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:

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?

A strengthened NDC around 2030 is the strongest indication of the UK's intent to be a leader in climate change.

As one of the first major economies to legislate for net-zero, a revised and strengthened NDC is a strong positioning tool for other countries to follow suit whilst maintaining the momentum behind our own domestic commitment. Around the world, we are seeing other countries starting to form their own commitments. For example, in Europe, the new European Commission is debating its proposed Green New Deal which would similarly aim to legislate for net-zero across Europe.

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?

BEIS figures (Energy Trends, December 2019) show that individual and household consumers account for 29% of all energy consumed in the UK. Additionally, 66% of the energy consumed by domestic consumers comes from hydrocarbons.

Consumers, through their evolving demand for energy, have a large and significant role in driving emissions reductions as their consumption habits change to reflect the growing awareness of the need to contribute to reducing the impacts of climate change.

For individual and household consumers, Government should be encouraged to incentivise changes in consumer behaviours that shifts demand towards green energy products and energy efficiency initiatives, or through policy that can facilitate technological shift to better options.

For example, accelerating the usage of alternative fuel vehicles (such as EVs or hydrogen and green gas buses) or heat pumps offers a credible and visible way of measuring emissions reductions and could be facilitated through policy. Ørsted has welcomed the recent policy announcement that will accelerate the end of the sale of petrol and diesel vehicles by 2035.

In the same way European Emissions Standards like Euro 6 provides a policy pathway for internal combustion engine technology to become cleaner, the UK Government's introduction of policy to end the sale of petrol and diesel calls altogether accelerates the technological shift that offers consumers better zero-emissions vehicle choices.

As an electricity supplier in the B2B sector, our business customers choose to sign with Ørsted as a means to access a 100% green electricity supply. Within our sector, we see the small but emerging development of a green Power Purchase Agreement (PPA) market from large energy users who are demanding and committing to long-term offtake of clean, green energy. This can be driven by both a natural demand for clean energy from customers, but also through effective carbon pricing and policies that seek to place limits on emissions.

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?

The Committee on Climate Change's own report on net-zero states that *'all options that can help to meet a net-zero target domestically should be explored fully. Single transition pathways, which rely on all technologies and measures succeeding are too risky and inflexible' (p190).* We share this view, but our experience in deployment at scale of offshore wind has helped inform our views on how risks and costs are lowered.

From an emerging technology perspective, the largest uncertainty remains in the deployment pathways of new technologies that will be required to achieve net-zero in a cost-efficient manner. Whilst different areas of the economy may require a different approach, there should be an underlying focus on supporting the deployment emerging technologies such as electrolysis through to delivery at scale, which would not only facilitate decarbonisation, but lower costs.

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?

Within electricity generation, Government has been rewarded through promoting the deployment of renewable energy through stable policy over successive governments that have promoted deployment and attracting investment whilst gradually introducing competition to reduce costs. Offshore wind is the best example of this where we have seen costs drop from £119.89/MWh to £39.65/MWh in three successive auction rounds under the Contracts for Difference regime. The Government's Sector Deal with the offshore wind industry to deliver 40GW by 2030 (source: Queen's speech briefing notes, 2019) has also provided certainty to this industry that has allowed investment to be made. We believe a similar level of success can be achieved to emerging technologies such as electrolysis if a similar plan is developed by Government. At present whilst there is innovation funding to develop electrolysis to commercial scale, there is no mechanism to deploy the technology at scale that would then allow cost reductions to occur.

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:

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:

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:

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?

We believe that the Contracts-for-Difference (CfD) mechanism is a successful policy instrument in lowering the cost of delivering emerging technologies and enabling them to become mainstream choices in the UK generation mix.

The CfD mechanism's success comes from the overall policy direction that the CfD was set under via Electricity Market Reform, which was to address the energy trilemma of maintaining security of supply whilst decarbonising the energy sector whilst maintaining affordability to consumers. It has done this by offering a CfD framework that promotes competition through careful auction design whilst offering revenue-stabilisation that lowers the risk to billion-pound infrastructure investment. At the same time, a Capacity Mechanism (CM) is in place to maintain security of supply, which now also has emissions limits in place for future CM rounds.

We are now able to see the success of the CfD mechanism as costs have lowered by 67% from the first allocation round in 2014 compared with the most recent results in 2019 under the third allocation round. Government projects that this most recent round would have zero budget impact (source: BEIS 2019 CfD AR3 Results announcement). The results of the third allocation round come below Government power price projections. This demonstrates the value of revenue stabilisation in securing a project to a developer, as well as rewarding consumers with successive projects at lowering cost, whilst meeting Government and societal objectives.

The EMR's underlying drivers of addressing the energy trilemma can be viewed as a successful policy model that other countries are seeking to replicate (i.e. European models for supporting offshore wind, and some European Member States are also thinking of implementing CM). We believe that the Government will need to continue to set the policy objective of addressing the trilemma in future policy.

A future power system without the CfD mechanism would result in the loss of the revenue-stabilisation mechanism as well as a successful, competitive means of procuring zero-carbon energy. Without the means to stabilise revenues, the risk profile of delivering large-scale infrastructure, regardless of sector, increases and presents a significant risk to securing finance and reaching final investment decision.

Within the energy sector, we do see an emerging market for corporate Power Purchase Agreements (cPPA), and with Northumbrian Water, Ørsted signed the first offshore wind power cPPA for 30% of the output of our 573MW Race Bank project. However, cPPAs remain a very small market which cannot provide an alternative pathway to secure the 40GW of offshore wind by 2030 required by the UK Government.

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?

It will be important for CCC to account for the UK Government's upgraded pledge to deliver 40GW of offshore wind by 2030, up from 30GW. This increases the delivery of offshore wind from an average of 2GW/yr to 3GW/yr over the next decade.

Facilitating this level of build-out will require closer cooperation with all stakeholders such as environmental, planning, consenting bodies, National Grid as well as supply chain to ensure enhanced delivery against not only decarbonisation, but with all stakeholders in mind

The offshore wind sector is also predicted to play a substantial role in the next stage of innovations on a pathway to net zero. As costs of developing a conventional offshore wind farm come down, there is merit to exploring the potential incorporation and co-location of battery storage in wind farms and the development of renewables hydrogen as a means to seek further efficiencies from integrated solutions and unlock system benefits.

In order to realise these opportunities, mechanisms like the CfD will continue to play a strong role in providing a route to market.

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?

Ørsted was involved in Phase 1 of the BEIS Hydrogen Supply Competition with ITM Power and Element Energy to look at creating a stackable 100MW electrolyser facility powered by offshore wind. This would enable zero-carbon hydrogen to be deployed at commercial scale, which could be applied in sectors that are difficult to electrify. The falling cost of deploying renewable energy also means that it is becoming increasingly viable to create hydrogen from electrolysis. The latest results from the third allocation round achieved strike prices as low as £39.65/MWh (in 2012 prices) which is 67% lower than the results from the first allocation round in 2014, only six years ago.

Government has already committed to providing research and innovation funding via the Hydrogen Supply Competition, Industrial Energy Transformation Fund, and the Low Carbon Hydrogen Production Fund. These funds are valuable to bringing low-carbon hydrogen production into the commercial-scale required to meet the decarbonisation challenge, but a further mechanism to deploy the technology at scale is when real cost reductions are experienced that brings value to consumers.

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?

The industrial learnings from the mass deployment of offshore wind can also apply to electrolysis, which can also see costs fall as economies of scale are realised, and as learnings are spread through the industry. In the same manner that Contracts-for-Difference facilitated the mass deployment of offshore wind that resulted in costs falling, a similar competitive mechanism for electrolysis could also reap similar rewards.

The CCC correctly identifies some of the areas of application for hydrogen within the economy, namely to namely to service demands for some industrial processes, transport, as well as heating. We believe the early uptake of low carbon hydrogen to go into industrial and transport sectors.

These sectors have difficult to electrify segments that make use of low-carbon hydrogen more appropriate and are already the first to go ahead with exploring the use of low-carbon hydrogen. These sectors are also first movers as they are not necessarily dependent on major national infrastructure reform such as a creation of a hydrogen gas network or national refuelling network. They can produce and consume hydrogen on-site or use a single production consumption point to fuel a local network.

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: