



2021-IP01: The CCC's Sixth Carbon Budget Report

The UK's Committee on Climate Change (CCC) is a statutory body established under the Climate Change Act of 2008, upholding the purpose of advising the UK Government with independent advice on building a low-carbon economy and preparing for climate change. The Committee published its Sixth Carbon Budget report, a detailed pathway to Net Zero, on the 9th December 2020.

'The Sixth Carbon Budget, The UK's path to Net Zero'¹ report recommends 'that the UK sets a Sixth Carbon Budget to require a reduction in UK greenhouse gas emissions of 78% by 2035 relative to 1990', a world-leading commitment putting the UK on track for net zero emissions by 2050. The report notes that early action is crucial and that this feat is achievable at low overall cost, providing a leading offer from the UK, a feasible path and benefits for the UK.

This report and recommendations support global climate action by reflecting the goals of the Paris Agreement, recognising the UK's responsibility as a developed nation whilst providing a pathway reflecting the 'highest possible ambition' within the country's capabilities. The recommended pathway would reduce the UK's annual per capita emissions by 2035 to under 3 tCO₂e per person and goes beyond the actions so far required from the world on average. Comparable action from other developed countries, with developing countries following slightly later, would limit global warming to well below 2°C and to limit warming the modelling generally suggests that all regions would need to follow similar paths to those being considered in developing regions.

The work used three main scenario cases to identify a balanced path to net zero; '**Headwinds**' (where policies only manage to bring forth societal change / innovation at the lesser end of the scale, with no widespread behavioural shifts or innovations that significantly reduce the cost of green technologies), '**Widespread Engagement**' (with higher levels of societal changes and a reduced demand for the most high-carbon activities and increased uptake of some climate mitigation measures), and '**Widespread Innovation**' (greater success in reducing costs, more widespread electrification and a more resource and energy efficient economy). They also developed a further exploratory scenario, '**Tailwinds**', a highly optimistic (and uncertain) scenario where there is more success on both societal and innovation advances.

The Sixth Carbon Budget recognises that carbon capture and storage (CCS) is essential to any net zero pathway.

All scenarios rely on CCS in the electricity supply, with some bioenergy transitioning to BECCS (bioenergy with CCS) and nuclear and power generation using CCS to provide 10-25% of electricity. In terms of emissions scenarios, BECCS is included at scale in all scenarios and direct air capture also included at a lesser scale. The Headwinds scenario is more reliant on the use of large hydrogen and CCS infrastructure to achieve net zero.

The '**Balanced Net Zero Pathway**' was constructed as the basis for the CCC's recommended approach for the UK to reach net zero by 2050, noting that it is illustrative (rather than prescriptive) of what is

¹ Committee on Climate Change, '**The Sixth Carbon Budget, The UK's path to Net Zero**', 9th December 2020, www.theccc.org.uk/publications



a sensible path based on moderate assumptions. In this pathway the economy is more efficient as a whole, with fossil fuels largely phased out and natural gas use limited to combustion with CCS for power generation and industrial processes. Resources are more diverted to the most carbon efficient uses, with BECCS being used by 2035 to deliver engineered removal of CO₂ at scale. CCS is also used to avoid further emissions from industry as well as permanent removal of CO₂ from the atmosphere and in electricity / hydrogen production, with CCS being applied to the manufacturing and construction sector at scale by 2030 (and continuing to remove CO₂ at similar levels through to 2050 and beyond) and by 2050 around 60% of the CO₂ captured is in the greenhouse gas removals sector, with a further 20% used for hydrogen production and 10% used with gas in the power sector. CCS is deployed at scale in the Balanced Pathway, 'primarily in manufacturing & construction, hydrogen and electricity production, and greenhouse gas removals'.

Figure 1, below, shows the total amount of CO₂ captured in the Balanced Net Zero Pathway, as you can see over 100MT would be captured by 2050, mostly from greenhouse gas removals and the production of hydrogen.

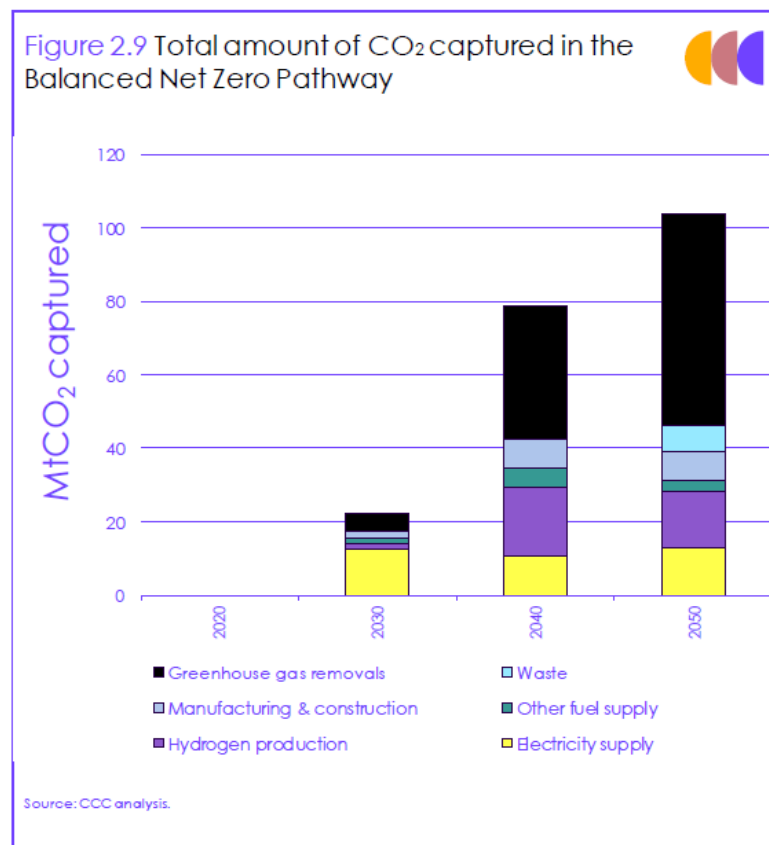


Figure 1, **Total amount of CO₂ captured in the Balanced Net Zero Pathway**,
'The Sixth Carbon Budget, The UK's path to Net Zero' by the UK CCC, figure 2.9, page 75

There is flexibility to meet net zero in a number of ways and a further look into the other scenarios shows that emissions in all three initial scenarios are all broadly comparable to the Balanced Pathway. The Balanced Pathway has a balanced mix of contributions from different decarbonisation options, the Headwinds scenario is most dependant on CCS, whereas the Widespread Engagement and



Widespread Innovation scenarios use less CCS than the Balanced Pathway. All scenarios and pathways investigated the use of CCS as a critical and cost-effective means of meeting net zero targets and sees that the exclusion of CCS is likely to significantly increase emissions by 2050. The Tailwinds scenario (that highly ambitious and unlikely world) was modelled with and without CCS, and even in this ambitious and optimistic scenario without CCS net zero would be achieved 8 years later than with, and with no potential left to go faster in one sector if another under-performs, meaning potential acute impacts on the overall emissions reductions that can be achieved and impacts on energy supply, waste and energy-intensive industry. Figure 2 below shows the Tailwinds scenario modelled with and without CCS, demonstrating the potential limited emissions removal with even the most optimistic circumstances. This supports the CCC's message that 'CCS is essential to achieving Net Zero, at lowest cost, in the UK. The importance of CCS globally further underscores the urgency of progressing CCS plans in the UK'.

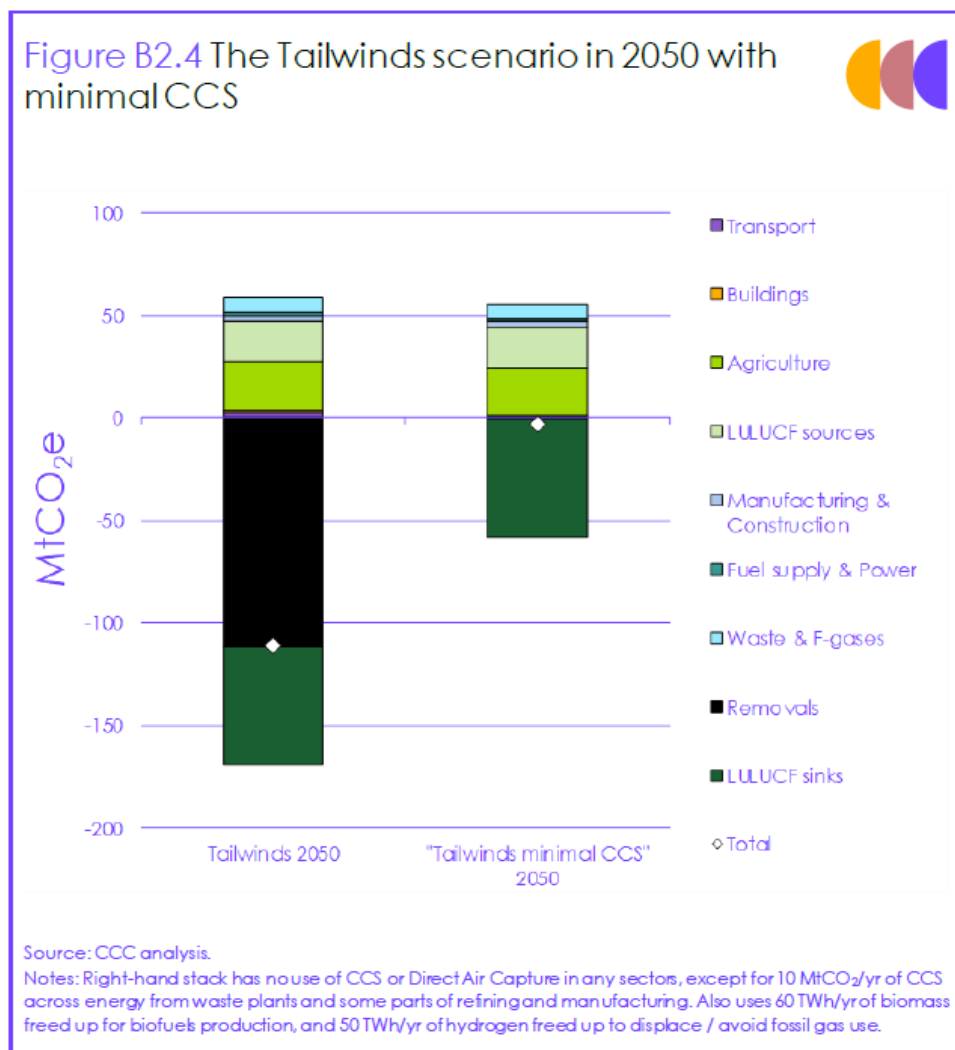


Figure 2, **The Tailwinds scenario in 2050 with minimal CCS**,
'The Sixth Carbon Budget, The UK's path to Net Zero' by the UK CCC, figure B2.4, page 90

When looking at key innovations in fuel supply in the Widespread Innovation and Widespread Engagement Scenarios, the report notes that there are 'uncertainties around delivering high capture



rates. Studies suggest capture rates above 95% achievable for most technologies', information taken from the 2019 IEAGHG report, 'Towards zero emissions from CCS' (report number 2019-02).

The CCC recommends a Sixth Carbon Budget of 965 MtCO₂e; to 191 MtCO₂e per year in 2035 which is a 63% reduction in emissions compared to 2019. The recommendations align to using the Balanced Net Zero Pathway as the minimum level of ambition through domestic action for the UK's pathway, albeit a fair pathway compatible with global efforts to limit warming to 1.5°C. The figure below demonstrates the recommended Sixth Carbon Budget with the Balanced Net Zero Pathway indicated.

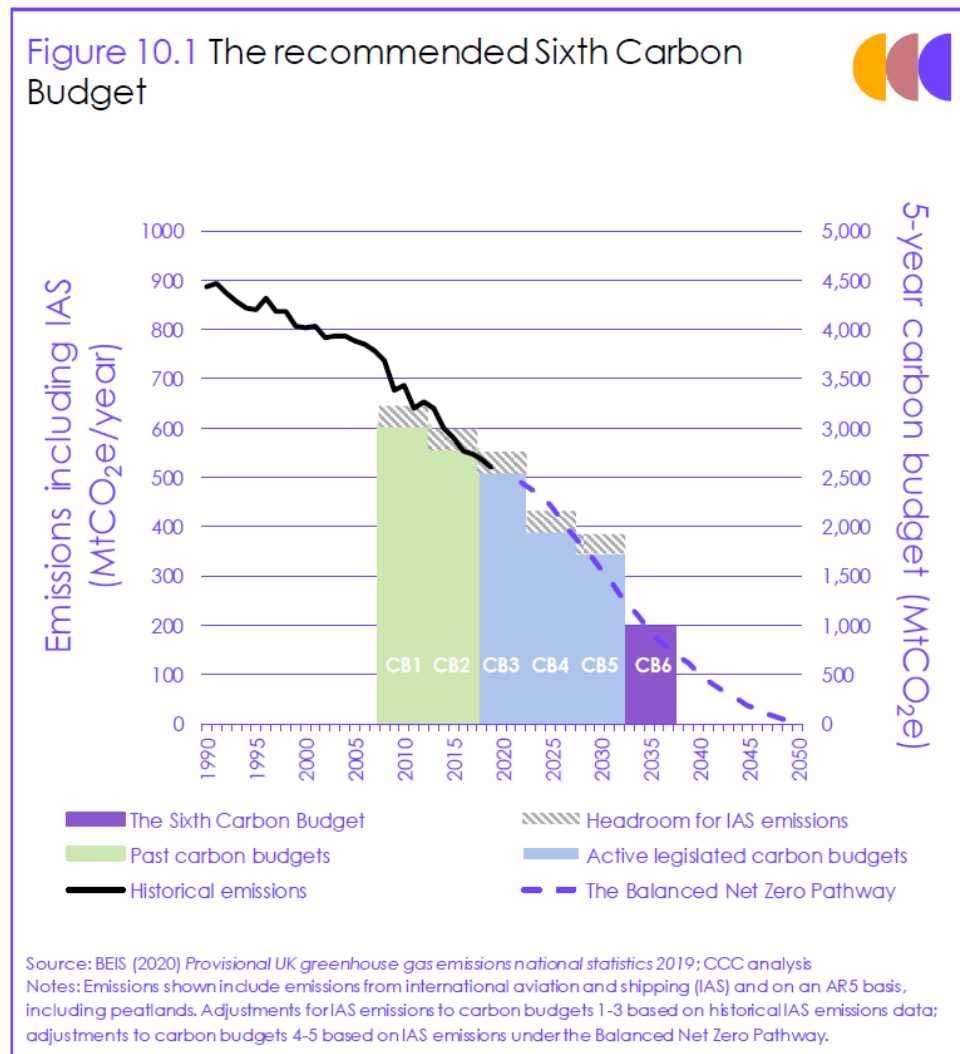


Figure 3, The recommended Sixth Carbon Budget,
'The Sixth Carbon Budget, The UK's path to Net Zero' by the UK CCC, figure 10.1, page 417

The Sixth Carbon Budget delves into costs of achieving net zero and the different pathways, and provides a vital new insight – that the central estimate for costs to achieve the budget is now below 1% of GDP throughout the next 30 years, from 2020-2050. Importantly, this is lower than the CCC's estimate in 2019 of 1-2% of GDP by 2050. Specifically, the 2020 analysis shows that 'the annualised resource cost of reducing greenhouse gas emissions to net zero would rise towards 0.6% of GDP by



the early 2030s, remain at approximately this level through the 2030s and early 2040s, before falling to approximately 0.5% by 2050’.

Without pursuing the ‘highest possible ambition’ to net zero, the UK will not be satisfying its obligations and requirements under the Paris Agreement. The budget will now be presented to parliament, potentially being set in law by summer 2021. This is an impressively detailed pathway of how a G7 economy can transition to net zero.

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