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.

Please limit your answers to <u>400 words</u> per question and provide supporting evidence (e.g. academic literature, market assessments, policy reports, etc.) along with your responses.

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: The net zero legislation demands a more rapid reduction to 2030 than our current trajectory laid out in the 5th carbon budget.

1. As the host of the 2020 COP conference, the eyes of the world are on the UK to raise its domestic ambition as a way to leverage greater ambition from the EU and the rest of the world.
2. The question of a joint NDC with the EU is still politically unresolved. We believe the EU considers its ambition of a 55% target for 2030 as currently unachievable without UK's involvement. Similarly, the UK's future role in the EU ETS remains unclear. Within this context, a clear path for gross emission reductions should be laid out (building on the 61% target in the 5th CB by 2030).
3. Ultimately, we strongly believe that the guidance to the CCC should be to recommend the level of the sixth carbon budget and revisions to the 5th CB based on the principle of "highest possible ambition" as laid out in the Paris agreement.

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:

1. The signalling value is immense both internationally and domestically. The fact that Britain has left the EU and is not diluting but in fact raising its ambition on climate change sends a strong signal to our partners. However, the country's credibility will also lie in showing that it is not just setting targets but also developing policy that will help achieve them. The Prime Minister said, on the 4th of February, that 2020 will be the year the UK turns the tide on global warming, acknowledging our historic responsibility and leading the world on decarbonisation. The politics is suitably fertile for proposing more ambitious 2030 carbon reduction targets.

2. The government should also take seriously any effort from the EU to separate the NDC process from other ongoing EU-UK negotiations, and consider drawing up a joint, cooperative NDC under that context. We believe this would encourage the EU to be more ambitious, sending a strong signal to other COP participants and therefore increasing the likelihood of a successful conference. However there is clearly a limited timeframe in which any such offer should be made and the UK government should continue its own domestic planning in the meantime.

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:

Government and businesses carry leading roles on decarbonisation, since many of the measures do not rely directly on individual actions. Where diffusion of low carbon technology or demand reduction requires the public to play a part, policy should promote much more democratic engagement (including, for eg., through citizen assemblies and facilitating greater input in planning and infrastructure decisions) and ensure more inclusive roll out of technology where different communities can benefit equally. Creating choice is critical and that will ultimately require policy to drive business action.

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: Overreliance on breakthrough technologies (such as CCS, hydrogen) might present too much of a risk in terms of achieving expected emissions reduction and might result in delay in delivery of other mitigation measures. Therefore, policy should ensure action is taken immediately on mitigation options where there is greater certainty, such as reducing energy and materials demand, improving technical efficiency, and promoting nature based solutions. This currently presents the most reliable way to achieve emissions reductions while delivering a wealth of benefits to businesses and society.

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?

For further evidence, we suggest the CCC review work on the scale of mitigation deterrence caused by GGR and the policy options (such as setting separate targets for emissions reductions and removals) to avoid this (http://wp.lancs.ac.uk/amdeg/), as well as work by academics part of the CREDS consortium (for a summary of key messages, see our latest publication *Balancing the energy equation*)

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: YES. The gross emissions in 2030 should be considerably lower than what is currently proposed in the 5th CB. The 5th CB aims for a 61% gross reduction upon 1990 levels by 2030. We estimate that in light of the net zero target, this should be raised to a minimum of 67% by 2030 with a possible range of 67-72%.

67% is slightly above the "max scenario" that the committee laid out in its 5th CB analysis. Our calculations indicate that a few major policy decisions (2030 sales ban on ICE vehicles, installation of 10 million heat pumps and further incentives for industry to cut emissions) can achieve this target.

Achieving the lower end of our proposed range requires an annual reduction of ~16.6 MT a year (3.3MT more than the current trajectory) but much less than the trajectory of outturn emissions which have been 18.3 MT a year since 2015, albeit primarily owing to cuts from low hanging options in the power sector. Early emission reductions are not just important from the point of view of temperature rise but this trajectory gives more flexibility in cutting emissions from 2030 to 2050 (requiring roughly 11.5 MT a year), which will be important for harder to treat sectors.

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: We believe the co-benefits for human health are the most important to highlight. The Lancet reports this in significant detail with positive results emerging from better air quality, enhanced physical activity, healthier diets and warmer homes. The CCC was quite clear in its message around net zero that every sector needs to see abatement and therefore a prioritisation of measures might prove to be counterproductive. Abatement measures across all sectors is now critical. However, the health co-benefits might indicate that a focus on transport, buildings and diets – three sectors where some tough choices have to be made and where consumer buy-in will be important, might need to be prioritised.

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?

There are also significant co-benefits associated with nature based solutions, such as peatland restoration and afforestation. These include improved biodiversity, air and water quality and flood risk mitigation. The net zero scenario considers only medium level ambition in the delivery of these interventions, while we think they should play a more significant role in mitigating emissions from land use.

Finally, promoting resource efficiency and demand reduction should be priority interventions to reduce emissions associated with industry and household consumption. Alongside cutting emissions in the UK, limiting resource inputs and ensuring they are used productively within the economy has important co-benefits ie reducing emissions elsewhere in global supply chains and minimising the environmental and human costs of extraction and production processes.

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: A few key things to consider/prioritise:

1. **Deployment as innovation**: it should be fairly obvious to an observer of the UK's energy system that the transition has been dramatic but largely owing to the fact that we witnessed cost reductions at an unprecedented scale. This was only possible through large scale deployment and therefore policy support should enhance deployment of clean technologies. Beyond renewables, we believe an immediate case for innovation can be made in deep house retrofits (eg. Energiesprong)

2. **Localism and community**: we have seen a tremendous interest in local authorities to tackle mitigation from the bottom up. The transition of the energy system towards more local/distributed base opens up a variety of possibilities of managing the transition with greater responsibility allocated locally (be it local councils or community energy groups). Policy advice from the CCC has largely been blind to this, perhaps for obvious reasons, but if this transition to net zero is to stand any chance of success, grassroots led bottom up action offers the most tangible way forward. The CCC could undertake some important research on the system-cost impacts of a more decentralised and distributed system with partial islanding of networks. Furthermore, it provides agency to actors at the local level to meaningfully address climate change.

3. **Technology lock-in:** The possibility of a lock-in to natural gas is real, particularly if the positive rhetoric around hydrogen shows much greater promise. There is ample reason to be wary of a gas lock-in that forces the UK to remain an importer of gas and subject to volatility of its pricing, particularly with dwindling north gas resources. There is a strong case for industrial growth in sectors such as CCS/SMR and the new possibilities of trade that opens, however, these options should not be viewed as default.

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4. **Demand reduction:** Our recent report highlighted the importance of demand reduction to get us on the path to net zero. Transport, buildings and industry all need to see a considerable reduction in demand and we believe that is possible with existing policy approaches. Within the context of a more climate aware citizenry, we think the opportunities are greater for behavioural changes than we have historically deemed possible. We have also quantified the co-benefits of demand reduction policies.

5. **Consumption emissions:** By 2030, the UK should have a robust approach to dealing with consumption emissions. Our report from 2018 highlights how cities can lead the way in tackling consumption based emissions. We believe consumption based emissions will soon emerge as an important political issue with implications for delivery of emission reduction and should therefore be considered more closely.

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: Most of the climate emergency declarations of UK's local areas are unrealistic from a technical delivery viewpoint but serve an important purpose of discussing and debating the challenge and solutions (particularly on transport and heat decarbonisation). We believe it is incredibly important for the committee to highlight the role of local areas/cities/towns in helping meet the carbon budgets.

They currently do not have a legal obligation and we believe they should not for the immediate future but local authorities, in our experience, are caught between a rock and a hard place. Pressure from constituents and a desire to do more on climate is driving ambitious targets but historic cuts to local authority funding and a lack of technical capacity is making it challenging for them to act.

We believe the committee should highlight policies that can be undertaken at the local level, with direct control from the local authorities and mayors that can contribute positively to the overall targets. A couple of specific examples include the opportunity for LAs to go above and beyond the national standards on new buildings and ability and resources to manage their local public transport systems.

An ongoing project of Green Alliance and UK100 will publish some of these policies, after deliberation with a group of local authorities, in July 2020.

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: A more thorough discussion is needed of who should be responsible for decarbonisation in which sector. This will become more pertinent if hydrogen and CCS

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increase gas prices in the same way that renewable energy deployment has increased electricity prices.

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:

1. Over half of car journeys made (58 per cent) are less than five miles. It is estimated that half of these trips could easily be substituted with walking and cycling.
2. Journeys of between five and 25 miles account for 43 per cent of car miles driven. These journeys could often be replaced by better public transport, particularly within and between cities
3. The potential to curb energy demand from transport could be much greater if medium length journeys were also targeted for switching to public transit, alongside approaches to reduce the need to travel at all.
4. Priority should be given to co-ordinating transport and planning objectives to reduce the need to travel. For instance, local authority housing targets should include the travel efficiency of new developments.
5. Greater investment in new and existing bus lanes, cycle & walking paths, public ownership of bus services and support for greater experimentation of shared mobility will be useful policy levers.
6. Clean Air Zones are another important lever to push for modal shift and reduce congestion while cleaning up air quality in city centres.
7. Workplace parking levies have been shown to be effective in Nottingham and many towns and cities in France as a mechanism which can fund local public transport whilst encouraging modal shift.

We believe the CCC's estimates are considerably conservative on modal shift and lot more can be achieved when adequate emphasis is given on modal shift, whilst highlighting the significant co-benefits of active walking and cycling.

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

ANSWER: As acknowledged by the Department for Transport, deployment of autonomous vehicles (AV) without efforts to promote extensive uptake of shared mobility could see vehicle miles increase by up to 70 per cent and exacerbate congestion. It is therefore essential that promoting shared mobility is seen as integral to the future deployment of AVs.

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: We believe the perceived barriers are broadly around the following:

3. **Ensuring a large supply of EVs**. If current rates sustain, over 2 million pure EVs need to be sold annually from 2030. OEMs see this as a considerable challenge, going from roughly 60,000 vehicles today.
4. **OEM investments** – with investment cycles around 6-7 years, if not longer, OEMs will need to make the switch to EVs very early in the 2020s to be able to transition smoothly.
5. **Brexit and EU regulation** – the political and regulatory climate is highly uncertain for OEMs to make significant decisions on retooling their factories in rapid time. Similar uncertainty prevails over supply chains and the ability to trade with Europe.
6. **Charging infrastructure** – from a demand point of view, inadequate or shoddy charging infrastructure will have a significant detrimental impact on the sales of EVs
7. **Consumer awareness –** There is a significant risk of consumer backlash, regardless of any perceived merits or demerits of such push back.
8. **Impact on vehicle markets –** it is hard to estimate the impacts on the market for ICE vehicles and the significant depreciation in their value.

Ways to mitigate them

1. **Double down on modal shift –** achieving the higher end of the possibilities for modal shifts will result in much less dependence on cars and that can go a long way in mitigating the supply challenge. The number of cars registered is reducing (with signs of a terminal decline).

2. **Charging infrastructure –** Ensuring a strategic delivery of charging infrastructure with the over £1bn that has been committed by the current government. This should include rapid charging across motorway service areas, achieving the goal of an access to a rapid charger within 30 miles of any consumer in the country.

3. **Consumer awareness –** the government should undertake a nationwide consumer awareness program on electric vehicles and modal shift, encouraging a steady shift away from ICE vehicles. A mix of fiscal and soft non-fiscal incentives will be necessary to make this shift alongside supporting a healthy cultural conversation around personal mobility.

With EVs expected to achieve upfront cost parity much sooner than the committee's assumptions and newer models hitting the markets regularly, we strongly believe a 2030 ban on sales of ICE is feasible and necessary to meet the demands of the climate emergency.

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: Resource efficiency should be prioritised across all manufacturing sectors. This will support business productivity by limiting resources costs and increase resilience through lower reliance on resource extraction and imports.

1. As proposed in our report *Lean and clean*, policy should incentivise innovation and scale up of low carbon and resource efficient supply chains in the UK, while government procurement policy, combined with ecodesign standards for energy and resource efficiency (applying both to consumer and industrial products), should drive lower carbon demand.

2. Emissions associated with construction and infrastructure projects accounted for about 10 per cent of UK emissions in 2014 and are due to increase as a share of buildings emissions. One of the main policy mechanisms to promote decarbonisation is to set requirements for whole life carbon assessment and targets for reduction.

The UK should set a roadmap for introducing requirements for the assessment of whole life carbon, targets for emission reductions and disclosure. All larger developments should be required to conduct a whole life carbon assessment by 2020, and the requirements should apply to all remaining developments by 2025. Targets for emissions reductions should be phased in from 2025 and apply to all developments by 2030.

3. Beyond technological innovation to develop low carbon NRMM, a further option to limit demand for NRMM is to support offsite construction methods and low carbon materials, which tend to be lighter. This enables much of the assembly to happen offsite and reduces the need for on-site excavation and heavy machinery.

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 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?

Our report *Lean and clean: building manufacturing excellence in the UK* highlights examples of policies that have successfully promoted energy and resource efficiency improvements in the manufacturing sector. This includes Japan's legal framework for the Effective Utilisation of Resources, which requires manufacturers to co-own reprocessing plants, so they can directly benefit from the recovered materials and components. And pre-commercial procurement by Sweden's innovation agency VINNOVA, used to de-risk innovations that could address environmental challenges.

There are also international examples of policy to tackle emissions from construction and infrastructure. The Netherlands set requirements for developments larger than 100m2 to assess embodied carbon in 2013 and in 2018 mandated an upper limit to the environmental impact of construction. Further examples of policy to tackle embodied carbon include Germany and Sweden.

Procurement can also play an important role in rewarding low carbon best practice and promoting innovation in low carbon manufacturing and construction. For example, the Buy Clean California Act requires state departments to set a maximum embodied carbon limit for construction materials such as steel, glass and insulation.

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?

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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?

a. The main evidence we have to suggest emissions could be cut quicker in the buildings sector is in the opportunities with deep house retrofits such as Energiesprong. Our recent report, supported by a host of other reputable organisations like the IET and Innovation catapults have endorsed this approach.
b. We believe this approach not just cuts emissions quickly but will address the crisis of productivity that has affected the construction sector over the last two decades (with fairly stagnant productivity rates since 1994).

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:

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:

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:

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:

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:
There needs to be a gross emissions target for aviation and this needs to include non-CO2 effects. We are advocating for separation of gross emissions and removals targets to avoid the perception of a licence to pollute. Demand management will be necessary through constraint of airport expansion and mechanisms such as taxing kerosene or frequent flyer levies.

Heathrow airport have proposed a mechanism of an environmental audit committee which would not allow further release of capacity if decarbonisation targets are not met. While this should not be used as a reason to allow Heathrow to expand, this could be a useful model for the sector nationally, whereby airports are not allowed to release landing slots unless they meet decarbonisation targets. Overall, the rate of decarbonisation must be greater than the rate of growth which is not the case in the industry roadmap (Sustainable Aviation report 2020) and there is a need to include non-CO2 effects in future gross emissions targets.

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: Given the substantial health benefits of more plant based eating, we recommend a greater level of ambition in accelerating the transition to low carbon diets and further quantification of the carbon benefits through land release from doing so.

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: As outlined in our response to question 8, we think that nature based solutions (particularly afforestation and peatland restoration) should play a more significant role in mitigating emissions from land use, in line with higher ambition scenarios that the CCC has investigated in its report on land use. These measures will bring a wealth of benefits to nature and society, while supporting a productive and resilient food system and promoting new supply chains for low carbon construction.

The target of 50% of upland peat is low considering the co-benefits to the water industry and flood prevention as well as large carbon savings. CEH has provided a lot of evidence in this area which points to higher ambition. Targets could be set alongside water industry asset management plan cycles.

The lowland peat target could be stretched, however, a credible methodology for rewetting and policy mechanism to incentivise this would be required. Demonstration projects would be helpful in this area.

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: