Building a zero-carbon economy – Call for Evidence

Background

On 15 October 2018 the governments of the UK, Scotland and Wales asked the Committee on Climate Change (CCC) to provide advice on the UK and Devolved Administrations' long-term targets for greenhouse gas emissions and the UK's transition to a net zero-carbon economy. Specifically: when the UK should reach net zero emissions of carbon dioxide and/or greenhouse gases as a contribution to global ambition under the Paris Agreement; if that target should be set now; the implications for emissions in 2050; how such reductions can be achieved; and the costs and benefits involved in comparison to existing targets.

The advice has been requested by the end of March 2019.

The UK's long-term emissions target is currently for at least an 80% reduction in greenhouse gas emissions from 1990 to 2050. It covers all sectors, including international aviation and shipping and is measured on a 'territorial' basis (i.e. based on emissions arising in the UK). On a comparable basis, emissions in 2017 were estimated to be 38% below 1990 levels.

The current target was set in 2008 based on advice from the Committee. That advice considered that to avoid the worst impacts of climate change, the central expectation of global temperature rise should be limited "to, or close to, 2°C", while the probability of crossing "the extreme danger threshold of 4°C" should be reduced to an extremely low level. That meant global emissions would roughly have to halve by 2050. The 2008 advice made the assumption that the UK should not plan to have a higher level of per capita emissions in 2050 than the global average.

The long-term target guides the setting of carbon budgets (sequential five-year caps on emissions that currently extend to 2032 and require a reduction in emissions of 57% from 1990 to 2030). 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).

Any change to the long-term targets would therefore be expected to have significant implications, not just in the long-term but on current policies to drive the transition.

The CCC will advise based on a thorough consideration of the relevant evidence. We expect that to cover:

- The latest climate science, including as contained in the IPCC Special Report on 1.5°C.
- The terms of the Paris Agreement.
- Global pathways (including those reported by the IPCC) consistent with limiting global average temperature rise in line with the goals of the Paris Agreement.

- International circumstances, including existing plans and commitments to cut emissions in other countries, actions to deliver on those plans and opportunities for going further.
- An updated assessment of the current and potential options for deep emissions reductions in the UK and emissions removals from the atmosphere, including options for going beyond the current 80% target towards net zero.
- An appraisal of the costs, risks and opportunities from setting a tighter long-term target.
- The actions needed in the near term that would be consistent with achieving the long-term targets.

This Call for Evidence will contribute to that advice.

Responding to the Call for Evidence
We encourage responses that are brief and to the point (i.e. a maximum of 400 words per question, plus links to supporting evidence, answering only those questions where you have particular expertise), and may follow up for more detail where appropriate.

You do not need to answer all the questions, please answer only those questions where you have specific expertise and evidence to share. It would be useful if you could use the question and response form below and then e-mail your response to: communications@theccc.gsi.gov.uk using the subject line: 'Zero carbon economy – Call for evidence'. Alternatively, you can complete the question and answer form on the CCC website, available here.

If you would prefer to post your response, please send it to:

The Committee on Climate Change – Call for Evidence
7 Holbein Place
London
SW1W 8NR

The deadline for responses is 12 noon on Friday 7 December 2018.

Confidentiality and data protection
Responses will be published on our website after the response deadline, along with a list of names or organisations that responded to the Call for Evidence.

If you want information that you provide to be treated as confidential (and not automatically published) please say so clearly in writing when you send your response to the consultation. It would be helpful if you could explain to us why you regard the information you have provided as confidential. If we receive a request for disclosure of the information we will take full account of your explanation, but we cannot give an assurance that confidentiality can be maintained in all circumstances. An automatic confidentiality disclaimer generated by your IT system will not, of itself, be regarded by us as a confidentiality request.

All information provided in response to this consultation, including personal information, may be subject to publication or disclosure in accordance with the access to information legislation (primarily the Freedom of Information Act 2000, the Data Protection Act 1998 and the Environmental Information Regulations 2004).

Question and response 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 response to a maximum of 400 words per question.

Part 1: Climate Science

Question 1 (Climate Science): The IPCC's Fifth Assessment Report and the Special Report on 1.5°C will form an important part of the Committee's assessment of climate risks and global emissions pathways consistent with climate objectives. What further evidence should the Committee consider in this area?

ANSWER: Not appropriate for Combined Authority comment.

Question 2 (CO_2 and GHGs): Carbon dioxide and other greenhouse gas gases have different effects and lifetimes in the atmosphere, which may become more important as emissions approach net-zero. In setting a net-zero target, how should the different gases be treated?

ANSWER: It is the Combined Authority's view that all different gases should be treated as a carbon dioxide equivalent.

Part 2: International Action

Question 3 (Effort share): What evidence should be considered in assessing the UK's appropriate contribution to global temperature goals? Within this, how should this contribution reflect the UK's broader carbon footprint (i.e. 'consumption' emissions accounting, including emissions embodied in imports to the UK) alongside 'territorial' emissions arising in the UK?

ANSWER: A consumption-based target may be beneficial, as this would demonstrate the carbon and energy efficiency of goods and services produced in the UK. Currently we compete against countries that may have less stringent environmental regulation generally, and lower carbon taxes specifically. It would help to demonstrate the efficacy of Carbon Capture and Storage (CCS). This is particularly important in areas such as Tees Valley, where a number of businesses located in the region are energy intensive and at risk of carbon leakage. If the regulatory approach in the UK is unattractive to such businesses, then there is a significant risk that they will relocate to other countries that are less restrictive. For this reason, consumption based emissions reduction targets, may support the decarbonisation of UK industry, and ensures we can play a clear role in developing global solution.

Question 4 (International collaboration): Beyond setting and meeting its own targets, how can the UK best support efforts to cut emissions elsewhere in the world through international collaboration (e.g. emissions trading schemes and other initiatives with partner countries, technology transfer, capacity building, climate finance)? What efforts are effective currently?

ANSWER: We support collaborations such as the Carbon Capture and Storage Research Centre, which provides a national focal point and integrates activity to undertake world-leading research and build capacity that can maximise the contribution of CCS to a low-carbon energy system, for the UK and internationally.

Question 5 (Carbon credits): Is an effective global market in carbon credits likely to develop that can support action in developing countries? Subject to these developments, should credit purchase be required/expected/allowed in the UK's long-term targets?

ANSWER: Not appropriate for Combined Authority comment.

Part 3: Reducing emissions

Question 6 (Hard-to-reduce sectors): Previous CCC analysis has identified aviation, agriculture and industry as sectors where it will be particularly hard to reduce emissions to close to zero, potentially alongside some hard-to-treat buildings. Through both low-carbon technologies and behaviour change, how can emissions be reduced to close to zero in these sectors? What risks are there that broader technological developments or social trends act to increase emissions that are hard to eliminate?

ANSWER: The Combined Authority supports the Carbon Capture & Storage Association's response to this question, which notes that decarbonisation of Energy Intensive Industries can be partially achieved by switching to renewable fuel sources, and by investing in energy efficiency. However, for industries which produce CO_2 as part of their manufacturing process, of which there are many at the cornerstone of the Tees Valley economy, CCS is the only way to remove these emissions.

The BEIS Industrial Decarbonisation action plans (2017) concluded that CCS could provide up to 37% of total emissions reductions across 8 energy intensive sectors. Europe's Energy Intensive Industries also recently highlighted CCS as one of 6 key solutions for meeting a net-zero target.

Switching to lower carbon feedstocks from the valorisation of waste and low carbon hydrogen has the potential to significantly reduce industrial emissions. Tees Valley presents a major opportunity in this area. The business base, infrastructure and natural assets that exist here, make the region a prime location to develop a national Hydrogen Centre, which can play a key role in facilitating the national move to low carbon energy solutions. CCS is critical to achieve this. As the Committee on Climate Change highlighted in its recent report on hydrogen, existing projects capturing CO_2 from the hydrogen production process result in 65-85% CO_2 savings. This is because the emissions from Steam Methane Reformer are not captured. However Autothermal Reforming of methane can reach around 95% capture, as it removes the need for an SMR.

Both CCS and low carbon hydrogen can be deployed in industrial clusters. Tees Valley

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potentially has the most to offer nationally in terms of the number of industrial plants located in close proximity, which can benefit from economies of scale. The Energy Systems Catapult recently concluded that CCS power generation can form part of the lowest cost pathway to power sector decarbonisation. Power generation with CCS could also enable the development of clusters by providing a large source of captured CO_2 whilst generating valuable clean firm power.

Continued targeted funding for innovation, plus an incentive for industrial CO_2 capture will be vital for technologies such as these to be deployed at scale, and Tees Valley could be a valuable national testbed.

Question 7 (Greenhouse gas removals): Not all sources of emissions can be reduced to zero. How far can greenhouse gas removal from the atmosphere, in the UK or internationally, be used to offset any remaining emissions, both prior to 2050 and beyond?

ANSWER: The role of Greenhouse gas removal will be essential to offset difficult or very expensive to abate emissions. Bioenergy and production of bio-fuel with CCS (BECCS) can play a significant role. Tees Valley presents a significant opportunity to utilise waste products from heavy industry, for example Europe's first bio-ethanol plant of its kind was developed in the region.

Recent research, including that from IPCC and Vivid Economics highlights the importance of removing emissions from sectors such as aviation and agriculture, which require behavioural as well as technological shifts. Whilst this presents one solution to achieve Greenhouse Gas removal, it requires a significant change globally in diet, population and energy use. This reinforces the importance of pursuing alternative pathways, including bioenergy with CCS.

The Committee on Climate Change's recent work demonstrates that as far as possible, use of biomass should be focused on construction and BECCS to achieve maximum emissions reduction. BECCS can encompass power generation, fuel and hydrogen production from biomass. The amount of BECCS that is feasible is dependent on availability of sustainable biomass, and is estimated to be in the range of 65 $MtCO_2e/yr$.

Targeted support will be needed to incentivise BECCS. This is particularly important to support industrial emitters to meet UK targets. Government is undertaking a review as to how Greenhouse Gas removal can be incentivised. However there is currently a lack of strategy on deployment, including timing for implementation. Implementing Greenhouse Gas removal at scale will require a significant lead-in time and investment in BECCS is unlikely until CCS infrastructure is in place. Therefore early decisions on CCUS infrastructure are time critical.

The recent announcement of the world-first multi billion pound energy project in Teesside is a clear step in the right direction. This will see a consortium of 6 global companies create a power plant in Tees Valley that will run on clean gas. It will deploy full-chain CCUS at scale, meaning CO_2 from the plant will be captured and then stored via pipelines under the

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North Sea. The infrastructure created will also enable wider industry to capture and store CO_2 from their processes. We are keen to ensure that this approach is supported and built upon in the future to offset emissions from industry.

Question 8 (Technology and Innovation): How will global deployment of low-carbon technologies drive innovation and cost reduction? Could a tighter long-term emissions target for the UK, supported by targeted innovation policies, drive significantly increased innovation in technologies to reduce or remove emissions?

ANSWER: Commercial deployment of low carbon technologies is critical to reducing costs. As noted above, Tees Valley provides the optimum location for rapid deployment, with well developed plans to implement CCUS at scale, creating opportunities for decarbonisation of transport, heat and industry through decarbonised hydrogen production. Developing CCUS in the UK as rapidly as possible will allow maximum potential to develop solutions that can also help other countries to decarbonise.

In the Clean Growth Strategy, Government committed £100m to innovation in CCUS technologies, some of which has been allocated to various competitions for CCU, CCS and hydrogen production. This is very welcome, and Tees Valley demonstrates the scale of potential, with a commercial deployment programme. It is critical that these solutions are supported to have practical application in the timeframe in which the UK will be required to meet a net-zero emissions target.

Setting clearer expectations through tighter long-term emissions targets could drive behaviour change, provided the right support mechanisms are in place. The decision to phase out coal is an example of where clear policy has driven behaviour change. This required a high-level ambition (phase out by 2025), a market mechanism (Carbon Floor Price) and a targeted set of policy instruments (CfDs and Capacity Market). A similar approach is needed to drive investment in low carbon technologies.

Question 9 (Behaviour change): How far can people's behaviours and decisions change over time in a way that will reduce emissions, within a supportive policy environment and sustained global effort to tackle climate change?

ANSWER: For Tees Valley with its heavy industrial base, the primary benefits to reduce emissions will come from de-carbonising industry. However behaviour change is also critically important at a global level. There are opportunities to pilot behaviour change alongside the industrial approach to maximise impact. This could include use of smart technologies, for example to manage loads on gas and electricity networks via use of storage (the smart grid concept). Smaller scale demonstrations to promote acceptance are also essential – this could include deployment of Hydrogen for heat and transport as well as novel technologies (for UK) such as heat pumps.

District heating will need to be deployed which will require a consumer friendly approach or it will flounder. The approach needs to ensure reliability is better than existing systems to avoid further any disruption, and installing systems needs to be carefully handled. Also the mechanism for paying for these developments will need to be most carefully explained and sold to the bill or tax payers.

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Transport has a large impact on emissions and there is a need to be more pro-active in supporting more sustainable transport options and provide incentives to alternatives to the use of the car and also make other forms of transport more effective in reducing emissions.

The potential introduction of hydrogen fuelled buses and trains as an initial starting point would make a major difference if linked to the renewal of fleet. This would potentially provide the infrastructure that would allow the investment to also be used by private cars and other fleets, including haulage. The development of hydrogen fleets in the Tees Valley has significant potential due to the availability of the resource as a by-product of industry. The area could provide an exemplar of hydrogen based transport provision and develop the local economy accordingly.

Bus patronage is falling within the Tees Valley and therefore there is a need for the public sector to look to investments that can provide greater prioritisation to bus usage. Current resource availability is insufficient. Additionally, there is a need to a greater level of investment in infrastructure to support walking and cycling.

Question 10 (Policy): Including the role for government policy, how can the required changes be delivered to meet a net-zero target (or tightened 2050 targets) in the UK?

ANSWER: The need for clear and consistent policies is critical.

CCS is unique in its ability to provide a decarbonisation solution across power, heat and transport (via low carbon energy production), industry and Greenhouse Gas removal. As the CCUS Cost Challenge Taskforce noted, to meet the Committee on Climate Change's estimate of up to 180MTCO_2 being stored per year by 2050, a rapid ramp-up of deployment is required from 2035. This requires a sensible industrial deployment strategy to build an industry and supply chain that is capable of rapid scale-up. Clear and consistent policy signals and sustained engagement across Government and industry will be essential to achieve this. The delivery of projects in the 2020s will be critical to ensure that CCS remains an option for the UK to meet its climate change targets.

Investment mechanisms for the development of CO_2 transport and storage infrastructure, industrial capture and CCS projects need to be decided in 2019 to enable investors to make decisions in the early 2020s. The direction of travel has been set in Tees Valley, with the recent announcement of the Clean Gas Project (referred to above), and it is critical to ensure that this momentum is maintained and supported to ensure that benefits are achieved at scale. A Government review of investment mechanisms is underway, and there must be no delay in public consultation on this in early 2019.

Designated funding is needed immediately to enable CCS cluster design and FEED studies for projects. Learning from pilot activity in areas such as Tees Valley can also help determine a future national approach. The Industrial Challenge Strategy Fund is a potential source of funding.

To ensure effective co-ordination between clusters and the different elements of the CCS supply chain, a CCS delivery or oversight body should be established. This was a recommendation of the Parliamentary Advisory Group on CCS and the CCUS Cost

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Challenge Taskforce.

There is also a short-term opportunity to bring down the cost of delivery time of CCUS projects by repurposing existing assets such as pipelines, and thereby establishing a base infrastructure. However these assets are at risk of infrastructure decommissioning decisions. The CCUS Cost Challenge Taskforce recommended that industry and Government move quickly to identify oil and gas infrastructure at risk of being decommissioned over the next 5-10 year, which could be retained as strategic assets for CCS. We support this recommendation.

Without the clear incentives of regulation or taxation the policy signals and sustained engagement are likely to under deliver. Therefore it would be useful to understand the benefit of the introduction of a carbon emissions price or floor price across all industries and activities, not just power.

Part 4: Costs, risks and opportunities

Question 11 (Costs, risks and opportunities): How would the costs, risks and economic opportunities associated with cutting emissions change should tighter UK targets be set, especially where these are set at the limits of known technological achievability?

ANSWER: Achieving the required targets for 2050 are already challenging for business. There is a risk that if the targets are tightened, some businesses could chose to move operations to alternative countries, where regulations are less restrictive (carbon leakage). This would not only have a catastrophic effect on the UK economy, it would also simply move the problem, and not support the achievement of a global reduction in emissions. It is therefore essential that the transition to 2050 is managed effectively and that businesses are supported throughout the process.

Question 12 (Avoided climate costs): What evidence is there of differences in climate impacts in the UK from holding the increase in global average temperature to well below 2°C or to 1.5°C?

ANSWER: Not appropriate for Combined Authority comment

Part 5: Devolved Administrations

Question 13 (Devolved Administrations): What differences in circumstances between England, Wales, Scotland and Northern Ireland should be reflected in the Committee's advice on long-term targets for the Devolved Administrations?

ANSWER: Not appropriate for Combined Authority comment

Part 6: CCC Work Plan

Question 14 (Work plan): The areas of evidence the Committee intend to cover are included in the 'Background' section. Are there any other important aspects that should be covered in the Committee's work plan?
ANSWER: We agree with the areas identified by the Committee. In addition, we propose considering the economic opportunities for decarbonisation, along with the implications for the resilience of UK infrastructure.