Committee on Climate Change

Independent advice to government on building a low-carbon economy and preparing for climate change

The Sixth Carbon Budget and Welsh emissions targets – Call for Evidence

Background to the UK's sixth carbon budget

The UK Government and Parliament have adopted the Committee on Climate Change's (CCC) recommendation to target net-zero emissions of greenhouse gases (GHGs) in the UK by 2050 (i.e. at least a 100% reduction in emissions from 1990).

The Climate Change Act (2008, 'the Act') requires the Committee to provide advice to the Government about the appropriate level for each carbon budget (sequential five-year caps on GHGs) on the path to the long-term target. To date, in line with advice from the Committee, five carbon budgets have been legislated covering the period out to 2032.

The Committee must provide advice on the level of the sixth carbon budget (covering the period from 2033-37) before the end of 2020. The Committee intends to publish its advice early, in September 2020. This advice will set the path to net-zero GHG emissions for the UK, as the first time a carbon budget is set in law following that commitment.

Both the 2050 target and the carbon budgets guide the setting of policies to cut emissions across the economy (for example, as set out most recently in the 2017 Clean Growth Strategy).

The Act also specifies other factors the Committee must consider in our advice on carbon budgets – the advice should be based on the path to the UK's long-term target objective, consistent with international commitments and take into account considerations such as social circumstances (including fuel poverty), competitiveness, energy security and the Government's fiscal position.

The CCC will advise based on these considerations and a thorough assessment of the relevant evidence. This Call for Evidence will contribute to that advice.

Background to the Welsh third carbon budget and interim targets

Under the Environment (Wales) Act 2016, there is a duty on Welsh Ministers to set a maximum total amount for net Welsh greenhouse gas emissions (Welsh carbon budgets). The first budgetary period is 2016-20, and the remaining budgetary periods are each succeeding period of five years, ending with 2046-50.

The Committee is due to provide advice to the Welsh Government on the level of the third Welsh carbon budget (covering 2026-30) in 2020, and to provide updated advice on the levels of the second carbon budget (2021-25) and the interim targets for 2030 and 2040. Section D of this Call for Evidence (covering questions on Scotland, Wales and Northern Ireland) includes a set of questions to inform the Committee's advice to the Welsh Government.

Question and answer form

When responding, please provide answers that are as specific and evidence-based as possible, providing data and references to the extent possible.

Arcadis

A. Climate science and international circumstances

Question 1: The climate science considered in the CCC's 2019 Net Zero report, based on the IPCC Special Report on Global Warming of 1.5°C, will form the basis of this advice. What additional evidence on climate science, aside from the most recent IPCC Special Reports on Land and the Oceans and Cryosphere, should the CCC consider in setting the level of the sixth carbon budget?
ANSWER:

Question 2: How relevant are estimates of the remaining global cumulative CO_2 budgets (consistent with the Paris Agreement long-term temperature goal) for constraining UK cumulative emissions on the pathway to reaching net-zero GHGs by 2050?
ANSWER:

Question 3: How should emerging updated international commitments to reduce emissions by 2030 impact on the level of the sixth carbon budget for the UK? Are there other actions the UK should be taking alongside setting the sixth carbon budget, and taking the actions necessary to meet it, to support the global effort to implement the Paris Agreement?
ANSWER:

Question 4: What is the international signalling value of a revised and strengthened UK NDC (for the period around 2030) as part of a package of action which includes setting the level of the sixth carbon budget?
ANSWER:

B. The path to the 2050 target

Question 5: How big a role can consumer, individual or household behaviour play in delivering emissions reductions? How can this be credibly assessed and incentivised?
ANSWER:

Question 6: What are the most important uncertainties that policy needs to take into account in thinking about achieving Net Zero? How can government develop a strategy that helps to retain robustness to those uncertainties, for example low-regrets options and approaches that maintain optionality?

ANSWER:

Question 7: The fourth and fifth carbon budgets (covering the periods of 2023-27 and 2028-32 respectively) have been set on the basis of the previous long-term target (at least 80% reduction in GHGs by 2050, relative to 1990 levels). Should the CCC revisit the level of these budgets in light of the net-zero target?

ANSWER:

Question 8: What evidence do you have of the co-benefits of acting on climate change compatible with achieving Net Zero by 2050? What do these co-benefits mean for which emissions abatement should be prioritised and why?

ANSWER:

C. Delivering carbon budgets

Question 9: Carbon targets are only credible if they are accompanied by policy action. We set out a range of delivery challenges/priorities for the 2050 net-zero target in our Net Zero advice. What else is important for the period out to 2030/2035?

ANSWER:

Question 10: How should the Committee take into account targets/ambitions of UK local areas, cities, etc. in its advice on the sixth carbon budget?

ANSWER:

Question 11: Can impacts on competitiveness, the fiscal balance, fuel poverty and security of supply be managed regardless of the level of a budget, depending on how policy is designed and funded? What are the critical elements of policy design (including funding and delivery) which can help to manage these impacts?

ANSWER:
This response is framed in connection with the buildings sector. This is an area where no research has been undertaken and accordingly, the potential impacts on sector and national competitiveness have not been developed in detail. They are material in that the affordability and deliverability of mass-scale decarbonisation will depend on the assembly of an installation and delivery supply chain.
The construction supply chain is fragmented, has a casual workforce and is under-capitalised. Research undertaken by Arcadis for BEIS (1) provides some insight into the structure and behaviours of the industry. The market for skills is likely to shrink as a result

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of the adoption of a new migration model. This is likely to have an impact on the fiscal balance as the cost of construction will increase in excess of background inflation as a scarce labour force applies its bargaining power. Since 2014, according to Arcadis tender price indices (unpublished), national average construction prices have increased by 19% compared to 9% for CPI. This was the direct result of capacity constraint. This resource constraint could affect the whole sector once decarbonisation commences at scale.
The sector is currently not aware of the decarbonisation opportunity and accordingly, is not undertaking the long-term planning required to develop the capacity outlined in question 27. Furthermore, negative industry experience of the Green Deal (2) (3), where businesses made significant investments in contracts, makes it highly unlikely that the industry will invest in advance. In our view, the critical elements of a programme required to deliver scale and certainty are as follows:

- Business case assessment of the economy-wide impact of decarbonisation and warm homes – e.g. health and well-being benefits as well as energy savings (4)
- Pain/gain incentives to drive demand. Energy cost savings are an insufficient incentive to encourage owners to incur high up-front costs. Carbon pricing may be a component of this policy response.
- Marketplace creation. Most repair and maintenance work is undertaken by micro-SMEs. A market will need to be pump primed to additional capacity to address the approx 70% increase in R&M work (5). Pump-prime could consist of initial work in the public sector, very-low cost finance etc.
- Quality assurance. Policy should consider how the quality of work is assured through registration and inspection schemes.
- Skills and competence. Development of training resources including competency frameworks and the provision of training capacity in advance of demand.

(1)BEIS construction report
https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/252026/bis-13-1168-supply-chain-analysis-into-the-construction-industry-report-for-the-construction-industrial-strategy.pdf
(2) https://www.constructionenquirer.com/2015/09/24/birmingham-bins-1-5bn-carillion-green-deal/
(3)https://www.nao.org.uk/wp-content/uploads/2016/04/Green-Deal-and-Energy-Company-Obligation.pdf
(4)Business case in Warm Homes for All sets out this logic.
http://www.cied.ac.uk/publication/warm-homes-retrofit/
(5) See answer to Q 29

Question 12: How can a just transition to Net Zero be delivered that fairly shares the costs and benefits between different income groups, industries and parts of the UK, and protects vulnerable workers and consumers?

ANSWER:

D. Scotland, Wales and Northern Ireland

Question 13: What specific circumstances need to be considered when recommending an emissions pathway or emissions reduction targets for Scotland, Wales and/or Northern Ireland, and how could these be reflected in our advice on the UK-wide sixth carbon budget?

ANSWER:

Question 14: The Environment (Wales) Act 2016 includes a requirement that its targets and carbon budgets are set with regard to:

- The most recent report under section 8 on the State of Natural Resources in relation to Wales;
- The most recent Future Trends report under section 11 of the Well-Being of Future Generations (Wales) Act 2015;
- The most recent report (if any) under section 23 of that Act (Future Generations report).

a) What evidence should the Committee draw on in assessing impacts on sustainable management of natural resources, as assessed in the state of natural resources report?

b) What evidence do you have of the impact of acting on climate change on well-being? What are the opportunities to improve people's well-being, or potential risks, associated with activities to reduce emissions in Wales?

c) What evidence regarding future trends as identified and analysed in the future trends report should the Committee draw on in assessing the impacts of the targets?

d) Question 12 asks how a just transition to Net Zero can be achieved across the UK. Do you have any evidence on how delivery mechanisms to help meet the UK and Welsh targets may affect workers and consumers in Wales, and how to ensure the costs and benefits of this transition are fairly distributed?

ANSWER:

Question 15: Do you have any further evidence on the appropriate level of Wales' third carbon budget (2026-30) and interim targets for 2030 and 2040, on the path to a reduction of at least 95% by 2050?

ANSWER:

Question 16: Do you have any evidence on the appropriate level of Scotland's interim emissions reduction targets in 2030 and 2040?

ANSWER:

Question 17: In what particular respects do devolved and UK decision making need to be coordinated? How can devolved and UK decision making be coordinated effectively to achieve the best outcomes for the UK as a whole?

ANSWER:

E. Sector-specific questions

Question 18 (Surface transport): As laid out in Chapter 5 of the Net Zero Technical Report (see page 149), the CCC's Further Ambition scenario for transport assumed 10% of car miles could be shifted to walking, cycling and public transport by 2050 (corresponding to over 30% of trips in total):

a) What percentage of trips nationwide could be avoided (e.g. through car sharing, working from home etc.) or shifted to walking, cycling (including e-bikes) and public transport by 2030/35 and by 2050? What proportion of total UK car mileage does this correspond to?

b) What policies, measures or investment could incentivise this transition?

ANSWER:

Question 19 (Surface transport): What could the potential impact of autonomous vehicles be on transport demand?

ANSWER:
University of Adelaide studies (1) present a segmented growth forecast, highlighting adoption by public transport, haulage and private drivers. DfT forecasts traffic growth (2) to 2050 ranging from 5% to 71% reflecting high levels of uncertainty with respect to occupancy and also the value of mobility.
AVs are expected to have a significant impact on commuting behaviour. Arcadis (3) has analysed mode shift and reduction in personal car ownership in US, predicting a range of outcomes from a 20% to 60% shift depending on the density of the city. The study does not assess whether replacing a human driven vehicle with a self-driving vehicle will reduce traffic volumes. The Adelaide Study, referenced above (1) projects that CAV will contribute to increased congestion to 2050 as a result of consumer attitudes to ride sharing etc. However, the wider adoption of AVs should free-up parking spaces. Arcadis Research (4), Citizens in Motion, highlights that 6,300 Ha of land could be reclaimed from parking in London through the widespread adoption of CAV.
Arcadis has also modelled extreme future mobility scenarios for the Amsterdam Municipality (5) based on the assumption of fixed total travel demand. Our study showed that the potential for low cost, point to point transport will be a significant factor driving modal shift towards the adoption of CAV. This finding reinforces the potential threat to mass transit solutions such as buses as a result of the wider adoption of CAV. The impact of this trend on rail transport is examined by Oxera (6) who highlight the potential increase in mode substitution that is sensitive to crowding, congestion and journey time.
(1)Victoria Transport Policy Institute. Autonomous Vehicle Implementation Predictions. 2020. https://www.vtpi.org/avip.pdf
(2)Road Traffic Forecasts 2018, DfT.
https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/834773/road-traffic-forecasts-2018.pdf

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(3)Arcadis. Driverless Future, 2018. https://www.arcadis.com/en/united-states/our-perspectives/driverless-futureautonomous-vehicles-and-urban-policy/
(4) Arcadis. Citizens in Motion, 2018 https://www.arcadis.com/en/united-kingdom/our-perspectives/connected-and-autonomous-vehicles/hub/
(5)University of Delft. Mobility Impacts of Automated Driving and Shared Mobility. https://www.narcis.nl/publication/RecordID/oai%3Atudelft.nl%3Auuid%3Aa5eb11ac-527b-4645-b260-0378e31a0649
(6)Oxera, Autonomous Vehicles in Transport Appraisal, 2018. https://www.oxera.com/agenda/autonomous-vehicles-in-transport-appraisal/

Question 20 (Surface transport): The CCC recommended in our Net Zero advice that the phase out of conventional car sales should occur by 2035 at the latest. What are the barriers to phasing out sales of conventional vehicles by 2030? How could these be addressed? Are the supply chains well placed to scale up? What might be the adverse consequences of a phase-out of conventional vehicles by 2030 and how could these be mitigated?

ANSWER:

Question 21 (Surface transport): In our Net Zero advice, the CCC identified three potential options to switch to zero emission HGVs – hydrogen, electrification with very fast chargers and electrification with overhead wires on motorways. What evidence and steps would be required to enable an operator to switch their fleets to one of these options? How could this transition be facilitated?

ANSWER:

Question 22 (Industry): What policy mechanisms should be implemented to support decarbonisation of the sectors below? Please provide evidence to support this over alternative mechanisms.

a) Manufacturing sectors at risk of carbon leakage
b) Manufacturing sectors not at risk of carbon leakage
c) Fossil fuel production sectors
d) Off-road mobile machinery

ANSWER:

Question 23 (Industry): What would you highlight as international examples of good policy/practice on decarbonisation of manufacturing and fossil fuel supply emissions? Is there evidence to suggest that these policies or practices created economic opportunities (e.g. increased market shares, job creation) for the manufacturing and fossil fuel supply sectors?

ANSWER:

Question 24 (Industry): How can the UK achieve a just transition in the fossil fuel supply sectors?

ANSWER:

Question 25 (Industry): In our Net Zero advice, the CCC identified a range of resource efficiency measures that can reduce emissions (see Chapter 4 of the Net Zero Technical Report, page 115), but found little evidence relating to the costs/savings of these measures. What evidence is there on the costs/savings of these and other resource efficiency measures (ideally on a £/tCO2e basis)?

ANSWER:

Question 26 (Buildings): For the majority of the housing stock in the CCC's Net Zero Further Ambition scenario, 2050 is assumed to be a realistic timeframe for full roll-out of energy efficiency and low-carbon heating.

a) What evidence can you point to about the potential for decarbonising heat in buildings more quickly?

b) What evidence do you have about the role behaviour change could play in driving forward more extensive decarbonisation of the building stock more quickly? What are the costs/levels of abatement that might be associated with a behaviour-led transition?

ANSWER:

a) Almost all of the technologies required to deliver low carbon heating are available (1). Air-source heat-pumps are a mature technology and prototypes of hydrogen-compatible boilers were demonstrated in the UK in 2019 (2). Supply chains for insulation solutions and high-performance windows and doors are mature. Decarbonisation is possible but delivery will not accelerate until effective funding and incentive solutions are available. When they are, they will in turn support investment in scale and skills. Barriers and opportunities are summarised in an IET Report (3). The main barrier to the acceleration of decarbonisation in the private sector is the extended pay-back associated with retrofit projects. CIED's 'Warm Homes for All' report suggests that the payback is 15 to 20 years (4). The lack of a compelling financial incentive and low-cost finance for homeowners is a powerful barrier to progress. The problem is concerned with behaviour and incentives – not technology.

b) Evidence for behavioural change associated with decarbonisation is limited. Whilst the RHI has supported sales of heat pumps, the market is still not large enough to be self-sustaining. The electric vehicle (EV) market in Norway is a good example. 50% of vehicles sold are low-e. Norway has combined generous purchase incentives such as VAT exemption and free charging with penalties for drivers of conventional vehicles including higher taxation. Now that low-e sales have reached 50%, the incentives are being reduced. These examples show that carbon emitting will need to be penalised in order to make incentives 'pointed' and payback periods short enough. Another aspect of behavioural change that should be addressed is ease of access to the market. Wider adoption will be promoted if work is assured, undertaken by registered tradespeople and completed at a fixed price. Services like Boxt.co.uk, which provide a customer-friendly service for gas boiler

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replacement have set new standards that customers will expect as part of an effective retrofit programme.

(1) Green Construction Board http://www.constructionleadershipcouncil.co.uk/wp-content/uploads/2019/05/GCB-Energy-Mission-Report-300419-FINAL.pdf
(2) https://www.boilerguide.co.uk/worcester-bosch-present-hydrogen-ready-boiler-chancellor
(3) IET Scaling up to Retrofit. https://www.theiet.org/media/1675/retrofit.pdf
(4) CIED. http://www.cied.ac.uk/publication/warm-homes-retrofit/

Question 27 (Buildings): Do we currently have the right skills in place to enable widespread retrofit and build of low-carbon buildings? If not, where are skills lacking and what are the gaps in the current training framework? To what extent are existing skill sets readily transferable to low-carbon skills requirements?

ANSWER:
This response focuses on retrofit. This sector currently has no scale or capacity. Using assumptions developed in the 'Warm Homes for All' proposals developed by the Labour Party in 2019, 27 million homes and an unknown number of non-residential buildings require retrofit between now and 2050(1). Costed at a relatively conservative £15,000 per unit (2), the total cost of the residential retro-fit programme will be £400 billion. If delivered over 20 years, this implies a 70% increase in housing R&M over the current value of £28bn per annum(3). This will add approximately 12% to annual construction output. On a pro-rata basis, additional output will require an increase in the labour force of at least 280,000.(4) This assessment is likely to be an underestimate as retro-fit is a labour-intensive activity. The skills likely to be required will be at a higher level than is current in the R&M market, where basic trade skills are often more than sufficient to meet need. Furthermore, retraining will also be required in some segments such as heating and ventilation. A good example of this will be the requirement for qualified installers of Air-Source Heat Pumps, where there are currently 1,000 employed. This can be compared to the 80,000 registered gas safe plumbers currently in the marketplace.(5)

There is no mechanism to develop market capacity in advance of an increase in market demand. Our assumption is that the UK R&M market is served by ultra-small SMEs. There are 260,000 firms that employ fewer than 8 people in the sector (6). Typically, it is difficult to motivate investment into new market opportunities and skills in this sector as the current market offers enough opportunity for these SMEs to meet their business objectives. Furthermore, these businesses do not typically access training mechanisms such as the training delivered by the CITB or that funded by the Apprenticeship Levy.

Two other areas of capacity that should be considered are programme management and the quality assurance function required to ensure that an investment delivers the required improvement in carbon. These skills are typically held by a small number of national contractors and international consultants, including Arcadis. Following the failure of the

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Green Deal in 2015, and given the low profitability in the industry, we anticipate that the construction industry will not invest in the potential of retro-fit ahead of the implementation of a plan that delivers demand at scale.

(1) https://labour.org.uk/press/warm-homes-for-all-labours-plan-to-reduce-energy-bills-create-jobs-and-tackle-the-climate-emergency/
(2) Arcadis assessment
(3) ONS https://www.ons.gov.uk/businessindustryandtrade/constructionindustry/datasets/outputintheconstructionindustry
(4) Arcadis assessment based on ONS data https://www.ons.gov.uk/employmentandlabourmarket/peopleinwork/employmentandemployeetypes/datasets/employmentbyindustryemp13
(5) Data from David Pinder, Chair of Green Construction Board
(6) Data from ONS Construction Statistics 2018, table 3.1a https://www.ons.gov.uk/releases/constructionstatisticsnumber202019edition

Question 28 (Buildings): How can local/regional and national decision making be coordinated effectively to achieve the best outcomes for the UK as a whole? Can you point to any case studies which illustrate successful local or regional governance models for decision making in heat decarbonisation?

ANSWER:
The Bristol City Leap Programme (1) is an example of an initiative to align local government and community energy infrastructure with long-term investors. Bristol has a long track record in low-carbon infrastructure and was the UK's 1st European Green Capital in 2015. The award was the product of a 10-year partnership between the public, private and community bodies. Bristol has the largest cluster of environmental and sustainability businesses in the UK, and has one of the UK's first municipally-owned energy companies. The prospectus identifies a programme of £875m for low-carbon energy investment. Bristol developed a resilience strategy in 2016 (2), informed by consultation within Neighbourhood Partnership Areas.which include the development of an evidence base, including a mini-Stern Review for Bristol, the identification of opportunities and the development of the plan.
This plan has informed the delivery of Bristol City Leap.
(1) Bristol City Leap https://www.energyservicebristol.co.uk/wp-content/pdf/City_Leap_Prospectus%204-5-18.pdf
(2) Bristol City Council https://bristol.citizenspace.com/city-directors-department/climate-and-energy-framework/supporting_documents/OurResilientFuture%20v2.pdf

Question 29 (Power): Think of a possible future power system without Government backed Contracts-for-Difference. What business models and/or policy instruments could be used to continue to decarbonise UK power emissions to close to zero by 2050, whilst minimising costs?

ANSWER:
Production costs for renewable generation have seen significant reductions in recent years, particularly from offshore wind developers. The recent Government backed CfD auctions cleared at

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around £40/MWh which was significantly lower than previous auction outcomes and close to wholesale market prices. A review of the North Sea Offshore Sector by New York Port Authority provides a useful pan-national overview of alternative strategies necessary to accelerate investment covering transmission, interconnects, development and electricity rate structures (1)

For the more mature and established renewable generation technologies, a situation can be envisaged within short timescales where requirements for Government backed CfDs are no longer necessary large-scale established renewable technologies with developers prepared to commit investment based solely on long-term market price projections. (2)

However, support will continue to be required for innovative and/or high cost generation technologies with significant output potential. Such support will enable emergent technologies to become established and for production costs to fall through learning and economies of scale.

For other large-scale technologies (e.g. nuclear) ongoing CfD support is likely to be required, albeit with strike prices that reflect long-term efficiency targets for capital and operating costs. The availability of relatively low-cost renewable generation not reliant on Government backed CfDs will also increase efficiency incentives on other technologies to compete and reduce costs.

Clearly, an energy system increasingly reliant on electricity will need to be resilient and secure. Therefore, it will be key to maintain fuel diversity within the generation mix and policy instruments may be required to achieve such diversity. Given the challenges associated with the electrification of transportation and particularly heat, it will be necessary to accelerate investment in energy efficiency initiatives in order to reduce installed capacity requirements. Therefore, policy instruments that reduce and amortise the costs of energy efficiency measures will continue to be required to achieve widespread adoption.

(1) New York Port Authority. https://www.nypa.gov/news/press-releases/2019/20190807-key-learnings-offshore-wind-transmission-models

(2) News items only – no research or evidence available.

Question 30 (Power): In Chapter 2 of the Net Zero Technical Report we presented an illustrative power scenario for 2050 (see pages 40-41 in particular):

a) Which low-carbon technologies could play a greater/lesser role in the 2050 generation mix? What about in a generation mix in 2030/35?

b) Power from weather-dependent renewables is highly variable on both daily and seasonal scales. Modelling by Imperial College which informed the illustrative 2050 scenario suggested an important role for interconnection, battery storage and flexible demand in a future low-carbon power system:

   i. What other technologies could play a role here?

   ii. What evidence do you have for how much demand side flexibility might be realised?

ANSWER:

a) The role and extent of interconnector capacity between neighbouring European states requires further detailed evaluation. There is a risk that scenarios that assume the UK is largely self-sufficient with respect to electricity production and consumption could lead to a

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higher cost power system than is necessary and could also exacerbate delivery challenges. Such production self-sufficiency, as opposed to widespread low-carbon resource sharing across borders, will result in increased generation investment requirements with lower asset utilisation. An integrated and interconnected grid will enable low cost resource sharing of intermittent renewable power generation and accommodate imports / exports from nations with surpluses / deficits respectively - both within day and on a seasonal basis.

The assumed role of nuclear energy in the 2050 indicative generation mix appears modest. The assumed output of 26TWh appears to equate to the output of Hinkley Point C alone although the possibility of further nuclear new build is recognised at Sizewell C and Bradwell.

Question 31 (Hydrogen): The Committee has recommended the Government support the delivery of at least one large-scale low-carbon hydrogen production facility in the 2020s. Beyond this initial facility, what mechanisms can be used to efficiently incentivise the production and use of low-carbon hydrogen? What are the most likely early applications for hydrogen?

ANSWER:

Question 32 (Aviation and Shipping): In September 2019 the Committee published advice to Government on international aviation and shipping and Net Zero. The Committee recognises that the primary policy approach for reducing emissions in these sectors should be set at the international level (e.g. through the International Civil Aviation Organisation and International Maritime Organisation). However, there is still a role for supplementary domestic policies to complement the international approach, provided these do not lead to concerns about competitiveness or carbon leakage. What are the domestic measures the UK could take to reduce aviation and shipping emissions over the period to 2030/35 and longer-term to 2050, which would not create significant competitiveness or carbon leakage risks? How much could these reduce emissions?

ANSWER:

Question 33 (Agriculture and Land use): In Chapter 7 of the Net Zero Technical Report we presented our Further Ambition scenario for agriculture and land use (see page 199). The scenario requires measures to release land currently used for food production for other uses, whilst maintaining current per-capita food production. This is achieved through:

- A 20% reduction in consumption of red meat and dairy
- A 20% reduction in food waste by 2025
- Moving 10% of horticulture indoors
- An increase in agriculture productivity:
  - Crop yields rising from the current average of 8 tonnes/hectare for wheat (and equivalent rates for other crops) to 10 tonnes/hectare
  - Livestock stocking density increasing from just over 1 livestock unit (LU)/hectare to 1.5 LU/hectare

Can this increase in productivity be delivered in a sustainable manner?

Do you agree that these are the right measures and with the broad level of ambition indicated? Are there additional measures you would suggest?

ANSWER:

Question 34 (Agriculture and Land use): Land spared through the measures set out in question 33 is used in our Further Ambition scenario for: afforestation (30,000 hectares/year), bioenergy crops (23,000 hectares/year), agro-forestry and hedgerows (~10% of agricultural land) and peatland restoration (50% of upland peat, 25% lowland peat). We also assume the take-up of low-carbon farming practices for soils and livestock. Do you agree that these are the key measures and with the broad level of ambition of each? Are there additional measures you would suggest?

ANSWER:

Question 35 (Greenhouse gas removals): What relevant evidence exists regarding constraints on the rate at which the deployment of engineered GHG removals in the UK (such as bioenergy with carbon capture and storage or direct air capture) could scale-up by 2035?

ANSWER:

Question 36 (Greenhouse gas removals): Is there evidence regarding near-term expected learning curves for the cost of engineered GHG removal through technologies such as bioenergy with carbon capture and storage or direct air capture of CO_2?

ANSWER:

Question 37 (Infrastructure): What will be the key factors that will determine whether decarbonisation of heat in a particular area will require investment in the electricity distribution network, the gas distribution network or a heat network?

ANSWER:

Question 38 (Infrastructure): What scale of carbon capture and storage development is needed and what does that mean for development of CO_2 transport and storage infrastructure over the period to 2030?

ANSWER: