience with existing

voluntary schemes, the approval process (by the European Commission) has been slow and schemes are assessed at different rates. Some respondents also noted that this approach is consistent with other schemes, such as the RTFO.

Government response

Government decision: voluntary schemes will count as evidence of compliance with the sustainability criteria but their use will not be mandatory

We are pleased that there was support from across industry for this proposal with over two thirds of respondents agreeing that voluntary schemes should count as evidence of compliance with sustainability criteria. We believe that third-party certification is necessary to ensure fair assessment of sustainability claims and that suggestions of an authorised central scheme would not be appropriate. In addition, it will ensure a consistent approach to sustainability certification and simplify the administrative burden on fuel suppliers.

We anticipate that voluntary schemes could be recognised for a specific scope. For example, certain feedstocks, geographies, one or more of the land-use criteria, the GHG criteria (including the possibility to calculate actual values) and the mass balance system. Our expectation is that DfT will provide a list of approved voluntary schemes with their respective scope.

Although there was no consensus on whether this step should be mandatory, we have not seen enough evidence or reasoning to diverge from the approach taken in the RTFO. Therefore, we can confirm that a reliance on voluntary schemes will not be mandatory. To clarify, all suppliers will be required to present evidence to demonstrate compliance with sustainability criteria. However, suppliers will have the flexibility to bring their preferred evidence providing that the Department for Transport deem the information provided to be satisfactory.

Officials will engage with existing voluntary schemes approved under the RTFO and CORSIA to understand how they could potentially play a role in providing evidence of compliance under the SAF mandate. We will collaborate with voluntary schemes to ascertain how best to assess compliance with our proposed sustainability criteria. We will revert with more information on voluntary schemes in the second consultation including approval and review process for recognised voluntary schemes and the practicalities of demonstrating compliance using voluntary schemes or otherwise.

Question 41

What information should the obligated party provide, either through verifiers or other means, to demonstrate compliance with the sustainability criteria?

Summary of responses

There are three areas of information that stakeholders proposed should be provided for verification in line with what was set out in the consultation:

- the carbon intensity of the fuel to evidence that the obligation has been met;

- the list of feedstocks to ensure they are in line with those used to produce the SAF are included in the list of eligible feedstocks; and
- the compliance with land criteria.

Respondents also emphasised the importance of traceability to ensure materials can be traced across the entire supply chain and the integrity of sustainability claims can be verified. One respondent added that utilising a block chain solution would facilitate traceability. Other suggestions for information to be provided included production pathways, blend, mass or volume of SAF and feedstock origin. Others simply suggested that the information provided is in line with the other schemes such as the RTFO, EU RED, CORSIA and UK ETS. Some respondents highlighted that suppliers could provide documents given to them under approved voluntary schemes.

Government response

We thank respondents for proposing what information needs to be provided to demonstrate compliance with the sustainability criteria. However, given that the sustainability criteria have not yet been finalised, **we are not in a position to place a firm commitment on what evidence will need to be demonstrated. We will revert with a proposal in the second consultation and provide the opportunity for stakeholders to comment.**

Verification

Consultation proposals

On top of the proof of sustainability supplied by a voluntary scheme or the provision of evidence deemed acceptable by DfT, it was proposed that independent verification or assurance is also needed for fuel suppliers submitting claims under the SAF mandate.

Under the RTFO, this needs to be conducted by a qualified and competent party in line with the International Standard on Assurance Engagements (ISAE 3000, Revised) to at least the 'limited' assurance level defined by this (or another equivalent) standard. We welcomed views on whether verification should be conducted to a 'reasonable' assurance, which already happens in some circumstances under the RTFO.

Question 42

Do you agree or disagree that claims for credits under the SAF mandate should be verified? If so, should these be verified to a 'limited' or 'reasonable' assurance?

Summary of responses

Total	Agree	Neither agree nor disagree	Disagree	Don't know
43	33	6	0	4

Most respondents agree that claims for credits should be verified with the main argument that it stops fuel suppliers manipulating or abusing the mandate and thus ensures that all maintains credibility of the scheme. However, one fuel producer suggested that the voluntary scheme audit will give sufficient assurance of sustainability.

In terms of how the verification works in practice, several respondents drew comparisons with verifiers from other schemes, such as the RTFO and ETS, or suggested that any verifier should be part of a DfT approved list. A couple of respondents recommended that DfT takes into consideration the additional administrative burden that this would place on fuel suppliers. A fuel producer noted that it is imperative that international fuel suppliers must be held to the same standards as those based in the UK.

Total	Limited assurance	Reasonable assurance
25	12	13

Those that stated a preference for limited assurance argued that a reasonable assurance would add unnecessary cost to the verification of feedstocks and fuels and that a limited assurance consistent with RTFO is appropriate given the success of the policy. However, a consultancy argued that a reasonable level of assurance would ensure maximum traceability while two airlines called for consistency with UK ETS emissions reporting, for which they have to provide a reasonable level of assurance.

Government response

Government decision: claims for credits under the SAF mandate should be verified to a 'limited assurance'.

The majority of respondents agree with the proposal to impose mandatory independent verification of claims in order for credits to be issued and we can therefore confirm that we will proceed with the proposal as set out in the consultation. This is to provide assurance of the accuracy of the data submitted by suppliers. This verification of data will be carried out in accordance with the ISAE 3000 standard, although we note that there may be exceptions for fuels that do not have a suitable duty point.

The Government is keen to align practice with the RTFO where possible and has not seen sufficient evidence or reasoning to diverge from the approach taken in the RTFO. Although the RTFO currently stipulates the verification should be carried out to a limited assurance, the Department for Transport is exploring the need to increase this to reasonable assurance to reflect the increasing complexity of supply chains in fuel production. This is particularly pertinent to aviation fuel. A reasonable assurance would require high level of evidence gathering but would increase the degree of confidence users of the assurance statement can place on the conclusion. We will continue to explore the possibility of implementing a higher level of assurance and will revert with a final proposal in the second consultation.

Statistical releases and market information

Consultation proposals

DfT regularly releases reports with key information provided under the GHG Reporting Regulations and the RTFO. This information includes, for instance, the sustainability characteristics of biofuels supplied under the RTFO, the proportion of the different types of fuel supplied, the average carbon emission savings. This data is typically aggregated or presented for each fuel suppliers depending on the statistical release. The Government is keen to continue to provide transparent access to information collected as part of the proposed SAF mandate, where this information is not commercially sensitive. The consultation welcomed views on what information should be ideally released and when this should be best published.

Question 43

What data related to the SAF mandate should DfT make publicly available? How often should this information be published?

Summary of responses

Many respondents suggested that three broad areas of information should be published:

- Volume of fuel supplied: it was further suggested that this could be disaggregated by conventional aviation fuel and SAF, domestic and imported SAF or by each obligated supplier.
- Emissions: this was suggested to be published as one or more of average carbon emissions per tonne of fuel and level of fulfilment of mandate, total carbon emissions for aviation fuel in the UK or total carbon mitigated. A consultancy also suggested to report on particulate emissions relative to conventional kerosene.
- Sustainability characteristics of fuel: this included type of SAF (e.g. RCFs and RFNBOs), country of origin, production pathway and feedstocks used.

In addition to this, several respondents requested that fuel supplier activity should be made publicly available i.e. the exercise of buy-outs and credits claimed for each supplier. Similarly, one respondent stated that tankering activity by airline should be published. At the same time, several respondents urged DfT to protect commercial sensitivities by avoiding publishing data attributed to specific fuel suppliers or airlines or by aggregating data by type or size of organisation.

A third of respondents referred to the data published on the RTFO stating that it has an appropriate level of detail whilst protecting commercial sensitivities. Other comments recognised the advantages of publishing such data including upholding transparency, supporting industry in monitoring and reaching targets and increasing consumer confidence.

There were different views on how often this data should be published: these included: quarterly , annually and close-to-real-publication.

Government response

Government decision: the department will publish data related to the SAF mandate on a regular basis.

The Department for Transport recognises the importance of upholding transparency and aims to maintain confidence in policy decisions. We believe that one instrument to do this is releasing public statistics as they can inform future engagement with stakeholders and contribute to policy decisions.

In order to maximise the benefit of the publication, we are keen to incorporate a comprehensive set of data in the report. However, we recognise that commercial sensitivities may need to be protected. With this in mind, our preferred information to be included in the publication includes the volume, carbon intensity and emissions, and the sustainability characteristics of the fuel supplied, with the possibility of disaggregating each of these further.

With regard to the timeline, we have not seen enough evidence to diverge from the approach adopted in the RTFO i.e. we expect final reports will be published for each obligation period and quarterly reports for each year. We will share our final policy proposal on the timeline and information in the second consultation.

Glossary

1G biofuels	First generation biofuels
2G biofuels	Second generation biofuels
ASTM	American Society for Testing and Materials
ATI	Aerospace Technology Institute
AtJ	Alcohol-to-Jet
Avgas	Aviation gasoline
Avtur	Aviation turbine fuel
CCUS	Carbon capture, utilisation and storage
CfD	Contracts for Difference
CORSIA	Carbon Offsetting and Reduction Scheme for International Aviation
DAC	Direct air capture
DEF STAN	Defence Standard
ETS	Emissions Trading Scheme
FEED	Front end engineering design
FOAK	First of a kind
FT-SPK	Fischer-Tropsch Synthetic Paraffinic Kerosene
GFGS	Green Fuels, Green Skies
GHG	Greenhouse gas
HEFA	Hydroprocessed Esters and Fatty Acids
HVO	Hydrotreated Vegetable Oil
ICAO	International Civil Aviation Organization
ILUC	Indirect land use change
MSW	Municipal solid waste
PtL	Power-to-Liquid
RCF	Recycled carbon fuel
RFNBO	Renewable fuel of non-biological origin
RTFO	Renewable Transport Fuel Obligation
SAF	Sustainable aviation fuel
UCO	Used cooking oil