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: We agree with leading UK environmental NGOs that the target of reaching net-zero greenhouse gas (ghg) emissions by 2050 is an insufficient contribution to preventing warming greater than 1.5°C, and that far more ambitious year-on-year reductions in ghg emissions are required. However, we focus our response on the role of bioenergy and BECCS, and the importance of properly accounting for its ghg impacts in relation to climate targets. (See answer to Question 3 below).

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: n/a

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:

At present, all emissions from bioenergy are ignored in the UK's carbon accounting and carbon budget. A ghg methodology is used to establish whether biomass, biofuels or bioliquids are eligible for renewable energy subsidies or to count towards the Renewable Transport Fuel

Obligation (RTFO). Nonetheless, the ghg emissions calculated for this purpose are ignored in UK carbon accounting for the energy or transport sector. These emissions are also ignored in the context of the UK's national emissions reporting if they arise overseas, as in the case of imported biomass feedstock (e.g. wood pellets imported from the southeastern USA).

Secondly, the methodologies used for subsidy and RTFO purposes are not grounded in science. In the case of biofuels and bioliquids, all Indirect Land Use Change (ILUC)

emissions are ignored. In the case of solid biomass, smokestack emissions are assumed to be zero. A report published by the Department of Energy & Climate Change (DECC) in 2014 highlighted that it was possible for bioenergy to "lead to high GHG intensities (e.g. greater than electricity from coal, when analysed over 40 or 100 years)" and yet be classified as meeting standards for ghg reductions under the methodology used under UK renewable heat and power subsidy regulations.[1]

Ignoring the very real emissions from bioenergy misrepresents the UK's overall ghg emissions and incentives pathways which, whilst reducing ghg emissions on paper, will do nothing to reduce ghgs going into the atmosphere from UK activities, and in many cases increase emissions as much or even more so than equivalent amounts of energy generation from fossil fuels.

In the Annex to this submission, we share a list of relevant studies highlighting the need to account for bioenergy emissions.

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:

The UK remains the world's biggest importer of wood for energy and it relies more heavily on wood for so-called renewable electricity than any other country in Europe, and likely in the world.[2] Coal power station conversions in the UK, especially Drax's conversion of four units, are being cited by energy companies and policymakers around the world as an example to follow. Yet, as discussed, clear and compelling scientific evidence suggests the UK is dramatically undercounting the true ghg emissions impacts of these coal-to-biomass conversions.

At the same time, the UK continues to spend billions subsidising this technology instead of genuinely clean and renewable energy sources like solar and wind, as well as smart resources such as batteries and forest conservation efforts. If the UK decided to redirect subsidies for biomass electricity towards non-emitting renewable energy, it would reduce ghg emissions, set a positive international example of science-based policy reform, and reduce pressures on forests, especially in the southeastern USA.

Furthermore, we are deeply concerned that the UK, with support from the Committee on Climate Change, is seeking to become a pioneer of BECCS technology, based primarily on Drax's claims about the potential to capture smokestack CO2 emissions from its biomass units in the future. Drax's claims about creating a "carbon negative" power station are based on the same flawed carbon accounting that underlies support for standalone biomass electricity—in particular, on the erroneous assumption of biomass "carbon neutrality," which is the basis for the assumption that BECCS would be carbon negative. Given the UK's prominent role within the Powering Past Coal Alliance and its hosting of COP26, UK policy decisions over BECCS will be internationally important.

[1] Life Cycle Impacts of Biomass Electricity in 2020, Dr Anna L Stephenson Professor David J C MacKay FRS, DECC, July 2014

[2] Burnout: E.U. Clean Energy Subsidies Lead to Forest Destruction, NRDC, November 2019, https://www.nrdc.org/sites/default/files/burnout-eu-clean-energy-policies-forest-destruction-ip.pdf

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: n/a

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:

The UK's 'net zero' strategy must not be based on the assumption that BECCS is feasible and that it would be carbon negative. On the contrary, the UK's experience with biomass electricity suggests that large-scale reliance on burning biomass from forests would set back climate efforts and risk untenable ecological costs.

Only one technological pathway for BECCS has ever been demonstrated, and that involves the capture of CO2 from ethanol fermentation, which has been demonstrated in the US state of Illinois. However, the amount of CO2 captured at that ethanol refinery is far smaller than the amount of CO2 emitted from fossil fuel burning to power the refinery;[3] hence it cannot be described as 'carbon negative.' Further, as your 2018 report "Biomass in a Low-Carbon Economy" rightly points out:

"*Biofuels are used in the UK today in road vehicles and are mostly comprised of bioethanol from fermentation of crops such as wheat, corn and sugar beet, and biodiesel made from waste fats, such as used cooking oil and tallow. Sustainability concerns have increasingly highlighted the need to move towards advanced biofuels conversion processors. These processes are the subject of current research, with some demonstration plants in operation, but they are not yet widely deployed."*

Greater reliance on first generation ethanol production for BECCS would clearly be problematic due to the necessary land use change and associated ghg emissions, and cellulosic ethanol production remains in the R&D stage.

Capture of CO2 from any other bioenergy process has never been demonstrated. Drax's pilot project involves capturing 1 tonne of CO2 per day and then releasing it again to the atmosphere. At this stage, the novel solvent involved is about to be tested independently for the first time in Norway, which means that this process is in the very earliest R&D stages. Given that carbon capture has never been tested on flue gases from biomass plants, and that the size of the energy penalty is not known, the technical availability of such technologies cannot be assumed.

Critically, carbon capture technology can only capture the majority of smokestack emissions, not all of them; it cannot mitigate the carbon lost when a tree is cut and replaced by a seedling – or not replanted at all. In other words, it cannot make up for the resulting loss in the ability of forests to continue to absorb and store CO2 when trees are harvested for large-scale energy production.

[3] https://www.carbonbrief.org/analysis-negative-emissions-tested-worlds-first-major-beccs-facility

Drax's supply chain is high-carbon and relies entirely on imported wood, most of it sourced directly from forests (as opposed to sawmill residues and other genuine industrial wastes). New research shows that even when Drax's pellets come from so-called "sustainably managed" forests— the claim for Drax's company-owned pellet mills in Louisiana and Mississippi— burning those pellets for electricity increases CO2 concentrations in the atmosphere for more than 40 years when compared to the average carbon intensity of the National Grid. And there is no evidence that Drax is divesting from this supply chain. On the contrary, the company announced plans to increase the biomass it supplies to Drax Power Station from 1.2 million to 5 million tonnes per year.

What's certain is that a biomass plant with CCS would need to burn more wood per unit of energy. Already, Drax burns significantly more wood than the UK produces annually, yet its biomass units generate less than 0.8% of the UK's final energy demand. Increased logging for biomass energy depletes forest carbon sinks (including forest soils) and reduces the amount of carbon that would be sequestered if the same forests were allowed to grow undisturbed. Leaving forest ecosystems to grow is the most effective proven way of removing carbon from the atmosphere, and thus vital for keeping warming to 1.5 degrees. BECCS linked to wood-based bioenergy, on the other hand, would require more logging and thus reduce rather than increase natural carbon sinks.[4] The impacts of pellet production on forests are documented in reports listed in the Annex.

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: n/a

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: n/a

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: We believe that biomass electricity subsidies must end and the savings be redirected to genuinely non-emissive and renewable energy alternatives. This must happen far sooner than in the 2030s, given the urgency of near-term emissions reductions. Research conducted by Vivid Economics, which your Committee is aware of and has cited in prior reports, demonstrated that steep decarbonisation of the UK power system is possible by 2030 without reliance on expensive and controversial biomass and without

[4] Intact Forests in the United States: Proforestation Mitigates Climate Change and Serves the Greatest Good, William R. Moomaw et.al. Front. For. Glob. Change, 11 June 2019

compromising system reliability. The analysis concluded that as soon as 2021, the UK can meet year-round electricity demand with a grid increasingly dominated by solar and wind—and no biomass, even under the most challenging conditions.

In the future, we hope that there will be no subsidies for biomass electricity but only for wind, solar and other non-emissive renewables, as well as for energy conservation, efficiency and smart resources, such as investment in electricity storage. We also hope that there will be no public funding or other incentives for BECCS.

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: n/a

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: n/a

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: n/a

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: n/a

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: n/a

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: n/a

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

ANSWER: n/a

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: n/a

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: n/a

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

ANSWER: n/a

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: n/a

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: n/a

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:

At present, wood-based bioenergy is primarily used for electricity generation and does not play a major role in industry. However, we urge the CCC and policymakers to apply the lessons from the adverse impacts of large-scale forest biomass use in the power sector to all sectors. Incentivising large-scale reliance on woody biomass-burning in steel production, for example, could drive the very same adverse impacts on forests, climate and communities that we are seeing from wood-based electricity.

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: n/a

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

ANSWER: n/a

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: n/a

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: n/a

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: n/a

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: n/a

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:

Please see our comments above. Whichever models and policy instruments are chosen, they must focus support on genuinely non-emissive and renewable energy sources like solar and wind, supporting smart resources (e.g. storage), and energy conservation and efficiency. They should not support high-carbon sources of energy, including from forest biomass.

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: n/a

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: n/a

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: n/a

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: n/a

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: n/a

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:

Please see our comments above. BECCS technologies (other than CO2 capture from ethanol fermentation) are not technically proven yet. Furthermore, as studies related to the climate impacts of biomass electricity and ILUC linked to crop-based bioenergy show, large-scale bioenergy is not carbon neutral, and therefore combining it with CCS cannot make it carbon negative (i.e. result in atmospheric 'ghg removals').

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: n/a

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: n/a

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: n/a