Committee on Climate Change

The Right Honourable Amber Rudd, MP
Secretary of State for Energy and Climate Change
Department of Energy and Climate Change
3 Whitehall Place
Westminster
London SW1A 2AW

28 January 2016

**Implications of the Paris Agreement for the fifth carbon budget**

Dear Secretary of State,

Congratulations on the constructive role played by the Government, and you personally, in achieving the global agreement at COP21 which aims to limit warming to well below 2°C, to reach zero net global emissions this century, and regularly and transparently to review progress towards these goals.

The Paris Agreement[1] has greater long-term global ambition than current UK targets assume. But the pledged contributions by the EU and others have not yet changed. On that basis we **repeat our recommendation that the fifth carbon budget be legislated at 1,765 $MtCO_2e$**. The Agreement, combined with the requirements under the Climate Change Act, make it clear that this is the minimum level of UK ambition necessary. It should be met through domestic effort, and will require new policies and plans to be set by the Government during this Parliament.

We elaborate on each of these points in the rest of this letter. More detail, including the full set of budget recommendations from our November advice,[2] can be found in the annex.

***The Paris Agreement and the fifth carbon budget***

The Paris Agreement is the first truly global effort to reduce emissions. It lays the foundations for increasing international action, making it clearer than ever that UK effort will happen alongside efforts across the world. Significantly, the Agreement aims to hold the increase in global temperature to well below 2°C above pre-industrial levels, to pursue efforts to limit it to 1.5°C and to reach net zero global

[1] FCCC/CP/2015/L.9/Rev.1, http://unfccc.int/resource/docs/2015/cop21/eng/l09r01.pdf

[2] CCC (2015) *The fifth carbon budget – the next step towards a low-carbon economy.* https://www.theccc.org.uk/publication/the-fifth-carbon-budget-the-next-step-towards-a-low-carbon-economy/

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emissions of greenhouse gases in the second half of the century. This is more ambitious than the basis of the UK's statutory target for 2050, which was a global path to hold the temperature rise close to 2°C.

This increase in ambition raises the question of whether the fifth carbon budget should be tighter than we have proposed. Our judgement is that our existing recommendation is sufficient at this time, although a tighter budget may be needed in future:

- The measures underpinning our proposed fifth carbon budget are on the cost-effective path to the existing UK 2050 target (to cut greenhouse gas emissions by at least 80% below 1990 levels). They could also keep open the possibility of deeper reductions by 2050 should these become appropriate.
- The proposed fifth carbon budget would support an increase in EU ambition, consistent with the need for all parties to increase ambition to deliver the goals of the Paris Agreement:
  - The emissions pledges made by nations (including the EU) did not change in Paris, and they are not on a cost-effective path to 2°C or below. The agreement creates a system to review and raise pledges, and the UK should continue to push for a revised EU pledge more consistent with the agreed global ambition.
  - The cost-effective path to the existing 2050 target, on which our proposed budget is based, exceeds the UK's likely obligation under the current EU 2030 package. The budget therefore supports and prepares for greater 2030 ambition at the EU level.
  - Greater EU ambition is likely to lead to a tightening of the EU Emissions Trading System cap. If this occurs, the UK budget should be tightened to align to the new cap.
- We identified further measures that could enable lower emissions (by about 200 $MtCO_2e$) over the period 2028-32. Even under our proposed budget it is sensible to keep these in play as a contingency for policy under-delivery or higher energy demand. It could be appropriate to commit to these in future through a tighter budget, for example if the EU and other nations also commit to action consistent with the new ambition, or if the UK 2050 target is tightened.

We therefore repeat the recommendation from our November 2015 advice that the fifth carbon budget be legislated at 1,765 $MtCO_2e$. The Government should aim to achieve it through domestic effort, without banking or borrowing from other carbon budgets. As required by the Climate Change Act, we would advise on any change required to this and other existing targets if a significant change in circumstances occurs.

We will assess further the implications of the increased ambition in the Paris Agreement for UK climate policy. Our intention is that this assessment will feed into the government plan being developed this year to meet carbon budgets, and discussions about the UK's emissions targets for 2050 and beyond. We will draw on new evidence as it becomes available, such as the invited special report on the 1.5°C goal by the Intergovernmental Panel on Climate Change and the review being undertaken by the EU.

We also note that the ambition of the Paris Agreement will only be realised with effective action on emissions from international aviation and shipping. The UK should support such action, particularly at the meeting of the International Civil Aviation Organisation in the autumn of 2016.

***Other changes in circumstances***

At the end of November the Government cancelled £1 billion of funding for the UK's Carbon Capture and Storage (CCS) commercialisation programme.

CCS has a crucial role to play in cost-effective decarbonisation (see annex). Our estimates, and those of others, suggest the cost of meeting the 2050 target would be twice as high without CCS.[3] It is also vital to meeting the longer-term global goal of reaching net zero (possibly negative) emissions.

The recent funding decision must not and does not exclude CCS permanently from playing a significant role in reducing UK emissions, provided an alternative approach is implemented quickly. Without rapid development of an effective approach to deliver CCS, much larger and more costly actions will have to be taken in sectors such as transport, buildings and agriculture to prepare for the 2050 target in the Climate Change Act. The Committee will provide further analysis of the UK options for developing CCS at lowest cost in due course and will monitor developments in this area.

***Implications for this Parliament***

In light of the Paris Agreement our proposed fifth carbon budget represents a minimum level of UK effort during 2028-32. It requires continued emissions reductions beyond the currently-legislated fourth carbon budget. We therefore repeat our conclusions[4] on the need for new plans and policies in this Parliament to meet the existing carbon budgets and to prepare properly for the ambition agreed in Paris. We emphasise the following:

- **Electricity.** Extend funding under the Levy Control Framework beyond 2020 and award contracts to low-carbon generators to achieve a total sector emissions intensity below 100 $gCO_2$/kWh by 2030.
- **Carbon Capture and Storage (CCS).** Develop urgently a new approach to CCS in the UK.

[3] CCC (2015) *Power sector scenarios for the fifth carbon budget.* https://www.theccc.org.uk/publication/power-sector-scenarios-for-the-fifth-carbon-budget/

[4] CCC (2015) *Meeting Carbon Budgets – Progress in reducing the UK's emissions.* https://www.theccc.org.uk/publication/reducing-emissions-and-preparing-for-climate-change-2015-progress-report-to-parliament/

- **Buildings.** Address the significant shortfall in low-carbon heat before the end of 2016, ensuring better integration with energy efficiency and fuel poverty.
- **Surface transport.** Maintain support for upfront costs of electric vehicles and charging infrastructure, and push for stretching 2030 EU emission standards.
- **Infrastructure** should be built with the expectation that UK emissions will fall further beyond 2050. We welcome the establishment of the National Infrastructure Commission and will work closely with it to further develop cost-effective efforts to tackle climate change.

We will assess developments across all of these areas in our next progress report to Parliament in June 2016.

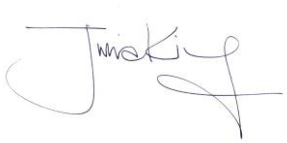
Yours,

Lord Deben

Professor Sam Fankhauser

Professor Brian Hoskins

Paul Johnson



Baroness Brown

Lord Krebs

Professor Jim Skea

The Committee on Climate Change
1st Floor,
7 Holbein Place,
London SW1W 8NR
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## Annex

In November 2015 we provided our statutory advice on the level of the UK's fifth carbon budget, covering the period 2028-32. We recommended the budget be set at 1,765 $MtCO_2e$ including emissions from international shipping. This requires a continuation of the historical rate of emissions reduction: greenhouse gas emissions fell 36% below 1990 levels by 2014, must fall 52% by 2025 under the existing budgets and would fall 57% by 2030 under the recommended budget.

We stated in our report that we would write to the Secretary of State in early 2016 to set out how the outcome of COP21, and any other significant changes, affect our recommendation.

### *Our fifth carbon budget recommendations in full*

Our full recommendations, which are unchanged by this letter, were set out in Box 1, page 12 of our November advice.[5] They are as follows:

**1. The budget.** The fifth carbon budget should be set at 1,765 $MtCO_2e$ for 2028-2032, including emissions from international shipping. On the current accounting basis (i.e. excluding emissions from international aviation and shipping), the budget would be 1,725 $MtCO_2e$.

**2. International aviation.** Emissions from international aviation should continue to be allowed for by setting the budget on the path to meeting the 2050 target with international aviation emissions included. However, the accounting for these emissions remains uncertain, so they should not be formally included in the fifth carbon budget.

**3. Credits.** The budget should be met without the use of international carbon units (i.e. credits) outside the EU Emissions Trading System. If unexpected circumstances mean the budget cannot be met cost-effectively without recourse to purchase of credits, the Committee would revisit this advice, including an assessment of the strength and validity of the credit market at that time. Credits could also be used to go beyond the proposed budget to support international action to reduce emissions.

**4. Policy: low-carbon power.** The Government should develop policy approaches consistent with reducing carbon intensity of the power sector to below 100 $gCO_2/kWh$ in 2030 (compared to 450 $gCO_2/kWh$ in 2014 and 200-250 $gCO_2/kWh$ expected by 2020).

**5. Policy: other sectors.** For sectors outside the EU Emissions Trading System the Government should develop policies to drive an average rate of emissions reduction of 2% (6 $MtCO_2e$) per year from 2014 to 2030. The Carbon Accounting Regulations should be set to ensure that emissions from these sectors are limited to 1,175 $MtCO_2e$ over 2028-2032 (1,135 $MtCO_2e$ excluding emissions from international shipping), which is the Committee's best estimate of the cost-effective path to the statutory 2050 target.

[5] CCC (2015) *The fifth carbon budget – the next step towards a low-carbon economy.* https://www.theccc.org.uk/publication/the-fifth-carbon-budget-the-next-step-towards-a-low-carbon-economy/

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***Changes in international circumstances since our fifth carbon budget advice***

Our advice in November balanced a range of factors the Committee has a duty to consider: affordability, energy security, meeting the long-term target to reduce greenhouse gases, competitiveness, international circumstances and others.

We made four main assumptions about international circumstances in our advice ahead of COP21:

1. International action was aimed at limiting global average temperature rises to less than 2°C above pre-industrial levels. Cost-effective pathways likely to meet that goal involve a 40-70% cut in global emissions by 2050, relative to 2010, and emissions at or below zero by 2100.

2. The UK's statutory long-term target (to cut emissions by at least 80% below 1990 levels by 2050) remained an appropriate contribution to that goal. It is based on an equal share of emissions per person worldwide in 2050; it is hard to envisage an agreement that would allow the UK to emit more than the average per person level in the long term.

3. The EU has pledged to cut its emissions by at least 40% below 1990 levels by 2030. While the contributions of Member States are yet to be finalised, our best estimate is that it implies an emissions allocation of around 590 $MtCO_2e$ for UK sectors covered by the EU ETS, and no more than 1,310 $MtCO_2e$ for the rest of the economy over the fifth carbon budget period.

4. There would be a process to raise the total ambition of international emissions pledges, given the gap between forecast emissions to 2030 and paths consistent with 2°C. There is scope for the EU to cost-effectively raise its own pledge, and the UK government has argued for an EU target of 50% consistent with this.

The Paris Agreement, supported by 195 States, includes features consistent with our assumptions:

- An aim to peak global greenhouse gas emissions as soon as possible, followed by rapid reductions. A balance between anthropogenic sources and sinks is to be reached in the second half of this century.

- The introduction of a five-yearly system of reviewing and raising ambition in a nationally-determined manner, recognising that current ambition in aggregate falls short of what would be required to limit global temperature increase to 2°C.

A key element of the Paris Agreement that goes beyond our assumptions is the aim to hold the increase in global average temperature to well below 2°C above pre-industrial levels, and pursue efforts to limit it to 1.5°C. This draws into question whether three distinct, but inter-related, aspects of the UK climate regime are still sufficiently ambitious: the fifth carbon budget advice, the 2050 target and the most appropriate target for the UK after 2050. The work we commit to in this letter will consider the latter two issues in more detail. We have concluded that the fifth carbon budget remains appropriate based on current evidence.

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***The importance of Carbon Capture and Storage (CCS)***

CCS makes a substantial contribution across several sectors in our scenarios to meet the 2050 target. This will only be possible if there has been sufficient development in the period to 2030.

Our central scenario, which underpins the proposed fifth carbon budget, includes deployment of CCS in power and industry at a cost of around £2 billion in 2030:

- Up to 7 GW of capacity fitted with CCS in the power sector, generating 48 TWh in 2030. Annual costs (relative to unabated gas generation) increase in line with deployment to around £1.6 billion in 2030. We estimate the entire programme would generate at an average cost of around £110/MWh, reflecting costs decreasing from £150-170/MWh for the first plant to below £100/MWh with continued deployment;

- 3 $MtCO_2e$ per year of emissions savings in heavy industry in 2030, at a cost of around £200 million, in 2030. This rises to 6 $MtCO_2e$ per year, at a cost of around £500 million, in 2035 through extension to the cement and refining sectors.

These scenarios reflect detailed work that the Committee commissioned in 2015 to consider approaches to reduce the costs of CCS at the lowest cost to the consumer.[6] That work concluded that UK deployment of CCS in the power sector is required over the period to 2030 in order to provide anchor loads for $CO_2$ infrastructures and to reduce risks for projects in both power and industry. Economies of scale in infrastructure that can only be unlocked through deploying CCS 'clusters' in the UK provide the majority of potential cost reduction. International learning in capture technology can provide further cost reduction but is not a substitute.

We estimated in our November advice that the absence of CCS in 2050 would require extra emissions savings of at least 35 $MtCO_2e$ per year in order to meet the 2050 target. This is likely to require almost full decarbonisation of buildings and surface transport by the middle of the century. The best current evidence suggests this would be substantially more expensive than deployment of CCS, even allowing for the initial high costs of projects in a CCS commercialisation programme.

In part this reflects that CCS supports options for decarbonisation beyond its direct application, including:

- Use of hydrogen in transport, buildings and industry (the lowest cost source of low-carbon hydrogen is likely to be from fossil fuels with CCS);

[6] Pöyry & Element Energy (2015) *Potential CCS Cost Reduction Mechanisms.* https://www.theccc.org.uk/publication/poyry-element-energy2015-potential-ccs-cost-reduction-mechanisms-report; and Gross (2015) *Approaches to cost reduction in carbon capture and storage and offshore wind.* https://www.theccc.org.uk/publication/gross-2015-approaches-to-cost-reduction-in-carbon-capture-and-storage-and-offshore-wind

- Roll-out of heat networks (where a significant proportion of potential derives from using recoverable heat from thermal power stations);
- Use of heat pumps (where CCS power generation could be important in meeting the seasonal swing in electricity demand);
- Use of bioenergy in CCS plant (implying 'negative' emissions that can offset hard-to-reduce emissions elsewhere in the economy and make the most of scarce bioenergy resource).

A reduced role for CCS to 2050 therefore both reduces its direct contribution to lowering emissions, and also closes down a range of important options that could compensate for this shortfall. It is the combination of these two effects that leads to estimates by the CCC and the Energy Technologies Institute that the cost of meeting the 2050 target would double without CCS.