

UK Sustainable Aviation Fuels Mandate
Department for Transport Consultation
Response from Richmond Heathrow Campaign, 19 September 2021

INTRODUCTION

1. This Report is a written response from the Richmond Heathrow Campaign (RHC) to the DfT Consultation titled '*UK Sustainable Aviation Fuels Mandate, 23 July 2021*'.
2. The DfT proposes introducing a UK SAF blending mandate and says 'A long-term obligation can generate demand for SAF, provide an incentive to SAF producers (in the form of a tradable credit) and signal to investors the vital role the Government believes the technology will play in the UK. The consultation seeks views on:
 - the high-level ambition and design of the proposed SAF mandate,
 - the eligibility criteria SAF will need to meet,
 - the interactions between SAF and other domestic and international policy, and
 - the compliance, reporting and verification principles that will steer the subsequent development of the proposed scheme.'

The consultation also welcome views on how best a SAF mandate could be designed to foster SAF plants development in the UK, and whether it should be complemented by a more comprehensive policy framework. The DfT says 'we anticipate that this consultation is likely to be followed by a second consultation which both reflects findings from the first and addresses more fully the details of administering a mandate'.

3. RHC represents three amenity groups in the London Borough of Richmond upon Thames: The Richmond Society, The Friends of Richmond Green, and the Kew Society, which together have over 2000 members. The members of our amenity groups are adversely affected by noise from Heathrow Airport's flight paths, poor air quality and road and rail congestion in west London. We acknowledge Heathrow's contribution to the UK economy and seek constructive engagement in pursuit of a better Heathrow. We are an active participant in the Heathrow Community Noise Forum.
4. Our premise is that it would be preferable to aim for a better Heathrow rather than bigger Heathrow and to capitalise on the world beating advantage of London's five airports, in particular by improving surface accessibility to all five airports, which would be a major benefit to users. We believe aviation growth should be shared across the UK and not concentrated at Heathrow and other South East airports. Our approach is to continue supporting the case for no new runways in the UK and we believe this is well supported by the evidence produced by the Airports Commission and the DfT in relation to the Airports National Policy Statement, 2017 and by the Climate Change Committee in its Sixth Carbon Budget, 2020. We seek aviation net zero carbon and now with electric propulsion on the horizon and a bit of wishful thinking, zero noise and zero air pollution - the three zeros.
5. Over recent years we have undertaken extensive research on Heathrow and submitted a large number of papers to the Airports Commission, the DfT, CAA and others, which can be found at www.richmondheathrowcampaign.org These include a response to the DfT's Jet Zero consultation on 8 September 2021.

Contact details: Peter Willan, BSc Eng(Hons), MBA, ARSM, FCMA, FEI, HonRCM Chair, Richmond Heathrow Campaign action@richmondheathrowcampaign.org

A GREENHOUSE GAS EMISSIONS SCHEME TO REDUCE THE CARBON INTENSITY OF JET FUEL

Q1. Do you agree or disagree that a SAF mandate should be introduced in the UK?

Answer: Agree conditionally and provisionally

Comment:

1. As we explain later we have significant doubts as to an SAF mandate's efficacy in reducing aviation carbon during its limited potentially useful 25 year life span, i.e. between the scaling up of SAFs in the 2030s to peak production in say 2050 and subsequent decline as zero carbon propulsion increasingly populates the aircraft fleet and removal of GHGs from the atmosphere becomes price competitive.
2. The DfT is in a difficult position promoting zero carbon propulsion and GHG removal while, in so doing, hastening the demise of SAFs and a viable SAF investment payback.
3. The challenges and uncertainties to a successful mandate are substantial and the cost of failure to the UK is huge in the absence of alternatives such as demand management, which seemingly the government and DfT obstinately refuse to contemplate in spite of the Climate Change Committee's recommendations. Potential investors in SAF refineries and UK wide transport and storage surely are not convinced that demand management will not become an imperative and in so doing scupper their investment plans. It would be better to include demand management in the plans from the start and thereby reduce investor uncertainty.
4. We agree with the question, but only on the condition demand management is given mitigation priority. Our agreement is provisional until we see a firm proposal with evidence and an impact assessment. The current framework is too speculative for final decisions on a mandate going forward.

Q2. Do you agree or disagree that an obligation to supply SAF in the UK should sit outside the RTFO?

Answer: Yes

Comment:

1. We see the multiple schemes, e.g. UK SAF mandate, Renewable Transport Fuel Obligation (RTFO), UK ETS, ICAO CORSIA, EU ETS and other global carbon schemes as extremely difficult to integrate efficiently and effectively. Potentially, an SAF mandate could be more effective for aviation if kept outside the RTFO but the mandate will need to interface with other schemes and the UK will need to interface globally in reducing carbon. In addition, the consultation has highlighted some of the weaknesses of the RTFO with which we concur.

Q3. Do you agree or disagree that a GHG emissions scheme based on tradable credits should be preferable to a fuel volume scheme when designing a SAF mandate?

Answer: Disagree on balance of pros and cons

Comment:

1. The aim is to reduce GHG emissions and a scheme based on GHG emissions directly relates to this objective. Also, the SAF feedstocks and fuel producing processes are heterogeneous and there are benefits of using a common metric based on GHG emissions for the life cycle

GHG reduction covering all feedstocks and processes. Furthermore, fuel volumes can mislead as to the GHG emissions because fuels are blended and their origins sub-merged.

2. However, volumes can be simpler to understand and manage. Fuels are not RHC's area of expertise, but as we understand it, SAF rules require SAFs to be 'drop-in' fuels and therefore to have similar performance and other characteristics to fossil jet kerosene. The quantity of CO₂ (not necessarily non-CO₂) emissions is based on the specific number of carbon and oxygen molecules combining to release exothermic energy. As we understand it, the CCC uses a specific 3.15 tonnes of CO₂ for every tonne of fossil jet kerosene or SAF burned. Similarly, the specific energy content of fossil jet kerosene, and we believe SAFs, is 12.0 kWh/kg of fuel and is a factor of the chemical bonding between carbon and oxygen. To the extent these two factors are constants across all jet fuels then volume of fuel is a good proxy for CO₂ emissions, if not GHG emissions. Incidentally, we prefer kWh rather than joules as a measure of energy, although of course they have a precise relationship. Fuel volume is central to the topic - its relationship with flight demand and operations, efficiencies, CO₂ emissions and prices of kerosene, SAFs and CO₂ and therefore fuel volume (provided the two constants hold) is probably the best metric for an SAF mandate.
3. We would expect specification for kerosene and SAFs to be very similar in terms of specific energy, otherwise aircraft will have to load more or less fuel for a route and in the case of more fuel, aircraft fuel tanks may not be large enough or more carbon will be emitted in carrying the additional weight.

Q4. Do you agree or disagree that the proposed SAF mandate obligation should be placed on fuel suppliers that supply aviation fuel (avtur) to the UK?

Answer: Qualified agreement

Comment:

1. Placing the obligation on the fuel supplier at the point of uplifting the fuel seems to be a reasonable approach for the reasons given in the consultation. The supplier may not have been in control all the way up the value added chain to the point of supply but is best able to provide the evidence of the SAF's provenance and life cycle GHG to that point. The supplier should be close or directly involved in the fuel and feedstock markets and the refinery investment and operational decisions.
2. Airlines, on the other hand, are once-removed from the supplier's involvement and are closer to the passenger and freight owner, who are the polluters and who ultimately should be paying the price for GHG pollution. If the suppliers are to bear the internalised costs of carbon, as proposed, it is essential these costs are passed on through the airlines to the polluters, i.e. their customers. The suppliers should provide the signals for supply chain investment. RHC strongly advocates an increase in ticket prices, partly to reduce demand growth to that recommended by the CCC, but also for the airline customers to pay the internalised costs of GHG (see response to Q12). The consultation inadequately deals with this whole economic chain for the supply and use of aviation fuels and the recent DfT Jet Zero consultation equally failed to deal with the subject properly, perhaps to avoid the critical subject of demand management.
3. The airlines have the ultimate choice as to whether to use fossil jet kerosene or SAFs and these decisions will be based on availability of SAFs and price competitiveness with kerosene and its associated carbon costs and in the longer run the marginal abatement costs

of zero carbon propulsion, efficiencies and removal of GHG from the atmosphere.

4. The suppliers of kerosene and SAFs may not be the same and it is not clear how the three markets (kerosene, carbon and SAF) and their participants will operate in tandem over the short, medium and long term. Market supply and demand and price stability will be essential. The price of kerosene will be just as important as that of SAF. At the moment there is a huge price gap between kerosene and SAFs, based on costs, and the carbon market may not be able to bridge that gap, especially if kerosene prices weaken as demand reduces. Price breakeven needs to be achieved by 2030 or it will be too late to generate adequate financial returns on SAF investments, given the relatively short commercial lifespan of SAFs. The suppliers of kerosene have already made the refinery and transport investments and the technology is proven and the markets highly efficient - none of which can be said for the supply of SAFs.
5. SAF suppliers are clearly at the decision nexus on SAFs and it seems sensible for an SAF mandate to focus the obligation on the suppliers.

Q5. Should the obligation apply to all avtur supplied into the UK, regardless of whether this is subject to fuel duty or not?

Answer: Yes

Comment:

1. Where exemptions might be justifiable, for example in the case of emergency services, we believe it still preferable to internalise the cost of carbon across the board, and make good in other ways any potential exemption cases. We are not in favour of exemptions on GHG costs in view of the seriousness of the climate emergency.

Q6. If the obligation applies to all avtur supplied into the UK, should there be a threshold below which fuel is not obligated, in a certain obligated period? Should this threshold distinguish between dutiable and non-dutiable fuel?

Answer: Probably No

Comment:

1. In principle, a threshold might be justifiable if it saved administration costs but we cannot support a threshold for private general aviation and we believe the aim should be to avoid thresholds for reasons given in our response to Q5.

Q7. Where do you think the assessment point should be placed for jet fuel not subject to fuel duty, and how is this going to affect the definition of the proposed obligated party (aviation fuel suppliers to the UK)?

Answer: see comment.

Comment:

1. We agree with the consultation issues raised on this point but are not in a position to comment on the best approach, other than as in our responses to Q5 and Q6.

FUEL ELIGIBILITY AND SUSTAINABILITY CRITERIA

Q8. Do you agree or disagree that only certified SAF that meets the DEF STAN 91-091 specification should be eligible under the proposed SAF mandate?

Answer: Qualified agreement

Comment:

1. Presumably, it is intended the standard will apply to fuels blended in the UK or overseas where the same or equivalent standard is adopted. Also, presumably aircraft may use SAFs not meeting this standard and there is a question of mixing SAFs of different standards and specifications in aircraft tanks and the safety and performance issues that arise. Many aircraft, other than on domestic routes, spend their lives visiting airports around the world and cannot be held to using a single standard of SAF, unless and until that standard is the most prevalent standard globally. Furthermore, the feedstocks for SAFs are heterogeneous and are likely to have different specifications as a result, notwithstanding their ‘drop-in’ qualities.
2. We foresee considerable practical difficulties in managing the mixing of SAFs from heterogeneous feedstocks. Residual SAFs will remain in aircraft tanks on arrival at destinations before loading SAFs from possibly different sources. Clearly, it would be hugely uneconomic to empty and clean aircraft tanks before re-loading fuel. Specifications can vary as to the blend limit (e.g. 30% or 50% max.) so when mixing SAFs with different limits in aircraft tanks it will be almost impossible to know whether the resultant blend is compliant and whether it is safe. An example of the risks: bio-fuels, contain oxygen and oxygen attracts water and the two together, even in trace amounts, can have a highly corrosive impact on certain metals, especially at the high operating temperatures of a gas turbine. We foresee considerable safety and specification difficulties, even with adoption of DEF STAN 91-091 specification. Fossil jet kerosene, on the other hand, is processed from relatively homogeneous feedstock - light oil - in relatively straightforward oil refineries and there is a global standard.
3. The author of this response many years ago advised a large secondary aluminium smelter in the US on the use of a variety of feedstocks, such as scrap beer cans and packaging, in refining aluminium in competition with primary aluminium for Detroit’s vehicle engine blocks. Managing the impurities in scrap, technically to a high standard and commercially, was a substantial challenge. Consistency in composition of SAFs in aircraft tanks and in use from heterogeneous feedstocks could be a major barrier to their use.

Q9. Do you agree or disagree with the sustainability criteria set out here? If you do not agree, what alternative or additional criteria would you recommend?

Answer: Qualified agreement

Comment:

1. We broadly agree with the DfT’s approach to sustainability but all three types of feedstock - bio, non-bio and syn fuels still burn carbon as a means of propulsion. Justification of sustainability is based on either carbon in the fuels being removed from the atmosphere (e.g. by growing plant feedstock) or as with municipal waste the prevention of GHG entering the atmosphere (i.e. methane from rotting waste). The processes in producing SAFs from the feedstocks and the transport and storage of the feedstocks and SAFs are required as far as possible to be zero emission (e.g. using carbon capture and storage). It is recognised that the life cycle carbon (LCA) of an SAF is unlikely to be zero but currently a maximum GHG of only 40% is required. The issue of aviation non-CO2 emissions (e.g. contrails) is uncertain at present and not dealt with properly by the consultation.
2. The DfT approach relies on the removal of GHG from the atmosphere and in a world with

limited feedstocks, the risk is that the feedstocks directed to SAFs could be better used by other sectors of the economy or other countries. Some potential feedstocks should not be considered for fuel. Food and feed crops are clearly ruled out as a fuel feedstock but the decisions on other feedstocks and the use of land are not so clearly defined as to their long-term sustainability. For example, diverting bio-fuel from a refinery producing bio-diesel merely transfers the carbon saving from road transport to aviation and probably with lost refinery yield. Choosing the counterfactual alternative and evaluating a comparison between options is key to sustainability as defined by the DfT and open to question. The choice is often set out as between a fuel and the alternative without the broader impact on the UK as a whole.

3. In the case of waste, should we not be seeking to reduce waste rather than giving it value as a feedstock for SAF, which thereby enables some people to go on holiday (this is only one step away from producing waste to facilitate holidays). In the secondary aluminium example referred to in our response to Q8, the impurities in the scrap aluminium were allocated a shadow cost using linear programming to optimise the feedstock. In effect the consumers responsible for the scrap incurred a cost for the contamination in their waste. Surely, that should be the case for municipal waste (a potential feedstock of SAF) and where possible the waste should be reduced in quantity and the methane pollution captured and stored by liquefaction paid for by those creating the waste. As currently proposed by the DfT, the polluter-pays- principal is diverted from the producer of the waste to the airline customer as consumer of the SAF. A similar situation arises with other by-products such as gases from manufacturing when used as non-bio feedstock for SAFs.
4. Additionally, it is not clear whether the methane contribution to climate change, avoided when using municipal waste, is more or less than the GHG contribution to climate change from use of the waste as a feedstock for SAFs.
5. Water use should be restricted in any sustainability test but seemingly is not mentioned other than its use as feedstock for syn fuels. The world faces a water crises within the next 10 years.
6. We do not agree with out-of-sector offsetting as a solution for aviation. Using non-food crops directly in the production of SAFs is one thing but afforestation by paying a third party does not solve the climate change emergency. Trees need to be planted anyway and not as an excuse to fly.

Q10. Do you agree or disagree with the feedstocks set out here and listed in Annex B? If you do not agree, what alternative or additional feedstock(s) would you recommend?

Answer: Broadly agree but see comment.

Comment:

1. We are not experts on the chemical and physical details of the SAFs and hence their sustainability, GHG emissions, suitability or commercial viability. However, we do value the 6th Carbon Budget as a reference on the whole subject of SAFs and Figure 1 has been extracted from the Budget by RHC. It provides a rather different scenario compared to the DfT list of SAFs referred to in the consultation.

	Aviation Fuels - Power		
	2018	2050	2050
TWh	Actual	Baseline	Balanced Net Zero
Biomass FT jet		0	14
HEFA biojet		0	8
Biowaste FT jet		0	0
Synthetic jet		0	10
	0	0	32
Fossil jet	159	205	94
Aviation Fuels TWh	159	205	126
Efficiency improvement pa		0.7%	1.4%
Passengers mppa	292	478	365
Pax Increase 2018 to 2050		64%	25%
Net airport expansion		Yes	No
Carbon MTCO2	39	51	23

Figure 1 Prepared by RHC from 6th Carbon Budget data.

Q11. Do you agree or disagree that the baseline life cycle carbon intensity for aviation fuels for reporting purposes under a UK SAF mandate should be 89 gCO₂e/MJ? If you do not agree, what should the baseline emission be and/or how should it be calculated?

Answer: Disagree

Comment:

- Our understanding is that fossil jet kerosene has a specific energy content of 12.0 kWh/kg and the 6th carbon Budget assumes 3.15 tonnes of CO₂e from one tonne of fuel. This equates to 73 gCO₂e/MJ on combustion. The 89 gCO₂e apparently includes fuel extraction, processing and transportation. It would be helpful if the SAF Mandate matched the carbon and energy intensities used by the 6th Carbon Budget for combustion (i.e. 73 gCO₂e/MJ) and then accounted for the other life cycle carbon. The proposed SAF mandate uses a volume approach in setting a maximum carbon content of 40% and an anticipated minimum of around 20% based on the ratio of 73 to 89 gCO₂e/MJ.
- We have not seen any information on the life cycle energy efficiency of different propulsion systems including the fuels. Energy is lost as heat as well as kinetic energy required to transport the fuels on the ground and in the air. Arguably, if the source were the sun or wind, it would not matter to the same extent but otherwise the kinetic energy used in flight is far from 100% efficiently produced and used and will vary with fuel type and associated propulsion system. Further information on energy efficiency would be welcome.

Q12. What should the minimum carbon intensity reduction SAF will need to be (subject to the final GHG methodology used)?

Answer: see comment

Comment:

1. Figure 2 is prepared by RHC from the CCC's 6th Carbon Budget, December 2020 and shows SAFs are budgeted to eliminate 8 Mt of CO₂e a year by 2050, assuming 25% blend of SAF with fossil jet kerosene.
2. The DfT's Jet Zero High Ambition Pathway is replicated in Figure 3. The DfT Jet Zero also assumes SAFs eliminate 8 Mt of CO₂e a year by 2050, assuming 30% blend of SAF with fossil jet kerosene. The difference between the 25% and 30% blend but same mitigation is due to the amount of fuel, given different demand growth rates, demand management and efficiencies.
3. We have added a comparison of the CCC and Jet Zero mitigation in Figure 3. It shows the great divergence in demand management and efficiency. RHC believes the DfT is over-optimistic, and given the historical under-performance of aviation in carbon reduction since 1990, there is little confidence in aviation's 30 year performance to 2050.

UK Aviation Balanced Net Zero. No expansion Annual Carbon Abatement in 2050	Demand	Kerosene/SAFs mass and energy		Carbon Emissions
		Figure 2	mppa	Mt/yr
Base Year 2018	292	13	159	40
Unconstrained demand growth (avg 1.6% pa, 64% 2018-2050)	+186	+7	+98	+24
Year 2050	478	20	257	64
Baseline Efficiencies (avg. 0.7 pa, 20% 2018-2050)		-4	-52	-14
Unconstrained Baseline scenario year 2050	478	16	205	51
Demand management	-113	-4	-48	-12
Balanced Net Zero demand (avg 0.7 pa, 25% 2018-2050)	365	12	157	39
Additional Efficiencies and hybrids (avg. 0.7% pa)		-2	-31	-8
Sub-total		10	126	31
Sustainable Aviation Fuels (SAFs) 25% replacement		0	0	-8
Sub-total		10	126	23
Removal of carbon from the atmosphere (GGR)			0	-23
Aviation Net Zero Carbon year 2050	365	10	126	0

Source: CCC 6th Carbon Budget Dec 2020 - RHC Interpretation. Note figures are rounded. Assumes one tonne of kerosene produces 3.15 tonnes of carbon and one kg of kerosene produces 12.0 kWh of energy. TWh is terawatt hours i.e. billion watt hours.

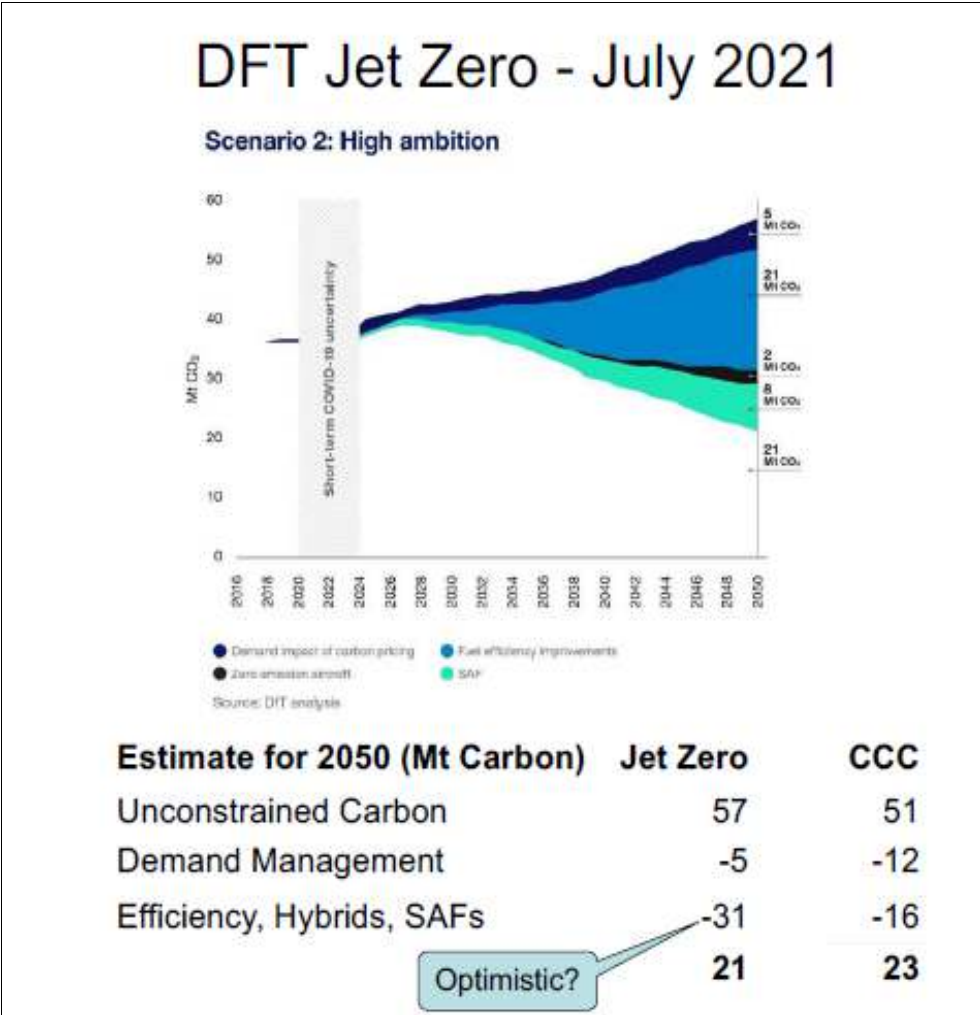


Figure 3

4. A major question is whether SAFs can be supplied at competitive prices to kerosene. Figure 4 shows the RHC model for airline decisions on whether to purchase kerosene or SAFs with a cap and trade scheme, based on one tonne of fuel.

	Price/tonne	SAF Option		Kerosene Opti	
		Tonnes	Cost £	Tonnes	Cost £
Kerosene	500	0.75	375.0	1.00	500.0
Kerosene CO2e	£221.0	2.36	522.1	3.15	696.2
SAF	£1,057	0.25	264.3		
SAF CO2e LCA	221.00	0.16	34.8		
			1196.2		1196.2

Figure 4 Example cap & trade scheme prepared by RHC

5. The SAF abatement costs for reducing the 8 Mt of CO2e are shown in Figure 5 prepared by RHC as £7 bn a year by 2050. If for example, in 2050 and assuming 25% SAF and 20% LCA carbon by volume and the CO2 traded price were £221/t, kerosene £500/t and breakeven SAF price of £1057/t, the fuel cost (kerosene, SAF and carbon) would be £1.2 bn per Mt of fuel and based on 10 Mt of fuel needed for 365 mppa in 2050, the total fuel cost would be £12 bn a year, which is an increase of £7 bn compared to the counterfactual £5 bn without SAFs and CO2e costs.

6. Figure 5 also shows the components of the £16 bn a year of abatement costs needed to ensure demand does not exceed the CCC ceiling of 365 mppa by 2050, assuming expansion has been ruled out but if not, another £12 bn a year of abatement costs would be needed. Slippage on the targets could require the 365 mppa ceiling to be reduced to 2019 levels of around 300 mppa. This response and further detail on the increase in APD to full and fair value and on airport expansion is included in RHC’s response on 8 September 2021 to the DfT’s Jet Zero consultation (subject to minor change to the kerosene fuel cost in Figure 5).
7. We have included Figure 5 to show the monetised framework in which RHC believes aviation carbon reduction, including the use of SAFs, needs to be assessed.

Figure 5	Pre- Demand Management Revenue	Demand Management Increment	Required Revenue
Indicative Demand Management Components to achieve 365 mppa demand ceiling in 2050	£ bn/year	£b/year	£bn/year
Airline costs before fuel, carbon and APD (365 mppa)	29.0	0	29.0
Kerosene fuel cost (10 Mt @ £500/t)	5.0	0	5.0
Fuel Efficiency, hybrids net of capex and opex costs	0	-2.2	-2.2
SAFs and carbon costs	0	7.0	7.0
Greenhouse gas removals of residual carbon	0	1.0	1.0
APD increased to Full and Fair level	2.9	9.7	12.6
Sub-total	36.9	15.5	52.4
Undefined revenue gap	0	0.5	0.5
Total UK Ticket Revenue	36.9	16.0	52.9

Q13. Are there any land use (direct or indirect) or other implications associated with the feedstocks set out earlier that we should reflect in the eligibility criteria and minimum GHG threshold?

Answer: Yes, see response to Q9

Comment:

Q14. As more CCUS becomes available and the carbon intensity of fuels can decrease further, should the envisaged minimum carbon emissions intensity threshold be raised up over time?

Answer: Yes

Comment:

Q15. What GHG methodology should be used to calculate the carbon intensity of fuel?

Answer: see response to Q11

Comment:

Q16. How should the GHG methodology vary to take into consideration the different fuels, feedstocks, power sources and production pathways?

Answer: see response to Q12

Comment:

Q17. Do you agree or disagree that SAF that does not meet the proposed eligibility and sustainability criteria should incur an obligation?

Answer: Disagree

Comment: Obligation should not be incurred

OVERARCHING TRAJECTORY

Q18. Do you agree or disagree that a SAF mandate should start in 2025?

Answer: Disagree

Comment: Should be sooner.

Q19. Do you agree or disagree that the targets should assume a linear growth up to 2035 and an exponential growth after 2035?

Answer: No

Comment:

1. According to the Jet Zero consultation, the next ten years seemingly are about experimenting with different pathways with mitigation action being deferred until after 2030 or even 2035. This is far too late.

Q20. What scenario do you think represents the best trade-off between ambition and deliverability? What evidence can you provide to support your position?

Answer: see response to Q12

Comment:

1. We believe the 6th Carbon Budget sets out achievable ambition, policy, targets and action (except in respect of how demand management should be performed) and that 25% SAF blend by 2050 and aviation carbon net zero is achievable.
2. But the CCC assessment report to parliament in June 2021 already shows the failures against target and on that form even 365 mppa ceiling is becoming too high and a ceiling of zero passenger growth is becoming likely.
3. Figure 6 shows the 6th Carbon Budget Balanced Net Zero pathway fuel mix on a temporal basis 2018-2050. We have not compared this in detail with the DfT High Ambition pathway on a temporal basis but the two reduce carbon at a rate of 8 Mt a year by 2050 and between now and then appear to be on similar profiles. But as we said in response to Q1 and to other questions we believe the DfT approach is lagging the 6th Carbon Budget's timeline potentially by a significant amount, not least by not considering demand management upfront.

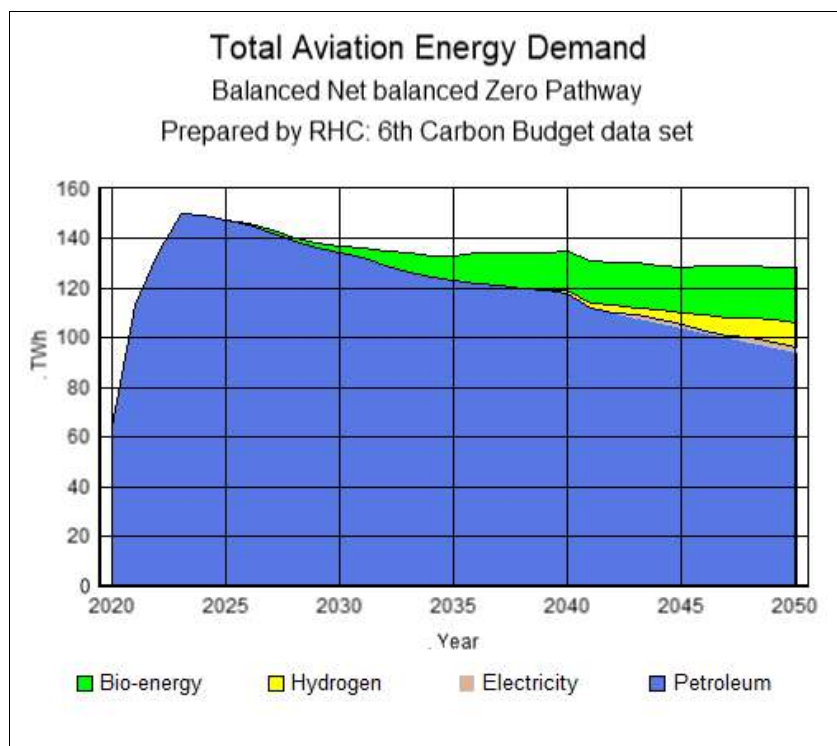


Figure 6

Q21. Do you agree or disagree that we should include review points in 2030 and 2040, depending on initial mandate levels?

Answer: No

Comment:

1. We recommend the dates being 2025, 2030, 2035, 2040, 2045 and 2050.

Q22. 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?

Answer: Yes

Comment:

1. We have not examined sufficiently how best to cap use of HEFA. But our understanding is that the price of SAF from HEFA is likely to be much less than that from other feedstocks, at least for some time. There may be insufficient HEFA feedstock to satisfy aviation demand given other potential uses.

Q23. How can power-to-liquid fuels innovation and roll-out be accelerated? Should a subtarget and/or a multiplier be introduced?

Answer: see comment

Comment:

1. We have not examined sufficiently how power-to-liquid innovation can be advanced. But we note that use of multipliers can distort production, for example from say bio diesel to SAF without any improvement in overall carbon mitigation and probably with a loss in refinery yield.

Q24. How can SAF produced through pathways other than HEFA and power-to-liquid be accelerated?

Answer: see comment

Comment:

1. We have not examined other pathways sufficiently to make recommendations.

INTERACTIONS WITH OTHER DOMESTIC AND INTERNATIONAL POLICY

Q25. Do you agree or disagree that SAF GHG emissions reductions should be claimed only once under different schemes?

Answer: Yes

Comment:

Q26. How could the UK ETS, CORSIA and proposed SAF mandate be used together to continue to incentivise uptake, while preventing double counting of emissions reductions?

Answer: see comment

Comment:

1. We believe the several carbon mitigation schemes need to be kept as separate as possible.
2. There are substantial differences between UK aviation and global aviation so bringing them into line under one scheme or even several schemes would be challenging:
 - a. There are carbon implications from the high propensity of the British to fly.** More Britons travel abroad than any other nationality, according to official data from the international trade body for aviation. In 2018, 8.6% of all international travellers were British followed by the US with 7.6% and China 6.6 per cent. The global aviation industry emitted 915 Mt of carbon in 2019 or 2% of total global carbon emissions of 42 Gt. UK aviation emitted 39.6 Mt or 8% of total UK emissions of 522 Mt; as such the UK aviation carbon footprint is relatively high.
 - b. International aviation is not taking carbon emissions seriously.** 60% of global passenger demand (but 96% of UK demand) is for international flights, which is the responsibility of the UN-ICAO and disjointedly outside the scope of COP 26 that covers domestic aviation. The ICAO offsetting scheme for international aviation (CORSIA) will be largely ineffective in our view, on account of the un-reliability of offsetting schemes, low carbon price of a few dollars per tonne of CO₂e that lacks commercial incentive and the temporary life of the scheme - to 2035. CORSIA is a convenient excuse for the UK aviation industry and government not to take dedicated action.
 - c. International aviation is predicted to grow at environmentally unsustainable rates.** The ICAO forecast substantial global aviation growth of over 4% pa through to 2045 compared to the CCC's unconstrained forecast of 1.6% pa or carbon constrained 0.7%pa for the UK. These differences create pressure on UK aviation to downplay the climate issues in the face of competition.
 - d. International fault lines on who should pay.** Developing nations seek financial

assistance from reluctant developed nations in mitigating a relatively high growth rate for carbon emissions. Bridging the major financial divide will be essential at COP 26 if there is to be co-operation in achieving aviation net zero.

- e. **While claiming leadership, the UK is beholden to passenger and fuel markets.** There are practical issues of carbon leakage and competition between nations and tankering of fuels and international laws governing aviation such as the Chicago Convention. These are real problems but risk the UK not taking bold unilateral action on carbon.
 - f. 70% of passengers on UK international flights are UK resident but carbon accounting allocates 50% to the UK, based on departures alone, and therefore the **UK bears less than its fair share of global aviation carbon costs.**
3. Regarding UK schemes (UK ETS and RTFO) we have already responded on the RTFO. As regards the UK ETS, the 6th carbon Budget targets 23 Mt of aviation GHG to be removed from the atmosphere by out-of-sector means and this therefore by-passes an SAF mandate and the UK ETS may be crucial in assisting the mitigation needed.

Q27. Do you agree or disagree that SAF that has been produced on the back of industrial plants or clusters which have received competition funding from government can be claimed under the proposed UK SAF mandate?

Answer: Agree

Comment:

1. The majority of people around the world do not fly (50% in the UK). In the UK, 15% of people take 70% of all flights.
2. RHC believes the polluter should pay (airline customers) and neither the government nor tax payer should be supporting the relatively few people who can afford to fly. But in so far as the competition funding is relatively small in amount we have no objection.

Q28. Do you agree or disagree that SAF should no longer be rewarded under the RTFO when and if a SAF mandate is in place?

Answer: Agree the SAF should no longer be awarded under the RTFO

Comment:

Q29. What provisions should the UK SAF mandate include to reduce the risk of tankering even further?

Answer: see comment

Comment:

1. Tankering may be a problem and we realise it is difficult to account for. Better information on the topic and working with airlines to minimise it would be a help.

DELIVERING SAF TO THE MARKET

Q30. Do you consider a more comprehensive policy framework beyond a SAF mandate is required to build a successful UK SAF sector?

Answer: Yes

Comment:

1. We are disappointed the HM Treasury has failed to meet its promises on a Net Zero set of policies and consultation well ahead of COP 26. We have attempted to provide a monetised framework in our response to Q12. Also, as we have said, the DfT failure to support demand management, taking account of airport expansion and the CCC ceiling of 365 mppa, leaves a gaping hole in the policy framework. We have also referred to our research showing that the aviation sector is substantially under-taxed compared to other UK sectors and that there is good reason to increase APD to a full and fair level. APD is a general tax best used to meet the UK's fiscal needs - it is not a pollution tax to be paid over to the industry to mitigate its pollution. Increasing APD to a full and fair level would materially reduce demand growth. It should be emphasised that demand management does not necessarily mean no growth and the CCC ceiling still allows for demand growth of 25% between 2018 and 2050 and more if other mitigations exceed their targets.
2. Current UK plans concentrate on bio refineries in the north of the UK, resulting in high freight costs of municipal waste feedstock across the UK and transport of fuel to the south to Heathrow and Gatwick, which use around 70% of UK aviation fuel. A more comprehensive assessment of the transport and storage logistics is needed when dealing with waste. Similarly, transport of hydrogen, SAFs and captured CO₂ are unlikely to be able to use existing pipelines and a full assessment is needed. Investors in bio-refineries may not be the same investors in transport and storage infrastructure and this could lead to hesitation on making the necessary investment.
3. There are considerable uncertainties in achieving net zero and other mechanisms must be developed and introduced soon, otherwise achieving net zero carbon is at great risk. RHC proposes that instead of a carbon tax or a frequent flyer levy (rejected by the HM Treasury), there be introduced an airport carbon (or greenhouse gas) quota system over five year cycles (or less), which is driven by UK Carbon Budgets and airport Action Plans. Airports are best placed, as with the night noise quota system, to work with airlines on aircraft fleets, routes and operations to meet noise and carbon targets. A quota system focussed on three airports would cover 80% of aviation carbon emissions - Heathrow 55%, Gatwick 15%, and Manchester 10%. This is especially relevant to an SAF mandate as the airports are at the point of supply. We outlined the RHC proposal in greater detail in our response to the DfT Jet Zero consultation.

Q31. If you believe this is the case, how can this policy framework be designed? Please provide any evidence you may have available to support your answers.

Answer: see response to Q30

Comment:

Q32. Should buy-out be allowed? If so, how should the buy-out price set to encourage actual supply of SAF and delivery of carbon savings? How should the buy-out evolve over time?

Answer:

Comment: We have not examined buy-outs sufficiently to make recommendations

Q33. What penalties should be introduced in addition/alternatively to a buy-out to ensure sustainable SAF, that meets the proposed criteria, is supplied?

Answer: see comment

Comment: We have not examined buy-outs sufficiently to make recommendations

SCHEME PRACTICALITIES, REPORTING AND VERIFICATION

Q34. Do you agree or disagree that a mass balance approach should be the only chain of custody system permitted under the proposed SAF mandate?

Answer: see comment

Comment: We have not examined chain of custody sufficiently to make recommendations

Q35. Where do you think the chain of custody will need to end? Please refer to any evidence to support your position.

Answer: see comment

Comment: We have not examined chain of custody sufficiently to make recommendations

Q36. Do you agree or disagree that obligated suppliers will need to report annually information on the aviation fuel supplied to the Department for Transport, regardless of whether they claim SAF credits?

Answer: Yes

Comment:

Q37. Do you have views on what information obligated fuel suppliers should report?

Answer: see comment

Comment: We have not examined the information requirements sufficiently to make recommendations

Q38. Do you have views on the reporting calendar?

Answer: see comment

Comment: We have not examined the reporting calendar sufficiently to make recommendations

Q39. Do you have views on what the timescale for submitting claims and the information/evidence required by this process should be?

Answer: see comment

Comment: We have not examined the reporting calendar sufficiently to make recommendations

Q40. Should certification provided by voluntary schemes count as evidence of compliance with the sustainability criteria of the SAF mandate? If so, do you think this step should or should not be mandatory?

Answer: see comment

Comment: We have not examined the certification sufficiently to make recommendations

Q41. What information should the obligated party provide, either through verifiers or other means, to demonstrate compliance with the sustainability criteria?

Answer: see comment

Comment: We have not examined the verification sufficiently to make recommendations

Q42. Do you agree or disagree that claims for credits under the SAF mandate should be verified? If so, should these be verified to a 'limited' or 'reasonable' assurance?

Answer: see comment

Comment: We have not examined the verification sufficiently to make recommendations

Q43. What data related to the SAF mandate should DfT make publicly available? How often should this information be published?

Answer: see comment

Comment: We have not examined data publicity sufficiently to make recommendations.