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:

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:

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:

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:

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:

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:

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?

Greenhouse gas removal through BECCS and afforestation could offset remaining emissions prior to 2050 and out to 2100. Our work indicates it may be challenging to reach the amounts assumed in future scenarios, thus requiring either alternative greenhouse gas removal methods or more action on emissions reduction.

Integrated Assessment Models (IAM) used to explore future emissions pathways use afforestation and biomass energy with carbon capture and storage (BECCS) for greenhouse gas removal in 1.5°C, 2°C and 2.5°C scenarios[1,2,3]. Our analysis of 1.5°C and 2°C scenarios, in one IAM, show BECCS use increasing from 2020 onwards to store up to 7-14 $GtCO_2$ per year by 2100[4]. In these scenarios half of the biomass is from agricultural and forestry residues and half from energy crops. These are grown in 12 regions in the model and one third of these are developed (including western Europe). Western Europe together with USA, India and China account for 55-58% of all CO_2 stored from both fossil and biomass sources[4].

Our analysis highlights concerns with two key assumptions. First, the CCS deployment rates are very challenging compared to historical rates of fossil, renewable or nuclear technologies and entirely dependent on stringent policy action to incentive CCS. Second, in the model land for food production and primary forests is protected and energy crops are grown on abandoned agricultural land and expansion into natural grassland. However, delivering this in the real world is highly dependent upon strong governance and regulatory frameworks[4].

Our expert elicitation with stakeholders from policy, academia, business and non-governmental organisations explored nine key assumptions about BECCS in future scenarios. The results suggest that technical aspects of CCS are sound, but concerns were raised about the expansion of bioenergy (e.g. land availability, future yield improvements), the lack of necessary policy frameworks to incentivise CCS and regulate sustainable biomass production and the social acceptability of BECCS[5].

Analysis of the land use implications of BECCS cautions that the CO_2 stored can be offset by emissions from land use change if energy crops replace high-carbon content ecosystems (e.g. boreal forests)[6]. There is disagreement amongst IAMs, other land models, and field-based measurements about the productivity of bioenergy crops under climate change[6,7,8].

[1]Fuss et al 2014 tinyurl.com/y73turrw [2]Bauer et al 2017 tinyurl.com/yasefqo6 [3]IPCC 2018 tinyurl.com/ydxvgtdl [4]Vaughan et al 2018 tinyurl.com/ybwrhdtq [5]Vaughan & Gough 2016 tinyurl.com/yav8j5vj [6]Harper et al 2018 tinyurl.com/y8arnz7e [7]Li et al 2018

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tinyurl.com/yc3laqkv [8]Kruase et al 2017 tinyurl.com/y6vrhxjn

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?

So far investment into practical and engineering research and development for BECCS has been very limited. While modelling exercises show the potential of BECCS, practical testing and engineering exercises (CCS technology and transport infrastructure are lacking behind[9]. Increasing the scale of technology and applications and developing a shared infrastructure could reduce the cost by about 45%[10].

[9]International Energy Agency (2018) tinyurl.com/y9ryd6u5 [10]Energy Technologies Institute (2016) tinyurl.com/ybgv8fdt

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:

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:

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:

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:

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:

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: