



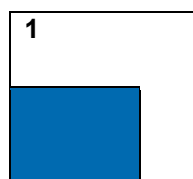
Department
for Transport



Sustainable Aviation Fuels Revenue Certainty Mechanism

Revenue certainty options to
support a sustainable aviation
fuel industry in the UK

Cover images



1 Airport refuelling vehicle with an aeroplane taking off.

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Ministerial foreword: Parliamentary Under Secretary of State Anthony Browne MP

In the Jet Zero Strategy (JZS) the Government committed to achieving “Jet Zero” - net zero UK aviation emissions by 2050. Decarbonising aviation will be a challenge, but meeting this challenge is vital for UK connectivity and growth. This is a shared commitment with the aviation sector who are very conscious of their responsibilities for meeting sustainability targets and that decarbonisation needs to be a central objective in future progress.

Sustainable aviation fuels (SAF) are a key lever in the transition to “Jet Zero” and represent an industrial leadership opportunity for the UK. Supported by the introduction of the SAF Mandate from 2025, we expect substantial growth in the volumes of SAF produced, green jobs created and ultimately increasing carbon savings. The Mandate will require 10% of jet fuel to be made from sustainable feedstocks by 2030 and provides an incentive for SAF producers. The government’s confirmation of the SAF Mandate policy, including key policy parameters such as the cap on fuel made from hydroprocessed esters and fatty acids (HEFA), buyout price and Power to Liquid (PtL) Mandate and commitment to lay the statutory instrument (SI) this summer, provides a strong signal to investors about the government’s commitment to SAF, utilisation of the HEFA based SAF available today, as well as stimulating the development of waste based and PtL SAF in the UK and globally. We are committed to work hand in glove with the UK SAF industry to ensure we produce the fuel that is needed to deliver much of the Mandate ambition in future. The first commercial transatlantic flight on 100% SAF, completed in November 2023 by Virgin Atlantic exemplifies what can be achieved by industry and government working in partnership.

The commitment to SAF is not just happening in the UK, we are seeing more countries around the world setting out similar policies. This is an opportunity for the UK to continue to be one of the global leaders in the development of SAF. The UK already has SAF being produced in the P66 Humber Refinery, with 13 other projects being developed across the country with support from the government’s Advanced Fuel Fund. We want to work with industry to build a successful SAF industry. The industry and government ambition is to see at least five commercial scale SAF plants under construction in the UK by 2025.

This consultation underpins the commitment the government made in September 2023 to develop a revenue certainty mechanism to enable the UK to build a successful sustainable

and competitive SAF industry at the scale that is required to meet our net zero targets. This consultation will provide the insights for policy design for any such mechanism.

Executive summary

The Government's **Jet Zero Strategy** set out how we plan to achieve **net zero emissions** from UK aviation by 2050 whilst continuing to support the growth of this important sector. A key pillar of the strategy is advancing the use sustainable aviation fuel (SAF).

The government has been clear that it wants to see the UK continue to capture its share of the SAF global market and play a leading role in the development, production and use of SAF, allowing us to achieve net zero flying and creating thousands of green jobs.

SAF can be made from a variety of feedstocks, from waste gases to municipal solid waste, and is importantly a 'drop-in' fuel that can be easily blended with conventional jet kerosene. Along with life cycle emissions savings, the use of SAF does not require engine or aircraft modifications and causes very limited disruption to the existing supply chain. The UK's SAF programme is one of the most comprehensive in the world, and includes:

- an ambitious **SAF Mandate from January 2025** to drive the demand for SAF in the UK, deliver a reduction in UK aviation carbon emissions of 2.7MtCO₂e in 2030 and 6.3MtCO₂e in 2040, and provides a long-term signal that now is the time to invest.
- The government has allocated **over £135 million** through the **Advanced Fuels Fund**, which aims to take UK SAF plants through to completion and supports our ambition to see five plants under construction in the UK by 2025.
- We have established a **UK SAF Clearing House**, which will support the testing and approval of innovative fuels.

SAF is already available in the UK: Provisional statistics showed that 48 million litres were supplied in 2022¹ (accounting for 0.4% of all supplied jet kerosene in the UK), but this will need to increase rapidly in order for production and supply to keep pace with demand.

SAF Mandate and other policy frameworks

The SAF Mandate is set to be implemented in 2025 and introduces specific targets for the proportion of SAF in the aviation fuel mix, which suppliers and airlines need to comply with. These targets will increase from 2025 to 2040, providing 15 years of certainty for the industry. By 2030, at least 10% of jet fuel should be made from sustainable feedstocks. In

¹ Based on provisional statistics for 2022: [Renewable fuel statistics 2022: Third provisional report - GOV.UK \(www.gov.uk\)](https://www.gov.uk/government/statistics/renewable-fuel-statistics-2022-third-provisional-report)

2025, the overall SAF trajectory will be set at 2% of the total fossil jet fuel supplied, which is equal to around 230,000 tonnes of SAF. This will increase annually to 10% in 2030 and 22% in 2040.

The Mandate will also introduce tradeable certificates for the supply of SAF, with additional certificates awarded for fuels with higher GHG emissions savings. A buy-out mechanism will operate to allow suppliers to discharge their Mandate obligation. A successful and resilient SAF industry will need a range of technologies and feedstocks to meet increasing demand, therefore by setting a cap on HEFA that becomes more stringent over time, the UK SAF Mandate will create a space for more advanced fuels. In addition, a power-to-liquid (PtL) obligation will be introduced from 2028 at 0.2% of total jet fuel demand and will reach 5.5% of total jet fuel demand in 2040. This will accelerate the development of this type of fuel which has reduced risk of feedstock competition and other negative environmental impacts.

To avoid double incentivising fuel supply, the SAF Mandate certificates will be a separate scheme from the Renewable Transport Fuel Obligation (RTFO) and SAF will no longer be eligible under the RTFO.

Investment barriers

Commercial-scale, domestic SAF plants will be important to supply the levels of SAF that will be needed to keep pace with demand. However, these are major investments and, for non-HEFA based SAF plants, are often using technologies which comes with risks for potential investors. Reducing exposure to revenue risk for these projects could help attract more investment. This is the subject of this consultation and is further explored in the case for further intervention in section 1.

Alongside revenue uncertainty there are other risks for developing commercial-scale UK SAF plants. Section 1 provides the strategic context on these wider risks that can be categorised as technical (for example, construction, nascent technologies and supply chain maturity) and commercial (for example, availability of capital and scale of finance).

Revenue certainty mechanism proposals

In September 2023 the government announced that we would design and implement a revenue certainty mechanism to attract private investment and enable SAF projects to be deployed at scale in the UK. The announcement was clear that any mechanism will be industry funded. This followed the publication of independent advice commissioned by the Department for Transport from Philip New and significant input from stakeholders through forums, such as the Jet Zero Council, which have been pivotal to developing the options in this consultation. Our commitment to continuing this work was also enshrined in legislation through an amendment to the Energy Act 2023 which committed government to consult on a revenue certainty mechanism within six months of the Energy Bill gaining Royal Assent.

In this document we develop the mechanics of the leading shortlisted options, demonstrating how these mechanisms could work in practice and how they might interact with other government policy. The leading options will all require legislation: Guaranteed Strike Price (GSP) and the Buyer of Last Resort (BOLR) are two mechanisms involving private law contracts which would require primary legislation, whilst the Mandate Floor Price (MFP) and Mandate Auto-Ratchet (MAR) are regulatory mechanisms applied to the

SAF Mandate, and could be implemented through additional secondary legislation. The consultation also presents key design considerations for private law contracts - for price setting, allocation of contracts and interactions with wider policy frameworks.

This consultation also undertakes a detailed assessment of the options for revenue certainty mechanisms against three key overarching principles: 1) investability, 2) deliverability, and 3) affordability. Against these criteria the private law contract-based mechanisms scored the highest, with a GSP coming out highest overall. The consultation welcomes views on this preferred mechanism, including on the trade-off between deliverability timeline and the level of certainty provided, when compared with other mechanisms.

Whichever option is chosen for implementation, it will need to function in tandem with wider domestic and international regulatory frameworks, including subsidy interactions. It also must also complement government initiatives to drive UK SAF plant construction, such as grant funding competitions (for example, the Advanced Fuels Fund).

Next steps

There are a number of detailed proposals in this consultation, and the evidence we collect will be important in helping us set our design parameters for the preferred mechanism. There will be opportunities to discuss views on the content of this document, through Jet Zero Council delivery and sub-group meetings and our regular stakeholder workshops.

We look forward to receiving your responses to these proposals.

How to respond

The consultation period began on 25 April 2024 and will run until 20 June 2024. Please ensure that your response reaches us before the closing date. If you would like further copies of this consultation document, it can be found at <https://www.gov.uk/dft#consultations> or you can contact LowCarbonFuel.Consultation@dft.gov.uk if you need alternative formats (Braille, audio CD, etc.).

Our preferred method of receiving responses is via email. If you are unable to respond by email, we would invite you to please let us know by asking someone to email on your behalf. If none of the above is possible, then we invite you to provide responses to:

SAF Commercialisation Team, Low Carbon Fuels

Great Minster House

33 Horseferry Road

London

SW1P 4DR

When responding, please state whether you are responding as an individual or representing the views of an organisation. If responding on behalf of a larger organisation, please make it clear who the organisation represents and, where applicable, how the views of members were assembled.

We will be convening meetings with stakeholders throughout the consultation period. If you would be interested in attending these events, please contact:

LowCarbonFuel.Consultation@dft.gov.uk

Freedom of Information

Information provided in response to this consultation, including personal information, may be subject to publication or disclosure in accordance with the Freedom of Information Act 2000 (FOIA) or the Environmental Information Regulations 2004.

If you want information that you provide to be treated as confidential, please be aware that, under the FOIA, there is a statutory Code of Practice with which public authorities must comply and which deals, amongst other things, with obligations of confidence.

In view of this it would be helpful if you could explain to us why you regard the information you have provided as confidential. If we receive a request for disclosure of the information, we will take full account of your explanation, but we cannot give an assurance that confidentiality can be maintained in all circumstances. An automatic confidentiality disclaimer generated by your IT system will not, of itself, be regarded as binding on the Department for Transport (DfT).

DfT will process your personal data in accordance with the Data Protection Act (DPA) and in the majority of circumstances this will mean that your personal data will not be disclosed to third parties.

Confidentiality and data protection

This consultation is carried out by the Department for Transport, working with other government departments.

In this consultation we are asking for:

- your name and email, in case we need to ask you follow-up questions about your responses (you do not have to give us this personal information, but if you do provide it, we will use it only for the purpose of asking follow-up questions)

If an organisation we are additionally asking for your organisation's:

- name, for identification

Your consultation response and the processing of personal data that it entails is necessary for the exercise of our functions as a government department. DfT will, under data protection law, be the controller for this information. [DfT's privacy policy](#) has more information about your rights in relation to your personal data, how to complain and how to contact the Data Protection Officer.

As sustainable aviation fuels policy has many interactions with other government policy and work, to ensure we develop effective policy, we may share your responses with other government departments, such as Department for Energy Security and Net Zero (DESNZ) and Department for Environment, Food and Rural Affairs (Defra). We will remove your personal details before we share your response with other government departments.

We will not use your name or other personal details that could identify you when we report the results of the consultation. Any information you provide will be kept securely and destroyed within 12 months of the closing date.

Consultation principles

The consultation is being conducted in line with the Government's key consultation principles which are listed below. Further information is available at <https://www.gov.uk/government/publications/consultation-principles-guidance>

Consultation principles:

- Consultations should be clear and concise
- Consultations should have a purpose
- Consultations should be informative
- Consultations are only part of a process of engagement
- Consultations should last for a proportionate amount of time
- Consultations should be targeted
- Consultations should take account of the groups being consulted
- Consultations should be agreed before publication
- Consultation should facilitate scrutiny
- Government responses to consultations should be published in a timely fashion
- Consultation exercises should not generally be launched during local or national election periods

1. Strategic context

This section describes the background to the consultation and the strategic case for developing a revenue certainty mechanism for UK SAF production. It sets this in the wider policy context and outlines the government's overarching vision for deploying SAF.

The challenge

The government has committed to legally binding targets for greenhouse gas (GHG) emissions including net zero by 2050 and interim carbon budgets. Transport remains at the centre of our decarbonisation efforts as the largest emitting sector, accounting for 27% of the UK's GHG emissions².

The aviation industry's contribution to GHG emissions is projected to continue to grow in the coming decades, becoming one of the UK's largest contributors by 2050. The Jet Zero Strategy, published in 2022, set out how the government would achieve net zero emissions from aviation by 2050. The Strategy sets out three guiding principles; international leadership, delivered in partnership and maximising opportunities, and six core policy measures; systems efficiencies, sustainable aviation fuels, zero emission flight, markets and removals, influencing consumers and addressing non-CO₂.

However, zero emission technologies such as electrification and hydrogen are unlikely to offer significant decarbonisation potential for aviation in the short to medium-term. While aircraft efficiency is helping play a role, SAF is currently the most effective way to start to decarbonise long-haul flights. By pricing CO₂ emissions, market-based measures can drive cost-effective emissions reductions, making efficiencies, the removal of residual emissions, zero emission flight and SAF more economically attractive. As such, SAFs that are technologically available, and compatible as 'drop in fuels' for current and planned aviation fleets, are widely expected to play a critical role in decarbonising aviation up to and beyond 2050.

On average, the associated GHG emissions from using SAF are 70% less than fossil jet fuel on a life cycle basis. There could also be the potential to reduce non-CO₂ impacts of aviation such as contrails, by reducing particulate emissions. There is uncertainty around the scale of non-CO₂ impacts, but some studies indicate that they may account for over half of climate impacts from aviation³.

² [Decarbonising Transport – A Better, Greener Britain \(publishing.service.gov.uk\)](https://www.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/108482/Decarbonising_Transport_-_A_Better_Greener_Britain.pdf), p.14

³ [jet-zero-strategy.pdf \(publishing.service.gov.uk\)](https://www.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/108482/jet-zero-strategy.pdf), p.55

DfT committed to improving its understanding of the non-CO2 impacts of aviation, and the potential for SAF and other decarbonisation measures to mitigate these impacts. We launched a multi-year research programme alongside the Department for Business and Trade and the Natural Environment Research Council to support the commitments made in the Jet Zero Strategy. On 13 October 2023, we launched the first call for projects which was targeted at academia. An industry call will follow later in the year.

A range of production pathways for SAF are under development globally with a small number in commercial deployment. Making the leap from the lab to commercial scale has proven difficult as small demonstration facilities are capital intensive and often unprofitable at the scale involved. Commercial plants can then typically cost £600 million to £2 billion to reach economical scales of production and tend to run at a loss during their first years of deployment.

Where plants are first-of-a-kind, the capital requirements are often seen as too large for venture capital or too risky for most private equity and fund investors. This means that most of these projects are reliant on debt financing. The UK's market for green finance is strong⁴ but debt finance will look for significant mitigation against risk if funding is to be offered at a reasonable cost of capital.

The government response to the publication of independent advice from Philip New 'Developing a UK Sustainable Aviation Fuel Industry'⁵ defined key barriers to investment that SAF producers face:

- **Technology risk:** Advanced SAF technologies are at early technology readiness and require innovation and demonstration before they are ready for commercial deployment. Even then the risk remains that a plant will not operate as expected.
- **Feedstock risk:** There is significant competition for resources that can be used as feedstocks for SAF production. There is a risk that in the absence of long-term feedstock contracts, producers will not attract sufficient feedstocks to maintain forecasted production levels and revenues.
- **Construction risk:** Building a SAF plant presents risks of issues that cause delays or impact the plants performance specifications. These could occur from ground condition, interface between different parts and underestimation of time and cost to build and commission.
- **Revenue certainty:** Due to uncertainty regarding the future cost of SAF and an undefined market price, there is a lack of confidence over the revenue that SAF production will attract.

The opportunity

The UK is well placed to take advantage of the opportunities that SAF production presents, due to competitive strengths in engineering, aviation technology and fuel infrastructure. This is alongside the development of supportive industries including renewables, hydrogen production, greenhouse gas removals, and carbon capture, utilisation and storage (CCUS). SAF is now starting to be produced and supplied in the UK through the support of

⁴ [Mobilising Green Investment - 2023 Green Finance Strategy \(publishing.service.gov.uk\)](https://publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/121444/mobilising-green-investment-2023-green-finance-strategy), p.20.

⁵ [Developing a UK sustainable aviation fuel industry report \(publishing.service.gov.uk\)](https://publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/121444/developing-a-uk-sustainable-aviation-fuel-industry-report)

the Renewable Transport Fuels Obligation (RTFO) – 48 million litres of SAF was supplied and certified under the RTFO in 2022⁶, which accounted 0.4% of all supplied jet kerosene in the UK. Whilst this more than doubled from 2021, this is still limited compared to the demand for SAF that the Mandate will drive.

The Jet Zero Strategy ‘high ambition’ scenario set out that SAF is expected to contribute 17% of the abatement required by 2050. The government will introduce a mandate by 2025 to secure these emissions reductions, with an interim target for 10% SAF in the UK aviation mix by 2030 (1.5 billion litres).

A vision for a UK SAF industry

The government has been clear that it wants to see the UK capture its share of the global SAF market, by playing a leading role in its development, production, and use. The Jet Zero Strategy, published in 2022 made a commitment to having at least five UK SAF plants under construction by 2025. A thriving UK industry will secure wider benefits beyond emissions reductions including:

- **Economic growth:** A domestic SAF industry would secure investment and high-skilled jobs in our industrial regions. Independent analysis from Sustainable Aviation estimates by 2030, this could generate up to £1.8 billion gross value added (from production and global exports) and over 10,000 jobs for the UK, which may rise to £10 billion gross value added and 60,000 jobs by 2050⁷.
- **Securing supply:** Global demand for SAF is expected to increase rapidly and it is likely to exceed supply, requiring the UK to compete internationally to secure fuel. Meeting a greater amount of the SAF mandate through domestic production could protect the UK from global market volatility and increase fuel security.
- **Global leadership:** Most UK aviation emissions come from international flights and the global nature of the sector means that international collaboration is crucial for decarbonisation. The UK is committed to working through the International Civil Aviation Organisation (ICAO) to help deliver its long-term global goal of net zero carbon emissions by 2050, for which over 50% of the reductions needed in 2050 could come from cleaner fuels. The UK also negotiated hard in ICAO to secure a global target to reduce emissions from global aviation fuel by 5% by 2030, as an important step towards net zero by 2050. A strong domestic industry underpins our international position and allows us to assist other countries in delivering on their own ambitions and together achieving a global transition to cleaner aviation energy.

To establish the level of support required to build a UK SAF industry that maximises the potential economic and environmental opportunities, we need to estimate the scale of a UK industry that can feasibly be achieved.

The growth of a UK SAF industry could be limited by the demand for SAF driven by the Mandate, especially non-HEFA waste-based SAF which the UK industry is particularly focused on, several factors including feedstock availability (including biomass, municipal solid waste and low carbon hydrogen), electricity grid capacity and access to technologies

⁶ Based on provisional statistics for 2022: [Renewable fuel statistics 2022: Third provisional report - GOV.UK \(www.gov.uk\)](https://www.gov.uk/government/statistics/renewable-fuel-statistics-2022-third-provisional-report)

⁷ Sustainable Aviation roadmap: [SA9572_2023CO2RoadMap_Brochure_v4.pdf \(sustainableaviation.co.uk\)](https://www.sustainableaviation.co.uk/wp-content/uploads/2023/04/SA9572_2023CO2RoadMap_Brochure_v4.pdf), p.35.

like CCUS. Considering these areas, DfT has undertaken provisional analysis of what the potential scale of a UK industry could be, utilising modelling from the SAF Mandate.

The analysis suggests that the UK could have up to 7 operational SAF plants by 2030 and up to 25 by 2040. This could include a mixture of HEFA and non-HEFA and power to liquid plants, securing the UK's place at the forefront of technological innovation and decarbonisation.

At this scale, the UK could produce up to 600,000 tonnes of SAF annually by 2030 and up to 2,000,000 tonnes by 2040. By 2040 this would represent up to 70% of the total SAF required to meet our SAF Mandate targets, securing carbon emission savings of 4Mt per year.

Existing arrangements

This section describes the actions that are already being taken to support the production, supply, and use of SAF in the UK.

The Renewable Transport Fuel Obligation (RTFO)

In the UK, we have encouraged the use of low carbon transport fuels through a combined demand and supply-side approach. On the demand side, the Renewable Transport Fuel Obligation (RTFO) came into force in 2008, placing a legal requirement on suppliers of fuel to roads and non-road mobile machinery to supply a set percentage of sustainable renewable fuel. Since 2019, the RTFO has also included a 'development fuel sub-target' for strategically important fuels, including aviation fuels (which will no longer be eligible under the RTFO once the SAF Mandate is introduced). This provides targeted support to fuels we need most, and which are the most complex to produce.

The RTFO guarantees a UK market for low carbon fuels by setting regulatory volume targets, and therefore provides certainty to industry. The additional revenue stream for producers generated by the ability to acquire tradeable certificates in return for supplying renewable fuels improves the bankability of projects and encourages investment. It is designed to provide additional support to the most sustainable fuels, with fuels derived from wastes and residues able to claim double rewards. The emphasis on waste derived fuels has proved successful: in 2022, 66% (2,182 million litres) of all biofuels supplied in the UK was made from waste feedstocks⁸.

Whilst the RTFO has led to over £1 billion of investment in UK production facilities, this has focussed primarily on either processing feed wheat and sugar beet into bioethanol, or waste vegetable oils into biodiesel – both so-called 'first generation' technologies. Critically, since the scheme is funded by motorists, it is less suitable to ask those consumers to cover ongoing costs of aviation fuel in the RTFO.

⁸ [Renewable fuel statistics 2022: Final report](#)

UK SAF Mandate

In April 2024 the government published its response to the second consultation on the SAF Mandate, confirming the detailed design of the scheme. The Mandate will start from January 2025. Once the Mandate enters into force, SAF will no longer be eligible for support under the RTFO. The Mandate has ambitious targets, requiring at least 10% of jet fuel supplied to the UK to be made from sustainable sources by 2030.

Whilst the Mandate is largely a demand side measure, by creating a long-term requirement on aviation fuel suppliers to supply SAF it creates a clear signal to develop SAF production facilities in the UK and globally. The Mandate also provides a financial incentive to supply SAF through issuing tradeable certificates. These certificates are rewarded for the supply of SAF in proportion to the GHG savings achieved and can be traded between suppliers. The value of the allocated certificates is not set by the government, but the buy-out price⁹ within the Mandate effectively sets the maximum value of certificates. SAF producers will receive price support for SAF either directly (through earning certificates themselves if they are also a fuel supplier), or indirectly by selling to suppliers who will be willing to pay a premium over the cost of fossil kerosene for the SAF to fulfil their obligations and avoid buy-out. It is intended that the value of certificates will narrow the gap between the price of kerosene and the cost of SAF, thereby encouraging production of SAF.

However, we have listened to views of stakeholder that the SAF Mandate alone may not in all cases provide sufficient long-term revenue certainty to maximise investment in UK SAF production facilities. In the first consultation on the SAF Mandate¹⁰, most respondents suggested that a more comprehensive policy framework beyond a SAF mandate is required to drive domestic supply and scale investment in UK SAF plants to build a successful UK SAF sector. The government has since committed to introducing a revenue certainty mechanism to provide further reassurance about future revenues and drive investment in SAF production in the UK¹¹.

The government confirmed the design of the Mandate in a government response published recently¹². We will lay the required UK legislation in 2024 so that the Mandate can commence from 1 January 2025.

UK Emissions Trading Scheme (UK ETS)

The SAF mandate will sit alongside the UK Emissions Trading Scheme (UK ETS) that applies to some UK aviation emissions. Where use of eligible SAF is reported on UK ETS routes, it is currently 'zero-rated' and aircraft operators can claim a corresponding reduction in their UK ETS obligations. This is intended to help bridge the cost differential between SAF and conventional aviation fuel as the industry develops.

⁹ Where suppliers do not have sufficient certificates to meet their obligation, they can buy out the remainder of their obligation for a fixed price per tonne of SAF (i.e. the buy-out price) for the amount they have not supplied.

¹⁰ [Mandating the use of sustainable aviation fuels in the UK - GOV.UK \(www.gov.uk\)](https://www.gov.uk/government/consultations/mandating-the-use-of-sustainable-aviation-fuels-in-the-uk)

¹¹ [Department for Transport, Revenue certainty mechanism for SAF: delivery plan, 04 September 2023](https://www.gov.uk/government/consultations/revenue-certainty-mechanism-for-saf-delivery-plan)

¹² [Pathway to net zero aviation: developing the UK sustainable aviation fuel mandate - GOV.UK \(www.gov.uk\)](https://www.gov.uk/government/consultations/pathway-to-net-zero-aviation)

The UK ETS Authority will develop proposals on how the UK ETS should treat the use of SAF by aircraft operators in the light of the SAF mandate and will consult on these in due course. The Authority will consider full alignment with the SAF Mandate sustainability criteria. While SAF will continue to be zero-rated under the UK ETS in the short-term, the Authority will continue to explore alternative options to SAF being zero rated in the future.

Funding programmes

On the supply-side, the department has launched several competitions allocating capital grant funding to support UK production of SAF:

- The Advanced Biofuel Demonstration Competition (ABDC) was launched in 2014, allocating £15.5 million (matched by industry) to help construct first-of-a-kind demonstration-scale advanced low carbon fuel plants in the UK.
- The Future Fuels for Flight and Freight Competition (F4C) was launched in 2017, allocating £6.5 million across two competitive stages for plants focusing on producing fuels for HGVs and Aviation.
- The Green Fuels, Green Skies competition (GFGS) was launched in 2021, allocating £14 million to support for FOAK commercial and demonstration scale SAF plants during their early life cycle development stages (from feasibility study to detailed engineering).
- The Advanced Fuels Fund (AFF) was launched in July 2022, allocating over £135 million until 31 March 2025 in grant funding to support private investment in UK advanced fuels projects by overcoming perceived technological and construction risks. In December 2022, the first round of the Advanced Fuels Fund awarded five projects a share of £82.5 million. In November 2023, DfT announced the winners of the second round of the Advanced Fuels Fund. Nine projects will each receive a share of £53 million.

SAF Clearing House

In the Jet Zero Strategy, the government committed to establishing a UK SAF Clearing House to support testing and qualification of new advanced fuels for aviation. In March 2023, the department appointed the University of Sheffield as the delivery partner for the Clearing House, supported by Ricardo. The Clearing House is now fully operational after launching in November 2023. It acts as a central hub to co-ordinate testing and approval of SAF in the UK, helping to remove barriers to new fuel types coming to market.

SAF must undergo rigorous and expensive testing before being certified as safe to use in commercial aircraft, which, alongside a global testing and qualification bottleneck, can act as a significant barrier to the entry of new fuels to market. A UK Clearing House builds on existing expertise to help reduce uncertainty, cost and time barriers to SAF development without sacrificing safety and acts as a low-cost enabler to future SAF projects, while helping to alleviate global testing pressures.

Case for further intervention

All of the programmes and policies mentioned above help make the UK a competitive place to invest in SAF production. They help address the risks and barriers to investment set out in section 1, for example the funding programmes such as the AFF help to overcome technology and construction risks, whilst the SAF mandate provides price

support through tradeable certificates, which helps provide a level of price certainty for SAF producers.

However, there are some barriers to investment that are not fully addressed through the policies outlined above. Through our policy development process to date, we have identified that one of the key remaining barriers to investment is the risk of revenue certainty.

Revenue certainty

There are a several reasons why revenue certainty remains a key barrier to projects reaching Financial Investment Decision (FID) in the UK:

- There is no clear UK nor global market price for advanced (non-HEFA) SAF. A nascent and variable price means predicting the price that SAF will trade at in the UK over the short and medium to long term (for example, the next 10 to 20 years) is uncertain. There is uncertainty regarding global production volumes and given SAF is a highly fungible commodity and transport costs are relatively low, a ramp up in SAF production globally could significantly deflate SAF prices within the UK. Current market arrangements for SAF are largely ad hoc and bilateral with little to no transparency, which therefore provides very few insights and little confidence to potential investors.
- Policy and regulatory uncertainty. There is a perceived risk of future regulatory changes, which could impact on future price dynamics and subsequent returns on investment. This includes the possible adjustment of UK SAF Mandate targets, impacting the balance of supply and demand and subsequent price movements. This also relates to the level of the buy-out price within the mandate, which impacts the price that suppliers are willing to pay for SAF.
- Projects are competing for finance with other emerging low carbon technologies. Some other low carbon technologies already receive or are due to receive revenue certainty support. The low carbon electricity Contract for Difference (CfD) scheme has been in place since 2015 and a similar business model is being implemented for low carbon hydrogen production, carbon capture and greenhouse gas removal technologies. These business models are seen to increase investor confidence and bring down the financing cost of projects in the UK. These revenue certainty schemes have created a precedent for investors, such as debt financiers, who are looking for a secure return on their investment. With all else being equal, these technologies could outcompete SAF for green financing.

As outlined in the Written Ministerial Statement by the Secretary of State for Transport on 4 September 2023¹³, the government recognises the strategic importance of a UK SAF industry and wants to see the UK capture its share of the global SAF market by playing a leading role in the development, production and use of SAF. The government recognises that a revenue certainty mechanism will help to support future revenues and drive investment in SAF production in the UK.

¹³ [Government support for a UK SAF industry - GOV.UK \(www.gov.uk\)](https://www.gov.uk/government/press-releases/2023/09/04)

CONSULTATION QUESTION

Q1: Do you agree with this rationale for implementing a revenue certainty mechanism? If not, why not?

2. Scope

The department and industry have regularly collaborated to significantly progress the design of four shortlisted mechanisms that are the primary focus for this consultation. Finding opportunities to engage with industry, financial institutions, academic and interest groups when possible has been important to reaching the consultation's findings. Annex B outlines in detail the key engagement forums that have led to this point.

Further views are required to help progress the policy development and inform final decisions. Throughout the consultation, there are questions that gauge views on the preferred options and mechanism design (for example, contractual length) and gather supporting evidence.

Your answers to specific questions that weigh up the deliverability, investability and affordability of the shortlisted mechanisms will highlight the most important requirements from industry, such as the trade-off between higher level of price certainty for investors and a more complex mechanism with a later implementation date.

There will be opportunities to discuss the content of this document and your views with the team, through Jet Zero Council delivery and sub-group meetings, as well as our regular stakeholder engagement.

We look forward to receiving your responses to these proposals.

Out of scope

HEFA

We consider HEFA-based SAF production to have overcome many of the technical and commercial challenges that other technologies face. To date, we have focussed support on developing a UK SAF production industry focussed on advanced technological pathways to SAF, for example, through the Advanced Fuels Fund. Therefore, our analysis assumes revenue certainty support should not be targeted at HEFA-based SAF projects and instead focusses on technology pathways which have not yet reached commercial scale.

CONSULTATION QUESTION

Q2: Do you agree or disagree that HEFA-based SAF should not be covered by the proposed revenue certainty mechanism? Please provide supporting evidence.

Broader investment risks

As set out in section 1, there are multiple barriers to investment in commercial scale SAF production that still exist, including feedstock, technology and construction risk.

We understand the concern shared amongst some in industry over the confidence over the supply of feedstocks, in terms of availability and accessibility, for UK SAF projects. The Department for Transport's Low Carbon Fuel Strategy, to be published later this Spring, will build on the DESNZ Biomass Strategy, and set out a clear vision for low carbon fuels supply and demand across all transport modes, considering various feedstocks, to help identify potential risks, bottlenecks and opportunities. We recognise this is an important issue and will continue to consider it in parallel to this consultation.

The Advanced Fuels Fund, in addition to previous funding competitions, will help UK producers overcome some of the technology and construction risks associated with this first of a kind technology. As set out in the government response to the Philip New report¹⁴ in March 2023, it is important that government continues to work with industry to tackle these barriers and to explore how any potential interventions – by industry or government – could be targeted to address them. As with our work to help address feedstock risk, these barriers to investment are out of scope for this consultation.

Pre-mechanism measures

The government is aware of industry calls for further measures to enable UK SAF projects to reach Final Investment Decision (FID) before the introduction of a revenue certainty mechanism. There has been recent government financial support in the form of the Advanced Fuels Fund, as well as the Green Fuels, Green Skies competition, and this consultation is not considering interim measures or additional government funding competitions at this time.

¹⁴ [Government response to Developing a UK sustainable aviation fuel industry report \(publishing.service.gov.uk\)](https://publishing.service.gov.uk)

3. Revenue certainty options

Introduction

This section provides a detailed overview of the mechanisms that have been considered in detail both by government and stakeholders. We have concluded that the four shortlisted options below are the most suitable to achieve the desired policy outcomes. We have considered whether other financial structures to support SAF plants, such as tax schemes and/or other public and private financing schemes, would achieve our objectives but have not identified any other suitable mechanisms.

- **Guaranteed strike price (GSP)** – guarantees an agreed price per litre of fuel produced to SAF producers who choose to apply to the scheme, (similarities to low carbon electricity contracts for difference).
- **Buyer of last resort (BOLR)** – counterparty steps in to purchase SAF certificates when the market price falls below an agreed level. Thereby guaranteeing an agreed minimum price for the producer's SAF certificates redeemed through the SAF Mandate.
- **Mandate auto-ratchet (MAR)** – the Mandate (and its HEFA cap) adjusts when there is an oversupply in the market, to bring the price of SAF back closer to the buy-out price.
- **Mandate floor price (MFP)** – include a minimum price for certificates which is universally applied through the Mandate itself (in addition to the buyout price).

Guaranteed Strike Price (GSP)

How does it work?

- A SAF producer enters in a contract with a counterparty (an agent of government), the contract sets a price ('strike price') that the producer will be able to achieve when it sells the SAF product.
- The producer then sells the SAF at the market price at the time of production.
- If the market price is lower than the strike price agreed in the contract, the producer is provided with the difference from the counterparty.
- If the market price is higher than the strike price agreed in the contract, the producer pays the excess amount back to the counterparty.
- This gives the producer a guarantee that the revenue achieved from selling its product is sufficient to pay back debt raised to fund the investment.

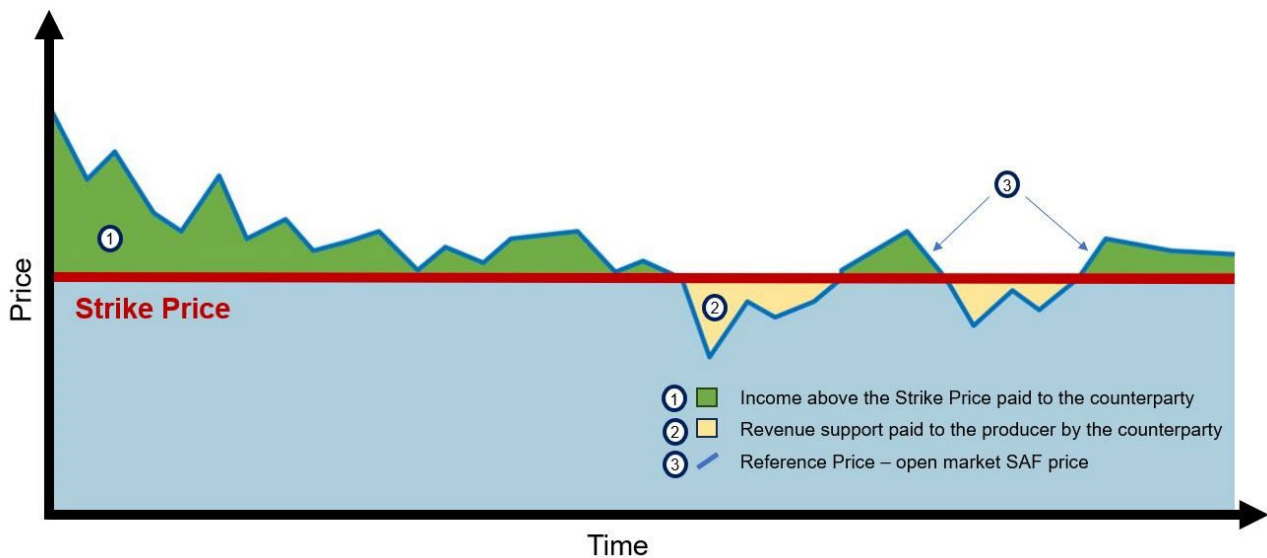


Figure 1: Illustration of GSP

How does it provide revenue certainty?

Guaranteeing a specific price through a private law contract provides legal certainty to producers that they will receive a certain price for the SAF they sell to the market. The amount of revenue certainty this scheme provides the SAF producer will be dependent on key parameters which are explored in Annex A, such as the creditworthiness of the counterparty they are signing the contract with.

Key design considerations

Many of the design considerations of this type of mechanism are similar to the Buyer of Last Resort mechanism, described below. Those in common, such as price setting and contract design, are set out in Annex A.

Interaction with other government policy

SAF Mandate

The guaranteed strike price mechanism would operate separately but in tandem with the SAF Mandate. No amendments to the SAF Mandate legislation would be required.

What is the legal basis / legislative requirements?

It is likely that primary legislation will be needed to provide regulation making powers. Secondary legislation will then be required to implement this type of scheme, for example, to establish a counterparty and put in place legal obligations. Existing primary legislation does not provide the necessary legal powers for a scheme of this type. It is worth noting that legislation for the Hydrogen Production Business Model has been secured through the Energy Act 2023 and the Hydrogen Production Revenue Support (Directions, Eligibility and Counterparty) Regulations 2023. This provides an indication of what level of detail would be required for a similar type of scheme.

How long will it take to deliver?

There are many factors affecting the speed of potential delivery and there can be no guarantees over the legislative timetable. However, our estimates indicate that in the best case scenario, the legislation required to implement this type of revenue certainty mechanism could be in force by Q4 2026.

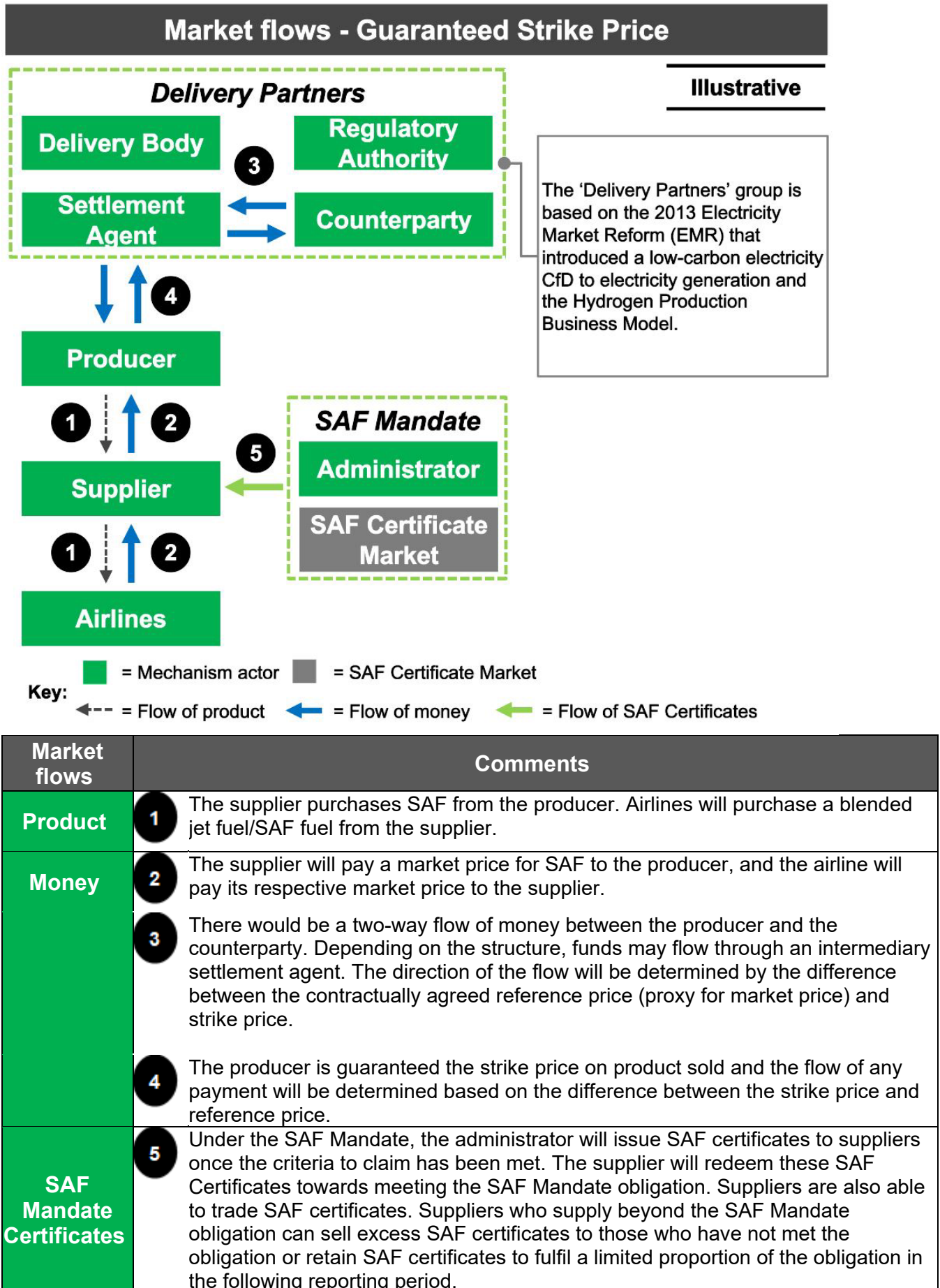


Figure 2: Market Flow illustration for GSP

CONSULTATION QUESTION

Q3: Do you agree with our explanation of the Guaranteed Strike Price mechanism? Is there anything else we need to consider?

Buyer of Last Resort (BOLR)

How does it work?

- A SAF producer enters into a contract with a counterparty (and agent of government), which guarantees that a 'Buyer of Last Resort' will step in and purchase their SAF certificates at an agreed price.
- The producer claims certificates (under the SAF mandate) for the SAF that they sell.
- If the value of those certificates falls (because the market price of SAF has fallen), the BOLR purchases them at the value agreed in the contract.
- The BOLR retains the certificates or sells them back into the market.

How does it provide revenue certainty?

The price that SAF producers can expect to receive for their SAF is assumed to equal the price of jet kerosene plus the value of the SAF mandate certificate associated with that fuel. By guaranteeing a minimum price on the value of SAF Mandate certificates, this mechanism provides SAF producers greater certainty over their minimum revenue from SAF production.

Guaranteeing through a private law contract provides legal certainty to producers that they will receive a minimum price for their SAF certificates. The amount of revenue certainty this scheme provides will be dependent on key parameters which are explored in Annex A, such as the creditworthiness of the counterparty.

Key design considerations

Many of the design considerations of this type of mechanism are similar to that of the Guaranteed Strike Price mechanism, described above. Those in common, such as price setting and contract design, are set out in Annex A.

Who is claiming SAF Mandate certificates?

This mechanism relies on the entities that have the private law contract with the Buyer of Last Resort also owning SAF Mandate certificates. Certificates can be claimed by whichever entity owns the fuel at the assessment point in the supply chain. The government response to the second SAF Mandate consultation confirmed this as being at the duty point. Currently, there are thought to be multiple scenarios regarding which entities will own the fuel at this point, which will impact who is eligible to receive SAF Mandate certificates.

Transparency and fluctuation of SAF Mandate certificate prices

SAF is a global market and prices will be impacted by several factors. Many jurisdictions are establishing SAF blending mandates, such as the European Union and Norway, therefore the supply of SAF to different countries is likely to fluctuate significantly, depending on various economic conditions in global markets.

Under the BOLR, certificates will be bought by the administrator when the market price for certificates falls below an agreed level. If the market price regularly fluctuates above/below the agreed level, knowing when to purchase certificates becomes very difficult. The BOLR would need to be designed in a way that is dynamic enough to respond to short term changes in market conditions.

What does the BOLR do with the purchased certificates?

The BOLR has the option to either:

- Sell the certificates back to the market immediately, which will likely result in a net loss.
- Retire the certificates from the market.
- Carry them over to the following year.

Interactions with other government policy

SAF Mandate

This mechanism has been designed with the SAF Mandate in mind and aims to simplify the interaction between the revenue certainty mechanism and the SAF Mandate. It is likely that some changes would need to be made to the SAF Mandate legislation, not least to allow the government (or its counterparty) to purchase certificates.

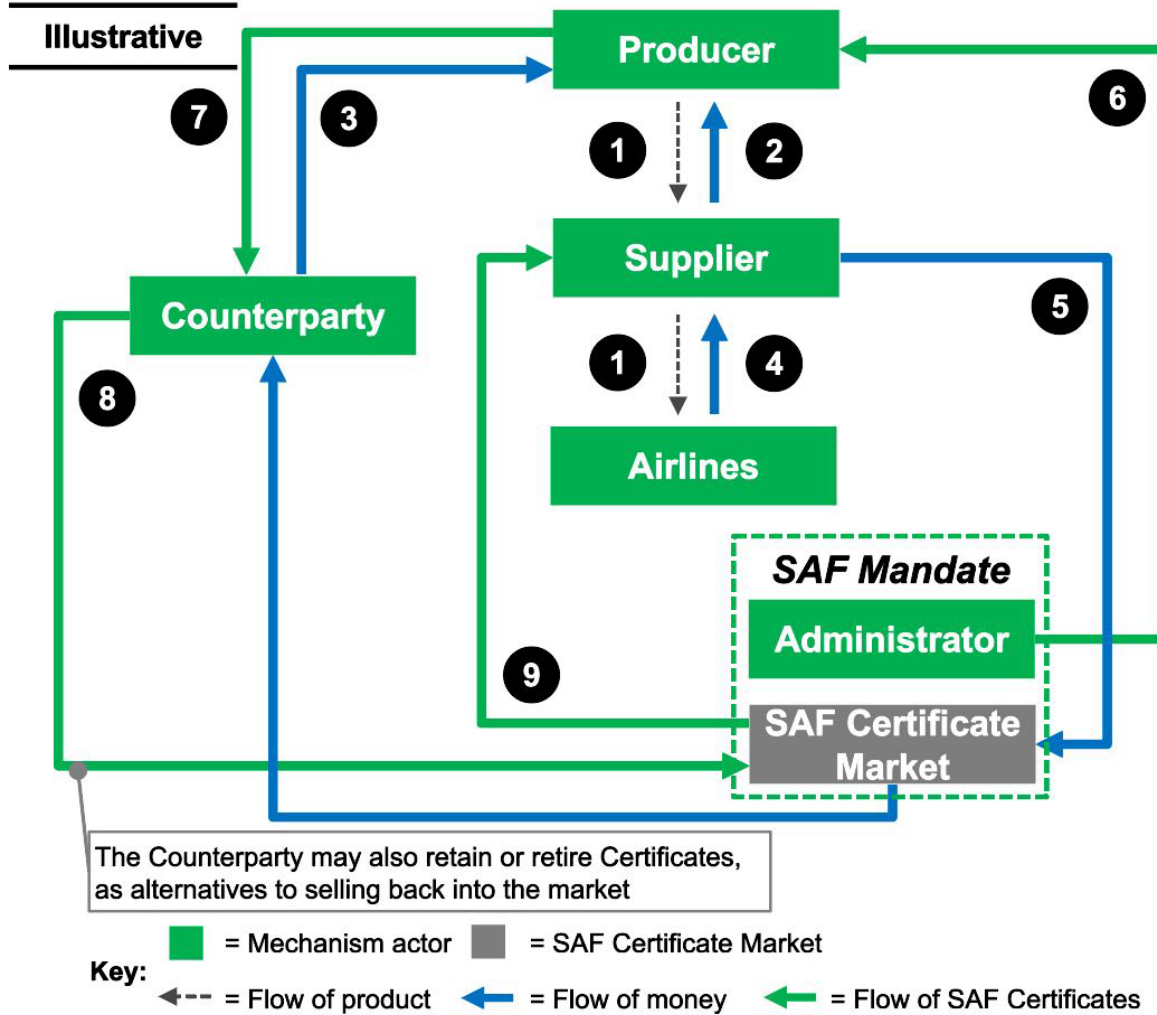
What is the legal basis / legislative requirements?

It is likely that primary and secondary legislation will be needed to implement this type of scheme. The exact scope of legislation required depends on the details of the scheme designed, such as who the counterparty to the scheme would be. For example, if the government was proposed to be the counterparty to the scheme, then new primary legislation would be required to enable the government to enter into private law contracts of this nature and may also need changes to the Mandate legislation.

How long will it take to deliver?

There are many factors affecting the speed of potential delivery and there can be no guarantees over the legislative timetable. However, our estimates indicate that in the best case scenario, the legislation required to implement this type of revenue certainty mechanism could be in force by Q4 2026.

Market flows – Buyer of Last Resort (when BOLR contract is called upon)



The Counterparty may also retain or retire Certificates, as alternatives to selling back into the market

Market Flows	When the market price of SAF Certificates falls below a BOLR Minimum Certificate Price	
Product	1	The supplier purchases SAF from the producer. Airlines will purchase a blended jet fuel/SAF fuel from the supplier.
Money	2	When the price of SAF certificates falls below the BOLR minimum certificate price, the supplier pays only the jet fuel price to the producer.
	3	The Buyer of Last Resort (the counterparty) is required to buy certificates from the producer at the minimum SAF certificate price.
	4	Airlines will pay the supplier for SAF even under BOLR where the SAF certificates falls below a minimum certificate price.
	5	Suppliers are required to purchase SAF certificates to fulfil the SAF Mandate obligation. <ul style="list-style-type: none"> When a producer invokes the BOLR contract, it is assumed that they will claim and sell the SAF certificates to the counterparty. From the supplier's standpoint, it acquires SAF at the jet fuel price from this producer. Therefore, they would not be able to claim SAF certificates on that fuel. To fulfil its Mandate obligation, the supplier

		must purchase SAF certificates from the market as they will be at a deficit of certificates compared to the SAF purchased.
SAF Mandate Certificates	6	The SAF producer would need to be the entity that claims the SAF certificates
	7	The counterparty purchases the SAF certificate from the producer.
	8	The counterparty has the option to sell SAF certificates in the market, to retiring them, or carrying over to the following year.
	9	Suppliers seeking to fulfil their SAF Mandate obligation will receive SAF certificates following purchase in the traded market.

Figure 3: Market flow illustration of BOLR

CONSULTATION QUESTION

Q4: Do you agree with our explanation of the Buyer of Last Resort mechanism? Is there anything else we need to consider?

Mandate Auto-Ratchet

How does it work?

- If the SAF Mandate targets are being exceeded by a certain level, then the Mandate Auto-Ratchet (MAR) mechanism automatically increases the Mandate obligation. This would ensure a balanced supply/demand of SAF and help maintain the price support that the mandate scheme is intended to provide.
- The SAF Mandate scheme is intended to close the gap between the price of fossil kerosene and the additional cost of producing and supplying SAF. SAF producers will receive price support for SAF via the mandate scheme either through:
 - Earning certificates themselves, or
 - The willingness of obligated parties to pay a premium for SAF over the cost of fossil kerosene, to claim certificates and fulfil their obligations.
- Consideration will need to be given to the HEFA cap and Power to Liquid (PtL) sub-target parameters, as well as the overall trajectory.
 - For example, the PtL sub-target would not be increased in line with the overall trajectory if the main target was being exceeded but there was limited PtL supply.

How does it provide revenue certainty?

MAR provides producers with more assurance that SAF certificates will retain their value in the long term and that the mandate will provide sufficient price support, therefore offering greater revenue certainty to SAF producers.

Key design considerations

Design variation

The 'ratchet' could be designed to offer varying degrees of certainty. The government has already noted the potential to raise the Mandate levels in the future, should the market and technology develop quickly and SAF costs and carbon abatement costs reduce significantly. The second SAF Mandate consultation proposed reviewing Mandate levels every five years and the government response confirmed a formal review every five years, with the first review to be carried out by 2030.

Additional guidance setting out more detail regarding how the government intends to review targets will provide additional levels of certainty regarding future SAF market dynamics, which in turn will impact SAF certificate prices.

The ratchet could be designed in a more rigid way, where a formula is designed to specify the conditions that need to be met for mandate levels to increase. Whilst this may provide additional certainty with regards to how targets will be increased, determining the exact conditions necessary for an increase could be challenging, and there may be some unintended consequences associated with baking-in these increases.

Fluctuation of SAF mandate certificate prices

Many jurisdictions are establishing SAF blending mandates, such as the European Union and Norway, therefore the supply of SAF to different countries is likely to fluctuate

significantly, depending on various economic conditions in global markets. A ratchet would need to be designed in a way that is dynamic enough to respond to short term changes in market conditions.

Interactions with other government policy

SAF Mandate

The ratchet would be a 'bolt on' to the SAF Mandate, ensuring that the SAF Mandate provides the intended level of price support. Implementing the ratchet would require changes to the legislation underpinning the SAF Mandate.

Renewable Transport Fuel Obligation (RTFO)

There are potential implications on the RTFO as increasing SAF targets could lead to diversion of feedstocks from the road sector to aviation to meet the higher obligation. This is something that needs to be carefully considered when reviewing either scheme's trajectories.

What is the legal basis / legislative requirements?

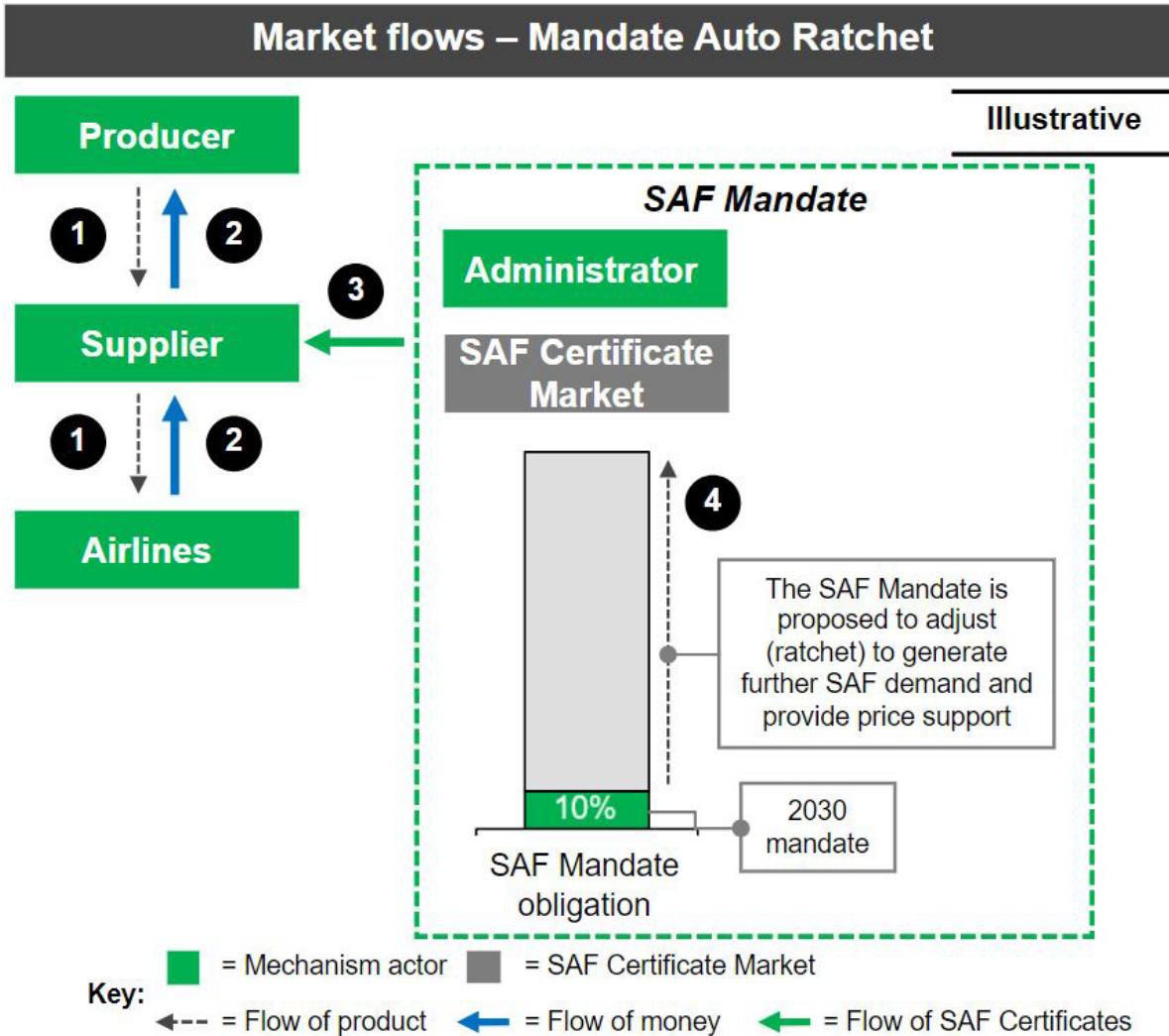
The legal basis for implementing a 'ratchet' would depend on the exact variation of the mechanism. Once the SAF Mandate targets have been set through the upcoming secondary legislation, any further amendment to those targets would require additional secondary legislation using the powers under the Energy Act 2004.

A light touch approach to the mechanism (for example, the guidance example discussed in the design variation section above) would not require any additional legislation to put the mechanism in place. However, amendments to the SAF Mandate legislation would be required in order for targets to be amended.

A more rigid approach (for example, where a formula for ratcheting the target is included in the legislation, or where the target level is indexed to certain parameters) would require new secondary legislation from the outset to amend the SAF mandate legislation to add the ratchet provisions. Changes to the target level could then be amended without further legislation in line with the formula. However, additional legislation would be required to make any necessary amendments to the formula.

How long will it take to deliver?

The time this mechanism takes to deliver will be largely dependent on the type of ratchet that is pursued and what legislation would be required. If secondary legislation was required, then this could be in force by Q2 2026.



Market flows	Comments
Product	1 The supplier purchases SAF from the producer. Airlines will purchase a blended jet fuel/SAF fuel from the supplier.
Money	2 The supplier will pay a market price for SAF to the producer, and the airline will pay its respective market price to the supplier.
SAF Mandate Certificates	3 Under the SAF Mandate, the administrator will issue SAF certificates to suppliers once the criteria to claim has been met. The supplier will redeem these SAF certificates towards meeting the SAF Mandate obligation. Suppliers are also able to trade SAF certificates. Suppliers who supply beyond the SAF Mandate obligation can sell excess SAF certificates to those who have not met the obligation or retain SAF certificates to fulfil a limited proportion of the obligation in the following reporting period. Should the SAF Mandate obligation ratchet increase, this would increase demand for SAF, raising the certificate market price.

Approach to ratchet the SAF Mandate

- 4 The criteria to ratchet the SAF Mandate are not yet determined. Several options have been identified, including forecasting SAF certificate demand based on existing and future SAF plants, the relationship between the certificate market price and buy-out price, and total proportion of obligation achieved. Further consideration may also be given to the magnitude of the increase and whether it will be a step change or gradual increase.

Figure 4: Market flow illustration of MAR

CONSULTATION QUESTION

Q5: Do you agree with our explanation of the Mandate Auto Ratchet mechanism? Is there anything else we need to consider?

Mandate Floor Price

How does it work?

- The Mandate Floor Price (MFP) introduces a minimum price at which SAF Mandate certificates can be sold.
- Trading of SAF Mandate certificates would be monitored and measures put in place by the administrator to prevent the sale of SAF mandate certificates below a certain price.
- This could be introduced via an amendment to the SAF Mandate using the existing legislative powers under the Energy Act 2004.

How does it provide revenue certainty?

By preventing SAF mandate certificates from being sold below a certain price, SAF producers could in theory guarantee that they will receive a certain level of income from producing certified SAF.

Different SAF technologies have varying cost profiles and would require different floor prices in order to provide the level of revenue certainty required to secure investment.

Key design considerations

What if no trade occurs?

Whilst we expect there to be some trading of SAF Mandate certificates between parties who have excess certificates and obligated parties who require additional certificates to meet their obligation, there will be a number of certificates which are never traded. This could be particularly likely where there is an excess of SAF in the market and fuel suppliers are able to buy SAF from multiple sources, which they can then use to claim certificates and meet their obligation.

Minimum value of certificates?

Price setting will need to prevent an excessively high floor price but avoids falling below the level to support minimum costs, such as operating costs and servicing debt. Determining the minimum certificate value would require monitoring sale prices (and potentially legal powers to do that) for SAF certificates. If the floor price includes a review mechanism or if the buy-out price is reviewed often, this would reduce the policy intent of providing long term price certainty.

Interactions with other government policy

SAF Mandate

Aviation fuel suppliers are the obligated parties under the SAF Mandate and are permitted to meet these obligations via supplying SAF volumes sourced internationally. The challenge for the MFP is ensuring that the benefit of a floor price sits with a UK producer given the likelihood of imported products and legal constraints on the use of the Mandate to favour UK producers.

Another key consideration for MFP is whether supplier-supplier trading of existing certificates would also have the MFP applied as certificates could only be redeemed at or above the level of the MFP.

Renewable Transport Fuel Obligation (RTFO)

As previously highlighted, the SAF Mandate has largely been modelled off the RTFO. A variation of this type would deviate from the way the RTFO operates.

What is the legal basis / legislative requirements?

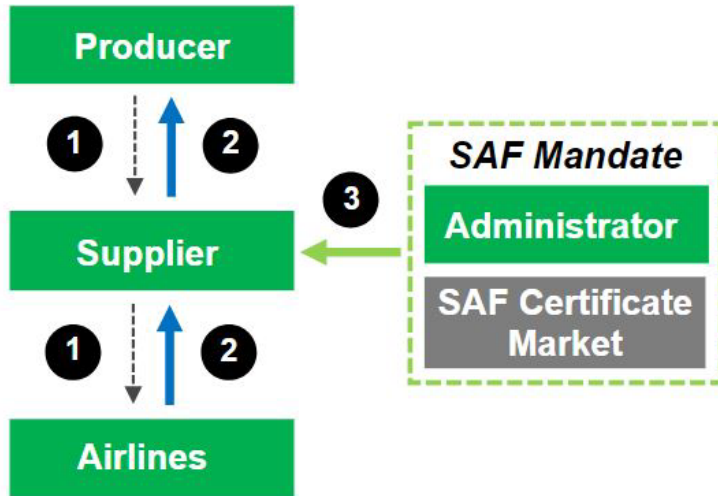
The MFP would be an extension of the existing SAF Mandate, therefore additional secondary legislation would likely be required. Additional powers would likely be required in order for the administrator to monitor the sale of SAF certificates and to prevent their sale below a certain price.

How long will it take to deliver?

Further design work would be required for the secondary legislation required to implement this revenue certainty mechanism related to the SAF Mandate and this could potentially be in force by Q2 2026.

Market flows – Mandate Floor Price

Illustrative



Government acts as the enabler of the mechanism by adding a price floor into the SAF Mandate. It is not a direct Counterparty to the transaction

Key: ■ = Mechanism actor ■ = SAF Certificate Market
 ←--- = Flow of product ← (blue) = Flow of money ← (green) = Flow of SAF Certificates

Market flows		Comments
Product	1	The supplier purchases SAF from the producer. Airlines will purchase a blended jet fuel/SAF fuel from the supplier.
Money	2	The supplier will pay a market price for SAF to the producer, and the airline will pay its respective market price to the supplier.
SAF Mandate Certificates	3	Under the SAF Mandate, the administrator will issue SAF certificates to suppliers once the criteria to claim has been met. The supplier will redeem these SAF certificates towards meeting the SAF Mandate obligation. Suppliers are also able to trade SAF certificates, with prices set at least at or above the minimum floor certificate price. Suppliers who supply beyond the SAF Mandate obligation can sell excess SAF certificates to those who have not met the obligation or retain SAF certificates to fulfil a limited proportion of the obligation in the following reporting period.
Approach to the MFP		
The MFP sets a lower bound for the value of a Mandate certificate. However, the benefit cannot be limited to UK-only projects (unlike the BOLR mechanism set out above) as the MFP mechanism would be included in the Mandate legislation.		

Figure 5: Market flow illustration of MFP

CONSULTATION QUESTION

Q6: Do you agree with our explanation of the Mandate Floor Price mechanism? Is there anything else we need to consider?

No Further Action

This approach means government taking no further action beyond measures which are already implemented or in consultation (for example, the SAF Mandate, Advanced Fuels Fund and wider SAF programme). The Government will still be monitoring market developments both in the UK and across other jurisdictions. Question 1 of the consultation asks respondents whether they agree with the case for further intervention on revenue certainty set out in section one.

4. Options assessment and conclusions

We have carried out a multi criteria assessment of the four options based on three main criteria: investable, deliverable and affordable. Each of these has sub-categories:

1. Investable	1.1	Means by which revenue certainty is provided for participating projects.
	1.2	Nature of revenue certainty provided.
	1.3	Creditworthiness of underwriter and/or counterparty.
	1.4	Supports UK supply-side competitiveness against international markets.
	1.5	Mitigates other risks/barrier and enables price and volume certainty to the rest of the supply chain.
	1.6	Stakeholders have familiarity and there is experience with the mechanism.
2. Deliverable	2.1	The mechanism can be designed and implemented by the end of 2026.
	2.2	Extent that new legislation is required additional to existing legislation.
	2.3	Is compatible with existing government mandates and wider policy.
	2.4	Is flexible and can be adapted to respond to changing market dynamics.
	2.5	Complies with UK subsidy control rules and UK competition law.
	2.6	Arranging the administrative process for all stakeholders is manageable.
3. Affordable	3.1	The proposed mechanism structure could protect investors.
	3.2	The mechanism enables contract allocation that supports competition between projects that incentivises cost reduction.
	3.3	Does not negatively impact the competitiveness of UK aviation industries.
	3.4	Impact on affordability to the government.
	3.5	Impact on affordability to the consumer.

Table 1: Option assessment principles and sub-principles.

	Investable						Deliverable						Affordable					Total score (% of max score)
	1.1	1.2	1.3	1.4	1.5	1.6	2.1	2.2	2.3	2.4	2.5	2.6	3.1	3.2	3.3	3.4	3.5	
GSP	2	2	2	1	2	2	0	NA	2	1	NA	1	2	1	1	1	1	21 (62%)
BOLR	2	1	2	1	1	1	0	NA	2	1	NA	0	1	1	1	1	1	16 (47%)
MAR	1	0	0	0	0	1	1	NA	2	1	NA	2	0	2	0	2	0	12 (35%)
MFP	1	1	0	0	0	1	0	NA	2	1	NA	2	0	2	0	2	0	12 (35%)

Table 2: Scoring of the mechanism options by each sub-principle

Each sub-principle has been scored from 0 to 2, depending on whether it supports the sub-principle fully (2), partially (1) or not at all (0).

Legislative requirements, subsidy control and competition law

Whilst we have provided an initial assessment within section 2, we have not scored sub-section 2.2 until further design work and consideration is undertaken to give a full assessment of the legislative requirements. It is clear which of the options require primary legislation and that is reflected in the deliverability scoring of each option. Likewise, more information is required to properly assess the subsidy control and competition law implications of these mechanisms, including compliance with WTO measures. Therefore, sub-principles relating to these factors have not been assessed at this stage.

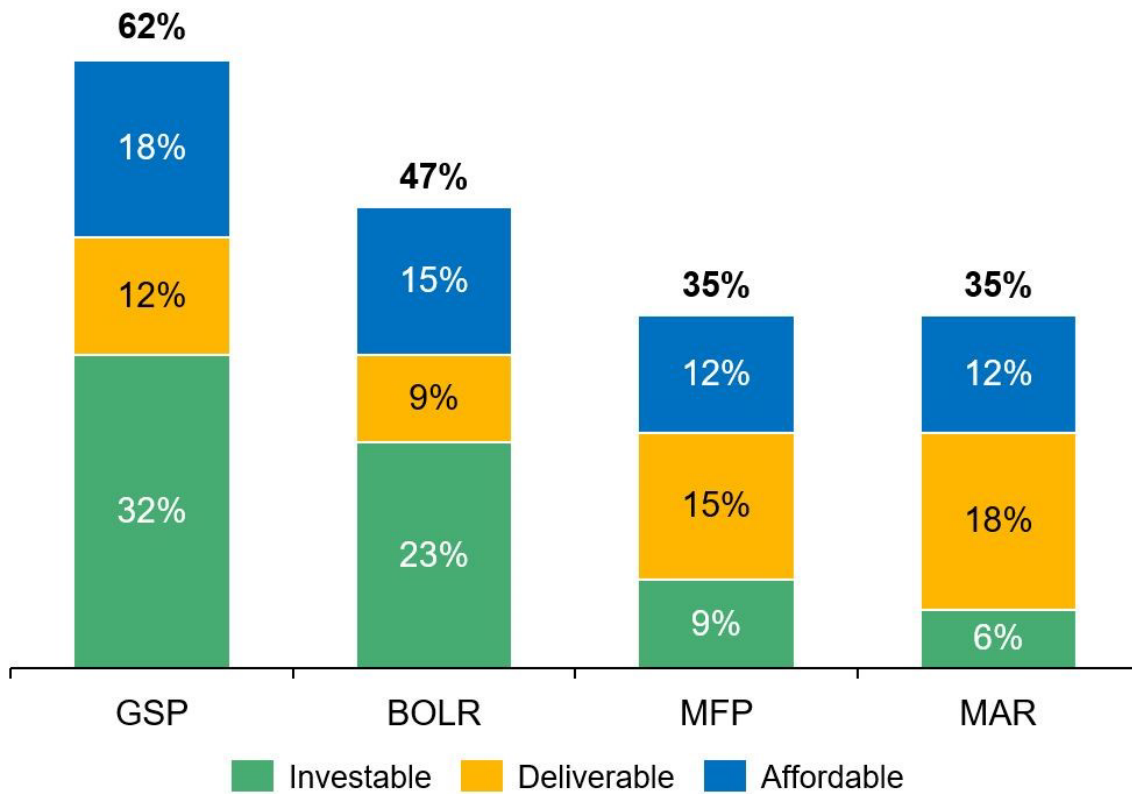


Figure 6: Bar chart illustration of mechanism scoring.

Along with the qualitative assessment, we have carried out the following assessment below based on the views of stakeholders and practicalities of delivering any of the mechanisms.

Guaranteed Strike Price (GSP)

Advantages

- Initial assessment scoring indicates GSP offers the highest level of confidence for investors.
- Successful precedent demonstrated by similarly designed schemes in other energy and fuel industries, such as renewables and nuclear.
- The strike and reference prices relate to fuel price, so a guarantee is provided on the entire price of SAF. This is unlike the BOLR, which guarantees a price on the value of SAF certificates, which will always be less than the total price of SAF, therefore providing less guaranteed revenue.
- GSP can provide upside return to the counterparty, for example, the counterparty receives payments in a short market where the price for SAF is above the agreed strike price. Therefore, the share of risk is fairer compared to the minimum floor price with BOLR, where payments are only made in one direction.
- Clear claim process because the GSP is linked to a definitive strike price which remains consistent throughout. So long as market trades can be observed, the reconciliation of payments is a straightforward process and can happen at regular intervals.
- Private law mechanisms can be directly targeted at the UK production of SAF, unlike Mandate-based mechanisms.
- Some design elements could be taken from existing schemes of a similar nature.

Disadvantages

- GSP would likely require primary and secondary legislation, in addition to a potential consultation. Delivery of the legislation by Q4 2026 is the best case scenario.
- Like BOLR, the allocation process of agreed contracts will likely involve an auction or negotiation, both of which are expected to be time consuming and complex.
- As with the BOLR, administering the scheme is likely to require a counterparty. Agreeing the most suitable counterparty and making the counterparty fit for purpose could take time and add complexity.
- As set out in Annex A, setting a strike price and reference price may be challenging given the nascency of the market and lack of comparatives and there would need to be a cost discovery exercise as part of negotiations with government.

Buyer of Last Resort (BOLR)

Advantages

- BOLR is a private law contract that offers the legal certainty over an agreed minimum price for SAF Mandate certificates, providing greater investment security.
- It provides protection against the risk of certificates reducing in value, which is designed to cover the minimum operating costs to the SAF producer.
- Private law mechanisms can be directly targeted at UK production of SAF, unlike Mandate-based mechanisms.

Disadvantages

- BOLR would likely require both primary and secondary legislation, in addition to a potential additional consultation. These legislative changes would need to include provisions that give Government the ability to purchase SAF Mandate certificates. Delivery of the mechanism is unlikely to happen before Q4 2026 without accelerated legislative timetable.
- The allocation process of agreed contracts will likely follow an auction or negotiation, involving fuel producers forecasting certificate prices, as well as calculating the fuel price level required to service debt and operating costs and the price of a SAF certificate.
- Divergence with existing RTFO policy as BOLR introduces a floor price into the UK SAF Mandate.
- Creates a significant contingent liability for the counterparty. This could be mitigated to some extent by supporting a limited number of certificates.
- Establishing the criteria determining a trigger point is challenging. It requires further consideration of how the counterparty actively monitors certificate price and over what timescale the certificate price needs to be below the minimum price in order for the mechanism to be triggered.
- As with the GSP, administering the scheme requires a counterparty. Agreeing the most suitable counterparty and making the counterparty fit for purpose could take time and add complexity. In the case of BOLR, the counterparty takes all the revenue risk, with no option for an upside return.
- We have identified some potential unintended consequences from this mechanism that would require detailed design work to understand and mitigate. For example, the mechanism alters the market dynamics within the SAF Mandate in certain circumstances, incentivising SAF producers to hold on to SAF certificates rather than passing to obligated suppliers.

Mandate Auto Ratchet (MAR)

Advantages

- Provides SAF project investors with greater confidence that the government will intervene to increase the amount of SAF needed to meet the UK SAF Mandate obligations, thus maintaining the SAF price level in the UK SAF market.
- The scheme can be designed as an extension to the existing SAF Mandate framework, therefore it is unlikely to require primary legislation (although would require further consultation).
- No complexities and time associated with the allocation of private law contracts, as with the contract-based mechanisms.
- The mechanism does not involve the transfer of funds to a SAF producer to provide revenue certainty, therefore it is assumed a counterparty or underwriter is not needed.

Disadvantages

- MAR is designed to keep the cost of SAF high, which impacts on the price consumers will pay for air travel.
- It is a regulatory measure and can therefore be amended via secondary legislation, providing less certainty to long term investors compared to an individually agreed price certainty mechanism that is contractually binding with a guaranteed minimum revenue level established.
- This mechanism provides benefits to all SAF suppliers, globally. There is no way of making this a UK-specific mechanism. With major EU markets potentially developing

SAF revenue certainty mechanisms based on private law contracts for individual projects, the MAR could make the UK relatively less attractive to investors.

- Before the scheme's administrator amends the criteria to activate a ratchet, a further consultation may be required along with legislative changes, depending on the form of ratchet.
- Limitless increase in SAF targets has potential significant consequences for the wider transport fuel sector and the Renewable Transport Fuels Obligation (RTFO).

Mandate Floor Price (MFP)

Advantages

- Provides SAF project investors with confidence that the value of certificates cannot drop below a certain value.
- The scheme can be designed as an extension to the existing SAF Mandate framework, therefore it is unlikely to require primary legislation (although would require further consultation).
- No complexities and time associated with the allocation of private law contracts, as with the contract-based mechanisms.
- As a regulatory scheme, the mechanism does not involve the transfer of funds to a SAF Producer to provide revenue certainty, therefore it is assumed a counterparty or underwriter is not needed.

Disadvantages

- Like the MAR, this mechanism can be amended via secondary legislation. Long term investors have reduced certainty compared to an individually agreed revenue certainty mechanism that is contractually binding with guaranteed minimum revenue level established.
- This mechanism provides benefits to all SAF suppliers, globally. There is no way of making this a UK-specific mechanism.
- Greater potential cost impact to industry than a targeted approach to a limited number of projects.
- Artificially prevents airlines accessing low SAF prices, therefore it is likely to increase the price of air travel for consumers more than the introduction of the SAF Mandate.
- We anticipate some complexities in the design, such as determining an appropriate minimum certificate price.
- The mechanism may not address revenue certainty in the scenarios where no certificate is traded for example, suppliers claim certificates for supplying SAF and use these certificates to comply with their obligation.

Illustrative assessment of financial impacts of a revenue certainty mechanism

To help better understand the potential cash flows associated with a revenue certainty mechanism, we have undertaken an initial assessment of the financial impact of the two leading revenue certainty mechanisms, on the basis that these two options are considered the most likely to deliver the scale of investment needed. Our assessment assumes, as set

out in the Written Ministerial Statement¹⁵ that the mechanism will be industry funded. Regardless of the funding mechanism, we assume that any financial impact will be passed through in full to air passengers via air fares or absorbed by the airlines. The modelling of the revenue certainty mechanism assumes that financial impacts of a mechanism are passed through in full to air passengers. In terms of the pass through of SAF costs, the modelling set out here assumes a 90% pass through from airlines to air fares¹⁶.

At this stage of policy development, where we are comparing the underlying principles of various revenue certainty mechanisms rather than detailed policy parameters, it is difficult to accurately estimate the potential financial implications of a revenue certainty mechanism. However, these illustrative scenarios will help participants better understand the market dynamics, and the order of magnitude of transfers between parties. At this stage it is necessary to make a number of assumptions and simplifications to allow us to begin quantifying the potential financial implications. Therefore, none of the figures quoted should be read as actual estimates of the final implemented policy. Ultimately, the cost of the scheme is dependent on how many plants (or how much UK SAF production) are supported through this mechanism. Therefore, costs or liabilities could be capped at a certain level. Also, industry may choose not to pass on all cost impacts to consumers.

The modelling of the illustrative scenarios has been developed by PwC on behalf of DfT. The analysis uses aviation demand projections and an aviation fuel mix forecast modelled by DfT. It draws on SAF production costs from the Whittle Laboratory Aviation Impact Accelerator (AIA), which have been combined with financing assumptions developed by PwC to estimate long-run levelized production costs for each fuel type. High and low SAF price scenarios have been modelled to illustrate the financial impacts of the revenue certainty mechanisms under different market conditions. High and low prices are defined relative to a central case where the SAF price is equal to the levelized cost of production.

The outputs include financial impacts under varying market conditions, including a long market (i.e. plentiful SAF and therefore lower prices), a short market (limited SAF availability and therefore higher prices) and a balanced market. In reality we do not expect an oversupply of SAF that would lead to a long market in the early years, particularly considering: (a) the feedstock limitations of hydroprocessed esters and fatty acids (HEFA) production, (b) the increase in countries introducing their own SAF obligations and (c) the timeline for likely development of first-of-a-kind 'second generation' SAF technologies.

For the illustrative scenarios detailed here, we have developed a scenario assuming four of the more advanced SAF plants within the UK would be producing PtL and other non-HEFA SAF in 2030 and be covered by the revenue certainty mechanism. These four plants are assumed to produce broadly the amount of second generation (non-HEFA) and PtL SAF we have assumed in the preferred mandate scenario in 2030.

¹⁵ [Government support for a UK SAF industry - GOV.UK \(www.gov.uk\)](https://www.gov.uk/government/support-for-a-uk-saf-industry)

¹⁶ The assumption of 90% pass through of SAF cost has been used in PwC's modelling of the revenue certainty mechanisms. This differs from the 75% SAF cost pass through assumed in DfT modelling for the SAF mandate. The PwC modelling was completed before the SAF mandate modelling and both assume the majority of SAF costs are passed through to air fares.

To provide a reference point for the scale of financial impacts related to a revenue certainty mechanism, total UK jet fuel revenue was estimated to be around £8.6 billion in 2022.¹⁷

Our illustrative assessment has demonstrated the following:

Short market conditions (low supply, high SAF price):

- Considerably less SAF is being produced than expected and therefore the price has risen above the strike price. The prices of different types of SAF in scope range from 20% to 80% higher compared to the cost of production.
- **BOLR mechanism.** Under this scenario SAF prices are high so the BOLR mechanism is not activated. Airlines have to purchase SAF at the existing market price, and SAF suppliers accept the market price. Estimated air fares are around £1 more expensive than in the baseline scenario without a mechanism as underlying SAF prices are assumed to be higher under this scenario in 2030.
- **GSP mechanism.** Under this scenario SAF prices are high. The GSP mechanism is activated and SAF producers need to pay back into the scheme as the price of SAF is above the guaranteed strike price. This results in a transfer from the SAF producers estimated to be in the order of £410 million in 2030 and £400 million in 2040, which ultimately feeds through to airlines. SAF producers continue to be able to cover the cost of producing SAF, and airlines offset some of the potential cost of higher SAF prices. Estimated air fares are close to those under expected prices without a revenue certainty mechanism in 2030.

Long market conditions (high supply, low SAF price):

- Considerably more SAF is being produced than expected and therefore the price has fallen below the strike price. The prices of different types of SAF in scope range from 30% to 60% lower compared to the cost of production.
- **BOLR mechanism.** Under this scenario, the BOLR mechanism is activated because the price of SAF has fallen below the minimum guaranteed price. Airlines purchase SAF at this relatively low market price from SAF suppliers where the estimated total cost is around £940 million lower than a scenario where the SAF price reflects the cost of production in 2030. Given the low price of SAF, which is below the strike price, airlines must pay into the mechanism to compensate SAF producers. The cost of fulfilling the revenue certainty commitment for the volume of the four plants in the AFF is estimated to be £250 million in 2030 and £310 million in 2040. This money is paid to SAF producers to ensure they can continue to provide SAF.
- **GSP mechanism.** Similar to the BOLR mechanism, under this scenario, the GSP mechanism is activated. Airlines purchase SAF at this relatively low market price from SAF suppliers where the total cost is estimated to be around £810 million lower than a scenario where SAF price reflects the cost of production in 2030. Airlines must also pay into the mechanism to compensate SAF producers to the

¹⁷ This estimate is based on the 2022 estimate for deliveries of Kerosene Jet fuel estimate from Table 3.13 as part of the National Statistics publication Energy trends produced by DESNZ. This estimate does not include the impacts of hedging i.e. using financial instruments to avoid higher fuel costs so the actual price paid by airlines likely differs from the price used for this estimate.

extent that the SAF price is below the strike price. The cost of fulfilling the revenue certainty commitment for the four AFF plants is estimated to be £340 million in 2030 and £390 million in 2040. This money is paid to SAF producer to ensure they can continue to provide SAF.

- In scenarios where funding is required, air fares are also estimated to be lower than under expected prices without a revenue certainty mechanism, by around £4 per ticket in 2030. This is because funding is only required in scenarios where SAF prices are lower than the currently forecast cost of production. Modelling assumes lower SAF prices are passed through to air passengers.

As noted above, given the early stage of analysis, there is a high degree of uncertainty as to the actual costs of any contracts agreed as part of a mechanism. To address this uncertainty analysis has been undertaken. This assesses the impact of varying the costs of SAF production on the estimated cost of funding a revenue certainty mechanism. The uncertainty analysis suggests that the cost of funding a mechanism could range from up to three times the initial estimates to as low as 40% of the initial estimates. The uncertainty analysis considers ranges for costs of production for each fuel, as well as the difference in cost associated with first of a kind plants, compared to plants for an established technology. Ultimately, Government can decide how much of the SAF market to cover once there is a greater understanding of the potential costs involved.

Conclusions

Taking the qualitative and quantitative assessments together we have reached the following conclusions:

- That the Mandate Auto Ratchet mechanism, whilst simple to introduce, would not encourage sufficient investor confidence and should therefore not be taken further in this process.
- That the Mandate Floor Price option would not provide sufficient confidence to the investment community to enable plants to move forward. However, it could be introduced in a quicker timeframe (by Q2 2026 compared to Q4 2026 at the earliest) which has been a key ask from industry.
- That the certainty required by the investment community is best achieved through a private law contract between a producer and government (or counterparty of government) with any costs ultimately being funded by industry.
- Of the two private law contract options, we consider the Guaranteed Strike Price to be the most investible and most straightforward to introduce, in addition to providing better value to the consumer.

CONSULTATION QUESTION

Q7: Do you agree or disagree that the Mandate Auto Ratchet option should not be taken forward? Please provide supporting evidence where possible.

CONSULTATION QUESTION

Q8: Do you agree or disagree that the Mandate Floor Price option should not be taken forward, even if can be delivered sooner than the private law contract mechanisms? Please provide supporting evidence where possible.

CONSULTATION QUESTION

Q9: Do you agree or disagree that the certainty required by the investment community is best achieved through a private law contract between a producer and Government (or Government backed counterparty)? Please provide supporting evidence where possible.

CONSULTATION QUESTION

Q10: Do you agree or disagree that the GSP should be the preferred option to consider developing of the two private law contract options? Please provide supporting evidence where possible.

5. Consultation questions

Section 1: Strategic case

1. Do you agree with the rationale for implementing a revenue certainty mechanism? If not, why not?

Section 2: Scope

2. Do you agree or disagree that HEFA-based SAF should not be covered by the proposed revenue certainty mechanism? Please provide supporting evidence.

Section 3: Revenue certainty mechanisms

3. Do you agree with our explanation of the Guaranteed Strike Price mechanism? Is there anything else we need to consider?
4. Do you agree with our explanation of the Buyer of Last Resort mechanism? Is there anything else we need to consider?
5. Do you agree with our explanation of the Mandate Auto Ratchet mechanism? Is there anything else we need to consider?
6. Do you agree with our explanation of the Mandate Floor Price mechanism? Is there anything else we need to consider?

Section 4: Options assessment and conclusions

7. Do you agree or disagree that the Mandate Auto Ratchet option should not be taken forward? Please provide supporting evidence where possible.
8. Do you agree or disagree that the Mandate Floor Price option should not be taken forward, even if can be delivered sooner than the private law contract mechanisms? Please provide supporting evidence where possible.
9. Do you agree or disagree that the certainty required by the investment community is best achieved through a private law contract between a producer and Government (or Government backed counterparty)? Please provide supporting evidence where possible.

10. Do you agree or disagree that the GSP should be the preferred option to consider developing of the two private law contract options? Please provide supporting evidence where possible.

Annex A: Detailed contract considerations

We have set out more detail regarding potential contract design within Annex A, covering the following questions:

11. Are there any other key elements of any revenue certainty mechanism contract that need to be considered?
12. Are there any other considerations that project developers will need to take into account?
13. Are there any other considerations that should be taken into account by the contract funder?
14. Which contract allocation method is most appropriate? Why?
15. Do you agree that this is the most appropriate way to administer a revenue certainty mechanism?
16. Do you have any views on the most appropriate counterparty?

Annex A: Detailed contract considerations

Precedents from similar mechanisms in other industries

1. Low-carbon electricity CfD (FID Enabling for Renewables (FIDeR) and low-carbon electricity CfD Allocation Rounds)

The low-carbon electricity CfDs (for example, for nuclear and renewables) are a government-supported mechanism to incentivise low-carbon electricity generation investment and reduce the cost of capital by providing producer protections against the market price of electricity, such as Hinkley Point C and Swansea Bay tidal lagoon.

FIDeR

Prior to the full launch of low-carbon electricity CfDs in 2014, a transitional scheme called Final Investment Decision enabling for Renewables (FIDeR) was run by government to award early contracts to projects experiencing investment hiatus as a result of the transition from the Renewables Obligation to CfDs. FIDeR involved the award of 'Investment Contracts' as opposed to full CfDs.

It opened an application window for interested projects, offering the same fixed "administrative strike price" to all projects of the same technology, which was enabled by price discovery through the Renewables Obligation (RO). A three-phase selection process (including Qualification, Evaluation (against minimum thresholds), and Affordability Assessment) was followed to get from 57 initial applicant projects to eight that were awarded Investment Contracts. Funding was provided via the Levy Control Framework.

Low-carbon electricity CfD auctions

The low-carbon electricity CfD scheme utilised auction-based allocation. The renewables scheme held its first auction ("Allocation Round") in 2014. Key features of the low-carbon electricity CfD allocation approach are:

- Consecutive allocation rounds, with pots for different technologies
- Projects must meet minimum eligibility criteria, including approval of a supply chain plan (≥ 300 MW projects only)
- Projects propose Strike Prices as sealed bids, subject to a strike price cap set by government

- Low-carbon electricity CfD contract terms must be accepted in full without negotiation
- Administered by National Grid ESO (not government)

To date a total of 225 projects have been awarded low-carbon electricity CfD contracts over five Allocation Rounds.

2. Electricity Interconnector Cap-and-Floor Regime

The Cap-and-Floor regime is the regulated route for electricity interconnector development in Great Britain. It aims to incentivise developers to build new interconnectors by limiting their exposure to electricity market price risk.

Market-led Allocation Approach

The Cap-and-Floor model was developed for, and first implemented on, the Nemo Link pilot project. Office of Gas and Electricity Markets (Ofgem) granted this project a Cap-and-Floor regime in December 2014, following a period of bilateral negotiation. Ofgem then transitioned to “Application Window” allocations to roll out the regime for other interconnector projects, which is like the “Market-led Proposals” approach shown on the previous page. When an Application Window is open, project developers can come forward with proposals to Ofgem to participate in the regime. To date there have been three Application Windows:

- Application Window 1 – 2014 (5 projects awarded)
- Application Window 2 – 2016 (3 projects awarded)
- Application Window 3 – 2022/23 (7 project applications)

The allocation process used by Ofgem has four main steps:

Step 1: Eligibility Check

Step 2: Initial Project Assessment (IPA) – *Evaluation of “needs case” for projects in terms of benefits for GB consumers. Eligible projects notified of provisional approval*

Step 3: Final Project Assessment (FPA) – *Detailed due diligence on project, allowing agreement of regime parameters and final approval*

Step 4: Post Construction Review (PCR) – *Outturn build costs used to set final cap/floor levels.*

3. The Hydrogen Production Business Model (HPBM) for low-carbon hydrogen

The UK government’s 2022 British Energy Security Strategy set the ambition of supporting up to 1GW of electrolytic hydrogen and up to 1GW of CCUS-enabled hydrogen being in construction or operational by 2025. This ambition will be supported by the HPBM, which provides revenue support to producers to overcome the operating cost gap between low carbon hydrogen and high carbon counterfactual fuels. The model is applicable to a range of hydrogen production pathways that meet the Low Carbon Hydrogen Standard and other eligibility criteria, and is able to facilitate hydrogen use in a broad range of sectors.

The Department for Energy Security and Net Zero (DESNZ) has set out the allocation process for electrolytic and CCUS enabled hydrogen production to 2030.

The first electrolytic allocation round was launched in 2022 (“HAR1”), with 11 successful projects announced in December 2023, totalling 125MW generation capacity. A second

allocation round for low carbon electrolytic and non-CCUS enabled hydrogen projects (“HAR2”) launched in December 2023, and aims to support up to 875MWs of low carbon hydrogen capacity. DESNZ has communicated to the market its intention to gradually transition to price-based allocation, implementing greater emphasis on cost/price in submission evaluation in subsequent annual allocation rounds.

To support CCUS-enabled hydrogen, DESNZ is taking forward the development of four CCUS clusters, Hynet (North West England and Wales), East Coast Cluster (Teesside and Humber), Acorn (North East Scotland) and Viking CCS (Humber). It is HMG’s ambition to allocate up to 4GW of CCUS enabled hydrogen through CCUS allocation rounds for Track-1, Track-1 expansion and Track-2, subject to project assessment, cluster assessment and successful negotiations with projects.

Private law contract considerations

If a mechanism were to have a private law contract basis, we would expect to consider the following in developing that contract:

- Approach to Price Setting
- Contract Duration
- Contract Allocation
- Counterparty to contract

CONSULTATION QUESTION

Q11: Are there any other key elements of a revenue certainty mechanism contract that need to be considered?

Approach to price setting

A SAF producer will need confidence that expected revenue will meet all project costs. To be viable, a SAF project must generate enough revenue to cover all project costs over an assumed investment period, which in the context of SAF production will include:

- Up-front construction and technology investment (financed up-front and then amortised over time)
- Production inputs (feedstock, power, chemicals)
- Operating costs
- Cost of capital

These costs are set out in more detail in figure 7 below.

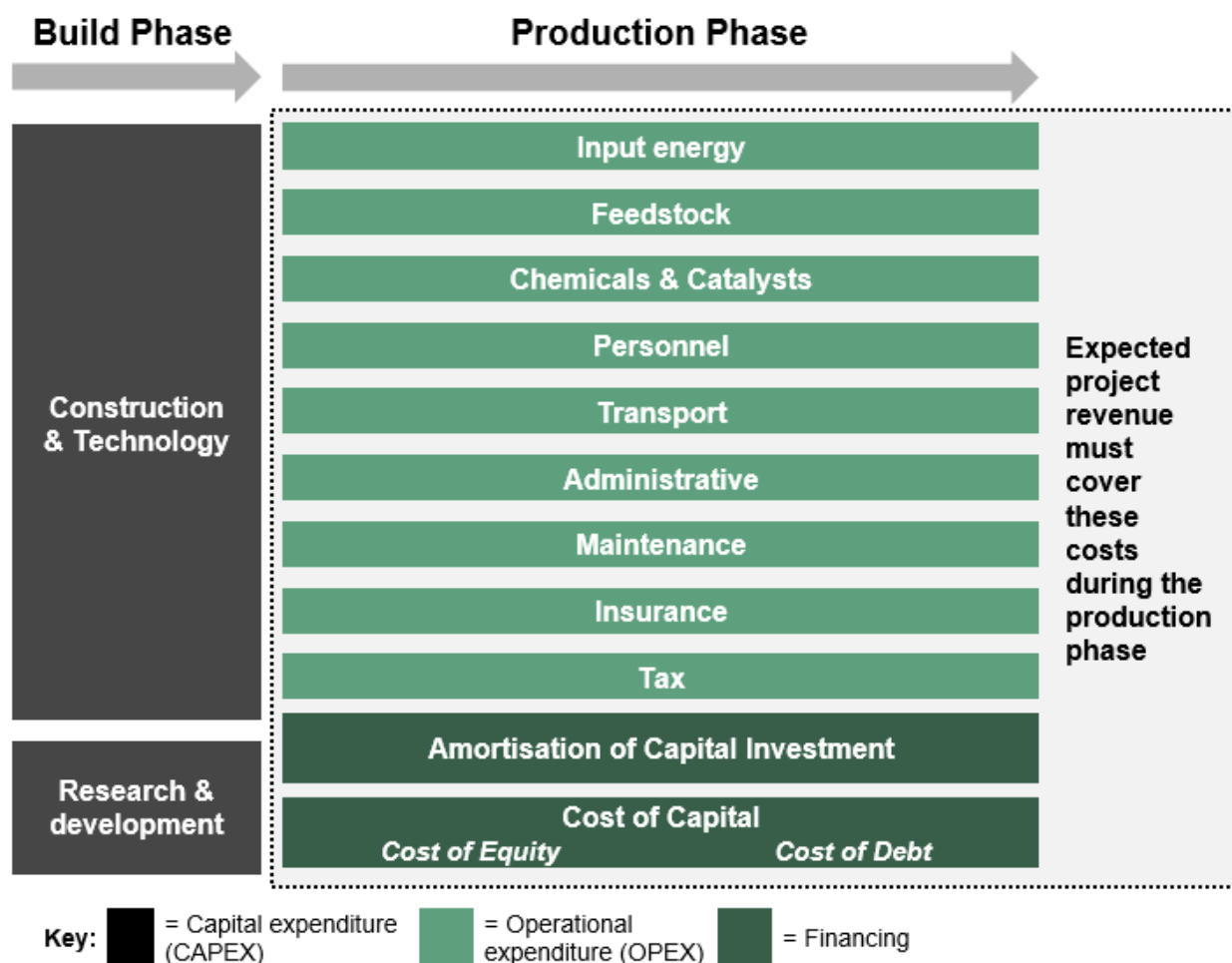


Figure 7: Illustration showing types of costs through project phases.

From the perspective of a SAF Producer developing a project, forecasting the project costs will be the starting point for proposing the minimum certificate price (under BOLR) or strike price (under GSP) required to generate sufficient revenue.

Because of the uncertainty inherent in forecasting project costs, the level of revenue certainty provided by a price certainty mechanism depends on:

- The predictability of project costs, as well as capex and opex, over time
- The extent of any adjustment mechanisms included in the mechanism pricing to “hedge” project cost uncertainties

GSP market reference price

The market for non-HEFA SAF is in its very nascent stage and there are not frequent enough trades to generate a regular and reliable market-wide benchmark price to use as a reference price in the GSP mechanism. Therefore, a range of alternative options that could be used as a proxy need to be tested.

Alternative Reference Price Options	Option Description
Achieved sales price	The actual price(s) that a Producer sells its output at.
HEFA SAF market price	The price reported by market reporters such as Argus media [and General Index].
Kerosene price	The well-established price benchmark that is well reported by market reporters.
Carbon price	Calculated as (Quantity of mitigated carbon by SAF) x (Current carbon price) is a good theoretical proxy for the decarbonisation benefit of SAF.
Input energy price	A measure of the price of energy used by a producer, on the assumption this would be positively correlated to the sales price of SAF.

Table 3: Options to determine reference prices for the UK SAF market.

These options have been tested against the following criteria:

- **Close correlation to SAF sales price** – The Reference Price should match exactly – or as closely as possible – the underlying price against which protection is being provided.
- **Relatively low complexity to arrange** – Limited administrative requirement for participants to set up and maintain visibility of a Reference Price.
- **Existing historical trend** – It is desirable for a Reference Price to have a historic track record to support forecasting.
- **Sustains project over life cycle** – Contract counterparties require confidence that the Reference Price will be available for at least the life of the contract.

Assessment against these criteria suggests that ‘Achieved sales price’ would be the most appropriate option. It uses real market data, is inherently linked to SAF and meets three of the four key criteria set out above (there is no existing historical trend). There is also a precedent in the **Hydrogen Production Business Model**, which proposes to use achieved sales price. The achieved sales price in this business model is subject to a floor price that is linked to the market natural gas price, which is the most likely alternative product that hydrogen offtakers would switch to. If a similar approach was taken for SAF, the price of jet kerosene could offer a sensible floor price, as there should be no situation where suppliers are able to purchase SAF for less than the jet kerosene alternative. Further detail on the assessment of other options can be found in Annex A.

BOLR market reference price

Activation of BOLR depends on comparing the certificate market price to the minimum certificate price. The certificate market price will be the price that SAF Certificates are being traded at in the market. To function as intended, BOLR contracts will have to refer to an agreed reliable source for up to date SAF certificate market price data. To facilitate an efficient transaction that provides effective support, the preference would be for all SAF certificates to be traded through a single exchange, with a single market price established on a periodic (for example, daily) basis and is visible to all market participants.

Setting a minimum/guaranteed price

The setting of both the minimum certificate price and guaranteed strike price will be impacted by the allocation of contracts. See section on contract allocation below for more detail.

BOLR – approach to setting the minimum certificate price

Regardless of how contracts are allocated, we expect the following approach will be taken by producers to determine what they deem the minimum certificate price:

1. **Forecast project costs** – producer forecasts their costs over the duration of the BOLR contract.
2. **Forecast revenue** – producer forecasts their expected revenue from SAF sales over the duration of the BOLR contract.
3. **Estimate minimum return requirement** – producer defines the minimum revenue they require under downside scenario(s) (for example, to meet operating costs, debt interest and repayments).
4. **Set Minimum Certificate Price** – producer targets this at a level necessary to maintain their minimum revenue requirement under downside scenario(s).

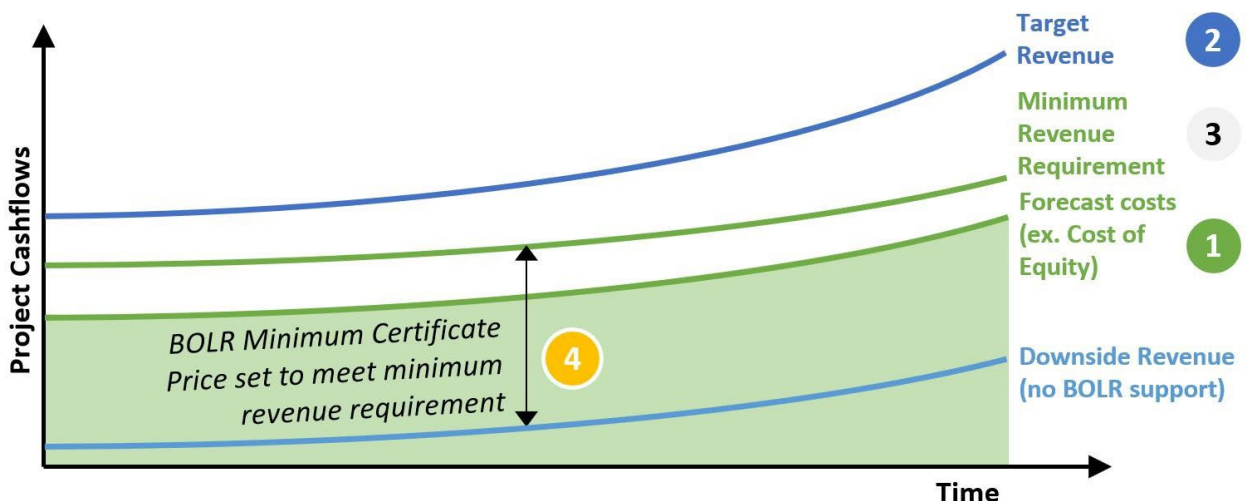


Figure 8: Illustration demonstrating the minimum revenue to cover project costs.

GSP – approach to setting the Strike Price

Regardless of how contracts are allocated, we expect the following approach will be taken by producers to determine what they deem should be the guaranteed strike price:

1. **Forecast project costs** – producer forecasts their costs over the duration of the GSP contract.
2. **Forecast revenue** – producer forecasts their expected revenue from SAF sales over the duration of the GSP contract.
3. **Calculate required Strike Price** – calculate the price to be received per unit of SAF sold to meet forecast project costs.

Adjustments to minimum/guaranteed price

Project risks make it difficult to forecast project costs with certainty, particularly for first-of-a-kind projects. The risk exposures of different costs, and their predictability, vary. Project developers therefore have different options for mitigating these project risks, including:

- Entering into long-term fixed-price contracts with suppliers (for example, feedstocks) and/or offtakers.
- Using insurance or other financial instruments to hedge certain risks (for example, interest rate swaps).
- Adding a risk premium to the minimum certificate price or guaranteed strike price, to achieve a larger “margin of safety” between forecast revenues and difficult-to-forecast costs.

These risks could also be mitigated through a BOLR or GSP contract, by allowing adjustments to the Minimum Certificate Price or Strike Price during the contract, which would protect a project from certain risks by allocating them to the Counterparty.

BOLR – what type of projects risks are suitable for allocation through Minimum Certificate Price Adjustment?

- **Adjustments for general market risks are unlikely to be appropriate for BOLR:** Under BOLR a Producer will have a natural hedge through exposure to SAF market prices (in contrast to a fixed Strike Price under GSP), which will reflect general market risks (for example, input energy prices) to which all Producers are exposed.
- **Project-specific risks that will not be under the control of the Producer:** Without any other mitigation, the Producer would make allowance for these risks by adding a risk premium to the Minimum Certificate Price.
- **Contingent risks with a direct impact on cost:** A project may identify specific risk events, which if they occurred, would materially affect the project’s cost base in a way that could not be mitigated.

GSP – What type of project risks are suitable for allocation through Strike Price adjustment?

- **Risks that will not be under the control of the Producer, including general market risks and project-specific risks:** In the absence of any other mitigation, the Producer would make allowance for these risks by adding a risk premium to the Strike Price, impacting value-for-money.
- **Contingent risks with a direct impact on cost:** A project may identify specific risk events, which if they occurred, would materially impact the project’s cost base in a way that could not be mitigated.
- **‘Over-compensation’ risks for the Counterparty:** Price adjustment could include protections to avoid excessive compensation for the Producer that undermines value-for-money for the Counterparty.

Key quality for price	Close correlation to SAF sales price	Relatively low complexity to arrange	Existing historical trend	Sustains project over life cycle	Comments		
					Opportunities	Challenges	Viability of Reference Price
Achieved sales price					<ul style="list-style-type: none"> Transparent, real market data - if the Strike Price is also set transparently and reliably to cover the costs of the project, the achieved sales price would provide investors with confidence that the GSP mechanism was working as intended and not inflating Producer profits. Provides the market with further data to hedge risk. 	<ul style="list-style-type: none"> Accuracy of data depends on Producer transparency. Risk of limiting incentives for Producers to maximise sales price. No historical data at the start of the mechanism. Achieved sales price could vary widely across market. 	<ul style="list-style-type: none"> Achieved sales price uses real market data and is inherently linked to SAF. The Reference Price for GSP will compensate Producers when costs cannot be met. As a benchmark, achieved sales price is the most reliable method for ensuring costs are met. Precedent: Hydrogen Production Business Model uses Achieved Sales Price, subject to a Floor Price of to the natural gas price (1.2x when used for feedstock purposes), which is the most common counterfactual fuel for hydrogen.
HEFA SAF market price					<ul style="list-style-type: none"> Market data availability – HEFA SAF is the only commercially viable pathway now, and its feedstock has historical traded prices. Should the feedstock component of HEFA SAF be a major cost driver, there would be correlation to the market price. 	<ul style="list-style-type: none"> If feedstock component of HEFA SAF is not a major cost driver, which is the case for majority of production pathways, then prices would be unlinked. In the event of short feedstock supply, the HEFA price would be consistently high and uncorrelated to the non-HEFA sales price. 	<ul style="list-style-type: none"> HEFA is a form of SAF produced from food-based feedstock. The HEFA market is already established and therefore historical data exists. However, given the use of different feedstocks compared to non-HEFA SAF, HEFA SAF prices could be uncorrelated to non-HEFA SAF prices. Precedent: Hydrogen Production Business Model as explained above, uses natural gas price as a floor price. The HEFA SAF price could take the same role for GSP.

Key quality for price	Close correlation to SAF sales price	Relatively low complexity to arrange	Existing historical trend	Sustains project over life cycle	Comments		
					Opportunities	Challenges	Viability of Reference Price
					Kerosene price	<ul style="list-style-type: none"> Readily available long term historical and recent kerosene price data. In the current nascent stage of SAF, SAF prices typically trend with jet fuel (kerosene) - correlation close to 1. 	<ul style="list-style-type: none"> SAF produced using PtL technology relies on feedstock with no relation to kerosene prices.
Carbon price	<ul style="list-style-type: none"> (Quantity of mitigated carbon) x (carbon price) is a good theoretical proxy for the decarbonisation benefit of SAF. 	<ul style="list-style-type: none"> Can expect carbon price to be volatile and impacted by a range of non-SAF related market factors. 	<ul style="list-style-type: none"> The value of carbon saving could potentially be correlated to the SAF sales price. Given the volatility in the carbon markets and the wide-stretching market, the impact of non-SAF related market factors would lead the carbon price to be uncorrelated, and like kerosene, increasingly so. Precedent: Industrial Carbon Capture (fixed trajectory reference price): a pre-defined reference price, that represents a forecast carbon price, will apply for 10 years to all industrial carbon capture projects. 				

Key quality for price	Close correlation to SAF sales price	Relatively low complexity to arrange	Existing historical trend	Sustains project over life cycle	Comments		
					Opportunities	Challenges	Viability of Reference Price
Input energy price					<ul style="list-style-type: none"> • Cost transparent: Input energy price directly contributes to SAF production costs. • If input energy for the project is sourced sustainably, it would align to key sustainability goals for SAF. 	<ul style="list-style-type: none"> • Only correlates to the SAF sales price when energy prices are stable. • If the production plant sources energy from multiple sources, the calculation could be complex. • Unlikely to fall below a Strike Price reflecting complete cost as a component, albeit significant, of the whole production costs. 	<ul style="list-style-type: none"> • The input energy price is likely the least viable benchmark for the SAF sales price. • The energy markets are highly volatile and whilst input energy price could be linked to SAF production costs, and therefore SAF sales price in a stable market, the energy price is highly unlikely to be.

Key:	 = Aligns to the quality	 = Does not align to the quality	 = Viable benchmark	 = Not a viable benchmark
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Table 4: Table showing the viability assessment of options for reference prices.

Contract duration

Consideration needs to be given to the length of the contract, in order to maximise project investability and minimise cost for fuel buyers, along with wider risks to the value chain. SAF project developers are seeking a long-term revenue certainty mechanism.

Investments in single large long-lived assets require some certainty of the revenue it will generate over its useful life to repay the significant up-front costs. This is particularly true for emerging product markets, like SAF, where market dynamics are not yet well understood. Revenue certainty, by definition, implies an arrangement that is in place for an extended period of time.

As is common for large single-asset investments, many SAF projects will use a project finance structure. Two key features of project finance are:

- The use of a relatively high proportion of debt to finance the project alongside equity, with the aim of reducing the overall cost of capital through higher gearing
- Debt providers' recourse to the owners (i.e. shareholders) of the project being limited to any equity paid in. For the project to be "bankable", it must be structured to give debt providers confidence that the project cashflows will be sufficient to repay the debt.

To support a project finance structure, a revenue certainty mechanism must therefore last at least as long as the repayment period for debt.

The majority of SAF buyers are not currently willing to offer producers long-term offtake agreements with agreed pricing. This means producers are not able to benefit from debt repayable over a longer period (for example, 10+ years) that would reduce the unit costs of SAF production.

Duration of a revenue certainty contract must balance minimising prices for fuel buyers and project investability.

The expectation from SAF suppliers (and subsequently the airlines) is for initial capital costs to be amortised over the full useful life of the facility, so SAF prices reflect the true economic cost of production. This also applies to an underwriter of an associated revenue certainty contract (the cost of which will be directly or indirectly linked to SAF prices). It is not always feasible to raise capital to finance a project over an investment horizon equal to the asset's useful life, but a revenue certainty contract can increase the investment horizon for initial investors.

The most appropriate duration for a revenue certainty mechanism is a balance between:

- The desire to use it as a lever to extend initial investors' investment horizon (which will tend to increase contract duration) and;
- Limiting the duration of support to a period where the impact on pricing remains affordable (as close as possible to the true economic cost of production)

Key considerations for project developers

Investment horizon – A SAF producer developing a project will evaluate the investment opportunity over a certain period based on how quickly project investors need to realise returns.

Debt repayment period – Lenders of debt to a project will expect certainty of revenue for at least as long as the debt repayment period – therefore debt repayment period and length of revenue certainty contract are co-dependent. The repayment periods that lenders are currently willing to offer for SAF projects will have to be tested through engagement with project developers and directly with lenders.

Feedstock supply certainty – Lenders of debt to a project will look for certainty of feedstock supply and pricing during the debt repayment period. For this reason, the length of feedstock supply agreements will influence the debt repayment period, and thus also the desired length of a revenue certainty contract.

Appetite for re-financing risk – Certain project equity investors may be willing to take the risk of financing a project with debt with a much shorter term than the revenue certainty contract. Both shareholders and initial lenders would then be exposed to the risks of re-financing debt part-way through the revenue certainty contract. This might support a case for longer durations should stakeholders be prepared to accept refinancing risk and the residual life of the plant support this.

CONSULTATION QUESTION

Q12: Are there any other considerations that project developers will need to take into account?

Key considerations for contract funder

Length of commitment – It is a policy decision as to how long a commitment to a revenue certainty mechanism should be. The proposed funders of the mechanism will have preferences for how long they are willing to commit, depending on their planning horizon, risk appetite etc.

Flexibility – A shorter contract length will allow problems to be addressed more quickly or support adaptation to market changes. However, this may undermine market confidence in the funder's long-term commitment to the stability of the mechanism (for example, potential for policy instability).

CONSULTATION QUESTION

Q13: Are there any other considerations that should be taken into account by the contract funder?

Mechanism	Contract term	Rationale
Low-carbon electricity CfD	15 years (some exceptions)	<ul style="list-style-type: none"> • Supports debt providers' need for a long-term guaranteed price to finance the project - around 10 to 15 years. • Evaluation of the <i>low-carbon electricity CfD</i> mechanism published in 2019 found that "the core feature of the low-carbon electricity CfD which attracts investors is its 15-year price stabilisation mechanism".
CCUS Dispatchable Power Agreement (DPA)	10 to 15 years	<ul style="list-style-type: none"> • Term of at least 10 years supports bankability for investors. • Projects will have flexibility to select preferred contract term length between 10 and 15 years, to accommodate a range of different approaches to delivering Power CCUS projects (for example, new-build v retrofit) and ensure term lengths are proportional to the expected operational life of each project. • 10 to 15 years contracts offer the right balance between annual costs and overall (contract life) costs. • Contracts longer than 15 years could result in undesirable technology "lock in".
Low Carbon Hydrogen Production Agreement (LCHA)	15 years	<ul style="list-style-type: none"> • Fixed term of 15 years applies to all eligible technologies and project sizes. • Reflect precedents set by low-carbon electricity generation CfDs (Allocation Round 4) and CCUS agreements. • Consistent with expectations of the potential time for a nascent low carbon hydrogen market to develop. • Long enough for projects to secure private sector financing.

Table 5: Table showing the contract duration for agreement mechanisms in other industries.

Contract allocation

If contractual mechanisms are pursued there are multiple ways contracts can be awarded. Typically, the process has either been through competitive allocation with assessment against qualification criteria, bilateral negotiations or through reverse auctions. We would need to explore these approaches to awarding contracts in more detail, but an overview is provided below. We welcome views from stakeholders on the key issues and criteria that the government should consider when developing its allocation process. The government will need to consider how to implement an allocation process, such as the appointment of a delivery body responsible for running the process or the in-house delivery capability required for bilateral negotiations, depending on the process.

Contract allocation method	Definition	Benefits	Issues	Examples of use
Market-led Proposals	Projects are offered the opportunity to come forward with proposals to receive support, triggering a process of qualification, diligence, and negotiation with the aim of agreeing to enter into a contract.	<ul style="list-style-type: none"> Flexible to respond to projects at different stages of maturity 	<ul style="list-style-type: none"> Lack of competitive tension Time and resource intensive due to non-standardised approach 	Electricity Interconnector Cap-and-Floor Regime Final Investment Decision Enabling for Renewables (partial)
Tendering Process	A defined process is run by a tendering organisation to a planned timetable, with multiple projects invited to submit proposals in a prescribed format at the same time. Projects will be evaluated together, with the potential for certain projects to be eliminated from the process at certain stages.	<ul style="list-style-type: none"> Competitive process Supports fairness and transparency - all projects are subject to the same process 	<ul style="list-style-type: none"> High cost Time and resource consuming 	CCUS (Transport & Storage) HPBM Electrolytic Allocation Rounds 1 & 2
Auction	Eligible projects bid a price (e.g. Strike Price) subject to auction constraints. A limited number of projects are allocated contracts based on ranking by price. Different auction models can be used, e.g. Sealed Bid or Descending Clock.	<ul style="list-style-type: none"> Competitive process Establishes market prices Most likely to incentivise lower project costs 	<ul style="list-style-type: none"> High cost to administer Projects could take on more risk Could be gamed by a consortium of bidders 	Low-carbon electricity CfDs (Sealed Bid) Capacity Market (Descending Clock)
Standardised Pricing	Pricing for contracts is set by the scheme Administrator according to a pre-defined standard methodology. Projects can choose to take up contracts based on this pricing.	<ul style="list-style-type: none"> Simple process to understand and implement Predictable for funder(s) 	<ul style="list-style-type: none"> Inflexible to project nuances and complexity High risk of market unattractiveness 	Final Investment Decision Enabling for Renewables (partial)

Table 6: Options for contract allocation

CONSULTATION QUESTION

Q14: Which contract allocation method is most appropriate? Why?

Counterparties

In the event of a private law mechanism being introduced and contracts being signed, the administrator or underwriter of the contracts would need to have certain characteristics. They would need to have the administrative experience and capability manage the contracts and would need to hold a high-grade credit rating to bring the level of financial certainty needed. For these reasons, we do not consider the airline sector, nor fuel producers to be suitable administrators. In the existing contracts for difference scheme, the Low Carbon Contracts Company (LCCC), which is a government owned private company, is the counterparty to the contracts awarded to successful developers of renewable and nuclear projects.

CONSULTATION QUESTION

Q15: Do you agree or disagree that this is the most appropriate way to administer a revenue certainty mechanism? If not, what alternatives do you suggest?

The Low Carbon Contracts Company is one example of such a counterparty but there are other bodies with regulatory functions in this sector that could be explored such as the Civil Aviation Authority.

CONSULTATION QUESTION

Q16: Do you have any views on the most appropriate counterparty?

Pre contracts

Stakeholders have proposed that a solution to the timeline concerns could be resolved by government entering into a 'pre-contract' in advance of the revenue certainty mechanism being implemented.

We have looked at precedents for this and whether similar schemes can be applied in this case. Our conclusion is that there are no legal powers to enable government to enter into such a contract. Whilst it may be possible to carry out explanatory work in advance of legislation going through Parliament, it would not be possible to enter into any form of legally binding contract.

Annex B: Supporting key external engagement

Philip New independent report: ‘Developing a UK sustainable aviation fuel industry’

In October 2022, we commissioned an independent report by Philip New to help understand the conditions needed to create a viable long-term sustainable aviation fuel (SAF) industry in the UK.

On 17 April 2023, we published the report on [‘Developing a UK SAF industry’](#) alongside a [government response](#), setting out what actions government and industry are already taking to address many of the report’s recommendations.

The government response to Philip’s report recognised that revenue certainty and feedstock barriers to investment remain some of the main areas for further action. It also confirms the government will work with industry to identify key feedstock barriers for SAF investments and potential government interventions to help address these barriers where possible.

In the response, the government committed to work in partnership with stakeholders through forums including the Jet Zero Council and its SAF Delivery Group and sub-groups to consider options for revenue certainty for a UK SAF industry, to be provided via an industry funded intervention. This work was presented to and discussed by the Jet Zero Council SAF commercialisation sub-group in April 2023.

Philip completed some further work for the Department for Transport, focussing on the potential for an industry led revenue certainty mechanism. This work was presented to the Jet Zero Council SAF commercialisation sub-group in August 2023.

Jet Zero Council

We have conducted extensive engagement through regular forums with the Jet Zero Council SAF Delivery Group and sub-groups to consider revenue certainty options for a UK SAF industry. This is part of the collaborative partnership between industry and government, ensuring a coordinated approach to the policy and regulatory framework needed to attract investment in SAF.

During summer 2023, the JZC SAF commercialisation sub-group split into two workstreams led by the Renewable Transport Fuel Association (RTFA) and the Green Finance Institute (GFI).

RTFA – This workstream brought together a group of industry stakeholders (including producers) to further develop the description and design of the revenue certainty mechanism options. This workstream was set up to focus on the practical deliverability of the various mechanisms and the RTFA held a series of workshops to inform this work.

GFI – This workstream brought together key stakeholders from the financial community to develop a greater understanding of the investability of each of these mechanisms. The GFI led a series of investor working groups which helped identify specific risks associated with UK SAF investment and put forward potential solutions to mitigate these. The first workshop sought views on a shortlist of revenue certainty mechanisms, whilst the second workshop discussed the potential efforts to establish a first of a kind SAF plant to set a marker to attract investors into the market. The final workshop introduced alternative options to regulatory or private law contract mechanisms, such as leasing mechanism, guarantees and insurance schemes.

During the August 2023 meeting of the Jet Zero Council SAF Commercialisation sub-group, the RTFA and the GFI presented their analysis of the design options for revenue certainty mechanisms, including outcomes from modelling work undertaken by the GFI.

In January 2024, we convened another sub-group meeting to update attendees on the government's progress designing the mechanics and the wider considerations for the shortlisted revenue certainty mechanisms.

Consultancy support

In October 2023, the department appointed PwC to help with the qualitative and quantitative analysis to inform the design of the revenue certainty mechanism options and conduct the principles assessment.

Several objectives were agreed in the scope of the work, including detailed analysis of previous literature regarding the barriers to investment in SAF production, modelling of financial impacts of a revenue certainty mechanism and an examination of the UK feedstock landscape. The outputs from PwC have informed the findings set out within the consultation.

Public sector equality duty and environmental principles

The Public Sector Equality Duty (PSED) came in to force in April 2011 (section 149 of the Equality Act 2010) and public authorities are now required, in carrying out their functions, to have due regard to the need to achieve the objectives set out under section 149 of the Equality Act 2010.

In this regard, an initial assessment has identified that no groups with protected characteristics are disproportionately impacted as a consequence of our proposals. We are interested in further understanding whether the financial impacts of a revenue certainty mechanism will be partially or fully passed on to passengers via aviation ticket prices over time, so we can continue to account for such impacts as SAF policy is implemented.

To support a robust PSED assessment informed by evidence, we invite comment on how the proposed revenue certainty mechanism may impact equality and how it could achieve the objectives set out under section 149 of the Equality Act 2010 to:

- eliminate discrimination, harassment, victimisation and any other conduct that is prohibited by or under the Equality Act 2010;
- advance equality of opportunity between persons who share a relevant protected characteristic and persons who do not share it;
- foster good relations between persons who share a relevant protected characteristic and persons who do not share it.

The introduction of the environmental principles set out in section 17(4) in the Environment Act 2021 will contribute to the improvement of environmental protection and sustainable development. Application of the environmental principles to policymaking will enhance environmental protection and promote sustainable development. As this policy develops, we will continue to consider the environmental impacts of a revenue certainty mechanism for a UK SAF industry.

What will happen next

A summary of responses and government response, including the next steps, will be published on the DfT website. Paper copies will be available on request.

If you have questions about this consultation, please contact:
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