

AEF response to DfT's Pathway to net zero aviation: developing the UK sustainable aviation fuel mandate



22 June 2023

AEF is pleased to have the opportunity to respond to this consultation and would welcome ongoing engagement with the Department on the issues raised. We are concerned that policy about alternative fuels for aviation – typically labelled Sustainable Aviation Fuel whether or not it is in fact sustainable in a net zero future – has been proceeding without key stakeholders having a good understanding of issues such as what lifecycle analysis values mean and what the whole-economy impacts might be of generating novel aviation fuels. We have therefore commissioned Cerulytics to produce a detailed report on these issues which we expect to be published during the summer. We will be keen to share the findings of this work with the Department as soon as possible.

Q1: Which 2025 target option strikes the right balance between ambition and deliverability? Do you have any evidence to support your position?

It is not possible, in our view, to answer this question on the basis of the information currently available about likely feedstock availability and about what the whole-economy impact would be of diverting wastes, hydrogen and renewable energy to the aviation sector by way of an alternative fuel mandate. It was a mistake for the Government to commit to an arbitrary target of 10% alternative fuel by 2030 in the absence of this evidence and we are concerned that trying to backfill this commitment with detailed policy without the evidence required is risky.

One risk is that creating incentives for the wrong fuels could end up increasing emissions at a system-wide level. There is a well-recognised risk, for example, that waste fats that are currently used for cosmetics or pet food could be diverted to aviation and then replaced with unsustainable alternatives such as palm oil. Another risk is that of mistakes being made to the carbon accounting for alternative fuels that create the impression that an emissions reduction is taking place when in fact it is not. This could happen if the lifecycle analysis for a given fuel is based on an assumption about counterfactuals (for example about what would have happened to the waste otherwise) that are inaccurate. This is a particular concern given that all emissions reductions associated with alternative hydrocarbons arise in the production phase, with the emissions from aircraft themselves remaining the same regardless of whether the fuel is fossil-based or not.

Each of the feedstocks identified in Figure 1 of the consultation document are likely to be problematic to source sustainably. Used Cooking Oil and Tallow currently have other uses so would need to be replaced in those other sectors. Animal fats meanwhile may be hard to scale up sustainably given the need to reduce consumption of animal products for climate reasons. (The CCC recommends a 20% reduction in meat and dairy by 2030 and 35% reduction for meat by 2050.¹) Forestry residues can take 100 years to replace in terms of new growth and in any case, as argued in a recent academic paper by David Lee and others “from an ecological perspective, there is no such thing as ‘residue’ biomass in a forest ecosystem as all biomass, living or dead, is part of the total ecosystem carbon stock (Keith et al., 2021).²” MSW is meanwhile not an appropriate feedstock to scale up since the UK has commitments to reduce and avoid waste production. These wider impacts in terms of the long-term sustainability of sourcing waste feedstocks in a net zero economy are not, as we understand it, reflected in the standard, ‘attributional’ lifecycle analysis that lies behind the carbon intensity values for the feedstocks proposed.

Several recent academic reports (including the Royal Society report in January, a paper from Imperial published just days later³ and the paper to which Prof David Lee contributed, referred to above) have highlighted the lack of any alternative hydrocarbon feedstocks for aviation that can easily and sustainably be scaled. This new evidence should give pause for thought in relation to the UK Government’s SAF mandate policy.

We note that the cost benefit analysis accompanying this consultation notes significant uncertainty concerning availability of feedstocks and that:

Given the lack of consensus in this area, and ahead of the publication of both the Biomass Strategy and the Low Carbon Fuels Strategy later this year, the analysis has used a wide range of feedstock availability assumptions, with no central value.

The very wide range of results from both significantly positive to significantly negative underline the need for caution before proceeding.

The document notes the need for more analysis reflecting system-wide impacts:

There will be interactions between greater SAF uptake and the options and costs of decarbonising other sectors, and also implications for maintaining security of supply. For instance, greater feedstock use may have implications for other sectors and may require additional electricity generation capacity or continued reliance on aviation fuel imports. The standard approach to appraisal used here does not account for these interactions. We will give further consideration to wider whole system implications ahead of the final cost benefit analysis.

We strongly agree with this conclusion and we regret that such analysis was not undertaken prior to any commitments being made about sustainable levels of alternative fuel for aviation. We have more fundamental concerns, in fact, about whether it is appropriate to consider re-use of the carbon in waste to represent a reduction in atmospheric CO₂ from aviation, particularly as LCA assumptions are based only on a given moment in time. Whereas biogenic material such as waste wood may be assumed in LCA to degrade and thereby release CO₂ in future, for example, using that material to make a fuel means that

¹ <https://www.theccc.org.uk/2022/06/13/governments-food-strategy-a-missed-opportunity-for-the-climate/>

² <https://e-space.mmu.ac.uk/631894/1/Becken%20Mackey%20Lee%202023.pdf>

³ <https://blogs.imperial.ac.uk/molecular-science-engineering/2023/04/04/low-carbon-fuels-for-aviation/>

the CO₂ will be released immediately. Given the need to rapidly stop the build-up of atmospheric CO₂ this is a significant problem in our view.

Ideally, the LCA methodology could minimise these risks by using consequential analysis to identify 'indirect' emissions that are likely to be significant, potentially incorporating them in a hybrid LCA approach that adds in ILUC factors or displacement emissions. This approach would reflect the fact that favourable or unfavourable LCA scores should not be the end of the process of impact analysis and should be supplemented with complementary analysis to identify the full climate impact and long-term potential of a fuel pathway.

Given current LCA conventions, however, the policy around alternative fuels in aviation should be alert both to the utility of LCA and its limitations. Where LCA results inform regulatory decisions there should be, if they are to be relied upon, ongoing assessment of the quality of the LCA scores that takes indirect emissions into account. This could identify areas in which a specific LCA could be delivering unwanted outcomes.

In the absence of an appropriate whole-system analysis, questions about balancing ambition and deliverability are premature.

Q2: Would you find it acceptable if the trajectory from 2025 to 2030 was set at an ambitious level and this led to high levels of buy-out and increasing costs to consumers?

We would argue that policy proposals should be assessed on the basis of their environmental credentials rather than whether or not they are expensive for consumers. There are unlikely to be any low-cost solutions for decarbonising aviation. If these existed they would probably have been delivered already. A high-level trajectory should only be set, however, if there is good evidence that this can be delivered sustainably once a whole-system perspective is taken.

Q3: Do you have any comments on the post 2040 proposal to legislate for targets continuing at the 2040 level, with the plan to update these when better data is available?

We would support the setting of targets only when appropriate data is available. Any uncertainty in the modelling, including but not limited to the period beyond 2040, should be reflected in the Government's characterisation of the Jet Zero Strategy, and in any graphical representation of the role of SAF in the Jet Zero trajectory.

Q7: Do you agree with where we have set our HEFA cap upper and lower bounds (upper bound is highest HEFA uptake modelled under the mandate, lower bound is no HEFA in the mandate)? Do you have any evidence to support this?

We would support a 0% HEFA cap as we do not consider the use of waste fats from agriculture to represent a good, long-term option for decarbonisation of aviation. To the extent that buy-out is deployed, however, it must be made clear in any carbon accounting that no GHG saving has been achieved and that the appropriate emissions reduction will need to be delivered through alternative measures in order to achieve the Jet Zero pathway.

While we support limits on HEFA use, we are also concerned that extracting the energy content of other wastes, and thereby using more renewable energy, may have undesirable outcomes at a system-wide level.

Q8: Do you agree that we should try to limit the diversion of feedstocks from difficult-to-decarbonise road transport modes as much as possible?

Q9: At what level do you think a HEFA cap should be set to balance mandate deliverability with road transport decarbonisation?

Adopting a whole-system perspective is important. HEFA should only be used in any sector, however, if it represents a genuine and sustainable CO₂ reduction. We are not qualified to comment on the best way to achieve emissions reductions in the road transport sector but our concerns about the dependence on waste fuels, particularly those associated with the meat industry, would apply also to fuel supply for the road transport sector. Equally, if the use of waste HEFA were to represent a genuine reduction to atmospheric CO₂ then a case could be made to prioritise its use wherever in the economy the fewest alternatives exist to decarbonisation. We find it hard to take a view on which of HGVs and aviation represents the most difficult to decarbonise.

Q10: At what level do you think a PtL mandate should be set to strike the right balance between ambition and deliverability? Do you have any evidence to support your choice, in particular considering low carbon electricity and hydrogen production, as well as carbon capture requirements?

We don't have our own evidence on scalability for PtL and as with other questions we don't feel that the necessary evidence is in place to enable a judgement to be made about the appropriate level for a mandate. We support the principle of a PtL sub-mandate, since PtL offers advantages over waste-based fuels, particularly when produced from green hydrogen and CO₂ captured from the air. Since the Government has, with good reason, ruled out crop-based biofuels for aviation, direct air capture of CO₂ offers one of the only alternative routes that actually involves a reduction of atmospheric CO₂ rather than the reduction relying on an accounting convention only (when the CO₂ from waste is attributed to the waste sector.)

However risks of a high PtL mandate include:

(i) Reliance on unsustainable feedstocks

We note that in the short to medium term neither the hydrogen nor the carbon component is likely to come from sustainable sources. The theoretical potential for PtL to represent a sustainable fuel option depends on wide-scale rollout of renewable energy (which is not unlimited) in particular to facilitate the production of green hydrogen, and on technology to capture CO₂ from the air (or perhaps from the sea) rather than from industrial processes.

(ii) Diversion of limited supplies of sustainable feedstocks

If a high mandate level were to be set for green PtL, it would be essential to include additionality requirements related to both the hydrogen and the carbon components of the fuel. There is a strong case for requiring the aviation sector to invest heavily in the

technology needed for its own decarbonisation which should include the requirement to pay for the feedstock required. In the absence of such condition, there is a risk that the aviation sector could hoover up available renewable electricity and carbon capture resources such that they are unavailable to more socially useful sectors of the economy.

Q14: Do you agree or disagree with the proposal that a buy-out mechanism should be a permanent feature of the mandate?

Agree

Q15: Do you agree or disagree with the information we could include in our reviews? Is there anything you feel we haven't considered but should?

There should be regular reviews of the lifecycle analysis value associated with any given feedstock. As noted above, this isn't a fixed calculation that is correct in all circumstances or over all timeframes. Instead, LCA calculations depend on numerous changeable assumptions and variables such as whether the fuel production has had indirect effects (driving up demand for unsustainable resources in other sectors as a result of feedstock being diverted, for example); releasing CO₂ more quickly than would have otherwise been the case (if, for example, vegetation had been left to rot), or whether creating a financial incentive for a given waste stream means that more waste is being produced than would otherwise have been the case.

Q16: Do you agree or disagree with our proposed flexible approach to review timelines?

Agree

Q17: Do you agree or disagree that low carbon avgas, low carbon ammonia and low carbon hydrogen aviation fuel, should be eligible for incentives without being subject to obligation providing they meet the sustainability criteria?

We cautiously agree. It's a concern to us however that we are being asked for comment on this issue before a definition of 'low carbon hydrogen' has been provided by the Government. In general, we are doubtful that a reliance on 'transition' technologies and fuels makes sense unless there is a very clear programme of phaseouts for anything less than net zero fuel.

Q20: Do you agree or disagree with the proposed definition of fuels that will be eligible for PtL certificates to be redeemed against the PtL obligation?

We are concerned about a definition of PtL that allows for the use of fossil wastes. More generally we are opposed to the proposed legislation that would reclassify recycled carbon fuels as sustainable. We see significant risks in the creation of financial incentives for fossil waste production to continue when there is an urgent need to focus on genuine net zero solutions such as carbon capture and storage for fossil waste, with e-fuel being produced from additionally captured carbon, not just from CO₂ avoidance. This point is now widely

accepted in relation to carbon offsets but seems to risk passing under the radar when it comes to alternative fuels for aviation.

With the industry and regulators increasingly under pressure to avoid greenwash, classifying fossil waste as renewable or sustainable would be a deeply regrettable move in our view.

Q21: Do you agree or disagree that the SAF mandate should adopt the criteria concerning additionality for RFNBOs that aligns with the RTFO?

As an aviation-specialist NGO we are not familiar with the detail of the RTFO.

We strongly support the need for additionality requirements for all alternative fuels generated for aviation. Simply allocating a carbon intensity factor to PtL generated with grid electricity risks draining the grid of green electricity that is essential for sectors such as home energy on which the whole population depends.

Q22: Do you agree or disagree that additionality rules should be introduced for nuclear power that follow the same principles as those currently applied to RFNBOs in the RTFO?

We are not familiar with the detail of the RTFO. All renewable energy required for alternative aviation fuels should be additional.

Q23: Do you agree or disagree that, where hydrogen is used as a feedstock, eligibility should be limited to biohydrogen derived from wastes or residues, RCF hydrogen and electrolytic hydrogen derived from renewable and nuclear power (when legal powers allow)?

We understand that CCC has a position on hydrogen that accepts the case for the use of blue hydrogen until sufficient green hydrogen becomes available. We're not yet as familiar with this work as we'd like to be but would encourage DfT to work closely with the CCC on this topic. In general, as indicated above, we do not support the classification of RCFs as 'sustainable' feedstocks for aviation fuels and would expect to see clear phaseout dates for any transitional fuels.

Q24: Do you agree or disagree that the contribution of energy content from hydroprocessing should be calculated?

Agree

Q25: What level should the maximum carbon intensity threshold be set to maintain high sustainability credentials while ensuring enough flexibility to allow a wide range of SAF to be developed? Please provide evidence to support your answer.

The question appears to contain an error. We assume that the intention was to ask a question about the minimum intensity threshold. Consistent with our responses to other

questions, we don't feel able to support a given threshold for fuels in the absence of additional considerations about the wider consequences of producing these fuels.

We would in fact support consideration of a maximum threshold being set! We have sometimes seen claims made about alternative aviation fuels that can provide emissions savings of more than 100%. This provides a clear illustration of the problems of interpreting the results of carbon accounting from a common sense perspective.

Q26: Do you agree or disagree that the minimum carbon intensity reduction should be increased over time? If so, how should it evolve?

As argued elsewhere, we are nervous about the idea of setting up a 'Sustainable Aviation Fuel' policy that uses fuels from unsustainable sources, since doing so creates a market for materials and energy sources that should be rapidly phased out.

We also consider there to be a real greenwash risk. The aviation industry would like to justify its continued expansion on the basis that it is in the process of a transformation towards 'taking the carbon out of flying'. If this involves continuing to release CO₂ from aircraft by using fuels made not from kerosene but from 'dead pigs'⁴ and plastic straws, then environmental organisations are likely to call out these claims as misleading.

There is an absolute and urgent need to cut atmospheric carbon. Only the very best performing options - those with very high carbon intensity thresholds - for decarbonising aviation should be receiving investment and financial reward in that context.

Q27: Do you agree or disagree that the GHG methodologies used in the RTFO should be adopted in the SAF mandate?

As indicated previously, we are not familiar with the detail of the RTFO. We would not support any bonus GHG value being attributed to airlines for the indirect impact of fuel production (credit for avoided methane from landfill, for example). There would seem to be a risk of confusion and of industry pushback, however, if CORSIA is using a different approach. Further work is needed to provide confidence in how the mandate should best capture indirect, whole-system impacts.

Q28: Do you agree or disagree that only disaggregated default values will be provided for downstream emissions while the rest of the SAF lifecycle will require the use of actual GHG values?

The way in which these values are calculated appears to us to be a very technical area of work, the results of which risk being mis-applied. Our understanding is that default values may diverge from actuals by a large margin. The analysis that AEF has commissioned, and that will be published during the summer, will address this and related issues.

⁴ <https://www.bbc.co.uk/news/science-environment-65727664>

Q45: In your view, should GHG reductions from CCS be rewarded under the SAF mandate? If so, should the reward extend to net negative emissions (i.e. less than 0 gCO₂e/MJ on a lifecycle basis), or should these be supported by an alternative GGR policy or a combination of policies?

It is essential to ensure that the carbon accounting in such approaches makes sense and is consistent with the approach to – for example – the meeting of carbon budgets. For this reason it is very important that the DfT’s approach aligns with that of the Climate Change Committee.

We note that CCC says this in the context of its Sixth Carbon Budget analysis⁵:

[W]hilst some SAF fuels can be strongly carbon-negative on a lifecycle basis at the point of use (e.g. if there is upstream biogenic CCS involved in their production), our Aviation sector analysis only considers the direct accounting CO₂ emissions from the use of SAF in the sector, i.e. nil and not negative. If an alternative accounting methodology were followed, the negative emissions from upstream biogenic CCS could be counted within the Aviation sector emissions, but then these upstream negative emissions would have to be excluded from the GHG removals or LULUCF sinks sector to avoid double-counting. Overall, these discussions reflect emissions accounting classifications and do not affect aggregate UK emissions.

AEF strongly supports the creation of appropriate incentives for investment in CCS. In fact, we agree with the CCC’s position to date that the case for a high level of e-fuels for aviation may not stack up well, for as long as renewable energy is scarce, against the use of fossil kerosene combined with CCS. In any case, the Jet Zero Strategy relies on greenhouse gas removal for delivering a larger share of aviation’s decarbonisation than any other measure.

However, we are concerned about the potential for double-counting and confusion in attempting to provide a CCS reward by way of the SAF mandate. While there could be a case under a different carbon accounting system for incorporating CCS into the LCA/CI value of a SAF, at present there is no penalty – such as a cost associated with kerosene – for the aviation sector if it fails to invest in the CCS necessary to achieve net zero by 2050. While the Government or another regulator should be responsible for management and delivery of these schemes, to the extent that they are relied on for achieving net zero aviation, financing should be levied from the aviation sector. There are currently no policy proposals of which we are aware that would deliver this. The SAF mandate should not reward GGR investment until counterbalancing policies are in place for kerosene use without GGR.

Q56: Do you agree or disagree with the proposed approach to align mandate multiple incentives rules as much as possible with the RTFO?.

While we can see the attraction of aligning the SAF mandate with the RTFO with a view to avoiding multiple incentives we are not familiar enough with the RTFO to be able to comment on this approach. We have some concerns about the policy of double crediting for PtL under the EU ETS that we would urge the UK to avoid.

⁵ <https://www.theccc.org.uk/wp-content/uploads/2020/12/Sector-summary-Aviation.pdf>