

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 (CO₂ 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: Page numbers below refer to my book, *The Burning Answer*, hereinafter (TBA) [*The Burning Answer: a User's Guide to the Solar Revolution*](#)

Aviation: Increase expenditure on solar fuel produced by electrochemistry and photo-electrochemistry from atmospheric CO₂ (TBA p 251-272). Since writing the book there has been great progress in producing solar ethanol <http://bit.ly/29Wd7RU>. If a higher energy density than ethanol for aviation is required then use chemical engineering with hydrogen from PV powered electrolysis (TBA p 315).

Agriculture: The anaerobic digestion (AD) of farm and food waste has immense potential (TBA p 205 – p 208) to provide low carbon bio-electricity (for the 15% flexible back-up required for an all-renewable power supply Q8, Q9) and low-carbon biomethane for the gas grid. Two important side benefits of AD:

- 1) AD will make dramatic cuts to the greenhouse gas (GHG) emissions of agriculture. If crop and animal waste is left to rot on the fields it decays to large amounts of GHG's including the particularly dangerous methane.
- 2) The digestate left from AD after bio-methane is extracted contains the trace elements the plants needed to grow in the first place. Hence it is an excellent fertiliser that can replace the high carbon fossil fuel fertilisers.

Industry: Should have tax breaks for installing rooftop PV and shallow geothermal heat pumps as being introduced by a leading supermarket chain (TBA p201-202)

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 roof top solar fuel scheme in Q6 is carbon neutral if powering fuel cells for transport. I would estimate it could be practical by 2030 (TBA p.315). If stopped at the methanol or ethanol stage it would be an extremely efficient and practical approach for atmospheric carbon dioxide fixation.

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: As far as low carbon electricity generation technologies are concerned, the most important messages from TBA are that the renewables have the lowest carbon footprint and we have already have the technologies to achieve a 100% all-renewable electricity supply hour-by hour all year, 80% wind and PV, 15% flexible bio-electricity and 5% storage (Q11). Indeed, had wind, PV and bio-electricity continued to expand in the UK at the same exponential rate achieved by subsidies in the years before the 2015 government change, an all-renewable electricity

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supply could have been achieved by 2025 <http://go.nature.com/2cKxuBK>

The exponential rise was a sign that rising demand had increased supply and led to reduced installation costs and further demand increase. Also, in Germany (and the UK Q11) wholesale electricity prices were falling. The extremely important CCC target of 50 gmCO₂/kWh in 2030 for all electricity generation would have been achieved 5 years early.

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: The previous answer shows how the right subsidies encourage the exponential growth of the renewables. The CCC should strongly criticise the government for cutting them. They should be reintroduced paid for by taxation so as not to affect the wholesale price. In the meantime, I have proposed that my *Get it from the Sun (GIFTS)* all-renewable electricity spreadsheet can be used to monitor a GIFTS challenge. This would help to re-stimulate the local efforts to introduce renewable electricity by informing countries, local authorities, towns and schools on how they were progressing toward being first to an hour-by-hour all-renewable power supply

<http://www.sgr.org.uk/resources/get-it-sun-expanding-renewable-electricity>

Most importantly individuals and communities can be involved as the numbers switching to an all-renewable power supplier can be included in the supply total. Also the amount of household and industry food waste sent for AD counts towards the 15% of flexible bio-electricity needed back up the wind and PV.

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: IMPORTANT. The CCC should take a much tougher line with the current government over its future plans for electricity supply. There is no chance that the DECC/BESS electricity scenarios, which give highest priority to natural gas, fracking and new nuclear, will achieve an electricity supply in 2030 below the CCC limit. Priority is given to natural gas which is least 9 times the CCC limit (TBA p183). Fracking has a carbon footprint at least 10 times the CCC limit and so should be immediately halted. The subsidies should be transferred to support new AD plants in the country areas threatened by fracking. Furthermore I argue (TBA p183-187) that the carbon footprint of nuclear is above the CCC limit. IMPORTANT: The CCC should do its own thorough study of the carbon footprint of Hinkley Point C, preferably with input from an independent expert (like van Leeuwen TBA p 187) to replace their analysis from Ricardo-AEA which has particularly suspect methodology (TBA 184-186). I also presented this critique at my CCC seminar in October 2015)

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: If the CCC insisted the government adhere to the CCC 2030 electricity targets by reintroducing renewable subsidies paid from taxation rather than levy, plus a feed-in-tariff to encourage farm waste and industrial and domestic food waste to be sent for AD, exponential growth would resume, jobs would be created, construction costs would fall. Most importantly, the renewables reduce the wholesale electricity prices in Germany (TBA p157-8) and the UK

<https://www.goodenergy.co.uk/media/1194/wind-and-solar-reducing-consumer-bills-an-investigation-in-to-the-merit.pdf>

By contrast all the DECC/BEIS scenarios show wholesale electricity prices rising due to higher natural gas prices.

The renewables carry the lowest risks and can provide electric power security ever hour of the year with around 80% wind and PV around 15% bio-electricity and 5% storage power according to my *GIFTS* spreadsheet (Q9).

<https://www.newscientist.com/article/2133760-energy-security-is-possible-without-nuclear-power-or-fracked-gas/>

These are very similar results to those found by the Kombikraftwerk Project in Germany (TBA p154-156).

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: My *GIFTS* Challenge (Q.9) could be used to monitor which of the four home countries would be first to an all-renewable power supply. I have already discussed this with members of the Scottish Parliament's environment department. Though they have a target of 2020 to produce as much electricity from wind as they consume in a year it is by no means certain that Scotland could beat Wales to a true, hour-by-hour all-renewable situation. Wales has the better solar resource and is further ahead with the AD of farm and food waste.

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: 1) See Q.10. The CCC should commission a thorough, independent, peer reviewed study of the carbon footprint of new nuclear power
2) See Q.9. I would like to give a seminar at the CCC to demonstrate the GIFTS software (which I have develop since my first seminar there in October 2015) to discuss if the CCC would like to participate in implementing the GIFTS Challenge.