**Jet Zero Further Technical consultation: GALBA response, April 2022**

This response is submitted by the Group for Action on Leeds Bradford Airport (GALBA): [www.galba.uk](http://www.galba.uk). GALBA is a group of concerned citizens in West Yorkshire. We have come together from a range of backgrounds and from across the political spectrum to stop the proposed expansion of Leeds Bradford Airport. We take a keen interest in wider aviation matters and responded to the original Jet Zero consultation.

**Consultation question 1 a) Do you agree or disagree with the range of illustrative scenarios that we have set out as possible trajectories to net zero in 2050?**

**Consultation question 2 Do you agree or disagree with the possible trajectories we set out, which have in-sector CO2e emissions of 36Mt in 2030, 28Mt in 2040 and 15Mt in 2050, or net CO2e emissions of 24-29Mt in 2030, 12-17Mt in 2040 and 0Mt in 2050? (question 3b of the initial consultation - values updated in line with the new analysis)**

We disagree with both.

There is no credible evidence to believe that the new, more optimistic assumptions about SAF uptake, zero emission flight and greenhouse gas removal technologies will materialise in reality to the extent needed and within the timescales assumed. There is still no credible evidence to believe the optimistic assumption made about the annual rate of aviation efficiency gains.

The Jet Zero Further Technical (JZFT) consultation rightly acknowledges some of the many barriers to achieving its more optimistic scenarios. However, it offers no credible evidence that they can be overcome in reality within the timescale assumed.

Despite the large number of acknowledged uncertainties, JZFT does not adopt the precautionary principle, nor offer any contingency options should its more optimistic assumptions fail to deliver in practice. This is an irresponsible and high risk gamble.

A. Introduction

1. The JZFT consultation has made new, more ‘ambitious’ assumptions about:
	* an increased uptake of sustainable aviation fuels, including advanced Power to Liquid SAF
	* the earlier and widespread introduction of zero emission aircraft into commercial service
	* a larger capacity for greenhouse gas removal technologies in 2050
2. JZFT has retained the same ‘optimistic’ assumption about aviation system efficiency gains as in the original JZ consultation.
3. To an even greater extent than the original JZ consultation, JZFT depends entirely on new technology and alternative fuels that are unproven and unlikely to be scalable to the levels needed within the timescale assumed.

B. Assumptions about higher SAF uptake

1. It is true that governments and industry bodies have made more ambitious statements about SAF production. However, no evidence has been presented in JZFT, or the original JZ consultation, to suggest that the practical and financial barriers to scaling up SAF production to the extent needed and within the timescales assumed can be overcome in reality.
2. Two key questions are not addressed at all in JZFT:
	* what will the total pool of SAF’s essential ingredients (sustainable biomass and renewable energy) be in 2030, 2040 and 2050?
	* what reason is there to believe that aviation is the best way to use those limited resources?
3. There is no evidence in JZFT that a cross-departmental ‘business case’ has been produced to assess whether prioritising sustainable biomass and renewable energy use for the aviation sector offers value for money in relation to other sectors and the overall goal of decarbonising the UK’s economy.
4. It is also important to remember that SAF use does not guarantee 100% CO2 abatement. Currently the certified blend rates range from 10% to 50% and the threshold considered in the UK SAF mandate is 60-70%.
5. There are serious questions to be answered about how the true abatement rate of SAF is calculated. Some methods result in the absurd position of SAF achieving over 100% abatement. The 2020 United Nations Environment Programme ([UNEP](https://wedocs.unep.org/xmlui/bitstream/handle/20.500.11822/34431/EGR20ch5.pdf?sequence=3)) report warns: “Assuming that biofuel combustion is carbon neutral is ... a fundamental accounting error that rests on implicit spatiotemporal boundaries and assumptions…” and notes that “for many biofuels, the energy return on investment is comparatively low or possibly negative” (section 5.3.3).
6. The latest [IPCC report](https://report.ipcc.ch/ar6wg3/pdf/IPCC_AR6_WGIII_FinalDraft_Chapter10.pdf) also notes that “alternative fuels from bio-feedstocks have variable carbon footprints because of different life cycle emissions associated with various production methods and associated land-use change”. The report explains that the different sources of bio-feedstocks “can have different associated life cycle emissions, such that they are not net zero-CO2 emissions but have associated emissions of CO2 or other GHGs from their production and distribution… In addition, associated land use change emissions of CO2 represent a constraint in climate change mitigation potential with biofuel… and has inherent large uncertainties” (p60). Proper life cycle accounting is needed to ensure only the best performing fuels are used.
7. There is also a risk that higher short term ambitions for SAF uptake will just divert existing sustainable supplies, rather than create new ones. The ICCT has assessed the ReFuel EU initiative and published a [report](https://theicct.org/sites/default/files/publications/Sustainable-aviation-fuel-feedstock-eu-mar2021.pdf) in March 2021. This cautions: “it is critical that policymakers set realistic SAF deployment goals that match the amount of fuel that could be made from available feedstock” and warns: "High near-term targets for SAF blending may only incentivise the diversion of waste oils from existing uses in the road sector..." and as a result make economy-wide decarbonisation more expensive.
8. Another [ICCT report](https://theicct.org/publication/aviation-global-evo-hydrogen-aircraft-jan22/) concludes: "Taking into account sustainable availability and an optimistic assumption for the deployment rate of novel conversion technologies, we estimate that there is a resource base to meet approximately 5.5% of the European Union’s projected 2030 jet fuel demand using advanced SAF. However, if the European Union adopts weaker incentives that primarily encourage the use of waste oils and diversion from the road sector, we estimate a maximum advanced SAF deployment of only 1.9% of projected 2030 EU jet fuel demand." Given that the necessary fuel process pathways have not yet been proven at a commercial scale, 1.9% seems a more prudent assumption. JZFT offers no evidence to suggest that 10% can be sustainably sourced for UK aviation by 2030, as assumed in scenario 3 and possibly also in scenario 2, though this gives no figure for 2030.
9. As the 2020 [UNEP](https://wedocs.unep.org/xmlui/bitstream/handle/20.500.11822/34431/EGR20ch5.pdf?sequence=3) report notes: “The major uncertainty lies in the cost and availability of the primary energy sources, such as sustainable biomass and renewable electricity” (section 5.3.3). The latest [IPCC report](https://report.ipcc.ch/ar6wg3/pdf/IPCC_AR6_WGIII_FinalDraft_Chapter10.pdf) adds: “Several issues limit the expansion of biokerosene for aviation, the primary one being the current cost of fossil fuel compared to the costs of SAF production”. The IPCC report also notes that current estimates of cost for non-biofuel SAF “are estimated to be approximately 4 to 6 times the price of fossil kerosene” (p62).
10. The UNEP report concurs, saying: “Ultimately, the price gap between incumbent fossil fuels and post-fossil fuels represents a key challenge that prevents investment both in the [aviation] sector and infrastructure on land. Without sufficiently stringent regulation in place to force or enable a business case for zero-carbon fuel use, these investments are unlikely to flow at the required scale until there is either a customer preference or a price premium for zero-carbon [aviation] services.” (section 5.3.3). A price premium means introducing higher and fair emissions pricing at levels that reflect the full climate damage caused by fossil fuelled flying. We return to this in response to consultation question 1 b) below.
11. There appears to be an assumption that significant public investment should be made to grow the UK’s SAF industry. JZFT offers no evidence that a cross-departmental ‘business case’ has been produced to assess whether prioritising SAF over investment in other zero carbon technologies offers value for money. For example, the great majority of people (and economic activity) depend on ground transport - cars, trains, buses, trams, tubes. A second example is housing. Almost everyone lives in a building, with vast numbers of properties in need of better insulation and the majority needing to switch from gas boilers to heat pumps. By contrast, government research regularly shows that a small, wealthier minority take the majority of flights and roughly half the population does not fly at all in any given year.
12. Public investment in ground transport, housing and other sectors - benefiting millions of people, bringing many co-benefits and supporting the UK’s emissions reduction targets - must be seen as a higher priority than aviation. At the very least a cross-sector review should be carried out to assess value for money rather than simply assuming high levels of public investment in alternative aviation fuels are justified.
13. Finally, offering large public subsidies for SAF production also reduces the incentive for the aviation industry to make its own large investments in SAF. This contradicts the ‘polluter pays’ principle that JZ says it seeks to uphold.

C. Assumptions about the earlier entry of zero emission aircraft

1. JZFT refers to a new ‘concept’ aircraft as evidence that zero emission aircraft will enter service from 2035 and be in widespread commercial use from 2040-2050. However, a ‘concept’ aircraft is just that - conceptual. JZFT offers no evidence to believe that this concept will become real within the assumed timescale for it to enter widespread commercial use.
2. All aircraft entering service for the last few decades have had the same configuration with updated aerodynamics, material, larger engines, etc. However, none have involved a novel configuration with different wings, different fuel type and storage location, different engine combustors, etc. We know that when the first tube-and-wing concepts were developed there were many iterations and failures before settling on a proven, safe design.
3. There remains significant uncertainty about what the optimum liquid hydrogen aircraft configuration would be for each class/size of aircraft and there are many hurdles to be overcome in technology development and certification. The first liquid hydrogen aircraft to fly will not be well optimised nor immediately suitable for mass manufacture. Furthermore, if JZFT’s goal is, for example, that by 2040 all flights under 2,000km should be hydrogen-powered, airports need to begin adapting accordingly now, which means halting and re-thinking all current airport expansion plans.
4. Aerospace manufacturers [Boeing](https://www.flightglobal.com/airframers/hydrogen-powered-airliners-unlikely-in-near-term-boeing-exec/140273.article) and [Airbus](https://www.reuters.com/business/aerospace-defense/airbus-tells-eu-hydrogen-wont-be-widely-used-planes-before-2050-2021-06-10/) have recently stated that “hydrogen won't be widely used in planes before 2050”. JZFT makes an assumption of 27% zero emission flight in scenarios 2 and 3 and 34% in scenario 4. While [ICCT modelling](https://theicct.org/publication/aviation-global-evo-hydrogen-aircraft-jan22/) estimates liquid hydrogen aircraft “could service about one-third (31 to 38%) of all passenger aviation traffic", that would only “mitigate 126 to 251 Mt-CO2e in 2050, representing 6% to 12% of passenger aviation’s CO2e emissions." Moreover, if liquid hydrogen aircraft are not introduced until 2035, there will be very few in service by 2040 so it appears more likely that they will have replaced around 1-2% of emissions by 2040 and just 5-10% by 2050.
5. Finally, an [EU research report](https://www.fch.europa.eu/sites/default/files/FCH%20Docs/20200507_Hydrogen%20Powered%20Aviation%20report_FINAL%20web%20%28ID%208706035%29.pdf) in 2020 concluded that even assuming the necessary technical developments occur “hydrogen propulsion is best suited for commuter, regional, short range and medium-range aircraft” (p5) and notes that hydrogen is “less suitable for evolutionary long-range aircraft designs from an economic perspective” (p6).

D. Assumptions about greenhouse gas removal (GGR) technology

1. We share the concerns of the cross-partyEnvironmental Audit Committee who recently warned that a focus on future GGRs risks distraction from actually cutting emissions now and could see “heavy emitters dodge their responsibilities”. The EAC warns that the future removal of carbon should not be presumed.
2. [In their letter](https://committees.parliament.uk/publications/9463/documents/161610/default/) to Kwarsi Kwarteng MP, sent on 28 March, the EAC raised several concerns:
	* additional emissions from transporting biomass required for bioenergy with carbon capture and storage (BECCS)
	* bearing in mind how BECCS and direct air carbon capture and sequestration (DACCS) are nascent technologies, why the government considers it appropriate to rely on them as a principal element of the net zero pathway
	* how the effectiveness of GGRs will be monitored and what (if any) safeguards or alternatives the government envisages to reach net zero if GGRs do not deliver the anticipated outcomes
	* what assurances the government has in place to ensure that captured CO2 will be stored securely, safely and permanently at proposed UK offshore sites
	* how these assurances will be reviewed as monitoring, reporting and verification procedures for GGRs are developed and implemented
	* lack of clarity about the government’s policy on the current and future sourcing of biomass for use in BECCS, how sustainable it is over its lifecycle and how it is compatible with overall policy objectives on domestic and global biodiversity and carbon neutrality
	* whether the government supports the reuse in other applications of CO2 removed by GGRs
	* what evidence the government is relying on in its assessment of the permanence of recovered CO2
	* whether the government supports the use of GGRs in enhanced oil recovery and recovered CO2 used in such applications therefore returning to the atmosphere
3. At present, GGR technology only exists at a small scale and the prospects of scaling it up to a commercial level face significant obstacles of cost and time. Adopting the precautionary principle would mean reducing the amount of emissions that aircraft put into the atmosphere in the first place and therefore reducing the quantity that needs to be removed in the future. This can most reliably and rapidly be achieved by introducing demand control measures. JZFT’s increased dependence on future GGRs as opposed to demand constraint now represents a major intergenerational injustice: carry on flying and emitting today - let the next generation pay to clear up the mess.
4. JZFT refers to Element Energy’s research into the potential of GGRs, in particular engineered GGRs. However, Element Energy’s conclusion is more nuanced than set out in JZFT. It says: “Most GGRs have significant uncertainties in their costs, resource needs and potential timelines for initial deployment, especially those which are less mature” (p100). The less mature GGRs include most types of engineered GGRs other than BECCS.
5. It also says: “In the high GGR demand scenario, engineered GGRs achieve over 100 MtCO2 removals, however here the system constraints for bioenergy supply and CO2 transport and storage availability are pushed towards their feasible maximum limits.” (p101).
6. The CCC’s analysis of biomass use for BECCS in 2050 suggests that more or less all sustainable biomass resources would be needed for this negative emissions technology. The graph below illustrates this point (p100 of ‘[Biomass in a low-carbon economy](https://www.theccc.org.uk/wp-content/uploads/2018/11/Biomass-in-a-low-carbon-economy-CCC-2018.pdf)’)
7. 
8. It is also important to note that both BECCS and DACCS use large quantities of water which is very likely to prove an issue in a future water-scarce world. A [New Scientist report in 2021](https://www.newscientist.com/article/2270227-carbon-negative-crops-may-mean-water-shortages-for-4-5-billion-people/) suggests that BECCS may mean “water shortages for 4.5 billion people.” Cultivating energy crops in large monoculture fields would also deepen dependency on synthetic fertilisers, pesticides and herbicides, thereby further destroying biodiversity.
9. This approach would lead to land-use change emissions that are likely to be worse than fossil fuel use and result in humanitarian impacts, eg land conflicts, rising food prices, water scarcity and pollution affecting communities neighbouring plantations and refineries. It is vital to minimise the risk of these impacts by only using sustainable feedstocks but this will further reduce the total availability of biomass.
10. There are two final questions about GGRs that are not addressed in JZFT:
	* how does the government propose to ensure the aviation industry invests its fair share of the costs in a rapid development of GGRs?
	* how is the aviation industry going to afford this investment if it does not charge higher fares, which would impact demand?
11. The carbon prices used in JZFT do not appear to be linked to the cost of scaling up GGR, which goes against the ‘polluter pays’ principle.

E. Assumptions about aviation system efficiency gains

1. The latest [IPCC report](https://report.ipcc.ch/ar6wg3/pdf/IPCC_AR6_WGIII_FinalDraft_Chapter10.pdf) states: “In the future… the highest rate of fuel burn reduction achievable for new aircraft is likely to be no more than about 1.3% per year” (p59). It concludes that “the literature does not support the idea that there are large improvements to be made in the energy efficiency of aviation that keep pace with the projected growth in air transport” (p60).
2. ICAO’s [Environmental report](http://www.icao.int/environmental-protection/Documents/EnvironmentalReports/2019/ENVReport2019_pg17-23.pdf) in 2019 assumed long term overall efficiency gains “even under the most optimistic scenario” of 1.37% per year. The report explains: “The computed 1.37% per annum long-term fuel efficiency includes the combined improvements associated with both technology and operations” (p17) which is the same combination as in JZFT.
3. Yet JZFT adopts the ATA report’s ‘optimistic’ rate of 2% per year while offering no new evidence to believe that this scenario is plausible. While ATA’s ‘likely’ scenario assumes “the most likely technologies are adopted based on the current well-developed technology plans” its ‘optimistic’ scenario assumes “some high-risk technologies are adopted in addition to the ‘likely’ case.”
4. JZFT makes a new assumption that passenger load factors will increase and improve efficiency per passenger. However, without higher and fair emissions pricing, technology development will be slower and airlines will have less of an incentive to fly with better load factors.

F. Assumptions about international collaboration

1. JZFT is very clear that its scenarios can only be achieved with extensive and rapid international collaboration. However, it offers no evidence to believe that such significant collaboration is likely to happen in reality.
2. ICAO does not have a good track record for achieving anything above ‘lowest common denominator’ agreements, due to the range of different attitudes to climate mitigation and aviation among its members.

G. Exclusion of non-CO2 emissions

1. As in the original JZ consultation, JZFT excludes aviation’s non-CO2 emissions from consideration, referring to ‘uncertainty’ about their scale. However, we know beyond reasonable doubt that aviation’s non-CO2 emissions damage the climate more than its CO2 emissions. The latest scientific research shows that only one third of aviation’s climate damage results from CO2 emissions, with two thirds coming from non-CO2 emissions.
2. Therefore the precautionary principle should be applied by including non-CO2 emissions in all scenarios to a realistic extent, using the latest scientific evidence and methodology. Understanding of some non-CO2 emissions is greater than others so at the very least, some (eg NOx) should be included. A recent research paper by Klower, Lee, et al, ‘Quantifying aviation's contribution to global warming’, models both CO2 and non-CO2 climate impacts from aviation. It is available [here](https://iopscience.iop.org/article/10.1088/1748-9326/ac286e).
3. As noted in the IPCC’s latest report, the non-CO2 impacts of liquid hydrogen aircraft remain poorly understood.

H. The updated scenarios

*Scenario 1 -* *Continuation of current trends*:

1. Given the obstacles to scaling up SAF production and commercialising zero emission aircraft, and in the absence of any demand control measures, this appears the most likely scenario.

*Scenario 2 - High ambition:*

1. JZFT offers no evidence to believe the higher SAF (including advanced Power to Liquid SAF) uptake assumption. Nor is there any evidence of a cross-departmental ‘business case’ that justifies prioritising aviation’s need for SAF over other sectors’ needs for biomass feedstock and renewable energy.
2. Sustainable feedstock and renewable energy will remain scarce resources and need to be used wisely, for the benefit of the majority and for the effective and efficient decarbonisation of all economic sectors.
3. Based on past experience, evidence from the IPCC and ICAO, and the current financial state of the aviation industry, there is no evidence to believe the 2% annual efficiency improvements assumption will materialise in reality.
4. Based on past experience and the current state of technological development, there is no evidence to believe that the ‘industry ambition’ for zero emission aircraft will be achieved within the timescale required.

*Scenario 3 - High Ambition with breakthrough on SAF*:

1. JZFT describes this scenario as speculative and extremely ambitious. In our view, that is an under-statement. In addition to the comments above, we make the following points.
2. Without adding a ‘price premium’ through higher and fair emissions pricing, the cost of kerosene will not fall significantly relative to SAF as it is likely to remain available in large quantities on global markets.
3. JZFT offers no evidence to believe that advanced SAF will be scaled up, within the timescale assumed, in order to reduce the cost.
4. JZFT offers no evidence that all the acknowledged barriers could be overcome within the timescale assumed. Possibly the only feasible approach would be to restrict the use of all sustainable biomass and renewable electricity to the aviation sector alone and this is not a credible policy option.
5. For context, in 2019 [ICAO (p20](https://www.icao.int/environmental-protection/Documents/ICAO-ENV-Report2019-F1-WEB%20%281%29.pdf)) estimated that for 100% SAF use to be possible globally in 2050, then by 2035 “328 new large bio-refineries would need to be built each year at an approximate capital cost of US$29 billion to US$115 billion per year.”

*Scenario 4 -* *High Ambition with breakthrough on zero emission aircraft*:

1. JZFT describes this scenario as speculative and extremely ambitious. In our view, that is an under-statement. In addition to the comments on scenario 2 above, we make these points.
2. JZFT offers no evidence that all the acknowledged barriers could be overcome within the timescale assumed.
3. ​​If this quantity of zero emission aircraft were actually to be in service from 2035, current airport expansion plans would need to be paused and airports would need to start reconfiguring now to accommodate them.

**Consultation question 1 b) Are there any alternative evidence-based scenarios we should be considering?**

1. Yes - demand control measures: higher and fair emissions pricing and preventing any net expansion of UK airport capacity to limit passenger growth to at most 25% from 2018 to 2050. All scenarios should include non-CO2 emissions, as discussed above.
2. The Climate Change Committee has considered all of the proposed technological and fuel developments set out in JZFT and has concluded they are insufficient on their own to reach net zero by 2050. They are certainly not capable of reducing emissions by 45% by 2030. That is why they recommend introducing demand control measures as both urgent and essential. In their ‘Independent assessment of the UK’s ‘Net Zero Strategy’, the CCC said again: “The Government does not address … limiting the growth of aviation demand in reducing emissions … [This] option must be explored further to minimise delivery risks from an increased reliance on technology...” (p4). We wholeheartedly agree with that statement and urge the DfT to do so.
3. The International Energy Agency (IEA) published its 'Net Zero by 2050' report last year, which maps out a pathway to limit global temperature rise to 1.5C. This has a scenario for aviation which differs significantly from JZFT. Like the CCC, the IEA says that behavioural changes must play an important role in reducing emissions in aviation’s 1.5C pathway. The IEA states: "even if all other decarbonisation measures in the aviation sector are maximised, some demand management will be needed to keep 1.5C within reach."
4. The IEA identifies three priority areas where demand management can have a significant effect on emissions:
	* keeping business travel to 2019 levels
	* capping long-haul flights (of 6+ hours) for leisure at 2019 levels
	* shifting demand to high-speed rail
5. In 2021 the French government introduced regulations requiring all airlines operating in France to suspend domestic airline flights on routes if a direct rail alternative with a travel time of less than 2.5 hours is available. The UK government should adopt a similar policy.
6. The IEA estimates that, while its three demand management measures would reduce total global flights by only 12%, without them (or alternative ones with an equivalent impact on emissions), residual global aviation emissions in 2050 could be over double what is required for a 1.5C pathway.
7. JZFT acknowledges that higher carbon emissions pricing has an increased abatement effect. The latest [IPCC report](https://report.ipcc.ch/ar6wg3/pdf/IPCC_AR6_WGIII_FinalDraft_Chapter10.pdf) also says “strategies that increase the cost of flying are likely to contribute to some avoidance of aviation-related GHG emissions” (p16). The 2020 ‘Bridging the Gap’ report for [UNEP](https://wedocs.unep.org/xmlui/bitstream/handle/20.500.11822/34431/EGR20ch5.pdf?sequence=3) concludes that raising the cost of aviation “will likely suppress demand … which may ultimately be the most effective means to manage the sector’s emissions.” (section 5.5.9). A [recent report](https://www.itf-oecd.org/decarbonising-air-transport) by the International Transport Forum of the OECD notes on p11: “Phasing out fossil-fuel subsidies, phasing in carbon prices, and internalising the costs of carbon emissions into consumer and firm decision making are important to enabling the green energy transition.”
8. Therefore, an effective UK policy for limiting aviation emissions should apply higher and fair emissions pricing as soon as possible - and certainly during the 2020s. This timescale would be consistent with advice from the IPCC that urgent action is necessary to reduce all emissions by 45% by 2030 to retain some prospect of limiting global heating to 1.5C.
9. The very recent report by Frontier Economics for BEIS, ‘[Economic Research On The Impacts Of Carbon Pricing On The UK Aviation Sector](https://www.gov.uk/government/publications/impacts-of-carbon-pricing-on-the-uk-aviation-sector)’, examined a wide range of options for the UK Emissions Trading Scheme (ETS). It supports the view that higher carbon pricing reduces aviation emissions. The Exec Summary states:
	* “Higher carbon prices are associated with greater and earlier adoption of alternative technologies and fuels and greater reductions in demand.”
	* “Higher carbon prices are also associated with larger decreases in aviation emissions both inside and outside the policy area [UK ETS].”
	* “The absolute level of UK ETS carbon price is more important in determining outcomes than the relative level of the UK ETS carbon price compared to the EU ETS carbon price.”
10. The report modelled a large number of UK ETS scenarios, including higher carbon pricing, and concluded: “None of the different combinations of UK ETS design options assessed produces substantially different outcomes between UK and non-UK airlines that are in competition with each other. As such, we would not expect UK airlines to be significantly disadvantaged compared to their non-UK competitors under any of the options assessed here.” It also said “we do not project a large impact on the number of passengers transferring through UK hub airports from any of the UK ETS options examined here. This is because most of these passengers are travelling on intercontinental journeys for which the UK ETS has only a small (or no) impact on costs.”
11. While the Chicago Convention prohibits a tax on fuel that is already on board an aircraft, it does not prohibit a tax on refuelling. Since leaving the EU, the UK is no longer bound by the EU’s Energy Tax Directive that exempted kerosene from taxation. The government could and should immediately introduce higher and UK ETS prices and simultaneously use its international influence to seek agreement for higher and fair levels of emissions pricing to be introduced globally.
12. If the government does not provide a clear emissions pricing signal (including both CO2 and non-CO2 emissions), there will not be an incentive for aerospace companies to take the risk of developing alternative technologies or for airlines to choose low carbon fuels over kerosene.
13. This key policy lever is missing from JZFT: a clear roadmap of increasing emissions pricing to accelerate technology development and low carbon fuel use and to limit the increase in passenger numbers. Figure 7 (below) from the Royal Society’s 2019 policy briefing, [‘Sustainable synthetic carbon based fuels for transport’](https://royalsociety.org/-/media/policy/projects/synthetic-fuels/synthetic-fuels-briefing.pdf), illustrates the likely difference in costs between fossil fuels and e-fuels up to 2050 without higher emissions pricing.
14. In an Annex, JZFT provides the DfT’s new low, medium and high emissions pricing assumptions for both the UK ETS and CORSIA but the high bands are not used to model future demand or emissions. We urge the DfT to incorporate those higher bands in re-modelled scenarios, which introduce the high bands in the 2020s. This would illustrate the effect of earlier and higher emissions pricing and enable comparison with other policy options.
15. In addition, all current airport expansion plans should be stopped. We urge the government to follow the advice of the CCC and prevent any net expansion of UK airport capacity until such time as the technological and fuel options in JZFT are proven at scale and aviation emissions are shown to be on track to reduce by 45% by 2030 and to net zero by 2050.
16. At the very least, the government should pause all those plans until a cumulative climate impact assessment is completed to calculate the effect of all proposed airport expansions on the UK’s emissions reduction pathway.
17. A completely alternative approach would be to make the starting point the CCC’s recommendation that passenger growth up to 2050 should be limited to a maximum of 25%. Then create scenarios that work backwards to understand what measures are needed by when in order to achieve the goal. The 25% increase limit has the support of the UK Climate Assembly.

**Consultation question 3 Do you have any other comments in relation to the updated illustrative scenarios?**

1. All the revised JZFT scenarios have UK aviation emissions above 2010 levels in 2030. That does not comply with the IPCC's repeated warning that all global emissions must be reduced by 45% by 2030, compared to 2010 levels, in order to retain some prospect of limiting global temperature rise to 1.5C.
2. Allowing passenger numbers to grow will simply erode all the in-sector reductions achieved between 2010 and 2030, so that aviation’s actual emission levels will remain broadly the same, rather than reduce.
3. In addition to the IPCC’s advice, the UK has a target to reduce all emissions by 75% by 2035. JZFT would see little or no reduction by 2035 - 58% of all JZFT’s reductions are expected to occur after 2040.
4. The following questions need to be answered:
	* Has the DfT carried out any cross-departmental analysis to assess how JZ fits with the UK's overall emissions reduction pathway?
	* Why are the aviation sector’s emissions not being put on a downward trajectory, like every other sector of the economy and society?
	* Where is the cross-sector ‘business case’ to justify giving the aviation sector such a privileged position?
5. The original JZ consultation used some version of the word 'uncertain' 27 times. JZFT uses it 16 times. That's a lot of uncertainty when the risk to be avoided is catastrophic and irreversible climate breakdown. It’s not good enough for the government to cross its fingers and hope for the best when, as the IPCC recently said, “a liveable future” for all humanity is at stake.