House of Commons Energy and Climate Change Committee Fifth Carbon Budget Enquiry

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Energy and Climate Change Committee
Fifth Carbon Budget Enquiry

Submission by Scottish Carbon Capture & Storage

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1. Identification

Scottish Carbon Capture & Storage (SCCS) is the largest Carbon Capture and Storage (CCS) research group in the UK. Our internationally renowned researchers work across the full CCS chain. Founded in 2005, we are a partnership of British Geological Survey, Heriot-Watt University, University of Aberdeen, the University of Edinburgh and the University of Strathclyde working together with universities across Scotland. SCCS is funded by the Scottish Funding Council.

2. Executive summary

- More than a decade of UK state R&D investment, totalling in excess of £250 million, has shown CCS to be effective, achievable and strategically beneficial to UK objectives.
- The cancellation in November 2015 of the UK Government's £1 billion CCS capital allocation is an unforeseen and fundamental change to UK energy and climate policy, carried out without consultation.
- UK Committee on Climate Change (CCC) advice was framed in expectation of UK CCS commercialisation programme delivery leading to routine delivery of the technology on electricity generation and some process industries towards 2030s.
- Removal of the CCS contribution towards the Fifth Carbon Budget and beyond severely limits flexibility in the delivery of other low-carbon generation, especially new nuclear where forecast delivery is increasingly in doubt – the CCC and the Department of Energy and Climate Change (DECC) should consider the impact of scenarios with no CCS and delayed nuclear capacity.
- There appears to be a misinterpretation by government of CCS as a technology that could be purchased as and when required, when it is in fact a core low-carbon enabling infrastructure requiring strategic development.
- In the absence of a clear CCS pathway, there is a risk that investors in new gas capacity will price in increased risk of reduced plant operation due to carbon budget constraints, and increasing the cost to consumers.
- The siting of any new gas plant, subject to capture readiness, should be assessed with respect to the viability (and cost) of pipeline and/or shipping connection to identified and secure CO_2 storage sites.
- There is now no pathway to decarbonising high-emission industries. Government should urgently investigate and evaluate the potential to connect, in a stepwise manner, CO_2 emissions from industrial sources to storage.
- The UK delegation to the Paris UNFCCC climate talks presented the UK Climate Change Act as exemplar of national action, so this must be implemented domestically. The Paris Agreement increases climate change mitigation ambition. As a member of the "high ambition coalition" the UK should work towards net zero emissions by 2050 rather than an 80% reduction.
- Setting the Fifth Carbon Budget as advised does not secure either the 80% or 100% reductions trajectory. It is technology and especially infrastructure choices informed by a long-term view towards the 2050 goal that should receive attention in this debate.

3. Carbon Capture and Storage context

3.1

CCS is a core component of national, regional (EU) and global decarbonisation pathways

consistent with achieving climate mitigation objectives[1][2][3]. For some applications (e.g. electricity, heat) CCS enables a least-cost transition for the whole economy. For others (e.g. process industry, gas sweetening, synthetic transport fuel) CCS is currently the sole option.

3.2

Globally, the first generation of commercial-scale CCS projects is in operation or under construction on coal power plant, gas processing, refining and steel production. These are primarily located in North America, the Middle East and Norway. With the exception of the Sleipner (operated since 1996) and Snøhvit (operated since 2008) gas sweetening projects in Norway, to date no commercial CCS projects have begun construction within Europe.

3.3

The UK is widely recognised to be uniquely well-positioned to develop, advance and benefit from CCS. The UK North Sea is an exceptionally well understood, socially permitted, and industry recognised CO_2 storage resource. **More than a decade of UK state R&D investment, totalling in excess of £250m, has shown CCS to be effective, achievable and strategically beneficial** both to delivering the UK's decarbonisation obligations at least cost and bringing new industry and revenue to the UK. There are additional benefits for the UK, including transfer of offshore skills and investment, development of efficient oil production with CO_2-EOR, licensing fees to store CO_2 from European states, and effective re-use of existing infrastructure, which defers decommissioning payments by UK Treasury. There are clear potential markets for UK skills in relation to designing and installing large numbers of CCS projects in China, the Middle East and Far East.

3.4

In November 2015, on the same day as HM Treasury's Autumn Spending Review, the UK Government announced the sudden withdrawal of the UK's £1bn capital funding allocation to the UK CCS commercialisation programme. This was prior to the imminent completion of the publicly funded CCS competition Front End Engineering and Design (FEED) studies by the Peterhead and White Rose projects, and without any consultation with stakeholders. At present, DECC has not put forward any revised strategy for CCS enablement, and statements by the Prime Minister, the Chancellor of the Exchequer and the Secretary of State for Energy and Climate Change have presented a muddled view, with CCS seen as "not working", "too expensive", and a possible "long-term" need.

3.5

The cancellation of CCS capital funding occurred on the eve of the presentation by the CCC of its Fifth Carbon Budget (2028-2032) recommendations. **As such, the CCC's advice was framed in the expectation of the completion of the UK CCS commercialisation programme and likely delivery of at least one CCS project on electricity before 2020, facilitating the potential for a second phase of CCS projects from the early-mid 2020s and leading to the routine operation of established CCS on electricity and some process industries from 2030**.

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[1] International Energy Agency (2015): Carbon Capture and Storage, The Solution for Deep Emissions Reductions http://www.iea.org/publications/freepublications/publication/CarbonCaptureandStorageThesolutionfordeepemissionsreductions.pdf

[2] Intergovernmental Panel on Climate Change (2014): Climate Change 2014 Synthesis Report, Summary for Policymakers, https://www.ipcc.ch/pdf/assessment-report/ar5/syr/AR5_SYR_FINAL_SPM.pdf

[3] Energy Technologies Institute (2016): ETI analysis of the UK energy system design implications of delay to deployment of carbon capture and storage (CCS) in the UK, http://www.eti.co.uk/wp-content/uploads/2016/01/ETI-letter-to-Chair-on-Future-of-CCS.pdf

We therefore address the questions of this enquiry, reflecting on this abrupt, unexpected and substantial change to the UK's energy and climate policy and decarbonisation strategy.

4. What is your view on the Committee on Climate Change's advice on the Fifth Carbon Budget?

4.1

We agree with the CCC's advice on the Fifth Carbon Budget in general and specifically with regard to CCS.

4.2

The CCC's Fifth Carbon Budget report correctly identifies the critical importance of near-term (2020s) roll-out of commercial-scale CCS, sited in the UK, in achieving the robust delivery of the UK Climate Change Act at lowest overall cost. Here, the CCC recognises the unique economy-wide value of CCS, providing low-carbon despatchable power generation, addressing industrial emissions and "opening up new decarbonisation pathways".

4.3

However, the CCC's central scenario assumed completion of the UK's CCS commercialisation programme with project investment in this Parliament enabling subsequent CCS deployment through the 2020s. This is now no longer credible. As a result, we turn to the "no CCS" scenario presented by the CCC – albeit even this assumes delivery of the commercialisation programme projects and corresponding delivery of 0.6GW low-carbon generation. This scenario fails to deliver sub 100g CO_2/kWh power sector generation intensity by 2030, introduces reliance on largely unquantifiable (in cost or development timescale) delivery of alternative on-demand generation sources and fails to provide a coherent decarbonisation pathway for industrial emissions.

4.4

Further, we reflect that delivery of a new generation of nuclear plant, both in scale of generation and timing of operation, remains uncertain. Given successive postponements of the Hinkley Point C project's projected completion dates (now suggested to be 2025), the most recent Final Investment Decision deferment on 27 Jan 2016[4] is characteristic of the ongoing construction time and cost overruns on similar reactors in France and Finland, leading to exceptionally poor delivery of reliable electricity generation capacity for this reactor type. Given the generally long lead-in times (well in excess of 10+ years) for nuclear power development in Europe, there is currently very little to guarantee that new nuclear capacity will be operational by 2030 at the scales envisioned in the CCC's scenarios. **As a "plan B", the CCC's "no nuclear scenario" uses a large CCS contribution to cover this shortfall – an option that is now most likely unavailable**. What is Plan B now?

4.5

Assessing the CCC's projections in the absence of both CCS and new nuclear delivery by 2030, a generation shortfall of around 64-90TWh in 2030 (17-24% of expected demand) is suggested, with a likely carbon intensity increase to 144-180g CO_2/KWh (54-93% over the central scenarios) subject to the proportions of the shortfall met by renewables, interconnectors and unabated gas.

[4] BBC 2016: Decision on new nuclear power plant 'delayed', http://www.bbc.co.uk/news/business-35415187

4.6

In the case of meeting the power generation gap entirely with unabated gas, it appears that exclusion of CCS and delay to nuclear delivery could double the predicted 2030 carbon intensity of generation and/or preclude the envisaged electrification of heating and transport, making the fifth (and subsequent) carbon budgets likely unattainable. **We suggest that the CCC might be invited to assess a "no CCS and delayed nuclear" scenario with arising consequences and options.**

4.7

Outwith power generation, the CCC correctly highlights the need for a "strategic approach" to the development and deployment of CCS for industry decarbonisation. Here, the CCC foresaw the synergy of industrial emitters being able to connect and cluster with the CO_2 infrastructures of CCS power plant "anchor" projects. This approach is now undermined, such that there now appears to be no coherent UK pathway towards supporting industrial decarbonisation. This risks driving out industry from the UK as the reformed Phase 4 of the EU Emission Trading Scheme is implemented from 2021[5].

5. Should the Government set the Fifth Carbon Budget in line with the Committee on Climate Change's advice?

5.1

We would support the setting of the Fifth Carbon Budget in line with the CCC's advice and emphasise that action to progress CCS is implicit in that advice.

5.2

The Fifth Carbon Budget as proposed appears consistent with the general emissions reduction pathway towards delivery of the UK Climate Change Act's final goal of a minimum 80% emissions reduction by 2050. Given the extensive promotion of the Act by the Prime Minister, Ministers and officials during the recent UNFCCC Paris COP21 negotiations as a robust model for delivering the UK decarbonisation, a failure to domestically endorse and agree to the budget as advised could widely damage UK credibility.

5.3

The UNFCCC Paris Agreement increases the ambition of the international climate change mitigation goal that framed the UK Climate Change Act. The deal seeks net zero global emissions in the second half of the century (Article 4), to achieve the revised temperature target of "well below 2°C […] and to pursue efforts to limit […] to 1.5°C" (Article 2). **As a member of the "high ambition coalition", Government should arguably consider the Fifth Carbon Budget as a minimum requirement and actively pursue increased ambition for the UK's domestic decarbonisation pathway so as to reach net zero emissions by 2050**. Assuming adoption of the Fifth Carbon Budget as proposed, reaching net zero emissions would entail reducing total UK emissions by an additional 2000 million tonnes of CO_2 equivalent in the period 2030-2050 compared with achieving the minimum 80% reduction set in the Act. This means that carbon reduction on energy alone is insufficient. To obtain net zero emissions by 2050 requires a scaling up of ambitions to offset all UK emissions. At present, CCS is the only technology capable of reaching into many of the diverse sectors of the UK economy, where emissions reductions will be required.

[5] DG Climat Action (2016): EU-ETS Revision for phase 4 (2021-2030) http://ec.europa.eu/clima/policies/ets/revision/index_en.htm

5.4

Setting the Fifth Carbon Budget as advised does not, in itself, secure either the 80% or indeed 100% reductions trajectory. Rather, it is technology and **especially infrastructure choices informed by the long-term view towards the 2050 goal** that should receive particular attention in this debate.

5.5

Here, we emphasise the unique role of CCS as the "glue that holds together" the long-term goal of economy-wide decarbonisation and suggest that setting the Fifth Carbon Budget as proposed in the absence of a robust "plan B" for CCS delivery would appear fanciful.

6. What challenges will the Government face in meeting the Fifth Carbon Budget?

6.1

We urge the Government to acknowledge and enact the role of CCS in meeting the UK's Fifth Carbon Budget or risk failing to meet decarbonisation targets with the extra cost this will incur.

6.2

CCS deployment is crucial to the robust, least-cost delivery of the Fifth Carbon Budget and the ongoing 2050 decarbonisation pathway.

6.3

Currently, following the November 2015 withdrawal of the £1bn capital funding for CCS commercialisation, Government has produced no clarity on either CCS intent or future action. This not only removes near-term (2020s) availability of CCS but also risks its unavailability in the 2030s and beyond. **Here, there appears to be a misinterpretation by Government of CCS as a technology that could be purchased as and when required, when it is in fact a core low-carbon enabling infrastructure**. The timely provision of this enabling infrastructure – CO_2 transport and storage – requires strategic and coordinated UK development.

6.3

In particular, the evaluation of specific geological storage sites cannot be "bought in". In the Central North Sea there is a closing opportunity to secure access to first-phase CO_2 storage with operational oil and gas sector pipeline, platform and borehole facilities. Securing later re-entry is uncertain and, certainly, higher cost. Additionally, the window of opportunity is also closing for enablement of CO_2-Enhanced Oil Recovery (CO_2-EOR), which analysis suggests could deliver a seven times return on national investment for Government[6].

6.4

It is critical that Government and the recently established Oil and Gas Authority (OGA) do not agree to decommissioning potentially relevant pipelines, boreholes or offshore facilities while re-evaluation of the UK's CCS options and strategy is under way. It may be that the burden of proof should be reversed, such that existing operators have to demonstrate no feasible re-use of the pipelines, boreholes and offshore compression before any decommissioning is agreed. Here, the role of offshore shipping could be especially important to enable effective use of existing offshore infrastructure with lower risk gradational financial investment.

[6] SCCS (2015): CO2 storage and Enhanced Oil Recovery in the North Sea: Securing a low-carbon future for the UK, http://www.sccs.org.uk/images/expertise/reports/co2-eor-jip/SCCS-CO2-EOR-JIP-Report-SUMMARY.pdf

6.5

Similarly for CO_2 capture, the policy and practical processes large and small to convert existing plant sites, facilities and equipment to capture 50-90% of CO_2 emissions cannot simply be purchased at the moment of need. These require timely evolution within national and regional government, authorities, agencies and commercial sectors.

6.6

For power generation the absence of CCS in the 2020-2030s will severely restrict flexibility in delivery of other decarbonisation components (especially new nuclear – see 4.4 above) and corresponding electrification of transportation and heating, and will encourage and enforce an increased reliance on largely untested and uncosted options (e.g. hydrogen, extensive biomass use, and Small Modular Nuclear, which requires Combined Heat and Power (CHP) networks to be built).

6.7

The Government recently announced its intention to cease coal generation in the UK by 2023-2025 (SoS DECC Rudd, October 2015), though we note with concern the equivocal wording of DECC's 26th January 2016 statement on energy actions[7]. Should the new gas generation to replace this capacity be delivered, it has been stated by Energy Minister, Andrea Leadsom, (All Party Parliamentary Group on CCS, January 2015) that it will be subject to CCS "capture-readiness" requirements. In the absence of near-term CCS demonstration – in particular, on gas – the absence of an organised institutional pathway to decouple CO_2 infrastructure investment from individual power or industry CCS plant development and a plan to deliver confidence to enable secure investment in CO_2 transport and storage infrastructure, it is likely that **investors in new gas capacity will price in the greater risk of reduced plant operation due to carbon budget constraints. This will, as a result, lead to increased costs to consumers**.

6.8

There is a complete absence of forward planning for infrastructure retention in the UK North Sea, and for new-build infrastructure to connect "capture-ready" power plant to CCS transport and storage offshore. To fulfil CCS-ready obligations, it is essential to consider onshore and offshore pipelines and the retention of offshore boreholes for CO_2 injection into storage sites.

6.9

The **siting of any new gas plant should be assessed with respect to the viability (and cost) of pipeline and/or shipping connection to identified and secured CO_2 storage sites**. These considerations will likely alter optimal new plant siting locations from those assessed only under gas supply connection and power transmission costs.

6.10

For industrial decarbonisation, as noted above (see 4.7), the curtailing of power generation "anchor" project delivery removes the assumed cluster connection pathway for enabling industrial CCS. Significant engagement with industry emitters has demonstrated strong interest in CCS, which is now at risk of being lost.

[7] DECC (2016): What the Government is doing to secure investment in clean, secure and affordable energy, https://www.gov.uk/government/news/what-the-government-is-doing-to-secure-investment-in-clean-secure-and-affordable-energy

6.11

We strongly suggest that **Government should urgently evaluate the potential to connect, in a stepwise manner, CO_2 emissions from industrial sources to storage**, potentially re-using existing pipeline and offshore assets to develop industrial CCS at lower investment cost and risk. Here, it is clear that shipping is a viable technological option for CO_2 transport along the UK coast, collecting high-concentration industrial CO_2 available at reduced capture cost, or CO_2 imported from Europe, and transferring ownership to North Sea storage or CO_2-EOR[8]. The alternative is increased pressure on the viability of industrial regions as reforms to the EU Emissions Trading Scheme (phase 4) tighten the availability of free allowances.

[8] SCCS (2016): Scottish CO2 Hub – a unique opportunity for the United Kingdom, http://www.sccs.org.uk/images/expertise/reports/working-papers/wp-2016-01.pdf