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APPLICATION BY LONDON LUTON  
AIRPORT OPERATIONS LTD

VARIATION OF CONDITIONS  
RELATING TO  
LONDON LUTON AIRPORT

(REF APP/B0230/V/22/3296455)

Rebuttal:  
Carbon and Climate Change

20 September 2022

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## 1. Introduction

- 1.1.1 This rebuttal proof of evidence has been provided to address certain comments made in the proofs of evidence of Cait Hewitt and Dr Alex Chapman on behalf of LADACAN.
- 1.1.2 This rebuttal is provided on the basis that it may assist the Inspectors to have some points covered in writing before the inquiry begins. This rebuttal is not intended to be an exhaustive response to that evidence. This rebuttal does not respond to each and every point of disagreement but rather picks up on certain points which may be helpfully addressed in writing. The fact that a point has not been addressed here should not be taken to indicate agreement.
- 1.1.3 This rebuttal also includes some further commentary on the Carbon Reduction Strategy in light of comments made by Dr Mark Hinnells on behalf of the local planning authority.

## 2. LADACAN-W5.1 Cait Hewitt

### 2.1 Case-by-case approach (Making Best Use)

2.1.1 In paragraphs 1.7, 1.8, 3.8, 3.9 and 3.16(a) of her evidence, Cait Hewitt suggests that, just because the management of aviation emissions is addressed at a national level, this does not remove the need for a case-by-case assessment.

2.1.2 First, and in any event, the emissions from the proposed development are set out in the Applicant's evidence along with the relevant national carbon budgets. ESA4 provides information which enables the Secretaries of State to appraise the likely climate impacts of this application.

2.1.3 Second, if and in so far as Cait Hewitt is suggesting that some further or different assessment to that which the Applicant has provided is required I do not agree with this point for the following reasons:

- a. Paragraph 1.9 of CD10.13 (Making best use of existing runways ('MBU')) identifies that (my emphasis):

*"For the majority of environmental concerns, the Government expects these to be taken into account as part of existing local planning application processes. It is right that decisions on the elements which impact local individuals such as noise and air quality should be considered through the appropriate planning process"*

Which needs to be read in conjunction with paragraph 1.11 of CD10.13 which states (my emphasis):

*"There are, however, some important environmental elements which should be considered at a national level. The Government recognises that airports making the best use of their existing runways could lead to increased air traffic which could increase carbon emissions."*

- b. In CD15.06 (Secretary of State's decision in relation to Manston Airport) paragraph 149:

*".. the Secretary of State is satisfied that Government's Transport Decarbonisation Plan and the Jet Zero Strategy, which set out a range of non-planning policies and measures that will help accelerate decarbonisation in the aviation sector, will ensure Government's decarbonisation targets for the sector and the legislated carbon budgets can be met without directly limiting aviation demand."*

And further, in paragraph 150:

*"For the reasons set out in the paragraphs above, the Secretary of State is content that climate change is a matter that should be afforded neutral weight in the planning balance."*

- 2.1.4 Cait Hewitt's evidence appears to be based upon a misunderstanding of national policy and is not correct in suggesting that (paragraph 3.16(a)) *"The claim that carbon emissions are not a matter for local planning decision-makers does not, to my knowledge, appear in government policy."*

## **2.2 Test of 'material impact'**

- 2.2.1 In paragraphs 1.11 and 1.12 of her evidence, Cait Hewitt asserts that a test for 'material impact' on climate change is outdated in some respects and underestimates the impact of the proposal. In paragraph 5.5 she goes further and contends that the benchmark of 37.5 MtCO<sub>2</sub> for aviation emissions is no longer relevant at all.

- 2.2.2 If and in so far as Cait Hewitt is referring to the fact that use of the 'planning assumption' only applies to carbon budgets up to and including the fifth carbon budget, then I agree. ESA4 acknowledges this in paragraph 5.7.1 (*"The assessment of aviation emissions further requires consideration of the year of assessment and whether the proportion of*

*international aviation emissions is included as a ‘planning assumption’ or is included within the UK carbon budget.”)* and with the inclusion of Table 5.10 (ESA4 page 40) which presents the carbon emissions associated with the proposed scheme as a percentage of the relevant carbon budget for different assessment years.

2.2.3 However, I disagree with any broad contention that the 37.5 MtCO<sub>2</sub> planning assumption no longer has any relevance as a benchmark for aviation emissions even in the short term. The planning assumption remains a useful benchmark at present as it has been used in a number of recent airport planning applications, and should be considered alongside other tests of materiality, such as comparing emissions with carbon budgets and the in-sector carbon trajectory included in the Jet Zero Strategy.

2.2.4 In paragraph 2.2 of her evidence, and in relation to the backdrop of the Prime Minister’s address to the COP26 World Leaders Summit in November 2021, Cait Hewitt suggests that any increase in carbon emissions should be properly justified before the development is permitted to proceed.

2.2.5 As stated clearly in ESA2, ESA4 and my PoE, the significance and relevance of climate impacts (i.e. carbon emissions) arising from the Proposed Scheme has been tested in different ways to determine if Government policies to meet intervening carbon budgets and to reach carbon net zero by 2050 would be materially impeded.

2.2.6 From 1 December 2008 when the Climate Change Act 2008 came into force, and as a result of its amendment, the Secretary of State for Business, Energy and Industrial Strategy has a legal duty to progressively reduce emissions in accordance with successive carbon budgets, including now the UK being carbon net zero by 2050 (my PoE, paragraph 2.2.1). The Secretary of State for Transport in the Manston Airport decision (CD 15.06) identified at paragraph 149:

*“.. the Secretary of State is satisfied that Government’s Transport Decarbonisation Plan and the Jet Zero Strategy, which set out a range of non-planning policies and measures*

*that will help accelerate decarbonisation in the aviation sector, will ensure Government's decarbonisation targets for the sector and the legislated carbon budgets can be met without directly limiting aviation demand."*

- 2.2.7 ESA2, ESA4 and my PoE all conclude that the Proposed Scheme would not impede the ability of the government to meet its targets for the sector or any of the carbon budgets in light of the level of emissions, and I remain firmly of that view.

## **2.3 Assessment against LBC's commitment to achieve carbon net zero**

- 2.3.1 In paragraph 1.13 of her evidence, Cait Hewitt claims there is a difference in the approach of LBC and LLAOL to achieve carbon net zero by 2040 and there is some ambiguity with LLAOL's characterisation of that commitment. She also questions whether the removal of liability of aviation emissions has been formally agreed by LBC (paragraph 6.2).

- 2.3.2 Dealing with the second of these points first, and with reference to CD11.42 (LBC's Climate Emergency Declaration), page 7 and the 'Legal' entry in the table, it is clear that LBC's commitment to achieving carbon net zero does not include aviation emissions. This is in line with Government policy, as described in paragraphs 2.1.1 - 2.1.4 of this rebuttal.

- 2.3.3 Turning to the first of these points, paragraph 5.6.12 of ESA4 states:

*"The scale of the GHG emissions from all sources except aviation in the 'with development' case is also considered within the context of local objectives for reducing GHG emissions. Therefore, the extent to which the Proposed Scheme affects the ability of Luton Borough Council to meet its climate change objectives for a carbon neutral area by 2040 is taken into account."* (my emphasis)

2.3.4 ESA4 also states (paragraph 5.7.4):

*“LLAOL has committed to work with Government, LBC, and other stakeholders to develop their approach to becoming a net zero airport by 2040 and will continue to monitor, report and review targets beyond 2025 through annual corporate reporting.”*

2.3.5 ESA4 further states (paragraph 5.7.5):

*“The mitigations required to achieve LLAOL’s net zero aim will be detailed in a Carbon Reduction Plan, which will include emissions reduction targets. The Carbon Reduction Plan will set out the roadmap for achieving a net zero airport for Scope 1 and 2 emissions, as well as indicating the approaches by which LLAOL can influence Scope 3 emissions. An Outline Carbon Reduction Plan was submitted in 2021 ...”*

2.3.6 LBC and LLAOL are both aligned with wanting their own operations to be carbon net zero by 2040, both excluding airline emissions.

2.3.7 The planning condition for a Carbon Reduction Strategy (CRS) is an appropriate mechanism for achieving LLAOL’s net zero aim. This is to be prepared by LLAOL and submitted to LBC for approval within 12 months of planning permission being granted, and with the CRS being reviewed and updated by LLAOL and approved by LBC every five years. I address this further in Section 4 below.

## **2.4 Jet Zero Strategy and CO<sub>2</sub> trajectory**

2.4.1 In paragraph 3.5 of her evidence, Cait Hewitt contends that *“while the Government considers it is possible for any additional emissions associated with expansion to be accommodated within its planned CO<sub>2</sub> trajectory, at no point does it indicate whether or not this is likely”* (Cait Hewitt’s emphasis).

2.4.2 Expansion beyond 19 mppa at Luton Airport is included in the modelling assessment supporting the Jet Zero Strategy (see CD 11.54).



- 2.4.3 Cait Hewitt states in paragraph 3.5: *“the Government has yet to produce a formal impact assessment of the Jet Zero strategy and, therefore, the modelling and analysis on which it rests should be regarded as illustrative only.”* The Jet Zero Strategy is based on four possible scenarios which are clearly provided as illustrative only (see para 1.2 of CD11.53).
- 2.4.4 In paragraph 3.6 of her evidence, Cait Hewitt contends that *“growth in aviation demand may generate a higher level of emissions than is currently accounted for under the Government’s approach”*.
- 2.4.5 Even if that were to be the case, I have already pointed out that, at a national level, the Secretary of State has a duty to meet the requirements of the Climate Change Act and meet the carbon budgets. In terms of accounting for emissions, the Jet Zero Strategy includes the in-sector carbon trajectory and airlines are required to report their emissions (from all flights, whether they are domestic, EEA or elsewhere) annually. The Government has the tools to track progress in reducing emissions and either apply existing tools (e.g. UK ETS) or develop new tools (e.g. SAF Mandate) to manage them. There is no suggestion in Government policy that growth in aviation would result in emissions failing to meet the requirements of the Climate Change Act.
- 2.4.6 In paragraph 4.13 of her evidence, Cait Hewitt refers to the fact that *“The BEIS minister himself has acknowledged the high level of risk inherent in the Government’s approach”*.
- 2.4.7 In fact, the context for this statement was a discussion at an Environmental Audit Committee meeting on net zero aviation and shipping held on 18 May 2022 around the risk of delivering the technologies required to ensure aviation sector emissions are sufficiently controlled (the discussion was in response to Q368 - the full transcript of this meeting is included in Annex A of this Rebuttal). The response from the Minister for Industry includes the following statements (my emphasis):

*“... the Climate Change Committee... says that demand management, or demand measures as they call them, must be explored further to minimise delivery risks. It is not that they have to be explored further as an end in itself, as could be inferred from your question. It is to minimise delivery risks elsewhere.”*

*“I accept there is a high level of risk, but we have been open and transparent about the high level of risk. My answer to the question to Ian was that we are at an early stage of development here. The fact that there is large risk is not unusual in early stages of development.”*

*“What we have to do over the next 28, 29 years is make sure that the combination of the technology options that we are putting forward—which we can talk about in more detail—plus the changes elsewhere in the aviation industry, gets us to the end point.”*

2.4.8 The Climate Change Committee advocated constraining growth in the aviation sector as one of the measures to reduce emissions but the Government disagreed with that approach and has adopted policy that considers a technology and carbon price driven approach more appropriate.

2.4.9 Other measures recommended by the Climate Change Committee are those included in the Jet Zero Strategy in terms of aircraft fuel efficiency and air space management, uptake of SAF, uptake of zero emission aircraft and the use of economic instruments such as the UK ETS and CORSIA. The rate of uptake or effect of each measure differs depending on the scenarios or pathways presented by both the Climate Change Committee and the Jet Zero Strategy. The key difference is that whereas the Climate Change Committee sought to propose a cap on aviation growth as one of *“a number of policy measures to help limit aviation demand and capacity, including no net increase in airport capacity, changes to ticket prices to reflect the principle that “prices of air travel ought to be more expensive than lower emission modes to reflect the higher emissions of air travel relative to*

*alternatives”, and measures to disincentivise business flying.”* (quoted in paragraph 4.18 of Cait Hewitt’s evidence), the Government has decided upon a market-based approach based on carbon price only which would have the effect of constraining growth if the cost of decarbonisation is too high. Cait Hewitt therefore may disagree with the Government’s policy, but that does not affect its status as Government policy.

2.4.10 Moreover, both the Climate Change Committee and the Government both recognise the legal duty of the Secretary of State to meet the requirements of the Climate Change Act and the carbon budgets, whichever pathway to carbon net zero is selected by the Secretary of State. The Minister for Industry identified in response to question 366 at the Environmental Audit Committee that the Government would continue to keep all options under review, but that he did not agree with the approach of disregarding technology improvements and systems efficiencies.

2.4.11 In paragraph 4.17 of her evidence, Cait Hewitt refers to Figure 9.4 in CD11.40 and seeks to call into question an assumed trend of continual aircraft fuel efficiency improvement, stating that:

*“Fossil fuel use per passenger-km increased substantially in 2020 (72% increase on 2019 levels) after two decades of progress to improve fuel efficiency, with an annual average change of - 3% from 2010-2019 (Figure 9.4).”*

2.4.12 Not only is this an attempt to quarrel with national policy, it is also based on a partial and tendentious analysis of the evidence. Apart from 2020 being an anomaly because of COVID -19 (see first paragraph, p327 of CD11.40), one can see from the lower graph in Figure 9.1 of CD11.40 (CCC Progress Report June 2022) the clear reduction in emissions in 2019 and 2020. The reason the ‘per passenger km’ emissions has increased is simply a function of airplanes flying with lower numbers of passengers (i.e. with more empty seats) as a result of COVID-19.

2.4.13 There is, in fact, robust evidence of future continued gains in aircraft fuel efficiency, based on the reported fuel efficiency of each aircraft type, the ‘mix’ of aircraft types within the fleet and the rate of retirement / replacement of older aircraft with newer, more efficient ones. As described in paragraphs 5.4.2 to 5.4.4 of ESA4, the fuel efficiency of each aircraft type is published by the European Environment Agency. The current ‘mix’ of aircraft types within the UK aircraft fleet is based on registration data maintained by the Civil Aviation Authority for individual airports and aggregated for the UK (see CD11.43, Section 4); the fleet mix for Luton is a subset, maintained by LLAOL. The rate of retirement / replacement of aircraft is determined nationally using the DfT Fleet Mix Model and at Luton based on national trends and discussions with individual airlines. The lead time required between an aircraft being designed and entering service can be in the order of ten to fifteen years or more, providing a deep insight into how fuel efficiency will improve.

2.4.14 In responding to question 397 at the Environment Audit Committee meeting referred to in paragraph 4.13 of Cait Hewitt’s evidence, the Minister for Industry at BEIS identified: *“several cycles to go through within the aviation industry that you can extract efficiency gains out of ... and that with every single cycle you get something like a 10%, 15% or 20% of a gain.”*

## **2.5 UK ETS and CORSIA**

2.5.1 In paragraphs 4.22 to 4.27 of her evidence, Cait Hewitt seeks to draw on a Climate Change Committee view that *“while the UK ETS plays an important role in delivering emissions reductions in a cost-effective way, CORSIA by contrast, will not in its current form provide effective mitigation.”* She concludes by saying that if CORSIA fails then emissions that fall outside the UK ETS (and hence, within the scope of CORSIA) should be considered relevant in the determination.

2.5.2 I agree with what Cait Hewitt must necessarily be accepting that the UK ETS is an appropriate control measure for emissions from domestic and EEA flights, noting of course that it is not the only control measure.

2.5.3 I also agree that CORSIA cannot be seen as a guaranteed panacea for other international emissions but that is not the way it has been approached. As Dr Mark Hinnells correctly identified in his evidence (paragraph 51c):

*“that this is for Government rather than the applicant or the inspectors, to manage and develop markets”.*

2.5.4 This again goes back to the point that the Secretary of State has a legal duty under the Climate Change Act to deliver net zero, and so it will be for the Government to manage such emissions as necessary in light of the effects of CORSIA.

## **2.6 Greenhouse Gas Removals**

2.6.1 In paragraph 4.30 of her evidence, Cait Hewitt contends that *“If removals are not delivered at the rate or scale hoped for in the Jet Zero Strategy then aviation emissions including the additional emissions associated with the proposed development at Luton would not be effectively mitigated in line with net zero”.*

2.6.2 The point that Cait Hewitt seeks to make in relation to Luton Airport is misconceived. Both the Climate Change Committee and the Jet Zero Strategy recognize that the rate or scale of delivery of any one of the key measures proposed (including aircraft fuel efficiency, air space management, uptake of SAF, uptake of zero emissions aircraft, carbon pricing and UK ETS / CORSIA and greenhouse gas removals) is likely to be different under different scenarios or pathways. However, in recognition of the potential variations in the rate or scale of delivery, the Secretary of State (CD15.06 paragraph 149) *“.. is satisfied that Government’s Transport Decarbonisation Plan and the Jet Zero Strategy, which set*

*out a range of non-planning policies and measures that will help accelerate decarbonisation in the aviation sector, will ensure Government's decarbonisation targets for the sector and the legislated carbon budgets can be met without directly limiting aviation demand."*

- 2.6.3 As I have stated above, airlines are required to report their emissions (from all flights, whether they are domestic, EEA or elsewhere) annually. The Government has the tools to track progress in reducing emissions. It can then decide whether any additional action is needed either through the use of existing tools (e.g. UK ETS) or through the development of new tools to manage them.

## **2.7 Non-CO<sub>2</sub> effects**

- 2.7.1 In paragraphs 4.31 to 4.36 of her evidence, Cait Hewitt argues that non-CO<sub>2</sub> effects are an important consideration of assessing the climate change impacts of aviation, and she notes that (paragraph 4.35): *"aviation's non-CO<sub>2</sub> impacts are causing harm but that there is currently no policy in place to tackle them nor any mechanism to apply a price to them. Any development likely to increase these emissions, such as the proposal under consideration here, is therefore a cause for concern"*. I note that similar points are sought to be made in the proof of evidence of Dr Chapman (see para.8.11 of his proof).

- 2.7.2 There is no dispute that non-CO<sub>2</sub> effects are important in relation to climate change, but these have been referred to in most, if not all, policy statements relevant to UK aviation planning since at least 2018. Indeed, paragraph 3.64 of the Jet Zero Strategy states (CD11.19):

*"Much of our Strategy focusses on how we reduce the CO<sub>2</sub> emissions from aviation, however, we also recognise that aviation has non-CO<sub>2</sub> climate impacts, which need to be addressed. Recent scientific evidence suggests the best estimate is that roughly two thirds of aviation's historical climate impacts are due to non-CO<sub>2</sub>, and that, whilst non-CO<sub>2</sub>*

*emissions can have both warming and cooling effects, the net warming rate is likely to be around three times that of CO<sub>2</sub>.*” (my emphasis)

2.7.3 Within paragraph 4.34 of her evidence, Cait Hewitt refers to paragraph 7.9.12 of ESA2 which, in turn, quotes the Climate Change Committee that the appropriate approach at a domestic level was *“not to assess or include the impact of non-CO<sub>2</sub> effects, given the significant scientific uncertainty surrounding their scale”*.

2.7.4 This point was made by the Inspectors dealing with the Bristol Airport decision at paragraph 205, where the airport in that case did not seek to quantify their effect in their environmental statement and the use of a multiplier to take account of their effects had been suggested by some. The Inspectors noted that there is no policy as to how non-CO<sub>2</sub> effects should be dealt with. The Inspectors rejected the criticism of the airport’s approach in that case. Having noted that the draft Carbon and Climate Change Action Plan had noted that such emissions should not be ignored in future selection of GHG reduction measures, the Inspectors concluded that given the extent of scientific uncertainty and given that future intention, it would be unreasonable to weigh the non-CO<sub>2</sub> effects in the balance against that development proposal.

2.7.5 It remains the case that there is no specific guidance on how to include non-CO<sub>2</sub> effects within an environmental assessment.

2.7.6 The Bristol Airport approach was to deal with non-CO<sub>2</sub> effects by referring to their future consideration in developing the Carbon Management Plan. That same approach would take place in this case through the proposed Carbon Reduction Strategy.

2.7.7 This is consistent with the approach supported by the Jet Zero Strategy which states (CD11.19, paragraph 3.66):

*“The research and analysis carried out thus far suggests that many of the measures to*

*improve efficiencies, rollout of SAF, and the acceleration of zero emission flight are expected to also have a positive impact on reducing non-CO<sub>2</sub> impacts. Where there is evidence to the contrary, we will carefully consider the overall impact on the climate and adjust our policies as required.”*

- 2.7.8 LADACAN has also sought to rely upon commentary in the “TAG” appraisal. The TAG appraisal guidance is simply not relevant in this case as that is guidance dealing with investment of public money in a transport intervention (as dealt with further by Mr Hunt). But in any event, I note that the second bullet point of paragraph 3.3.3 of TAG UNIT A5.22 Aviation Appraisal (CD16.11) states:

*“In addition to CO<sub>2</sub> emissions, aviation also has other climate change impacts. Lee et al (2010) concluded that the non-CO<sub>2</sub> climate effects could be up to double those of CO<sub>2</sub> emissions. Lee et al use Global Warming Potential (GWP) factors as a CO<sub>2</sub> emissions-equivalence for these non-CO<sub>2</sub> effects. However, whilst scientific advances have reduced key uncertainties, considerable scientific uncertainty still remains. Due to this uncertainty, especially surrounding the effects of different policy levers on non-CO<sub>2</sub> emissions, either a qualitative assessment should be made of the non-CO<sub>2</sub> impacts, or a quantitative assessment can be made as a sensitivity test, drawing on the latest guidance on GWP factors and BEIS guidance on valuing greenhouse gas emissions.”*

(my emphasis)

- 2.7.9 Therefore the TAG appraisal guidance permits a qualitative approach to be adopted, such as that implicit in the Bristol Airport reliance on future Carbon Management Plan, which is consistent with the notion of the Carbon Reduction Strategy in agreement with LBC proposed here.



2.7.10 Without prejudice to that, and in light of the assertions of Cait Hewitt, I note the following:

- a. First, if one was to apply a factor of three to the carbon emissions, logically this same factor would need to apply to the planning assumption for aviation emissions. This would result in no material change in the percentages already reported in ESA4.
- b. Second, to apply a factor of three to carbon emissions calculated for all scenarios in ESA4 and then to seek to compare these to the carbon budgets would not be a valid exercise as the carbon budgets do not include a budget for the non-CO<sub>2</sub> effects from aviation.
- c. In considering whether including non-CO<sub>2</sub> effects from aviation will impact upon the ability of the Government to meet its legal and policy commitment, I note that Government policy is based on the following three strategic objectives in the Jet Zero Strategy which would be unaffected by the Proposed Scheme:
  - i. *Work closely with academia and industry, and monitor global developments in this area, to better develop our understanding of non-CO<sub>2</sub> impacts and potential mitigations.*
  - ii. *Develop and implement policies to address and reduce non-CO<sub>2</sub> impacts.*
  - iii. *Work with industry and academia, including the CCC, to explore a means of estimating and tracking non-CO<sub>2</sub> emissions from the UK aviation industry.*
- d. Fourth, in considering whether the inclusion of non-CO<sub>2</sub> effects will impact upon whether Luton can meet its own carbon net zero commitment by 2040, there is no impact as this commitment specifically excludes aviation emissions. Non-CO<sub>2</sub>

effects are not associated with emissions from surface emissions or airport buildings and ground operations.

- e. Finally, the Carbon Reduction Strategy will include consideration of non-CO<sub>2</sub> effects. The aim would be to ensure that any measures adopted would not increase non-CO<sub>2</sub> effects. This could also include the reporting of both carbon emissions and non-CO<sub>2</sub> effects, with the reporting methodology updated when guidance becomes available.

### **3. LADACAN-W2.1 Dr Alex Chapman**

#### **3.1 Calculation of carbon emissions**

- 3.1.1 As set out below, I conclude that Dr Alex Chapman has incorrectly calculated carbon emissions from the Proposed Scheme, which he then uses incorrectly to determine economic costs. Mr Hunt's rebuttal proof of evidence also responds to Dr Chapman's economic costs approach.
- 3.1.2 In paragraph 8.24 and Table 2 of his PoE, Dr Alex Chapman seeks to present his own estimation of the greenhouse gas emissions associated with the Proposed Scheme. He estimates the annual average emissions over the period 2023 to 2050 to be 61,000 tonnes of carbon dioxide based on a linear interpolation of data presented in ESA4. He then seeks to use a factor of three to determine the CO<sub>2</sub> + non-CO<sub>2</sub> effect of aviation, based on an observation in paragraph 3.64 of the Jet Zero Strategy (CD11.19).
- 3.1.3 Taking the second of these points first, there is nothing in Government policy to support the notion of attempting to quantify the effects of non-CO<sub>2</sub> effects in this way for making determinations of this kind and it is contrary to the approach adopted in the Bristol Airport decision which I have set out above.
- 3.1.4 Taking the first of these points, and without prejudice to the second, the calculations that Dr Chapman makes are wrong. Table 5.7 on page 35 of ESA4, which is referred to by Dr Alex Chapman, reports total emissions for the years 2019, 2025, 2028, 2032, 2040 and 2050. Total emissions from the Proposed Scheme are calculated as the difference between the 'without development' and 'with development' values for each year. This is only possible for years 2025 onwards.
- 3.1.5 Table 5.7 therefore reports total emissions including all aviation emissions, surface access emissions and airport buildings and ground operations. This is clearly stated in the footnote to Table 5.7 and is illustrated in Figure 5.1 on page 36 of ESA4.

- 3.1.6 Even if it were right to apply a factor of three to aviation emissions in this sort of calculation (which is not the approach of Government policy), it is obviously incorrect to apply such a factor to non-aviation emissions, i.e. those associated with surface access, airport buildings and ground operations.
- 3.1.7 Tables 3.4 and 3.6 of my PoE provide the aviation emissions from the Proposed Scheme for the years 2025, 2028, 2032, 2040 and 2050. Aviation emissions from the Proposed Scheme in 2025 would be 17,200 tCO<sub>2</sub>, increasing to 21,700 tCO<sub>2</sub> in 2050.
- 3.1.8 If one was to apply a straight line interpolation from 2025 to 2050, using the approach adopted by Dr Alex Chapman, the total emissions from aviation would be 505,700 tCO<sub>2</sub> over the period 2025 to 2050 and hence, the annual average emissions over the same period would be 19,450 tCO<sub>2</sub>. This is significantly lower, by a factor of three, than those calculated by Dr Alex Chapman for the period 2023 to 2050.
- 3.1.9 If one applied a more logical analysis and looked at straight line interpolations between the years 2025 and 2028, 2028 and 2032, 2032 and 2040, and 2040 to 2050, the total emissions from 2025 to 2050 would be 672,800 tCO<sub>2</sub>, equivalent to an annual average of 25,877 tCO<sub>2</sub>. Again, this is still significantly lower than those calculated by Dr Alex Chapman, by a factor of more than two, in any event.

## 4. Carbon Reduction Strategy

### 4.1 Review Process

#### 4.1.1 The proposed Condition 29 states:

*“Within twelve months of the date of this permission, a Carbon Reduction Strategy shall be submitted to the Local Planning Authority for approval.*

*The Carbon Reduction Strategy and its outcomes will be subject to the following reviews:*

- i. Annually: independent verification by the Airports Carbon Accreditation Scheme with the results being made available to the Local Planning Authority.*
- ii. Annually: publication as part of the Airport’s Sustainability Report, available for review by all stakeholders, including the Local Planning Authority.*
- iii. Every three years: independent audit and inspection by the Airports Carbon Accreditation Scheme with the results being made available to the Local Planning Authority.*
- iv. Every five years: the airport operator review and update, including consultation with the Local Planning Authority and other stakeholders.*

*All approved measures in the Carbon Reduction Strategy (and subsequent updates) shall be implemented and complied with.*

*Reason: To ensure that the development mitigates, and is resilient to, the effects of climate change and ensure consistency with NPPF paragraph 148 to drive ‘radical reductions’ in carbon dioxide emissions.”*

#### 4.1.2 There is no disagreement between LLAOL and LBC on the need for a Carbon Reduction Strategy, to be prepared and submitted for review and approval by LBC within 12 months

of the grant of any permission, and the need for subsequent update, review and approval every five years thereon.

4.1.3 In paragraph 59 of his evidence, Dr Mark Hinnells suggests a number of measures for inclusion within the Carbon Reduction Strategy. These are summarised in Table 4.1 overleaf along with the relevant measures included in Tables 4.1 to 4.3 of the Outline Carbon Reduction Plan (CD4.05).

4.1.4 The measures proposed by Dr Mark Hinnells to deliver decarbonisation are all identified in the Outline Carbon Reduction Plan with, in many cases, specific measures identified.

4.1.5 A key theme running through Dr Mark Hinnells' proposed measures is the provision of measurable targets so progress can be tracked and reported. I agree with Dr Mark Hinnells and have provided an approach for this in Section 4.3 of my PoE. This approach is built on the short, medium and long term measures included in the Outline Carbon Reduction Plan for measuring, monitoring and reporting:

a. Short term:

Develop a Carbon Reduction Strategy with a 5 year emission reduction target, incorporated into LLAOL's strategic business plans, and reviewed on an annual basis regarding progress and any material changes in local or national policies.

ACA scheme – achieve 'Optimisation' level 3 (engagement with third parties in carbon footprint management).

b. Medium term:

Produce an updated 5-year Carbon Reduction Strategy and emissions reduction target, with regular monitoring of performance and progress updates.

ACA scheme – achieve the fourth level: ‘Neutrality’ (level 3+, achieve carbon neutrality by offsetting residual carbon emissions from airport direct emissions).

c. Long term:

Produce 5-yearly Carbon Reduction Strategies and emissions reduction targets, with regular monitoring of performance and progress updates.

ACA scheme – progress to advanced levels of accreditation:

- Fifth ACA stage, ‘Level 4 Transformation’: set a policy commitment to achieve absolute emissions reductions, strengthen stakeholder engagement, and further coverage of Scope 3 emissions in carbon footprint reporting
- Sixth (and final) ACA stage, ‘Level 4+ Transition’: compensation for residual Scope 1 and 2 emissions (if required), as well as emissions for staff business travel, using internationally recognised offsets.

4.1.6 There is substantive agreement between LLAOL and LBC in terms of the purpose and the contents of the Carbon Reduction Strategy, including the need to set targets to measure and report progress.

4.1.7 There is a future prospect to seek airports, including Luton, to become carbon zero (rather than carbon *net* zero) by 2040. This would represent a significant update in Government policy. If this were to occur, it could be accommodated within the agreed process of initially preparing a Carbon Reduction Strategy for review and approval by LBC with subsequent five year review and approval thereon. I would not expect to see this resulting in any change to the measures to be implemented in the short term, as illustrated in the Outline Carbon Reduction plan.

**TABLE 4.1 : Carbon Reduction Strategy Measures**

Ref	Measure proposed by Dr Mark Hinnells	Included in the Outline Carbon Reduction Plan
a	<b>Clear measures to deliver decarbonisation of existing buildings:</b> to show how the current airport buildings can contribute to the UK target of a 78% reduction from 1990 levels by 2035, as enshrined in the 6 <sup>th</sup> Carbon Budget, and then achieve zero emission by 2040 e.g. through moving to electric heating and cooling, and though storing heat which might normally be dumped for use elsewhere on the site, or at a different time.	<p><u>Short term:</u> Continue programme of upgrades to more energy efficient equipment and systems (e.g. air- handling equipment), supported by detailed survey of buildings and energy data to identify potential for energy savings and improved Building Management System controls.</p> <p><u>Medium term:</u> Facilitate options for replacing diesel generators with battery backup supplies or cleaner technology; alternatives to gas for heating requirements (e.g. air/ground source heat pumps, on-site biomass boiler, connecting to a district heating system); and review developments in the application of hydrogen-based energy infrastructure.</p> <p>Collaborate with LLAL on its expansion proposals in facilitating the development of low carbon or nearly zero net energy buildings.</p> <p><u>Long term:</u> -</p>
b	<b>Clear measures to deliver onsite or near site generation:</b> be clear how the airport will as it suggests in the Outline Carbon Reduction Plan, supply at least 25% of energy used by the airport (or by LLAOL) from on-site renewables (or near to site private wire if on site cannot be achieved) by end of 2026 and 50% by 2030 (the remaining power is assumed to continue to be bought from renewable sources).	<p><u>Short term:</u> Conduct feasibility studies and funding review with LLAL and LBC for on-site and near-site renewable or low carbon energy generation, e.g. from solar, biomass, CHP etc, including consideration of any existing feasibility studies carried out by airport partners.</p> <p><u>Medium term:</u> Work with LLAL to increase the proportion of on-site renewables used to supply the airport's operational electricity requirements, beyond the existing Responsible Business Strategy target of 25% by 2026, to 50% of electricity generated by on-site renewables by 2030.</p> <p><u>Long term:</u> Continually review the feasibility of investing in on-site renewable and low- carbon energy generation to reduce reliance on energy from grid supplies.</p>
c	<b>Clear measures to support UK targets on EV uptake.</b> The Outline Carbon Reduction Plan states (p21) <i>"In partnership with LLAL and LBC provide the infrastructure for 40 to 60 electric vehicle (EV) charging points by 2030, considerate of EV charging requirements, in line with the planned</i>	<p><u>Short term:</u> Work with the council to improve pedestrian and cyclist access routes, and cycle facilities at the airport (noting that policies are under consultation by LBC on the 'Transport Strategy and Local Transport Policies'.</p>



Ref	Measure proposed by Dr Mark Hinnells	Included in the Outline Carbon Reduction Plan
	<p><i>phase out of new petrol and diesel cars in the UK by 2030".</i></p>	<p>Review strategies for car-parking allocation, consider preferential parking for electric or hybrid vehicles and penalty charges for high emissions vehicles.</p> <p>Noting timescales to phase out the sale of new petrol and diesel cars in the UK by 2030, instigate feasibility studies and funding review to ensure the smart provision of electrical vehicle charging infrastructure, based on expected demand and charging patterns.</p> <p><u>Medium term:</u> Review renewals of contracts with bus operators and taxi operators to specify or incentivise the use of electric vehicles.</p> <p>Incentivise suppliers to promote delivery consolidation and maximise the proportion of full-load trips and use of low carbon vehicles.</p> <p>In partnership with LLAL and LBC provide the infrastructure for 40 to 60 electric vehicle (EV) charging points by 2030, considerate of EV charging requirements, in line with the planned phase out of new petrol and diesel cars in the UK by 2030.</p> <p><u>Long term:</u> Continued review of capacity requirements for the provision of electrical vehicle charging infrastructure.</p> <p>Continued review of surface access strategy, including any capacity constraints for the DART and other public transport options Update targets for staff and passengers using sustainable modes of transport to travel to and from the airport.</p>
d	<p><b>Clear measures to deliver zero emission service vehicles</b> within the airport. Vehicles may be electric or hydrogen or other technology, but need a plan for purchasing, appropriate contractual mechanisms for delivery partners, tenants, airlines or airline partners, and need appropriate fuel supply provision.</p>	<p><u>Short term:</u> Establish a programme for the phased electrification of airside vehicles. All new contracts with Ground Handling Agencies to require electric vehicles, if possible.</p> <p><u>Medium term:</u> -</p> <p><u>Long term:</u> Provide sufficient electric vehicle charging points for airside and landside operational vehicles to be electric or plug-in hybrid</p>

Ref	Measure proposed by Dr Mark Hinnells	Included in the Outline Carbon Reduction Plan
e	<p><b>Clear measures to deliver more efficient aircraft</b>, through, for example, operating a shadow carbon price based on BEIS carbon valuations, eg for landing fees to support modernisation of the aircraft fleet.</p>	<p><u>Short term:</u> Update airlines' "Conditions of use" policy to encourage low-carbon techniques during landing and take-off operations e.g. single/reduced-engine taxiing, advised take-off speeds.</p> <p>Incentivise implementation of more efficient aircraft through contractual agreements operations.</p> <p>Work with airlines, LLAL and an innovation working group, to plan for operational measures that will support airlines to implement policies from the Sustainable Aviation Decarbonisation Road Map for fuel-efficient aircraft, efficient operations and use of sustainable aviation fuels.</p> <p><u>Medium term:</u> As part of airspace modernisation, review the uptake of low-carbon techniques during landing and take-off operations and opportunities for further improvement.</p> <p><u>Long term:</u> -</p>
f	<p><b>Clear measures to deliver UK targets on Sustainable Aviation Fuel</b> given the assumptions in Jet Zero of 10% by 2030 and 50% by 2050, and any changes as Jet Zero is reviewed in 2027.</p>	<p><u>Short term:</u> See e. above.</p> <p><u>Medium term:</u> In partnership with LLAL and innovation partners promote the uptake of sustainable aviation fuels and review logistical requirements to facilitate storage and access at the airport, taking into account timescales for the development and demand for sustainable aviation technology.</p> <p><u>Long term:</u> Implement infrastructure to meet demand for low carbon aircraft e.g. sustainable fuel provision, electrical charging.</p>
g	<p><b>Clear measures to deliver Zero emission flight infrastructure.</b> The final Jet Zero strategy foresees 4% of abatement from Zero emission (hydrogen and electric) flights by 2050. This is based on smaller aircraft and shorter journeys moving to zero emission flight for 5% of ATMs by 2045 and 27% of ATMS by 2050. The strategy also stated Government will <i>"encourage the adoption of innovative zero emission aircraft and aviation technology in General Aviation"</i>. Thus, given the general aviation, business, and private flights from Luton, plus its</p>	<p><u>Short term:</u> In collaboration with LLAL and airlines conduct feasibility assessment and funding review for installing Fixed Electric Ground Power (FEGP) and air-conditioning supplies at aircraft stands.</p> <p><u>Medium term:</u> Facilitate installation of Fixed Electric Ground Power (FEGP) on all new stands as part of LLAL's future development of the airport.</p> <p>In partnership with LLAL facilitate infrastructure and airline requirements for the introduction of electric flights, focussing on LLA domestic and short haul flights.</p>

Ref	Measure proposed by Dr Mark Hinnells	Included in the Outline Carbon Reduction Plan
	domestic routes, there is a need for the final Carbon Reduction Strategy to support its airline customers to employ electric and hydrogen aircraft.	<u>Long term:</u> See f. above.  Review the demand and facilitate provision for pre-conditioned air for aircraft stands.

## **Annex A :**

**House of Commons Environmental Audit Committee Oral  
evidence: Net zero aviation and shipping, HC 520  
Wednesday 18 May 2022**

# Environmental Audit Committee

## Oral evidence: Net zero aviation and shipping, HC 520

Wednesday 18 May 2022

Ordered by the House of Commons to be published on 18 May 2022.

[Watch the meeting](#)

Members present: Dr Matthew Offord (Chair); Barry Gardiner; Ian Levy; Caroline Lucas; Jerome Mayhew; Cheryl Mackrory.

Transport Committee Member present: Ruth Cadbury.

In the absence of the Chair, Dr Matthew Offord took the Chair.

Questions 337 - 429

### Witnesses

**I:** Emma Gilthorpe, CEO, Jet Zero Council; and Sophie Lane, Chief Relationships Officer, Aerospace Technology Institute.

**II:** Robert Courts MP, Parliamentary Under-Secretary of State, Department for Transport; Eamonn Beirne, Deputy Director: Maritime Environment, Technology and International, Department for Transport; Holly Greig, Deputy Director: Aviation Decarbonisation Division, Department for Transport; Lee Rowley MP, Parliamentary Under-Secretary of State (Minister for Industry), Department for Business, Energy and Industrial Strategy; and Paul Griffiths, Head of Aerospace Team, Department for Business, Energy and Industrial Strategy.

Written evidence from witnesses:

[Aerospace Technology Institute](#)

[Department for Transport](#)

## Examination of witnesses

Witnesses: Emma Gilthorpe and Sophie Lane.

Q337 **Chair:** Good afternoon, ladies and gentlemen. Welcome to the Environmental Audit Select Committee. This is our inquiry into net zero aviation and shipping and it is our fifth hearing into the issue. The Chairman of the Environmental Audit Select Committee, Philip Dunne, has recused himself because he feels he has some interest in this area. Contrary to what the media would have you believe, we do have honour and integrity among our members, and Philip decided on this occasion that he would sit out this inquiry. Therefore, it has fallen to myself, Matthew Offord, to be acting Chair and I am grateful to my colleagues for allowing me to be.

Could our first two speakers introduce themselves and the organisations they represent, please, starting with you, Emma?

**Emma Gilthorpe:** Thank you, Chair. I am chief executive of the Jet Zero Council and, in the spirit of full disclosure, I am also the chief operating office for Heathrow Airport, but I am here today in my role as CEO of the Jet Zero Council.

**Sophie Lane:** I am the chief relationships officer at the Aerospace Technology Institute.

Q338 **Chair:** Thank you for making the time to come along today. I know that airports, particularly, have been in the news recently but fortunately it has not been Heathrow Airport. We will leave some of your colleagues to answer those questions.

How close is the aviation industry to achieving the Government's goal of net zero flights across the Atlantic? Do you envisage that that will occur in the next generation, or do you have any kind of timespan of when that will occur?

**Emma Gilthorpe:** I am cautiously optimistic, Chair, is the way I would put it. I think that what we have learnt over the last two or three years is that we understand the pathways that we need to pursue. There is some detail around those pathways that clearly has a way to go. One of those pathways is sustainable aviation fuel and that is a very well-understood path. That is going to be a big step for any long-haul flight at 2050. It will not be the only answer. Clearly, zero-emissions flight is likely to be centred around hydrogen fuel cells, hydrogen or electric, but those very long-haul transatlantic flights are going to probably be largely sustainable aviation fuel for a long period towards 2050.

Therefore, I think that the pathways are understood. There is a lot to do to make them a reality, but I would say that we are now at a relatively mature state, on sustainable aviation fuel, of understanding the steps that we need to take, and half the battle is whether you know the path



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that you need to take. Then we need industry and Government effort to make sure that we unlock that.

On the technology side—Sophie is far more equipped than me to talk about the detail—the path is less clear but it is clarifying at a rate of knots every month that goes past because of all of the investment that has been made in R&D.

Q339 **Chair:** Thank you. I will interpret that as meaning that it will not occur in the next generation. You mentioned the date of 2050, so that will probably be two generations away.

**Emma Gilthorpe:** A flight across the Atlantic, without harm to the environment, could occur in the next generation but it will be via SAF. Sorry for not being clear. Then it will need carbon capture in order to take the rest of the carbon out of the footprint of that flight, along with flight performance, airspace management and all of the other things that go into it. I think that in a generation it is going to be the SAF route that will sit at the centre of that flight, particularly if it is a plane of any scale or size.

Q340 **Chair:** You also mentioned pathways. I am just trying to nail down some of your descriptions. When you say “pathways”, is that issues around decarbonisation of aviation? You mentioned the joint working between the Government, industry and others, but where do you see decarbonisation actually needing to occur?

**Emma Gilthorpe:** From an aviation perspective, there are two routes to get there—two primary routes to take the emissions out. One is sustainable aviation fuel, and the other is a zero-emission path that, based on recent research, is likely for long-distance flights to be hydrogen based. For shorter-distance flights it could well be electric.

On the sustainable aviation fuel side, the technology is well understood. I should say I am not a chemical engineer, but the technology pathway is well understood. It is about scale and it is about price.

On the hydrogen and electric side of the pathway, it is more about understanding the technology and being able to create a commercialised airframe in that space that clearly has to pass a lot of certification, safety, regulatory processes in order to get there. Hence, it is on a longer timeframe than SAF.

Q341 **Chair:** Ms Lane, do you have anything to add from the technological and engineering side?

**Sophie Lane:** Yes. I would agree with Emma on that. The hydrogen pathway is viable. We believe it is feasible, but it needs a lot more work and a lot more investigation into what it will take to be able to do that. We have recently modelled, potentially, a mid-size aircraft in the late 2040s that could be hydrogen based. You can see that there is a pathway there but there needs to be a lot more investigation.



From a SAF perspective, as Emma said, at the moment, we go up to 50% blended SAF. If you were trying to get a net zero flight you would therefore need to be doing carbon capture alongside that. We see increasing ultra-efficient aircraft coming in earlier, so potentially in the late 2030s, early 2040s you could be looking at an ultra-efficient wide-bodied plane that would be flying with SAF.

Q342 **Chair:** Thank you. In terms of the pathways, you mentioned some of the regulatory frameworks. Where do you see gaps that need to be filled by that time so that you can achieve a net zero service by 2040?

**Emma Gilthorpe:** Let's call it the technology pathway, where you have to change the whole plane and the whole system that sits around a new fuel type. There is quite a long way to go. Historically, certification for a new airframe with new fuel as well would take between eight and 10 years to go through that process, and rightly so—we need safety to be at the heart of all flying, not least if we are doing something more innovative.

That is quite a long process and of course the challenge is you need to know what the airframe looks like, what the engines look like and what the fuel type looks like in order to start that process off. We have started to talk to the regulator, and we have created a new group within the Jet Zero Council framework that is going to be focused on the regulation. The CAA have this sort of sandbox methodology where we can work in parallel with the development of these new fleet types so that, rather than getting to the end of the process and then handing it to the regulator, you do the innovation with the CAA by your side, in effect, so that it can give you feedback along the way so that you minimise the time, but it is still going to take quite a few years.

From a SAF point of view, there will need to be standards set around quality, around the provenance of where that SAF comes from, so that we can be sure that the fuel is of a certain quality and we can be confident about the residual emissions. It is a drop-in fuel so that you do not need to change any of the engineering in the plane in order to accommodate the fuel. The regulation—with a small "r"—will primarily focus on how we create the right standards to ensure that we have great quality, sustainable aviation fuel and that we understand its implications for the environment, so that we can net off the residue with carbon capture in due course.

**Sophie Lane:** In terms of regulation and policies, from a technology perspective my interest is about how that technology gets adopted on to the aircraft going forward. I think that will require some market disruption, not least because SAF and hydrogen in the short term will be much more expensive than kerosene. Making the move towards these more ultra-efficient or zero-carbon platforms is going to require either the airlines to be incentivised or, potentially, taxes, for example, to be applied to carbon.





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In the wider sphere, the wider ecosystem, there are potentially some areas that need to be considered in order to enable that disruption in the market to bring these new platforms in.

Q343 **Chair:** That is a very interesting point because I understand that kerosene is not taxed in a commercial way, is it?

**Sophie Lane:** You are testing my knowledge there, I am afraid.

**Emma Gilthorpe:** Kerosene isn't taxed. Flying is taxed quite heavily through the air passenger duty but the fuel itself, no.

**Chair:** That is really helpful. Thank you. Jerome.

Q344 **Jerome Mayhew:** Ms Gilthorpe, you have been up and running now for almost exactly two years. Have you done any good yet?

**Emma Gilthorpe:** I have been the chief executive since last March and I was brought in by Ministers to bring a bit of structure and drive. Clearly, establishing any council or group when covid was just hitting was always going to be quite a challenging process, but I do think we have delivered some good in the last 18 months. I will give you a few examples of why I think that.

The first thing is that we have created a very focused approach to what we are doing. When I joined the council my observation was that there was a lot of what you might describe as individual views about the best order to do things in—preferences about which approach might be the winning approach.

The first and most important success I think we had was getting a really clear two-year road map for those sustainable aviation fuel and zero-emissions flights. From my point of view, as an operator, this is all about what we do now, the next year, the next two years and the next three years, because it is those actions that are going to eventually get us towards the 2030, 2040 and 2050 goals. We cannot rest on our laurels.

We created a two-year plan pretty rapidly after I took over and we got really clear about sharing what was happening across the industry as well. I would say there are quite defined groups on the aerospace side and then on the fuel and sustainable aviation fuel side, so it was about cross-pollinating those groups. There was a lot more conversation going on between them. It is all very well having a great fuel but if you cannot get it into the right airframe or there are issues of infrastructure, it is not going to get you anywhere, so a lot of cross-pollinating is going on.

I think you can see the types of activity that industry has undertaken since then. Let's look at what happened around COP. We had 500 flights that travelled with SAF in and around COP. easyJet's flights had 30%-plus SAF on them; that is a huge step forward for a normal passenger flight going up to Glasgow. Even before that we saw ZeroAvia flying commercial grade hulls in 2020, not with any passengers on yet but with



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hydrogen fuel cells. BA has very recently done a deal with Phillips 66 and committed to levels of SAF that are going to start to get the market moving, and this is one of our biggest hurdles of course with SAF.

**Q345 Jerome Mayhew:** Bringing that together, would you say that the role of the Jet Zero Council is sharing information around the industry? What about driving the timetable? We can all share information, and we can all encourage each other, but is it your role to drive the pace of change? If so, are you achieving it and how do you plan to do so in the future?

**Emma Gilthorpe:** Yes, it is part of my role. The caveat I would give is I am not the policymaker. The Government are responsible for policy. I can nudge and prod, and I am sure Ministers will tell you later that I do that from time to time. I am there to hold industry to account as well because there is a temptation—I have worked in different infrastructure sectors before—for industry to say, “Well, the Government needs to do blah,” and for the Government to say, “Well, if only industry did blah.” If you can both agree the plan, with the right steps, that is how you create the momentum.

I absolutely think we have created momentum. We have a clear pathway. We have early investments coming forward. We have the biggest contribution to ATI funding that we have seen in a generation. I think there is huge commitment and action to delivering on our near-term goals, which will all roll up into the longer-term net zero 2050.

**Q346 Jerome Mayhew:** That brings me on very neatly to you, Ms Lane. You have a kitty of £3.9 billion—something like that. What are you doing with it and how are you making it work for the country?

**Sophie Lane:** The recent investment that we got was £685 million over the next three years, which is an uplift of £235 million over where we were previously. Together with BEIS and Innovate UK, we invest that money into research technology programmes, between levels TRL 3 and 6, looking specifically at how we can take the country and the industry forward towards net zero 2050.

We just released our strategy last month, which set out how we do that. We are mainly looking at three key areas of the industry. It is about supporting ultra-efficient aircraft—the aircraft, particularly in the short term, that will be using SAFs or carbon-burning fuels, but if you can make them lighter, if you can make them more efficient, you use less fuel and thereby bring down the emissions.

We are also looking at zero-carbon technologies. That is a much more immature market. It is a growing market and we are looking at how we can support new entrants, as well as existing players, to be able to develop that within the UK and to grow our ability within the UK to be world leading. There are a particular number of areas we focus on.



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Then, lastly, there are cross-cutting technologies. Cross-cutting technologies look at how we produce these aircraft and at machining. It is about making things quicker, more efficient and more effective.

When you combine those three they are all mutually supporting. A number of the ultra-efficient technologies could be taken forward on to a zero-emission platform, for example. They are not completely separated. Together they give us an ability within the UK to maintain and potentially grow our market share. From the investment and the technology pathways that we are looking at, we think that we can grow our market share from 13% today—

Q347 **Jerome Mayhew:** Thirteen per cent. of what?

**Sophie Lane:** Thirteen per cent. of the global aviation market, and we think we can grow that to 18% by 2050. That is also a market that would be growing.

That is how we are investing. We have invested in a huge number of projects. Many of them are collaborative projects and go right down through to the supply chain. We have managed to be involved in a number of projects, such as the recent Rolls-Royce Spirit of Innovation flight, which created a number of world records but also proved technology. We are also involved in projects that will take forward understanding of what is possible. The FlyZero project, which was funded by the ATI with BEIS support, was one of those projects that looked at zero-carbon emission from the tailpipe.

Q348 **Jerome Mayhew:** Wrapping this up, you have described a lot of individual investments all going on in the three areas of investigation at the moment. However, would you agree that this whole area of getting down to net zero is an existential challenge for the aviation industry? Would you also agree that the aviation industry is full of very large corporations, which in normal times used to make a lot of money. We would all agree with that, wouldn't we? Therefore, why do those very profitable, very large organisations require Government intervention to solve their own existential problem? Why isn't the private sector carrying the load on this?

**Sophie Lane:** I think I started to mention this before. The private sector in this area is carrying huge technology risk, particularly when you are talking about zero emissions. In terms of developing the next generation of aircraft, there is a large amount of technology risk and also market risk. If we desire them to develop technology that is going to bring us towards net zero, which we do, some of that risk needs to be shared, and that is normal. That is also done in other parts of the world. You see it across Europe, for example, with national programmes. We are helping to share that risk but also to accelerate and develop those technologies quicker, which helps us and the aviation industry to be able to meet its targets.



**Q349 Ruth Cadbury:** I think my first question segues well from Jerome's questions. This is a question to you both: in terms of the public/private and Government/industry partnerships that you have been describing, does investment in a range of solutions, which have different timescales, different challenges and different levels of challenge, offer the best chance of sustained progress, or do you think Ministers should now be picking winners?

**Sophie Lane:** I should say that I do not think that we are in a position to pick winners at this point. I think there are a couple of reasons for that. The zero-emissions market is very immature at the moment. As I mentioned, we have done a recent study, FlyZero, which on paper shows the feasibility of what you can achieve, but it needs to be validated and more work needs to be done.

In the SAF arena we have a much clearer idea of the pathways, as Emma has said, but some of that still needs to be proven, particularly as you increase potentially up as far as 100% SAF. There are huge challenges with both of those pathways. Not all of them sit within the technology, but from our perspective we look at the ecosystem and the requirement to bring together things like how we are going to do the electrification—all of that kind of thing.

What that means is that, at the moment, there are still too many options, and if we started to drive down into one pathway over another I think we would potentially jeopardise the targets that we have set ourselves. I think we would also, potentially, from an industrial perspective, as a country and as an industrial sector, get left behind globally. At the moment that feels like a very high risk, particularly in the zero-carbon sector.

**Emma Gilthorpe:** I think that is absolutely right on the technology side of things. On the SAF side, we need to back SAF and we need to back it fulsomely now. It is technologically understood and, to be fair, the Government have made some good strides in that direction. We have the £180 million SAF fund, which is all about getting production up and running, particularly for those much smaller fuel providers that want to enter the market. This isn't all about big behemoths who already exist in the market. There are some good upstarts coming into that space.

Therefore, we must back SAF. We need to fulsomely get behind it. We need to scale up. We need to get the price down. From that side of the agenda, I do think we are picking winners now. I think it is about committing to a pathway, and that is very different to the technology side, which Sophie explained very well.

**Q350 Ruth Cadbury:** Sophie has talked about the UK being potentially left behind. Where is the UK comparatively internationally in this space? Are we leading? Are we level-pegging with some others or are we on catch-up?



**Emma Gilthorpe:** Again, it is probably easier if I cover the SAF side. I would say we are at a very important point because the US has come out with its blenders' credit. It has not gone through the legislative process yet, and the issue is not uncontroversial, but the US has sent a very strong market signal, and industry and fuel producers are getting behind it.

This is a global issue. Of course, we want SAF globally, but we will miss an opportunity for the UK economy if we don't move quickly. Shell has committed to an investment in Rotterdam for one of its first SAF plants. We want those SAF plants to be in Scotland, in the north, in north Wales. We want them to be in the UK giving us an opportunity to get the economic benefits of the jobs and the regeneration, particularly in areas where you already have the right infrastructure for these clusters to be developed. It really could not be a better industrial policy opportunity.

My worry is that we are at the 12 to 24-month point where we need to very firmly back this, or the risk is that the fuel gets produced elsewhere and is imported into UK airports and that we will have missed a massive opportunity for our economy.

**Sophie Lane:** I think I agree with that. From an industrial sector perspective, depending on how you measure it, we are either second or third in the world in terms of market share. We are world leading in a number of technology areas and we have world-leading infrastructure in a number of areas. The area where we have more risk is the zero-carbon area, where we certainly have skills but, particularly in hydrogen, liquid hydrogen, the cryogenics and the handling, we have less capability at the moment. We have less capability, but so does everyone else, and that is where the opportunity arises. There is real potential for us to be able to take a step forward and to be world leading in this area, but it will require some focus. So, from a technology perspective, we are looking across the board and we are also looking at what we have in other sectors that could potentially apply in the aviation sector.

Q351 **Ruth Cadbury:** I am going to go back to Jerome's question where he asked whether the private sector should be leading. Do you think the Government have done enough to ensure that we power ahead towards net zero in aviation?

**Emma Gilthorpe:** I think that, as a society, we would love to go faster. We have to work with the reality of what the Government have got on their plate at the moment across a whole bunch of different policy areas. We need to keep the momentum up, would be my answer, and we need not to be slowed down by all of those other things that are going on. I think it is well understood across the Government that pace is essential to our success in this.

**Sophie Lane:** Yes, absolutely, and the funding that we have received in the ATI will make a huge difference. It is a huge uplift but the problem is so complex and goes across so many areas, and the ecosystem is so



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wide. It is even beyond the traditional aviation ecosystem. That is why organisations like the Jet Zero Council have been very beneficial; they bring together that collaborative approach. Without collaborating across all those sectors, it is going to be very difficult to hit the targets we have set ourselves. I think pace is very important. I think stimulating the debate and keeping an open and honest approach about where the challenges are is very important going forward.

**Ruth Cadbury:** I think my colleagues will pick that up. I am a visitor from the Transport Committee. I will not take anymore time on this question, Chair.

**Chair:** Thank you. We move on to our next questioner, Barry Gardiner.

Q352 **Barry Gardiner:** Emma, why was the year 2019 chosen as the baseline for the airline industry to target an overall reduction of 15% by 2030? Obviously, it was before the pandemic and that is really important, but give me another reason.

**Emma Gilthorpe:** It depends where that piece of information is sourced from. The first thing I should say is—

**Barry Gardiner:** Sustainable Aviation is the source of it. The airline industry are targeting at least an overall 15% reduction in net emissions, relative to 2019.

**Emma Gilthorpe:** I should make it very clear that I am not here to talk particularly on behalf of the airlines' analysis. I would be very happy to go away and ask them that question and come back to you. What I would say is that a lot of the work that was last done by Sustainable Aviation in this space was in 2019 and, therefore, in terms of the analytical basis for their assessment, the work was probably undertaken then. I am happy to take that away and ask it the question. I know you have had a number of its members at this Committee, in fact, but I would certainly be happy to take this away and ask them that question.<sup>1</sup>

Q353 **Barry Gardiner:** Thank you, because obviously the year that one chooses for the baseline is critical in knowing whether you are actually making real achievements or whether they are statistical achievements.

Let me focus on the production of SAF and the production facilities. In the evidence that the two of you have provided to the Committee I feel a certain—what was that animal in "Doctor Dolittle"?—Pushmi-Pullyu. On the one hand, you want to say, "There have been some really good things going on," but on the other hand you say, "Actually, we really do need to move faster." Yes, we could be world leading, but the EU and the US are putting a great deal more resource into this than we are.

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<sup>1</sup> Note by witness – 'Sustainable Aviation is using 2019 as the base year for carbon emissions as this is the last normal year for emissions prior to the pandemic. The aim is to get to net zero emissions, so while a baseline has no bearing on this per se, 2019 is the most helpful reference point for the industry to track progress'.





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I suppose the question, which picks up from what my colleague, Ruth, was asking you about, is how fast are we moving, not necessarily relative to others but relative to what we need to be doing to achieve our own objectives? Don't give me criticism of one thing or praise of another. Give me an overall assessment: are we doing enough to get to where we say we want to be?

**Emma Gilthorpe:** I go back to what I said to your hon. Friend earlier, which is that we are at an inflection point. We have been going fast enough but we need to keep up the momentum in the next couple of years.

Let me explain why I say that. In the period where we have been going very fast, we thought, "Yes, absolutely, we are on track"—and the US came out with their blender's credit. Shell decided to go to Rotterdam. The French Government made a statement about how they were going to treat hydrogen economically, which stimulated Airbus to make some choices over its development plans. So this is a very fast-moving environment, and depending on which day of the month or which month of the year it is, you can convince yourself that you are at the head or that you are behind.

We need two things now to make SAF fly. We need to finalise the mandate—the mandate being the 10% sustainable aviation fuel by 2030. That has been consulted upon and we now need to get that to a position where the mandate is enacted. That will send a very important signal to producers that that requirement will be in place. In effect, it is signalling the demand in the marketplace.

Q354 **Barry Gardiner:** I just want to be absolutely clear here. I don't want to interrupt your flow, but you were talking about the Government's net zero strategy and you were saying "finalise the mandate". At the moment, the 10% is an aspiration rather than a mandate. What needs to happen in legislation to make sure that this is a binding commitment?

**Emma Gilthorpe:** I think Ministers Courts and Rowley are here later, and they will be able to give you their perspective. I am not an administrative expert but let me tell you what I think needs to happen. Alongside the Jet Zero strategy was a consultation on mandates. The industry responded fulsomely to that and for the most part, from what I have read, backed the idea of a 10% mandate. However, they have to go through the consultation process in order to make sure that the eventual policy is very robust.

There needs to be a further, final stage to that consultation process, and hopefully that ends up with a clear path forward for that 10% SAF and there are no hurdles. Then it can go into the legislative process, which requires legislative time. As we know, those things aren't fast. However, if the policy is finalised—like I said about the US blenders—it will start to send signals. So it is a very important step to get that consultation finalised, even before the legislation passes.



Q355 **Barry Gardiner:** Again, I do not want to interrupt your flow but I do want just to be sure. If you were making a recommendation to this Committee as to what recommendations we might make to the Government, would it be: get on, finalise that mandate and give as clear a signal as possible to industry about the 10% SAF by 2030?

**Emma Gilthorpe:** A clear policy signal as soon as possible would be incredibly helpful.

**Barry Gardiner:** Thank you. Please continue.

**Emma Gilthorpe:** In terms of the second thing that we need and that we must not forget, we talked about some of the larger players in the aviation sector previously, and I think the sector is characterised by some larger players, but there are also smaller players. We have people like Velocys, LanzaTech and others who are entering this market, producing these low-carbon fuels. Whereas, potentially, some of the larger players can use their profits to invest in green fuels, for investors in other companies—which I feel are important to create the right competitive dynamic around this, to drive the scaling up of this fuel as rapidly as possible, because competitive tension is ideal—we need to make sure that this is investible.

At the moment, sustainable aviation fuel, depending on the price of kerosene, which is linked to the price of a barrel of oil, is approximately four times more expensive than kerosene. You can have a mandate but, as long as that price differential remains, it will have a dampening effect on the market and it will send a signal to investors that they cannot be sure that, as the market scales up, the product will be bought forever more.

Bridging that price differential—which sometimes the industry calls a price stability mechanism, which has been very successfully done in wind and in other sectors as well, including nuclear to an extent—is a key part of making sure that this is a long-term infrastructure play. It isn't something that you invest in and magically everything appears in three years' time; we are talking about decades-long investment. The signal to the investors needs to be: there is a stable price here, so if you pile in your money—

Q356 **Barry Gardiner:** What are you looking for, a contract for difference or what?

**Emma Gilthorpe:** That is one of the routes that the industry says is here. It has been used before. Investors tend to like predictability and, therefore, mechanisms they are familiar with. I know there is work going on in the Department for Transport looking at this and looking at the options but, in order to get the scale and the price right to really drive production, we need that as well as the mandate.

Q357 **Barry Gardiner:** Thank you. Anything to add, Sophie?





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**Sophie Lane:** No, that is fine. From a technology and an ATI perspective, we don't actually cover SAF, so I do not have anything to add on SAF production.

**Q358 Barry Gardiner:** What does the Jet Zero Council think is the biggest challenge to the commercialisation of SAF? I am particularly thinking here in terms of not only technological challenges but also feedstock and biomass.

**Emma Gilthorpe:** I have answered the economic challenges. I think the technological challenges are waste of fuel, cooking oil pathways. There are other agricultural pathways that do not tend to be pursued in this country. They have been pursued in the States, for example, where they have a very different dynamic around their feedstocks.

We need to make sure that we have a good pathway, from waste through to synthetic fuels, which again, coming back to hydrogen, is part of that pathway. We want to get to a position where we are not reliant on feedstock, but are reliant on hydrogen—I might have to get Sophie to help me at this point—and chemicals to produce sustainable aviation fuel, rather than black bag waste or cooking oil deposits. That is the expected SAF path. The chemistry, again, is well understood, but there is more work to do to scale it up.

**Q359 Barry Gardiner:** In terms of biomass and corn husks and stuff like that, when does that reduce its percentage to zero as a feedstock?

**Emma Gilthorpe:** I cannot answer that question, can you, Sophie?

**Sophie Lane:** To be honest, there are a number of different views on this and it needs more work. There are recent studies that suggest there could be more feedstock than we previously assumed. With the information we are working on we think that around the 2030s we should be looking at more synthetic SAF. That does not mean that the feedstock would not be there.

**Q360 Barry Gardiner:** Let me tell you what troubles me about this. Between them the Ukraine and Russia have 29% of the world's grain. Therefore, they have a huge stranglehold on potential feedstock here. When we are talking about sustainability of fuel, it isn't sustainable if you cannot sustain the feedstock in the first place to create it. I suppose my point really is, yes, we have the seven production facilities coming onstream, and, yes, we may have to ramp that up to 14, but if we don't actually have the basic ingredients, or if they are held to ransom and at a premium, we have a real problem in delivering on the agenda that we have up to 2030, do we not?

**Ruth Cadbury:** Or if there is competition for their destination, such as domestic energy production and food.

**Emma Gilthorpe:** I think that is well observed. Energy security is currently very high on our list, but there are other pathways. You don't



have to use agricultural crops. As I said, waste is a very popular one, particularly in this country, because we are running out of things to do with it even though recycling is improving by the year. I think there are other routes that are very viable and very scalable, and the big push now is, how do you get the synthetic pathway moving quickly, which is more about getting the chemistry right.

**Sophie Lane:** From an ATI perspective, we would say that the most scalable solution is the synthetic SAF, and that is the long-term solution. As Emma said, you need hydrogen in the production process in order to do the synthetic SAFs. That would start to bring down the costs of both, but it potentially also enables your zero-emission pathway as well.

**Chair:** Thank you very much for your time this afternoon. We greatly appreciate you coming along and the information you have given us.

## Examination of witnesses

Witnesses: Robert Courts MP, Eamonn Beirne, Holly Greig, Lee Rowley MP and Paul Griffiths.

Q361 **Chair:** Could our second panel introduce themselves for the record?

**Holly Greig:** I am Holly Greig, deputy director of the Aviation Decarbonisation Division at the Department for Transport.

**Eamonn Beirne:** I am Eamonn Beirne, deputy director of Maritime Environment, Technology and International, at the Department for Transport. I am also head of the new unit, UK SHORE.

**Robert Courts:** Robert Courts, the aviation and maritime Minister.

**Lee Rowley:** Lee Rowley, the aerospace Minister.

**Paul Griffiths:** Paul Griffiths, the head of the Aerospace team at the Department for Business.

**Chair:** Thank you very much. We are very pleased that you are able to make the time to come along and speak to us this afternoon. I am going to call the first questioner, Ian Levy.

Q362 **Ian Levy:** Thank you all for attending today. The charity Possible has claimed that UK airlines have missed nearly all voluntary climate targets since they were set in the year 2000. Is there a case for Government to set a net emissions trajectory for the aviation industry on the way to 2050? Should we be setting some targets?

**Robert Courts:** I will kick off on this one if I may, Ian. The first thing to make clear is that the sector really does believe in net zero. It is absolutely committed, as is the Government, to achieving the target we have set. As you will know, we are the first major country to put net zero by 2050 into law and we are committed to doing that.



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There are a variety of ways in which we will be doing that and therein lies some of the complication. It is important that we keep on analysing what the sector is doing, making sure that we continue to hold both them and ourselves to account with progress. The principal vehicle through which we do that is of course the Jet Zero Council, which brings together our two Departments, academics and industry in order to drive progress.

We are consulting on that at the moment. We have had two consultations and we are just going to announce the final Jet Zero Council later on this year. That will be the strategy, and the strategy will lay out including things like interim progress reports.

Q363 **Ian Levy:** That will set some sort of targets?

**Robert Courts:** Yes. It will be important that we keep on reviewing policy as we go along to make sure that we are measuring progress. It is important to note that, in any event, there has been enormous progress made in the course of aviation. We can see that, for example, between 2010 to 2019, international air movements increased by 23% but the associated UK international aviation greenhouse gas emissions increased by only 16% because of efficiency gains. You are seeing system efficiencies, which are taking place. I am not saying that that is enough—it is not enough—but that is taking place anyway, and then you start talking about things like SAF and of course further aerospace demand, which we will go on to do in due course.

Q364 **Ian Levy:** Does anybody have anything else they would like to add?

**Lee Rowley:** Part of the question to answer your question is, what is the level of reasonableness in terms of this industry about how far we push them? That is entirely reasonable. How far do we accept that this is a hard-to-decarbonise sector? In all the documents and all the strategy, there is a recognition—it is perfectly transparent—that this is a hard-to-decarbonise sector that we will not be able to decarbonise entirely very easily, and we will probably be reliant upon offsets elsewhere. That does not mean we should not push, but I think it does mean that we have to accept that it is going to be a very challenging road and, secondly, that we are at quite an early stage in that process.

I obviously cannot comment on individual voluntary targets, because it is for the individuals who set them to determine how reasonable it was for them to do that. In terms of the wider system, I think we are starting to make progress, and hopefully that progress will accelerate.

Q365 **Caroline Lucas:** The Climate Change Committee has recommended that growth in aviation should be constrained to 25% by 2050 and that a demand management framework will be essential in order to control aviation sector emissions. Why does the Government's assessment of the need for demand management appear to differ so markedly from the CCC's?



**Robert Courts:** As Minister Rowley said, this is a case of balance. We also have to look at the things that aviation brings to the UK. Of course, it brings interconnectedness. Approximately one third of children born in the UK have at least one parent born abroad, so we need that connectivity. We are an internationally minded country in any event. Aviation also supports about 230,000 jobs and brings about £22 billion to GDP. That is the economic and social side of it.

Q366 **Caroline Lucas:** You cannot negotiate with the climate, can you, in that sense? If we are serious about our climate targets, all of these other benefits that aviation undoubtedly brings—

**Robert Courts:** Let me finish the second part of my answer. That is the economic and the social side, and we have to look at that.

The modelling that we have produced, which is in the Jet Zero strategy consultation, and then the technical consultation, suggests that with our high-ambition modelling we can bring this down to 15 megatonnes. As Minister Rowley said, it is a hard-to-decarbonise sector. We will not be entirely able to dispense with emissions, but that is a great deal of emissions removed, at which point we can then start looking at out-of-sector abatement techniques.

The modelling that we have, which is all open of course—I am sure you will have scrutinised and you can scrutinise it—suggests that with that high ambition, with the use of technology, and with the multiplicity of things that we will put in place, we do not need to look at demand management and that we can do it without it. Obviously, we are a responsible Government and we will continue to keep all of the options under review, but I don't think the approach that you urge, of disregarding all those technology improvements and all the systems efficiencies—

**Caroline Lucas:** I do not think I said anything about disregarding, so I would rather you did not put words in my mouth. I have not said anything about disregarding. What I have said is—

**Robert Courts:** The reason I say that is that you are urging us to go to demand management without exploring those things. I am just gently pushing back on that.

Q367 **Caroline Lucas:** Wait, please, Minister. I have said nothing about whether or not we should pursue other technologies. Of course, we should. The question is whether or not pursuing those other technologies will be enough. That is where you seem to be on a different trajectory from the Climate Change Committee and, indeed, from a report that was produced just this week from Element Energy. I wonder if you have had time to look at that report. That organisation has done many modelling sessions for the CCC and for Government in the past, and they have said there are real dangers in putting so much faith in technologies that are as yet unproven in terms of speed and scale, rather than bringing in an



element of demand management and demand reduction right now.

**Robert Courts:** The short answer is the modelling that we have suggests that we can achieve our ambitions without demand management. That is what we have set out in the Jet Zero Council. New technology is often unproven until it is proven. What we should be doing is pouring our ambition, our energy and our governmental resource into making sure that they do work, because there are all sorts of—

Q368 **Caroline Lucas:** Do you recognise the precautionary principle?

**Robert Courts:** I do understand the precautionary principle, yes.

**Caroline Lucas:** Sorry, I did not ask if you understood—that would be very patronising. Do you recognise it and the importance of it in this debate?

**Robert Courts:** I recognise it, yes. I am not saying that that is the right approach to take here, though.

**Lee Rowley:** Can I just follow up? We have to be careful with our choice of quotations because the Climate Change Committee—I read the independent assessment on the UK's net zero strategy before I came here today—says that demand management, or demand measures as they call them, must be explored further to minimise delivery risks. It is not that they have to be explored further as an end in itself, as could be inferred from your question. It is to minimise delivery risks elsewhere.

It is important that we are clear on what other organisations are saying if we are going to talk about it here. Then they go on to talk about there being a whole range of other benefits that could come with demand management. Fine, but that is a set of policy decisions that are taken more widely in Government. The Climate Change Committee said it is about mitigating delivery risks. I accept that—

**Caroline Lucas:** Mitigating—

**Chair:** Caroline, you have asked the question. Could you allow the Ministers to answer?

**Lee Rowley:** I accept there is a high level of risk, but we have been open and transparent about the high level of risk. My answer to the question to Ian was that we are at an early stage of development here. The fact that there is large risk is not unusual in early stages of development.

What we have to do over the next 28, 29 years is make sure that the combination of the technology options that we are putting forward—which we can talk about in more detail—plus the changes elsewhere in the aviation industry, gets us to the end point.

Q369 **Caroline Lucas:** I am absolutely delighted that you are being transparent about risk, but I find no reassurance in the fact that you are willing to take such risks when the risks that we are talking about are



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risks with the liveability of the planet into the future, so I hope you will understand why I am a little concerned about that. But perhaps I could come to my next question, because I am being—

**Lee Rowley:** That is an important point to come back on. We all want to tread more lightly on the earth. That is why we have all signed up to net zero, and it is why there is an extraordinary amount of work to try to change in one generation what has been 400 years of industrial activity. At the same time, it is incumbent upon us all—those both in elected office and elsewhere in civil society—to recognise that we are at an early stage in this process, in one of the most difficult parts of industry to decarbonise, and saying that because risk is present that is a problem is fundamentally misunderstanding how we manage risk down over a period of time in order to achieve the ultimate objective, which we all share.

Q370 **Caroline Lucas:** The path that the Department has chosen to take is going to take a lot more risk than the one that is being proposed by the committee that is set up to give advice to the Government. I think that it is a problem that you are willing to take so much risk and that you are, therefore, not even content with constraining growth to 25% and are saying, “We are just going to put all our hopes in these other processes. Yes, we understand that things are not proven until they are proven. In the meantime we are going to carry on with unconstrained growth.” I think that is a problem.

However, I do want to come to my second question, which is whether or not the Government have given any consideration to using financial levers—like a frequent flyer levy—to manage aviation demand. Although there is the modelling that you are talking about, there is also a lot more modelling out there that would suggest that, in order to allow unconstrained growth of the aviation sector, so many other sectors in our economy are going to have to be so constrained that that might not be in the best interests of everyone in this country.

**Robert Courts:** Clearly, there was a consultation on aviation taxation that the Treasury put out. It is a wide range of views on all of that and, of course, as you will know, the APD banding was adjusted. There are four instead of two bands. That includes an ultra-long-haul band, so that those who fly the furthest pay the most. That is acknowledging those climate concerns that, understandably, we all have.

Q371 **Caroline Lucas:** On the frequent flyer levy in particular, has there been any Government consideration?

**Robert Courts:** It is something we have decided we are not going to do, for the reasons I have given. We think that, through the Jet Zero Council work, through the strategy that we have laid out, we can achieve our ambitions without that.

Q372 **Caroline Lucas:** You mentioned the air passenger duty changes. Could you tell us what the net effect on aviation emissions of those changes are likely to be?





**Robert Courts:** In terms of figures?

**Caroline Lucas:** Yes.

**Robert Courts:** I don't have exact figures on those. I am happy to write to the Committee if such figures exist—

**Chair:** It would be helpful if you could.

**Caroline Lucas:** The question about how air passenger duty tax regimes support progress towards net zero targets seems to be quite an important one.

**Robert Courts:** Yes. The principle of course is clear. That if you fly furthest then you pay the most. That is the basis of that.

Q373 **Caroline Lucas:** Yes, that is one argument. Another argument is that on short-haul flights there are often alternatives. For many people it is completely bamboozling that it is going to cost you three times more to take the train to Paris, let's say, than to fly. So there is another argument to say, "Hang on a minute, why are you making that cheaper when there are other ways you could do that journey?"

**Robert Courts:** There are a couple of ways of tackling the issue that you rightly identify. In some areas, the obvious example is the Scottish highlands—there are others of course—where there are no train services and such things aren't available. We have an eye to that as well because it is important for their economic development, connectivity and so on.

One of the things that we are exploring with the CAA is whether we will be able to provide information to passengers to enable them to make more environmentally aware choices, so that if other opportunities exist they can do that. Again, that is something we will be exploring as part of the Jet Zero strategy. That is about giving information to consumers.

While I disagree with you on demand management, where I perhaps do agree with you is that, if you are able to give consumers more information and more choice, and they are able to be aware of the environmental impacts of their choices and perhaps take a different view, information can make that happen.

Q374 **Caroline Lucas:** Do you not accept, though, that giving someone information when they don't necessarily have the means to be able to act on that information is not so helpful? If someone is trying to get to Paris for whatever reason and they can know that it is going to be a lot more environmentally damaging to fly but they cannot afford to pay three times as much to go by train, does that not suggest that there is a problem here with some of the price signals that it would be useful to address, rather than simply telling people that flying is going to damage the environment?



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**Robert Courts:** Then you are into issues of supply and demand and allowing the market to regulate prices. Of course, if there is more demand, you would expect the prices to go down.

Q375 **Caroline Lucas:** No, you are not—well, that is part of the question, but you are also into the debate about whether or not, for example, domestic aviation fuel is taxed. At the moment, we are essentially giving aviation a massive subsidy. Then we are standing back and looking terribly surprised that it ends up being cheaper than going by train.

**Robert Courts:** Because I think you are also forgetting the enormous importance of domestic aviation, what it does for economic development, what it does—

**Caroline Lucas:** You keep changing the subject every time I try to—

**Robert Courts:** I am not wishing to change the subject, but you are ignoring an important part of the subject.

**Chair:** Just a moment, Minister. Caroline, you have asked him the question; give him the opportunity—

**Caroline Lucas:** The Minister is answering a different question.

**Chair:** Can you please give him the opportunity to answer? I would ask you to keep to the questions rather than having a debate about airline subsidies. That is probably what we want to focus on today.

**Caroline Lucas:** I always thought that members of Committees could use a little bit of their own initiative when it came to questions.

**Chair:** Initiative, yes, but not far and wide ranging. Minister.

**Robert Courts:** I am not wishing to avoid the question. I simply think, with respect, that you are ignoring an important aspect of what aviation does, although it is right that we consider it.

**Caroline Lucas:** I do not think the climate cares much about that.

Q376 **Barry Gardiner:** I want to pick up on what you said about Jet Zero and the target, because we heard in the earlier session this afternoon about the importance that the industry attaches to the mandate for 10% SAF by 2030. What assurance can you give the Committee about how directly and how soon a very clear signal in law will be coming to the industry on that target?

**Robert Courts:** Thank you. It is an important point. I cannot give a direct indication in terms of timescale, in terms of a commitment on a date, but what I can say is that we have heard very clearly the request from industry for clarity—for a direct signal. Of course, a mandate is something we are consulting on and are looking forward to bring forward as soon as we can.

**Barry Gardiner:** I think you restated my question as an answer but I take it that you agree with the importance of—





**Robert Courts:** I agree with the importance of it and we are bringing it on as quickly as possible, but I cannot give a specific date.

Q377 **Barry Gardiner:** We heard in the earlier session that things are moving so fast in this area, with the Shell announcement about the production facility in Rotterdam, and also the way in which the US has been leapfrogging us on certain technologies. The evidence we heard suggested that, although we have been doing quite well to date, because of the leapfrogging that is going on and the change that is happening at such a pace, we need to up our own game at this point, which I think the previous witnesses called an inflection point. Do you agree with that, and how do you propose to make that necessary step change in both aspiration and delivery?

**Robert Courts:** In terms of sustainable aviation fuels?

**Barry Gardiner:** Yes.

**Robert Courts:** Of course, we have already had the Green Fuels, Green Skies conversation, which is part of that. I know you recognise that. Yes, we are stepping up not only our ambition but our delivery, which is the £180 million that was announced in the recent spending review. That is intended to commercialise sustainable aviation fuel and to have plants available in the UK.

Q378 **Barry Gardiner:** That is seven plants, Minister, and we have heard—not in the immediately previous session but in a previous evidence session—that to keep pace we need to be up to about 14.

**Robert Courts:** The important thing to remember here is that one should not look at the £180 million of Government money that is going in as being it. It is best seen as seedcorn money, and it is intended to spur the market, to bring forward a lot of the options that are available, which will unlock private finance. You can look forward to seeing more, but it would be a mistake to see Government action as the entirety of action across the sector.

The reason is a very simple one. With sustainable aviation fuel in particular, as I am sure you are aware, there are many different types. A lot of them are quite early, and it is important to get further along and see which ones are best commercialised. If the Government were to pour in lots of money and pick a winner at this stage, it might be one that did not end up being viable.

Q379 **Barry Gardiner:** I think we understand the reluctance of Government to pick winners, and I understand what you are saying there, but it is fairly clear that we have—as you have already outlined—set a clear strategy that is dependent upon SAF at this stage for the next decade, effectively. Therefore, the production facilities and the incentives that come in are going to be critical. What I was seeking was a bit more reassurance from you that that is very much a discussion that you and the Treasury are having.



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**Robert Courts:** Yes. This is the spending review period. I don't know what might be in another spending review period, but this is a generationally significant undertaking that we are going through. Of course, the conversation will carry on in the wake of the spending review.

Q380 **Barry Gardiner:** The Chair has allowed me to reprise my questions from the previous session with you, for which I am grateful. I should move on to shipping and marine emissions. Can we be clear that the Government are still pressing for absolute zero emissions from worldwide shipping by 2050?

**Robert Courts:** Yes, we really are a leading country, both in ICAO, the civil aviation sphere and in the IMO, which is just over the river from us—we can see it out of the window, in fact. We are a leading voice in both of those, and our ambition remains very high. We will push for higher ambition at both the upcoming ICAO summit from the civil aviation side of things this year, and IMO as well.

Q381 **Barry Gardiner:** You are also clear, because the Climate Change Committee has told you, that the Government's own progress in decarbonising shipping has been, in their words, "slow over the past decade and that changes in emissions have primarily been driven by changes in demand"—the very point that my colleague was making earlier on aviation—"along with some improvements in efficiencies from technology". We do need to have a much clearer plan for maritime emissions.

**Robert Courts:** Yes, I think we do, with respect. There is a two-pronged approach to maritime decarbonisation. One of those is around research and development, and the other side is the regulatory framework. On the research and development side, we have recently announced the UK SHORE, which of course Eamonn is the head of, and he may wish to come in on some of that in a second. It is £206 million that the Government have put in. It is the biggest amount the Government have ever put into maritime decarbonisation. This really is a step change. UK SHORE stands for UK Shipping Office for Reducing Emissions, which I am sure everyone knows, but that just for the record. This really does show the step change that we are seeking. That is the R&D side and, much as with SAF, R&D comes before everything else. You must get the R&D and find out what is going to work as a technology before you take the next steps.

I want to answer the second bit, which is the bit about the regulatory framework. We have a clean maritime plan, which was produced in 2019. We are going through the process of refreshing that, and we are going to have a new clean maritime plan in 2023. That sits in conjunction with the wider transport decarbonisation plan and it is under that that we are doing things like consulting on shore power, so that when vessels are in port they do not have to run their engines—they plug in, which is better for air quality as well as emissions. It is a two-pronged strategy.



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The reason I have, with your permission, Chair, dwelt on that for a moment is that I do want the Committee to understand quite how far-reaching the UK SHORE programme is—both the money we are putting into R&D and the fact that we have a holistic plan, through the transport decarbonisation plan and the clean maritime plan that sits underneath it, to decarbonise shipping. We are going to lay out a pathway to net zero—

**Q382 Barry Gardiner:** What are the objectives that you have set as the Minister for the SHORE unit?

**Robert Courts:** It falls under the wider clean maritime plan. It is with the view of decarbonising shipping by 2050, getting to that stage, plus the overall one.

**Q383 Barry Gardiner:** Are there specific objectives and targets that you have asked them to deliver?

**Robert Courts:** There are a number of things that fall underneath it. For example, things such as the clean maritime demonstration competition. We have had one of those, and that is now a multi-year programme, so there will be more of these demonstrator programmes that will be rolled out, and we will be saying more about that shortly. That sits underneath it and then we will be saying more in due course.

UK SHORE is a shipping office that deals with R&D. We had a clean maritime demonstration competition last year and we have announced a number of the winners under that. That is now a multi-year competition. That is one example.

**Q384 Barry Gardiner:** Would it be possible for Mr Beirne to give us some more?

**Eamonn Beirne:** Just building a little bit on what the Minister has talked about, UK SHORE is going to manage the R&D programme. Alongside that, we do also have the transport decarbonisation plan commitments, and we are coming forward with a consultation about the pathways to net zero. There is a forthcoming Course to Zero consultation, which is going to look at how one might decarbonise the sector out to 2050, and perhaps building some targets, and then that will be part of the clean maritime plan refresh in 2023. That comes to your point about what the steps are to get to 2050.

**Q385 Barry Gardiner:** How much do you estimate that decarbonisation will cost the UK shipping industry?

**Robert Courts:** I do not have the estimate at my fingertips, but there is no getting away from the fact that this is a hard-to-decarbonise sector, as is aviation. There will be a significant cost, but the sector understands, as we do, that it is something that we must do.

**Q386 Barry Gardiner:** What about the reskilling and retraining of mariners? I am thinking particularly as we move to hydrogen. That is a huge technological challenge in terms of the fleet, because we are going to



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have a very outdated fleet for a very long time. Also, I am afraid that expecting marine engineers who have been dealing with diesel engines for decades to suddenly switch will lead to problems if we don't invest in the skills base. What steps are you taking to ensure that that is happening simultaneously?

**Robert Courts:** You are absolutely right. We cannot know at the moment what those skills will be, because we are still in the fairly early stages in terms of what the fuel will be. We expect there will be a combination of hydrogen and ammonia. They would have different skills and different requirements. We cannot be specific about what those will be, but UK SHORE does also have a training element underneath it. Of course, that falls into much of the wider Maritime 2050 work we are doing around tonnage tax and training, and of course we will update all of that as well. There is a Merchant Navy Training Board that looks at those issues as well.

You are quite right. We cannot say at the moment what it will be, but there is a programme in place to help with this.

Q387 **Barry Gardiner:** I am sorry to push you on timescales, but timescales are absolutely critical when we are talking about the climate and the window of possibility that we have to stay within 1.5. Can you give us a bit more clarity on those timescales? This is critical.

**Robert Courts:** Timescales of what? Skills?

**Barry Gardiner:** Of all of it, of course, but we were talking about skills.

**Robert Courts:** On skills, there is also the National Shipbuilding Office which has been set up. That has a skills taskforce that is operating underneath it. That has just been set up. Skills is a central part of everything we are doing.

**Lee Rowley:** Perhaps I can come back on the timeline and the cost. I cover shipbuilding from a BEIS perspective. I would love to be able to give you the cost of a fleet of new ships that are net zero, or something equivalent, that gave you an indicator. The challenge with both shipping and aviation—and this is not trying to dodge your question, but is a reflection of where the situation is—is that we are still in that early stage of trying to work out what the solution is.

We must let multiple solutions go for a number of years until one or more emerge, and it is there where more clearcut cost profiles and timeline profiles will be able to be achieved. The overall objective is there; the process and the programme for getting there remains with a level of uncertainty at the moment—not in terms of not being able to get there, but precisely the process by which it is achieved. That is going to be a reflection of the reality for some years yet. Otherwise, we would all be saying right now that it is hydrogen aircraft or electric ships or whatever.



**Robert Courts:** That is my point. I referred a moment ago to whether, with shipping, it is ammonia or hydrogen. Clearly, the cost will vary between the two and the timescales will vary between the two, so it would be artificial to give a definite timescale at the moment when you do not yet know what the technology will be. We must accept, and I entirely agree with what Minister Rowley says, that there is an element of uncertainty inherent in everything that we are doing.

Q388 **Barry Gardiner:** I totally agree, and of course there is uncertainty. The difficult task that you, as Ministers, have is to chart our way through that uncertainty. You do that by regulation and you do that by setting targets and incentives. Therefore, what I am trying to pin you down on is: what is the mixture of those targets, incentives and regulations, and by what date?

**Robert Courts:** Do you remember that I said a moment ago that we were going to consult on a road map? It is called Course to Zero, so that is something that we are going to be doing later this year. You are right.

Q389 **Barry Gardiner:** By what stage will that road map have produced a timeline?

**Robert Courts:** I cannot tell you now what it will be, but it will clearly be a part of Course to Zero. Course to Zero is going to show us how we get there, and there will be a timeline involved.

Q390 **Barry Gardiner:** You will have seen the research from the Tyndall Centre in Manchester. They said that for shipping to pay its fair contribution to meeting the Paris climate goals and to be at zero emissions before 2050 and at least one third of the way by 2030, emissions by 2030 are going to be exactly the same as they are now. That is their assessment of where we are. I would love to hear from you why that is not the case. I want to have confidence that all you have been saying is going to get us to where we need to be by 2030, but there are people looking at this and saying, "It ain't going to happen."

**Robert Courts:** If you are asking me if there will be a timeline, there will be a timeline and that will be laid out in the Course to Zero, the consultation and the road map. I just cannot tell you what it is now, because we have not had that consultation yet. Clearly, I recognise the seriousness of the point you make, for the simple reason that, if you are purchasing a ship, the lifetime of a ship is 30 years, so if you are talking about 2050 we do need to act now. I think we are doing that, particularly with UK SHORE. I am keen to emphasise that.

Q391 **Barry Gardiner:** My final question is, what sort of support do you think the Government should be providing to the industry in the meantime?

**Robert Courts:** As I have laid out, there are two things we are doing. First and foremost—well, not first and foremost, because they are equal—there is regulatory framework. So we consult, and we have to do this in partnership; it cannot be Government telling the industry what to do—we



have to do it together. We work very well with the maritime industry, and Maritime 2050 is a good example of that. It is not the Government wishing to push the buck down the road and consulting; it really is important to make sure that they agree with what we are going to do and can deliver on it. That is why we have the Course to Zero consultation work, and it consults on, for example, shore power—that is something we have consulted on already. That is the regulatory side of things.

The other side is the UK SHORE work and the skills work that sits under the shipbuilding office, which is providing the R&D incentive and putting in a great deal of money in bringing forward all that exciting technology and making it more than exciting—making it commercially viable and deployable.

**Lee Rowley:** Perhaps I can give one example of that. A few months ago, I went to Belfast to visit Artemis Technologies. They are part of a consortium that has something like £33 million or £35 million as part of a group of about 10. They are trying to create a new set of electric propulsion technologies, which will work in ships and can then hopefully be commercialised to be utilised on ferries and so on. I think it was 10 or 15 days ago that they launched their first ship into the waters near Belfast.

There is a substantial amount of R&D money going in, through UKRI and Innovate UK. Shipbuilding—just like aviation—is eligible to go into many of those programmes. ATI is a specific ring-fenced function for aviation. Allowing thousands of flowers to bloom with the support of the Government will enable us to find which technologies move us forward as quickly as possible.

Q392 **Cherilyn Mackrory:** Can I build on that conversation a little, but hone in on ports and port infrastructure? Can I start with an open question? What are we doing at the moment to help ports decarbonise?

**Robert Courts:** I have already referred to probably the most important thing, which is shore power. We cannot emphasise enough quite how much the sector is leaning into this. They know it is something they must deliver on, and they very much are. I went to open the Horizon cruise terminal in Southampton recently, which is a very good example of shore power being used. The consultation on how we bring that on is particularly important.

There are also a couple of things that I have not mentioned, including some of our COP work. There is the Clydebank Declaration for a start, which is about green shipping corridors between one port and another, and also Operation Zero, which is about electrifying and decarbonising the small workboat sector, particularly for the offshore wind farm sector.

All of that will work with ports. Of course, as part of that, you will have to have a replacement for bunkering—the phrase “bunkering” comes from





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the days when it was coal, but bunkering these days of course will mean electricity for small workboats or ammonia or hydrogen for larger ones.

Again, it does come back to the same point around the seedcorn money—the R&D money that goes into understanding what is going to be the commercially deployable technology. That really is important. I know that it is frustrating that in many cases we cannot give definite answers. If you are talking about small workboats, it is probably going to be electricity and batteries, but that will not work for large tankers, container ships or anything where the size of the battery would make it undeployable. I am afraid we do just have to go through this process of R&D.

**Q393 Cherilyn Mackrory:** Could you give me a comparison as to where we are with some of the other comparable nations on this? Are we all working at the same speed, or are ports in other countries doing more?

**Robert Courts:** I think the UK probably has higher ambition than most others. I would not like to pick on countries in particular and say that we are further ahead. It is certainly clear from our COP work that the ambition that we have is genuinely groundbreaking, because we were the ones who laid out the Clydebank Declaration and invited others to join as leading nations—close European partners such as France, Germany, Spain and Italy, as well as the United States and New Zealand from further afield. They are the ones who have signed up to this broad statement of intent of what they want to achieve.

**Q394 Cherilyn Mackrory:** I will indulge my local constituency, if I can. On grid capacity, at somewhere like Falmouth, for example, if the working boats and potentially some larger vessels go to electric, there will need to be significant infrastructure in terms of grid capacity. What are the Government doing to look into that in a bit more detail? Sorry to nick Barry's line, but could you also give us timelines on how we are going to get to that point? You mentioned floating offshore wind, and that is going to be a big factor for that port in particular, but also others around the country, so there is a timeline there already. How are we doing on grid capacity?

**Robert Courts:** It is much the same point. You are quite right, if you are going to plug ships in, either to run them while they are alongside or to power smaller workboats, then clearly you are going to need that extra grid capacity. The power has to be cleanly generated; otherwise you are simply shifting emissions from one place to another. That will all be considered as part of the Course to Zero and falls into wider energy provision.

**Q395 Cherilyn Mackrory:** How much of that will be included in the clean maritime plan, and how much will be in a different part of Government?

**Robert Courts:** The provision of greener energy for the grid would not fall within the Department for Transport. That would be part of the wider mix that would sit within BEIS.



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Q396 **Cherilyn Mackrory:** Vessels are going to have an IMO rating, a bit like properties, A through to E. How are Government going to incentivise shipping to get to those cleaner emissions? Also, how are they going to incentivise ports to do business with ships with cleaner emissions?

**Robert Courts:** This is very much about tying up. That is what the green corridors idea is intended to do. It is all very well having a green ship, but if you cannot bunker it at the other end, you cannot refuel it, and that clearly will not be successful. What we are intending to do there is for people to sit down together. When you go to see ports, they are already talking about this, as you will know from your local area. They are already ahead of this, and it is very much about working through some of the regulatory side of things with the Maritime and Coastguard Agency, from our side, and then IMO on a global level. It is important to look at this global work, because so much of this is global, so much of this solution is international because—*[Inaudible.]*

**Cherilyn Mackrory:** Sorry, that was my paper was on the microphone.

Q397 **Chair:** In our last session—I know that Mr Rowley sat through that session—we heard about the cost of kerosene and the unknown cost of alternative fuels, particularly those that have zero emissions. How is the Government supporting investment in the development of alternative and zero-emission fuels for aviation and shipping?

**Lee Rowley:** Perhaps I can come in on that, and then I will ask Paul to make a few comments from a BEIS perspective. DfT leads on SAF, which I will let them speak about, but in terms of the aerospace side, it looks like there are a number of different buckets that you can extract a reduction in emissions from. One is efficiency, and there is still a set of cycles to go through within the aviation industry that you can extract efficiency gains out of. If you look at a Boeing 737 that came in in the late 1960s, early 1970s, versus the Boeing 737s that are out there at the moment, they have about half the impact that they did, and with every single cycle you get something like 10%, 15% or 20% of a gain. The Airbus A320neo is hoping for 15% to 20% gain over the previous element of the family.

Efficiency should not be forgotten about, but then you are looking at electric or hydrogen or, for the larger aircraft, probably SAF, which we will come to. Paul can talk more about electric and hydrogen, but that is very much in an early stage. You are starting to see some electric aircraft—single-seater electric aircraft—that have been flown. You are starting to see some movement on hydrogen—the FlyZero paper, which was a lot of UK academics coming together to work out some of the practicalities behind it, was published a few months ago.

So I think there is some progress being made here, but it does go back to that early stage point. But Paul can talk from a details perspective.

**Paul Griffiths:** To add to that, I would point out the overlap between the aerospace technologies, which can make aircraft more efficient.





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Therefore, whatever the unit cost of an amount of fuel, whatever the type of fuel, having a more efficient aircraft will help. We do that in a number of ways, predominantly through the Aerospace Technology Institute programme, which supports the mid-state research. That is working on things like better engines, better wings, aircraft systems. That allows the ongoing introduction of the incremental changes that we have seen over a number of years.

As those bundles of technologies build up, then eventually, in what is a competitive industry, the small aircraft can move to a new generation. Then, in terms of what we are doing to push ahead as fast as we can with the new zero-emissions aircraft, we will see to what extent, when and in what size of aircraft we are able to introduce new propulsion technologies, which could move us from low emissions to zero emissions for the aircraft in those particular classes.

That then gets combined with all the other things going on in the broader system around what we are doing to make it easier to introduce sustainable aviation fuels—those are different types, with synthetic fuels potentially in the future having zero emissions—but, also, then combining it with out-of-sector things like carbon capture and storage.

Q398 **Chair:** That is useful, but what actual investment has any Department put into this area?

**Robert Courts:** Are you asking about SAF?

Q399 **Chair:** I am asking about SAF, among the others.

**Robert Courts:** SAF is the £180 million fund that I referred to a few moments ago. I think the best way to understand this is that you have three stages. In the short to medium term, you have efficiencies and, as Minister Rowley said, you are seeing that in the Airbus A320neo, which is 20%, roughly, more efficient than previously.

Q400 **Chair:** That is only going half the way. When we talk about net zero, we mean zero.

**Robert Courts:** By no means does it do it. It is just part of the system of efficiencies and an example of something that is achievable now. Efficiencies would happen even if we did not do anything, but we are.

The second part of this is SAF. That is the £180 million fund that I referred to earlier, which is looking to commercialise and to deploy all the different SAF technologies out there. We are consulting on a blending mandate as well, so we continue to blend it. Then you start looking at things that are of course the responsibility of BEIS, and you have heard about new hydrogen aircraft in years to come.

**Lee Rowley:** I am looking for my list of projects. There have been hundreds of projects that have been supported and subsidised or enabled by ATI. You have some direct attempts at trying to push forward the



understanding. FlyZero was not the creation of an aircraft; it was the bringing together of academics to understand how a hydrogen aircraft could work in principle. There were about 80 of them, and they took a year or 15 months. They published a number of reports that said, "Well, in these three scenarios of a hydrogen aircraft—an original one, a mid-size one and a larger one—this is what you need to think about, and these are the kinds of reductions that you need on this in order to offset that." So there is a whole heap of academic thinking going on at this early stage behind those examples.

Then you have the ATI directly supporting technology. It has been involved, for example, in the Wing of Tomorrow for Airbus, which ensures that we understand how better to extract efficiencies out of wings. Therefore, when we have to put those wings on new types of propulsion aircraft, they can be ready to support the entire—

**Q401 Chair:** Thank you. That is very helpful. In the previous session there were discussions about the need to promote investment in alternative fuels, and the mechanism of contracts for difference was raised, particularly to assist in decarbonisation. What plans does the Department for Transport have to bridge the current price difference between fossil fuels and zero-emission fuels?

**Robert Courts:** You are quite right, Chair, that the high capital cost is one of the issues with SAF. We are considering contracts for difference. It is often used as an example that it worked in the offshore renewables sector, but it is much more complicated with SAF, for the simple reason that there is not just one technology type—one technology type will have a different energy output, for example. It is much more complicated. We are considering it, but what we are looking to do is to build the evidence base, and then we will take forward those discussions in due course.

I am afraid it is one of those frustrating things. It just does take time. It is much more complicated. I hope that I have made clear why that is. For example, one SAF technology might come from crops and another type might come from waste. Another type might come from air capture. They are all at different stages of development. They all have a different energy input and output. Therefore, how a CfD would work is not straightforward. You could do it on a ship type or an aircraft type, or you could do it on an input basis. There are a number of different ways.

This is an industry ask, and I have heard it very clearly. We are considering it, but I am keen that everyone understands that it is complicated. It is not as simple as applying it in the same way as you could have done for the offshore wind sector.

**Lee Rowley:** If the Chair will indulge me just for 30 seconds, I think the reason we keep going back to this early-stage point is, first, that—well, this is the early stage. But, secondly, it is a recognition of the fact that we have a lot to do, and we would accept that we have a lot to do. If you go back five years ago, when I was elected, if I had sat in this room



listening to people being asked the same questions, I do not think there would have been clear pathways. To Caroline's point a few moments ago, that is where you start getting to an unacceptable level of risk, where you have an objective but no clear pathways.

What I can see even in the seven or eight months that I have been a Minister is that the pathways are becoming clearer, and hopefully the earlier evidence session demonstrated some of that. There has clearly been a lot of progress, but what is also necessary is a recognition that there is a lot further to go. But the direction of travel is positive.

**Robert Courts:** For example, I made the point that we are, I think, the only country to have a clean maritime plan, and one that is refreshing. It is significant that we are the only country that has a plan. It has been around for years, and we are refreshing it to come up with a second iteration.

Look at the Jet Zero Council, for example. Again, I don't think any country has done this in quite the same way, where it has brought together Government, different Departments and different aspects and has working groups working on delivering SAF. They have met many times and are really driving these things forward. The fact that we are even able to talk about a lot of these things today is in large part because we have made the progress that Minister Rowley refers to. This is not all pie-in-the-sky aspirational stuff; in many cases we can show the emerging outlines of how the delivery will work.

Q402 **Chair:** Moving on from efficiencies of fuel supplies to different types of fuel, and hydrogen in particular—that has certainly taken some of our attention—the estimates are that aviation could use up to 20% of the total hydrogen available on an international scale. What are the Government doing to enable and increase the development of green hydrogen so that there is a supply chain that can deliver and support the industry?

**Lee Rowley:** This would come under the hydrogen strategy that we published last August, I think it was. Initially last August we committed to 5 GW of hydrogen by late in the decade. That has now been increased in the energy security supply. Hydrogen has been around for a long time, as you all know. We are now trying to industrialise it to make sure it is there and available for all of its different uses, of which aviation may be one. I think the hydrogen strategy itself will provide the overall framework for this, and then there is a series of more detailed pieces of work going on, with one in Teesside, about how you make transportation and hydrogen work together.

Again, this is early-stage—eight months after the strategy has been published, it is probably necessarily early-stage—but there is a lot of movement underneath to try to understand how it works, particularly on the transportation side. Paul, is there anything on that you would like to add?



**Paul Griffiths:** I think you have covered it.

Q403 **Chair:** That certainly covers aviation, but in terms of shipping, Minister Courts, how do you see nuclear-powered shipping contributing to net zero?

**Robert Courts:** The important point to make both with aviation and maritime is that we are—I alluded to this point earlier—technology-agnostic. I don't want us to be picking a sector ourselves or picking a solution. I don't think it is right for Government to do that, certainly at this stage. That is what all the demonstration competitions that we are doing are intended to do—look at these different options. Nuclear is one of them, but I don't think it is right for Government to be playing it—it is right for industry to come up with the solutions that will work for them.

Q404 **Jerome Mayhew:** Just before I come on to my main set of questions, I have one for Mr Courts. Just for clarity, you have mentioned two, if not three, times being able to plug in onshore to maintain shipping while it is in port, but also to recharge particularly smaller workboats. There was an undertaking by the Government to consult on the appropriate steps to support and, if needed, mandate the uptake of shore power in the UK. What happened to that? Did that consultation ever take place?

**Robert Courts:** Yes, we have just been consulting on it—that is the power consultation that I referred to.

Q405 **Jerome Mayhew:** This is not a trick question. I just want to know about shore power. That consultation was going to be launched before 2021, and my notes suggest it has not been published yet.

**Robert Courts:** The call for evidence has just closed so we are considering responses. It is happening.

Q406 **Jerome Mayhew:** Would you anticipate the outcome of that being published in the next six months, if I could tie you down to a date?

**Robert Courts:** I don't want to speculate and give a date that later turns out to be wrong, because we have to go through all those responses, and something may be produced by the responses that we have to look at. What I can say is that I will do it as soon as possible. The Department is very keen to make progress.

Q407 **Jerome Mayhew:** Is that like saying “in due course”?

**Robert Courts:** Now we are into some interesting, almost legalistic semantics.

Q408 **Jerome Mayhew:** I tried and failed. Getting on to the next batch of questions, we have the inclusion of domestic shipping within the UK—

**Robert Courts:** Sorry to interrupt you, but there is just one point I think I should make. I would expect it to be in time for the clean maritime plan refresh, which is next year, 2023. That will give you a guide.



Q409 **Jerome Mayhew:** On the UK emissions trading scheme, and the inclusion of domestic shipping within that, what impact—I am opening this up to everyone—do you think that is going to have on stimulating reductions in domestic shipping emissions?

**Lee Rowley:** We are still in the process of consulting on the amendments to the UKETS. It is open until the middle of June—another month or so—so it is probably difficult to speculate, because we need expert information on that, we need the industry information on that and then we need to work out how to structure it. I am not sure I can go any further. I know that isn't very helpful, but I am not sure I can go any further at this stage. There is an objective, there is a consultation and hopefully that will show the direction of travel and a trajectory that is positive, but the details, I think, will need to come in due course.

Q410 **Jerome Mayhew:** The understanding that informed the decision to consult on it was that this is likely to give a positive prod to the industry to develop its response.

**Lee Rowley:** Yes, and that is one reason why shipping was put into the sixth carbon budget. There is a recognition that it is difficult to put the contours of a rulebook around aviation and shipping, but, equally, each time we look at this, we can hopefully make incremental progress. We are doing that on aviation and are now bringing shipping in, with the right framework. Hopefully that provides the right form of behaviours, because we are trying to apply market behaviours to this to ensure that people make choices over the long term.

Q411 **Jerome Mayhew:** If you were to bring it within the UKETS, that is a market signal which is suggesting behavioural change. Are there other market-based measures that the Government is considering taking to reduce domestic shipping emissions, or is this the key consultation?

**Lee Rowley:** I don't have any other elements of this from a BEIS perspective. Are there any particular ones that you are thinking of?

Q412 **Jerome Mayhew:** No, it was an open question. I just wanted to flesh out the Government's thinking on this. It seems like it is quite early and that it is at the consultation stage rather than policy.

**Lee Rowley:** I think my colleagues in the Treasury would say that all options remain open and are considered on a very regular basis. Without being flippant, I think at the moment that we are focusing on the ETS element and trying to understand how to structure and frame that.

**Robert Courts:** Just to build on that, there are three options to expand it. There is the vessel activity-based option, which is where ship operators or owners are obligated to monitor, report, verify and comply with the scheme; alternative options, including the consultation on a fuel supply basis; and then a hybrid approach between the two. That is the domestic way we are looking at it. Other options are likely to be



international, which is where we go back to the IMO work and us driving for greater ambition at the IMO.

Q413 **Jerome Mayhew:** All of those options require detailed monitoring—effective and accurate monitoring. Do you think we are up to the job?

**Robert Courts:** Yes.

Q414 **Jerome Mayhew:** Just to flesh out that one-word answer, if you could, why are you confident that we are up to the job?

**Robert Courts:** Eamonn may like to give a slightly more technical answer but, from my perspective, it goes back to the point I was making to the Chair: we are advanced as a country—no other country has a clean maritime plan. We are advanced in our thinking about how we are going to develop this. We are a leading maritime nation in the way that we regulate and in our standards in any event. So, yes, I am confident in the systems being there for this, as they are for other things. Eamonn, is there anything more about the technical side?

**Eamonn Beirne:** Yes, we are developing and establishing a separate UK regime for monitoring, verifying and reporting shipping emissions. That will provide an awful lot of the data that we will see then feeding into the UKETS scheme.

Q415 **Jerome Mayhew:** On the ETS scheme, what we are really talking about is a price for carbon. There is a lot of debate as to what price for carbon would be effective in changing business behaviour and then, by extension, consumer behaviour. I am going to split this out, and I am going to bring in Ms Greig because you have got away with it up until now.

**Chair:** You have not gone unnoticed.

**Jerome Mayhew:** Yes, I am desperate to bring you in. In terms of aviation, do you have a concept of what price for carbon, applied to aviation, would start being effective in changing business and consumer behaviour? At the moment the industry is very largely protected from any price of carbon.

**Holly Greig:** I would not say the industry is protected, because the domestic aviation industry is already included in the UKETS. We are consulting now on aligning the UKETS with net zero, and we are also consulting on the removal of free allocation from the aviation sector. So I would not agree that the aviation sector is protected from carbon pricing.

To speak directly to the point that you have made around what the right carbon price would be, I don't have those figures in front of me. I would not necessarily want to speculate, but I recognise the point that you are making about how you put those pressures on industry.

Just speaking briefly to a point that was made earlier—this is slightly separate to carbon pricing, but I think it is worth mentioning—we have





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consulted in the Jet Zero consultation on an emissions-reduction trajectory between now and 2050 for the aviation sector. Indeed, we have proposed setting interim targets for the sector so we can hold them to account on the pathway to 2050. That just comes back to some of the points that were made earlier about whether the industry is taking this seriously and whether we are going to be monitoring them. I know the Minister was talking about the proposals in our consultation.

To answer your question directly, I would not want to give an exact figure, and I don't have an exact figure in front of me, but I would say that we have been very closely monitoring the pricing in the UKETS, and you can see that it is going upwards at the moment. People may have their own views about whether that is a positive thing, but it is going up, and as the Ministers have said the industry is responding to what we are asking them to do when it comes to decarbonising aviation. We are seeing improvements in efficiency, we are seeing them purchasing sustainable aviation fuels and we are seeing investments from them in aerospace R&D similar to what the Government is doing. So I would say that the incentives and the mechanisms that Government already has in place are showing what we would want to see from the aviation sector, but of course we need to see even more, as the Minister has said. So it is the start.

Q416 **Jerome Mayhew:** Is there a nuanced difference in relation to shipping, or would you have the same answer for shipping?

**Eamonn Beirne:** I would have the same answer. We are waiting in anticipation of the results of the consultation.

Q417 **Jerome Mayhew:** You may have noticed that the Treasury this week took the advice of this Committee and announced a consultation on the development and implementation of a carbon border adjustment mechanism as a precursor to being able to manage the price of carbon in our domestic economy. What impact, if any, do you think the potential implementation of a CBAM would have on the debate we have been having here.

**Lee Rowley:** That is a very difficult one to answer, because it depends on when it comes forward, how it interacts and what other parts of the world do—the point of a mechanism is to acknowledge what other countries are doing, which you know. I do not know what the outcome of a CBAM consultation will be when it starts. I think that the clearer elements of the approach, from an aviation perspective, or from a shipping perspective but using aviation as the example, are that once we get to the end of the ETS consultation, there is a recognition that we have to set an ETS—assuming it is in the consultation—or a set of principles that reflect the overall objective of getting to where we are trying to get by 2050, with a recognition of how difficult it is, what the technologies are in the individual sectors and then ultimately what the risk of carbon leakage is. In terms of other sectors that I cover for BEIS, there are large risks of carbon leakage in some of those, whereas there



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are limited risk of carbon leakage in others. You cannot leak carbon if you want to fly between London and Edinburgh. Some people on the Committee would not want people to fly from London to Edinburgh, but on the basis that they are allowed to, you cannot leak it to another part of the world. I think it is the case that the ETS consultation will create a product, and will probably create a product in the relative short term, and then the CBAMs will be a longer discussion.

Q418 **Jerome Mayhew:** The point I am making is if you are shipping product from around the world and your ships are heavily emitting carbon, then that will necessarily be affected by a CBAM. That is just an aside.

**Lee Rowley:** The other “problem” with shipping is that the link between the cost of fuel and the overall cost of shipping is quite weak, which is the challenge. The cost of fuel is not a major driver in what do or don’t ship, and that is one of the bigger problems in shipping, whereas aviation is a bit different.

Q419 **Jerome Mayhew:** I have just been reminded by my colleague here that there is an additional question, which I thought had already been answered. A lot of what the Government is planning to do in terms of the way we get from here to 2050 relies on negative emissions technologies. We have talked about BECCS and DACCS. Do you think it is wise for the Government to put so much reliance on these technologies to offset aviation emissions, in particular?

**Lee Rowley:** The question is: what is the alternative? The alternative is either not to do this or to start constraining demand. If Members of the Committee want to start taking package holidays off my constituents, that is for them to make the argument at a general election and to see whether they are successful or not. I would prefer throughout this process to take people with us, and taking people with us is about making sure that they are clear that they all want to tread on the earth more lightly, but they also have a series of things that they want to do in their lives, and quite rightly.

We are pretty open; we are pretty transparent. The Jet Zero consultation put four different scenarios out there, which demonstrated that there was always a cohort of emissions that would need to be covered in another way than just some of the things that we are talking about today, important as they are. It also recognises their variability in terms of where we achieve. From my perspective, offsets are going to be required; we should be clear about that and we should not necessarily criticise it. In trying to decarbonise the most complicated system that we have, there are going to be times when we have to change bits of the ledger. But by the same token, I hope you can see from the discussion we have had over the last few minutes that there is an incredible amount of work going into trying to minimise the amount of offset that is required.

**Robert Courts:** I would agree with that. It is important that we emphasise this point. We have to take people with us. We need to





maintain public consent for this. That is critical, and that is very much part of the approach that we are taking. Also, there are extraordinary advances happening in technology. Look at the things we have now that 20 years ago would have been fanciful. It is important that we also put our faith in that because of the progress that has already been made.

**Q420 Caroline Lucas:** I would just make one point, which would be that 15% of people take 70% of the flights, so it is about a few people flying a lot, rather than trying to stop your constituents in particular. On the issue of popularity, it is interesting to look at poll after poll in the citizens climate assembly, which was a programme sponsored by a number of Select Committees of this Parliament. The frequent flyer levy, which is one of the key ways of constraining demand was incredibly popular. I don't think we should assume, given that the issue is about constraining the ability of a very few people to fly an awful lot, that that is necessarily unpopular with our constituents.

**Lee Rowley:** I suppose it is whether the Chair wants us to get into a philosophical discussion about whether we constrain people's agency, which I have very strong views on.

**Chair:** The point has been made quite eloquently by Caroline. Ruth, final questions.

**Q421 Ruth Cadbury:** I am going to pick up on that one because my recollection from my Heathrow constituency experience is that airline passengers were concerned to not cause too much noise. There was a lot of support for noise reduction measures among passengers, particularly for those communities near airports. What evidence do you have that airline passengers are not interested in supporting carbon reduction measures? To put the question a different way, are passengers keener to fly middle distance than to go by train if the price differential is not so great?

**Lee Rowley:** I hope I have not inferred this, but I do not think that my suggestion is that people travelling by aircraft are not interested in this. I think they are. When we buy an air ticket—

**Q422 Ruth Cadbury:** Sorry, you think or you know?

**Lee Rowley:** It is perfectly clear that most people want to try to tread lightly on the earth in all of their actions, whether it be flying or something else. Equally, you can see through the acquisition of the ticket as an ordinary punter that there are lots of people who choose to offset their carbon. There are some mandatory carbon aspects that have been put on ticket prices elsewhere. I should defer to Minister Courts on this, but I wouldn't want to leave the impression in my previous remarks that I think it is not important. It is important, but we ultimately have to make sure that we can balance both of these points up by creating, on my side, the kind of technology that allows people to be able to still travel while treading more lightly on the earth.



**Robert Courts:** I hope neither of us have given the impression that we think that airline passengers are not interested in reducing their carbon input. I think they very much are. That is clear to all of us in reality. Again, that takes me back to the point that I made a little while ago about the work we are looking at with the CAA with regards to providing information to people so that they can make environmental choices at the time of booking. It may be that they choose one airline over another. It may be that they choose one method of travel over another. It may be that they decide they do not need travel at all. It is about choice being given to allow the individual agency and the freedom of choice that Minister Rowley has referred to, which I entirely agree with.

Q423 **Ruth Cadbury:** The choice between mode of travel is often determined by price differentials between the modes. As we know, air travel is externalising the cost, whereas for rail travel those external costs are included in the ticket price. Are the Government interested in and concerned about that?

**Robert Courts:** We are looking at ways in which we will be able to improve information given to people, and the breakdown of ticket prices, for example, might be a way that we would do that.

Q424 **Ruth Cadbury:** Moving on to technology, the airlines and aviation industry say—and I have no reason to dispute this—that the UK is one of the most connected countries in the world and is flying to destinations of all types all over the world. With new technologies, particularly hydrogen fuel cells and so on, an aircraft has to turn around and come back, so what is the international mechanism to address that challenge to ensure that planes can get back to the UK or whichever country they have started from?

**Robert Courts:** A very good point. There are two answers to it. The principal one is ICAO. I referred to the ICAO Assembly this year, and our ambition is part of that work. ICAO is important with all sorts of things because it sets international standards. As you rightly say, aviation by its nature is an international industry and you cannot fly a hydrogen aircraft if you cannot bring it back again. That is part of the work that it is going on there, but it is also some of the bilateral work that will be going as well. You can see that more clearly, perhaps, in the maritime sector, where I have spoken about green shipping corridors and the Clydebank Declaration, but we can also look to explore that with bilateral arrangements.

As I say, this does take us back rather to that chicken and egg point around which technology we are talking about. SAF clearly is very important because it is a drop-in fuel and it is much easier. The rating is going on—in fact that is very well advanced—to make sure that SAF can be dropped into existing aircraft types. That will be the short and the medium-term work. Then, the longer-term bit is the bit that falls under Minister Rowley's Department, around whatever the next generation will be—probably a mix of hydrogen and electric.



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**Lee Rowley:** ICAO is looking at it as a global issue. If you look at the interaction between the UK emissions trading scheme and the EU emissions trading scheme, what you can see is the jigsaw pieces starting to come together. You have the UKETS, which is covering all domestic aviation movement, so you have the backwards and forwards, and all of the movements backwards and forward to Gibraltar, so that is covered. Then what you have in the UKETS is the move over from us to somewhere in the EEA, and then in the EUETS you have the move back from EEA to the UK. We are consulting at the moment on putting Switzerland in to our side as well. Slowly and incrementally, we are building up the coverage, and then there are the broader global discussions that will happen.

Q425 **Ruth Cadbury:** A lot of UK aviation is UK residents flying for leisure purposes, often to small, isolated airports a long way from a capital city or to countries with very small GDP. Who funds the technology to ensure that the plane can get back to the UK at that destination airport?

**Robert Courts:** At the other countries?

**Ruth Cadbury:** Yes, at the remote airport, the destination airport, particularly long haul.

**Robert Courts:** That would largely be a matter for that country's Government to consider, in the same way we would here. That and industry together—it will be joint.

**Ruth Cadbury:** I will just now move on to the—

**Paul Griffiths:** If I can add to that? You are pointing to one of the difficult trade-offs that we have in the sector, because if you put aside the cost of the infrastructure—and that could be airports' infrastructure for kerosene, SAF and hydrogen, and it is hugely commercially challenging to have all of things either at the same time or in an overlapping way as the technology rolls out—you can imagine that in terms of the sort of aircraft that Airbus say they are seeking to bring to service by the mid-2030s, they are aiming for a hydrogen-propelled aircraft that would have a 2,000 nautical mile range, or something in that area. That would allow the aircraft to take off, go to its European destination and come back, and therefore you would only need the infrastructure at the home airport.

There is a very important trade-off there because if the aircraft is carrying fuel for two journeys, that inherently means it is taking more fuel. What we need is the technology for the aircraft and the ground infrastructure, and then there is also the regulatory regime that is going to be needed in the UK and in all the destination countries. That means that international co-operation and the technology development need to go together.

Q426 **Ruth Cadbury:** Thank you; that is interesting. I want to move on to the CORSIA, the carbon offsetting and reduction scheme for international



aviation. In the UK's transport decarbonisation plan the Government have said there will be negotiation at ICAO for emissions reductions to bring CORSIA in line with the Paris agreement-compliant target. What progress has been made ahead of the assembly later this year?

**Robert Courts:** CORSIA is, again, one of these international programmes that is perhaps little understood but is quite significant in its way. In October 2016, ICAO's 191 member states agreed to implement CORSIA as the first worldwide scheme of its kind to address carbon dioxide emissions in any single sector. From 2021 a total of 107 states have volunteered to participate in the scheme from 2022. It is about 80% of international aviation activity. From 2027 to 2035 the scheme will become mandatory, which will be a major step forward for the entirety of the global impact.

**Holly Greig:** Just to build on that, the other important point to make is looking to the assembly this year. As you mentioned, we have said that one of the UK priorities is to negotiate for a long-term goal for aviation. CORSIA, as the Minister was talking about, delivers the medium-term goal that was agreed at ICAO, which is carbon-neutral growth from 2020. What we are looking to negotiate at ICAO this year is a long-term goal for aviation. You will of course be aware that we have net zero 2050 in the UK but we do not have an equivalent global goal for international aviation and that is what we are hoping to negotiate at ICAO this year.

What we have done in the meanwhile to facilitate that—just what we did at COP26—is launch the international aviation climate ambition coalition, where we have 25 states, which represent over half of aviation's international emissions, who have come together to recognise the importance of agreeing that long-term goal at ICAO. Those are our like-minded partners globally, who we want to work with to negotiate this agreement at ICAO this year. We are working with them and have been meeting them regularly since we set up the coalition. We are working towards the ICAO Council that is happening in June and, indeed, the high-level meeting in July. We are very clear about the milestones that we need to hit in order to agree the goal at the assembly.

It is worth saying, of course, that this is an international negotiation, so we will be as ambitious as we can be from the UK, but it is going to rely on votes at ICAO to get the most ambitious goal that we can.

Q427 **Ruth Cadbury:** Thank you. Finally, on international aviation, the Climate Change Committee wants to see international measures that incentivise action on all greenhouse gas emissions from aviation because, of course, the other emissions from aviation are possibly even more concerning, with global warming. Where are those other greenhouse gases in the context of these international negotiations?

**Robert Courts:** That is a really important point, because this often gets talked about in the context of carbon. It is often used as a synonym for the two. Nitrogen oxide is the first other aspect, and the other one is the



potential impact of contrails. This is something where the research is not yet there to enable us to understand the impacts, so that we can understand what we best need to do. But it is a very good point; it is important we don't become blinkered in just thinking about CO<sub>2</sub> because there are those other two potential impacts as well. We are not quite in the position of understanding the science yet.

**Q428 Ruth Cadbury:** I must not leave out the work the Government are doing with the IMO on promoting a Paris agreement-compatible target for emissions reductions in maritime. Where are the Government on that? Do you think the IMO provides the necessary leadership on the regulation and full decarbonisation of global shipping?

**Robert Courts:** Yes. The IMO is clearly the body; it is the internationally leading organisation, which is critical for this. There has been an initial strategy, which was agreed in 2018 at IMO, on the reduction of greenhouse gas emissions from ships. That initial strategy is due to be revised in 2023, so that continues. We have our strong voice in that, and our ambition is leading in that as well. The IMO is in the initial stages of discussions on those mid-time measures and on revising that strategy. There are various working groups and so on that are going on at present.

**Q429 Ruth Cadbury:** Do the Government support the introduction of a global trading scheme for maritime emissions at IMO level?

**Robert Courts:** It is an option that we will have to consider, but we are keen to be as ambitious as we possibly can. Holly talked about the aviation sphere, and the same applies in maritime: this is an international negotiation, and of course it depends on other countries as well.

**Ruth Cadbury:** Thank you very much, Chair, and thank you for enabling me to attend this Committee.

**Chair:** A great pleasure that you were able to do so. I thank you all for your contributions and your time this afternoon.

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