



Betting it All on 'SAF': A Dangerous Flight Path

This is Safe Landing's response to the [UK Sustainable Aviation Fuels \(SAF\) Mandate Consultation](#).

Pilots and safety critical aviation workers are trained to always have a plan B. If we find ourselves with an uncertain outcome and we don't have a credible back-up plan, we have failed to manage the risk – we've failed to do our job. All 'SAF' or 'alternative jet fuel' pathways carry substantial risk of exacerbating environmental and social crises – they require intensive use of limited global resources, during a period in human history when we are battling to decarbonise our societies. If the UK and global aviation sector proceeds down a path that is reliant of the development of fuels which carry huge uncertainty and risk, and this strategy fails, then we have no back-up. The jet fuel has been burned, the temperature has risen, there may be no going back. Aviation as we know it may have to halt completely for some time – there will be no Safe Landing.

We believe that the quantity of 'SAF' produced in any given year should be strictly limited on a basis that ensures positive environmental and social impacts. We suggest that this quantity should be determined not by any given industry, but by governments at a national and international level, through careful economy- and society-wide assessment, and prioritisation of available resources.

We reject any proposed 'SAF' mandate that fails to provide a cross-economy impact assessment of environmental and social risk.

It is very clear to us that any 'SAF' mandate is of secondary importance to any policies required to constrain total fuel consumption by the aviation industry (and indeed other transport industries).

We reject any proposed 'SAF' mandate that fails to place a cap on total fuel consumption first. This cap should be set by assuming all fuel burned is fossil fuel kerosene (given the uncertainties of technological readiness, and environmental & social impacts of alternative fuels produced at scale) and by assuming an emissions reduction trajectory compliant with limiting global warming to 1.5°C.

We advocate for a ban on the use of 'HEFA', or at least for government policy to favour other fuel pathways. The aviation industry is about to undergo a huge transformation across aerospace manufacturing, airline operations and airport configurations – we believe that government support should primarily be targeted here – rather than squandered on further financing the fuels industry.

Questions:

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

Disagree.

Firstly, our group prefers to avoid use of the term 'Sustainable Aviation Fuel' or 'SAF' as it implies that any such fuel is by definition 'sustainable', that is: we can continue to use large quantities indefinitely without incurring any environmental or social impacts.

As such, we prefer to use the term 'alternative jet fuel' to refer to any drop-in alternative to conventional jet fuel, i.e., fossil fuel kerosene. This includes biofuels and power-to-liquid electro-fuels (e-fuels) which are produced using electricity.

From our experience within the aviation sector:

- biofuels are not sustainable, or scalable, to current levels of aviation fuel consumption – due to finite global quantities of sustainable biomass resource
- e-fuels are more sustainable, but are not scalable to current levels of aviation fuel consumption in the necessary timescales – due to finite global renewable energy generation

We believe it is highly likely that if any alternative jet fuel pathway is scaled too quickly, to a significant percentage of current levels of aviation fuel consumption, then it's likely that the sustainability of the fuels will be impacted. Indeed, it appears very clear that if large quantities of such fuels are produced in the near term (next 20 years), this would be highly likely to have negative environmental and social impacts. With this in mind, the quantity of alternative jet fuel produced in any given year should be strictly limited on a basis that ensures positive environmental and social impacts.

We suggest that this quantity should be determined not by any given industry, but by governments at a national and international level, through careful economy-wide and society-wide assessment, and prioritisation of available resources. As an example:

- we could conceivably reach 100% aviation fuel from biofuel in 2035, however, this would almost certainly require a diversion of all sustainable biomass resource to aviation (ahead of agricultural fertiliser, road transport fuels, carbon capture and storage, etc.) and an in-direct stimulation of non-sustainable biomass resource, e.g., increased crops and deforestation
- we could conceivably reach 100% aviation fuel from e-fuel in 2035, however, this would almost certainly require a diversion of all global renewable energy generation to aviation, massively increase the cost of electricity, and impede global decarbonisation efforts elsewhere

We therefore reject any proposed mandate that fails to provide a cross-economy impact assessment.

Importantly, it should be recognised that meeting any % target for fuel volumes, or fuel GHG % reduction will be made severely more difficult under scenarios where air traffic and fuel consumption grows, and will be made significantly more achievable under scenarios where air traffic and fuel consumption are constrained. To illustrate, if in 2035 the UK can produce or source 1 million tonnes of alternative jet fuel with greenhouse gas (GHG) savings of 60% relative to fossil fuel kerosene:

1. if total UK jet fuel consumption is 10 million tonnes in 2035, then alternative jet fuel will comprise 10% of fuel by volume/weight and GHG will be reduced by 6%
2. if total UK jet fuel consumption is 20 million tonnes in 2035, then alternative jet fuel will comprise 5% of fuel by volume/weight and GHG will be reduced by 3%

Clearly, the emissions prior to 'alternative jet fuel GHG abatement' would also be lower in Scenario 1 than in Scenario 2. Therefore, total emissions would be far lower in Scenario 1 than in Scenario 2. From this example, it appears very clear that an alternative jet fuel 'SAF' mandate is of secondary importance to any policies required to constrain total fuel consumption by the aviation industry (and indeed other transport industries).

Referring to the UK Jet Zero Consultation

In the "high ambition" and "SAF breakthrough" scenarios = Scenarios 2 and 3, the [Jet Zero Consultation](#) calculates that UK aviation will produce 29Mt of CO₂ by 2050, or 9.2 Mt fuel use. However, Scenarios 2 and 3 both assume overly optimistic assumptions for efficiency improvements and a carbon price that doesn't exist yet under current policies (UK ETS and CORSIA). Therefore, our group judges Scenario 1 as far more probable and likely: that calculates that UK aviation will produce 38Mt of CO₂ by 2050, or 12Mt fuel use. 30% alternative jet fuel use in this Scenario would be 3.6Mt.

However, the Scenario 2 data shows that "30% SAF" abates 8.2Mt CO₂ in 2050, requiring 2.6Mt of fuel, which is actually only about 22% of fuel consumption if Scenario 1 efficiency improvements play out (without higher carbon pricing or demand curtailment policies of some sort).

The other aspect is that every year prior to 2050 has lower 'SAF' production and higher total emissions.

1. Summing the emissions under the curve for each year from 2025 to 2050 of Scenario 1, we calculate approximately 1Gt of CO₂ or 320Mt of fuel use.
2. Summing the emissions abatement under the curve for 'SAF' in Scenario 2 we calculate 22.2Mt of CO₂ abated or 7Mt of 'SAF' use. Note: 7Mt of '70% GHG SAF' would only abate 15 Mt CO₂.

Therefore, we calculate over the 25 years that only 15Mt/1000Mt = 1.5% of CO₂ is abated with 'SAF', even under the "30% SAF by 2050" in Scenario 2. Bearing in mind this 30% target is judged highly uncertain by both the UK Jet Zero Consultation, and 'SAF' Mandate Consultation – even this "high ambition" stretch target is shown to be significantly underwhelming in terms of emissions abatement when assessed across the cumulative time period 2025-2050, rather than considering 2050 alone.

For these reasons we reject any proposed mandate that fails to place a cap on total fuel consumption first. This cap should be set assuming all fuel burned is fossil fuel kerosene (given the uncertainties of technological readiness, and the environmental & social impacts of alternative fuels produced at scale) and by assuming an emissions reduction trajectory compliant with limiting global warming to 1.5°C.

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

Potentially the largest issue facing 'SAF' is that no pathway has been commercialised that can produce fuel in significant quantities. The only pathway currently proven commercially is 'HEFA' produced from waste oils – however, the global supply of waste oil is severely limited and could, at

best, only be scaled to supply a very limited % of current aviation fuel consumption. We therefore view it as a distraction.

In addition to volume constraints, there is competition with other sectors and waste oils are already utilised to produce e.g., animal feed and road transport biofuels. The UK Government acknowledges within the UK 'SAF' Consultation (Para 4.8) that:

“Relying on this fuel could also divert used cooking oil (the feedstock primarily used to produce HEFA) away from the renewable diesel (HVO) production process. When plants increase the product slate of HEFA over HVO, their overall fuel yield decreases and production costs increase. This means pivoting this feedstock away from use in road transport at this stage will make economy-wide decarbonisation more expensive”.

Therefore, this demonstrates that limited waste oil feedstocks are better utilised in the road transport sector on both an environmental and economic basis. Scaling aviation 'HEFA' would only result in shifting of emissions savings from one sector to another, whilst reducing total emissions saved, increasing government spending and increasing tax payer costs.

We also recognise that policies favouring the diversion of waste oil feedstocks to air transport, are likely to make road and marine transport decarbonisation more difficult and expensive – which would increase costs for a wider section of society e.g., staple foods in supermarkets and is unlikely to be politically popular and sustainable.

For these reasons, we are concerned that the UK Jet Zero and 'SAF' Mandate Consultation scenarios rely on 'HEFA' scale-up, particularly in the near-term. Current and future cost projections for 'HEFA' distract from the real costs and timescales of more scalable pathways.

The UK 'SAF' Consultation (Para 1.7) also remarks that 'SAF' use:

“gives a route for existing oil refineries to transition towards more sustainable products, strengthening existing supply chains, building new ones and retaining the UK industry's expertise and skills.”

It appears that government support may be directed towards prolonging fossil fuel industry assets or new facilities which may become stranded-assets once the reality of their sustainability credentials become more obvious.

We advocate for a ban on the use of HEFA, or at least for government policy to favour other fuel pathways. As stated in the UK 'SAF' mandate consultation (Para 18), this could:

“drive the commercialisation of less developed SAF production pathways”

... and:

“reduce our reliance on fuel imports”.

We agree with this logic. As workers in the sector, we advocate that the government is selective and 'picks winners' for support, rather than wasting support, money and time on non-scalable pathways such as 'HEFA'. We would prefer to see any government incentives directed towards other fuel pathways (where scalability and sustainability criteria are more likely to be met – such as 'e-fuels') and Research & Development (R&D) support directed towards more efficient, radical aircraft designs that will be required given the higher fuel costs associated with these pathways. The aviation industry is about to undergo a huge transformation across aerospace manufacturing, airline operations and airport configurations – government support should primarily be targeted here.