Data centres must be included in the government's carbon budget

Submission to the Environmental Audit Committee from Opportunity Green, Foxglove, and Global Action Plan | 30 October 2025

Terms of reference addressed

How adequate and deliverable are the CCC's headline assumptions underpinning the 'balanced pathway' (e.g. sectoral reductions, technology deployment, economic circumstances, public behaviour) in ensuring compliance with the UK's statutory carbon budgets under the Climate Change Act, including in light of the new Carbon Budget Delivery Plan?

Are there critical interdependencies (e.g. between aviation, agriculture, and energy) that could affect delivery of the statutory targets?

Executive Summary

- **The current carbon budget process, including the Seventh Carbon Budget, makes no allowance for the appearance of a novel new demand for electricity in the form of data centres.**
- **Yet surging data centre installation and operation, with at least 100 installations planned, creates substantial new demands for electricity. Details from data centre planning proposals submitted, if built and operated, could imply an additional electricity demand for the UK equivalent to almost the whole of Denmark.**
- **Data centre electricity demand is unusual in being both very high, and continual. Pressure is on data centre operators to go for quick solutions to this, frequently now meaning fossil fuel power sources. Current industry self-regulation is inadequate and so there is a risk of substantial carbon emissions that challenge decarbonisation efforts inside UK carbon budgets.**
- **It is essential that the budgeting process in future includes forecasts for data centre demand and their associated emissions, and that government planning for data centre expansion occurs only inside this carbon budget.**

Data centre energy demand growth

1. Data centre energy demand is growing rapidly, and is forecast to rise further into the future. According to asset managers Macquarie: "Data centre capacity is rapidly growing. Global data centre power capacity has grown more than 200% in the past decade, from 26 gigawatts (GW) in 2015 to 81 GW in 2024."[1] They forecast global capacity rising to 300GW by 2030, driven onwards by soaring demands for Artificial Intelligence (AI) applications.

2. The UK, already the world's third-largest nation for data centres,(behind the US and Germany)[2] is expected to be a major participant in this expansion, with at least 100 new data centres currently at the planning stage across the country.[3] The UK government is actively encouraging this expansion, designating data centres "critical national infrastructure" to accelerate planning, creating "AI Growth Zones" to streamline the process of constructing data centres, and mooting, in the draft AI Bill, the removal of most planning restrictions on their construction.[4]

3. It is widely expected, in turn, that this will lead to a significant increase in electricity demand in the UK. The National Energy System Operator (NESO) has recently significantly uprated its own forecasts for future energy demand from data centres, with its 2022 forecast of 33 terawatt hours (TWh) of demand by 2035 being revised up to 41 TWh in its high-use scenario. By 2050, it expects between 30 to 71TWhto be in use, the wide range reflecting significant uncertainty. Nonetheless, even the lower end of this range is a little under the current electricity consumption of Ireland (34TWh).

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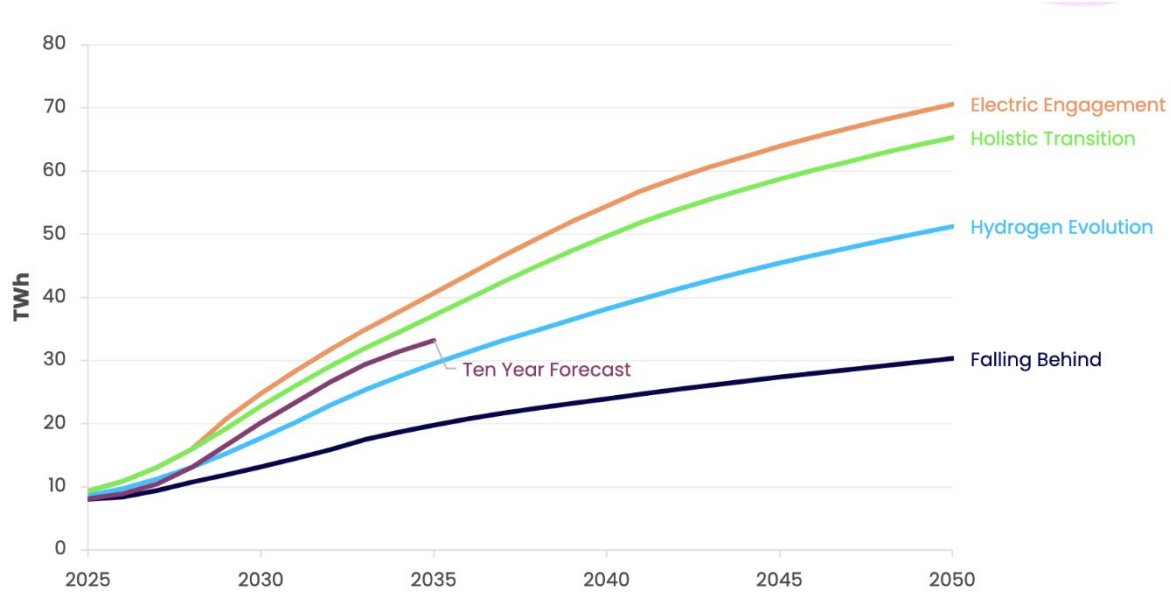
1 Audrey Lee, Daniel McCormack, "Data centres: Powering the growth of AI and cloud computing", Macquarie Asset Management, 20 August 2025.

2 Zoe Kleinman & Krystina Shveda, "Data centres to be expanded across UK as concerns mount", BBC News, 15 August 2025. https://www.bbc.co.uk/news/articles/clyr9nx0jrzo

3 Zoe Kleinman & Krystina Shveda, "Data centres to be expanded across UK as concerns mount", BBC News, 15 August 2025. https://www.bbc.co.uk/news/articles/clyr9nx0jrzo

4 James Meadway, "Hyperscale data centres will 'turbocharge emissions'", The Ecologist, 14 October 2025. https://theecologist.org/2025/oct/14/hyperscale-data-centres-will-turbocharge-emissions

NESO "Future Energy Scenarios", UK data centre electricity demands, TWh



Source: NESO, *Future Energy Scenarios 2050*, "Electricity demand for data centres", Figure 49.

Efficiency improvements alone do not tackle the problem

4. These significant increases in demand are occurring despite, and perhaps even *because of*, improvements in efficiency.

5. The industry's preferred measure of efficiency is Power Usage Effectiveness (PUE) which describes the ratio of energy used for the entire data centre operation relative to the energy used by the computing equipment only. A ratio of 1:1 would indicate, implausibly, that 100% of energy used by the installation was used by the computer hardware only.

6. A computer chip in operation generates heat, as the waste product from the electronic operations it is performing. The more and faster the operations performed, the more heat is generated; by way of example, a single Nvdia H100 Tensor FP8 chip, of the kind used to "train" Large Language Models, can perform around 3,300 trillion mathematical operations every second.[5] A chip's Thermal Design Power (TDP) describes the maximum heat that could be generated under a full workload, which in this case is around 350 W that would need to be managed by an installation's cooling system.[6]

5 Nvidia, "NVIDIA H100 GPU Datasheet", 2024.

6 Nvidia, "NVIDIA H100 GPU Datasheet", 2024.

7. A server rack would contain a bank of these chips, linked together; whilst a "traditional" non-AI data centre server rack might use around 5kW of electricity, the speed and complexity of the specialist chips used in AI applications takes this to around 200kW of electricity per rack.[7] Since a typical hyperscale data centre would today contain around 5,000 such racks, the electricity demands rapidly scale upwards with the complexity of the tasks being performed.

8. Since heat affects the performance of the chips, eventually leading to their failure, data centres must be cooled, which in turn demands more power. The relative size of this demand can vary, from 30% of total electricity consumed in older data centres, to around 7% in a modern, hyperscale installation.[8]

9. Reductions in energy demand for cooling are available through the use of liquid cooling, although here we note that demands for water can themselves become extraordinarily large: a liquid-cooled hyperscale data centre might use the same amount of water as around 40,000 households.[9] Even the smaller-scale data centres in operation today are already consuming well over 10 billion litres of water annually.[10]

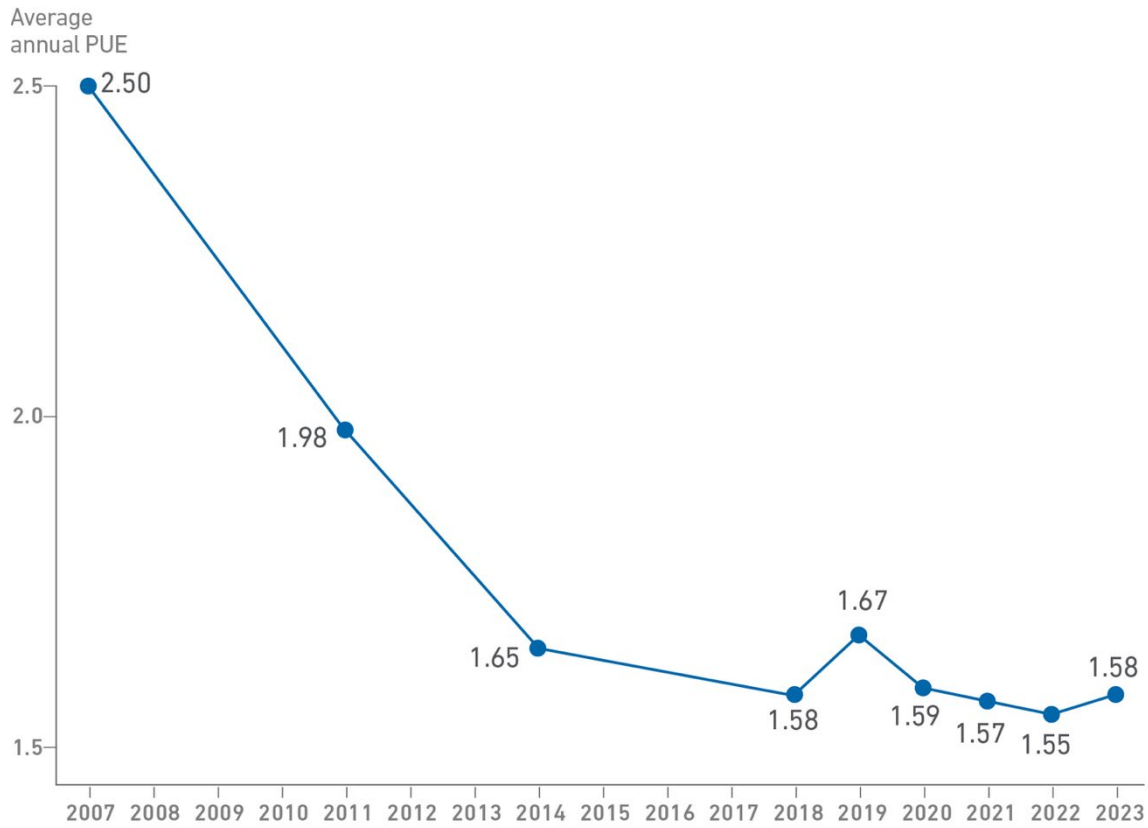
10. Improved data centre design, steady technological improvement, and to some extent government policy like the UK's Climate Change Agreement for data centres (which reduced the climate change levy in exchange for achieving target PUEs) has tended to mean that average PUEs have decline over time, from 2.5 in 2007 to 1.58 a decade later. But since 2017 progress has seemingly stalled, with significant growth in the size of installations not being matched by further improvements in efficiency.

7 Ben Atherton, "The square-foot race for AI space: Physical requirements for AI data centers", AFL, blog, 21 October, 2024. https://www.aflhyperscale.com/articles/physical-requirements-for-ai-data-centers/

8 International Energy Agency, "Energy demand from AI", April 2025. https://www.iea.org/reports/energy-and-ai/energy-demand-from-ai

9 Opportunity Green, "Data centres: how soaring demand threatens to overwhelm energy systems and climate goals", May 2025. https://static1.squarespace.com/static/64871f9937497e658cf744f5/t/682e0081bd6dc64bb45fcb1d/1747845250339/Data+centres-+how+soaring+demand+threatens+to+overwhelm+energy+systems+and+climate+goals.pdf

10 Foxglove, "Drinking water and data centres…", press release, 28 July 2025. Note that the 10bn litres figure is a significant underestimate, as half of England's water companies were unable to provide figures on data centre water use. https://www.foxglove.org.uk/2025/07/28/water-data-centres-floods-sewage/



Source: Uptime Institute, "Global PUEs- are they going anywhere?", December 2023.

Efficiency improvements have driven rising demand

11. However, this measure of efficiency underscores a significant problem. A more efficient installation, by the industry's own standard, may lead to more compute being produced from each kilowatt of electricity supplied. But since the size of installations has grown so much, any efficiency gains have been overwhelmed by the sheer scale of modern installations.[11]

12. As efficiency improves, computing power becomes cheaper, more applications can be programmed and provided, and so demand rises. Instead of fewer resources being used, efficiency improvements can lead to more resources being used. This is a longstanding feature of technological progress known as Jevons' Paradox, after the 19th century economist who first identified it.

11 There are other issues with PUE as a measure of efficiency, which captures only active power use and therefore excludes issues like harmonic losses (losses due to variations in the electric current of the system) and reactive power losses (losses due to variations in the supply of reactive power, necessary to maintain voltage stability). As a result it may offer an "inaccurate" or even "misleading" guide to a data centre's true efficiency. See Liam Blackshaw, "Power Usage Efficiency: not the whole story", Data Center Magazine, 1 January 2023. Power usage effectiveness: not the whole story | Data Centre Magazine

13. Digital industries have long depended on a version of Jevons' Paradox operating as a fundamental of their business model, as Microsoft CEO Satya Nadella identified in January 2025:

"Jevons paradox strikes again! As AI gets more efficient and accessible, we will see its use skyrocket, turning it into a commodity we just can't get enough of."[12]

Data centre's growing electricity requirements help drive fossil fuel use

14. The specific electricity requirements of data centres, with their demands for uninterrupted supply at a high volume, 24 hours a day, seven days a week, is unusual: most activities see demand peaking and troughing during the day, so that domestic demand surges in the early morning and evening, whilst workplace demand surges during the working day.

15. This creates strains for grid provision and access, but also pushes data centres operators and their customers to look for uninterruptible baseload supplies of electricity, for which fossil fuels and (in some rarer but growing cases) nuclear is well suited, with Microsoft (for example) restarting a mothballed reactor at Three Mile Island, Pennsylvania, and other developers investing in "Small Modular Reactors."[13]

16. On the grid side, there is a backlog of electricity connections for developers to use, which is pushing them into looking for gas grid connections, and then locating smaller gas generators onsite. One developer quoted in *Utility Week* noted:

"Data centres can't connect to the electricity network today… So they come to the gas network. They're coming to us and asking for a connection to the gas network and saying they'll build a small gas power station to power locally their data centre. And because we've got the capacity, we can just do it."[14]

17. The industry itself is very clear about the challenges, Jensen Huang, chief executive of Nvidia, the dominant global manufacturer of AI chips, warned in July that the UK government that it must expect to expand its fleet of gas-fired generators to meet its own AI goals.[15] Microsoft's Vice President of energy, Bobby Hollis, said in March that the company had "always been cognisant that fossil fuel-derived energy will not disappear as fast as we all would hope," and that "natural gas is very much the near-term solve that we're seeing, especially for AI deployments."[16] At the inaugural meeting of the government's own AI Energy Council, in June this year, with the DESNZ and Department for Science, Innovation and Technology Secretaries of State

12 Satya Nadella, Twitter/X, 27 January 2025. https://x.com/satyanadella/status/1883753899255046301?lang=en

13 Natalie Sherman, "Microsoft chooses infamous nuclear site for AI power", BBC News, 20 September 2024. https://www.bbc.co.uk/news/articles/cx25v2d7zexo. See, for an overview, Goldman Sachs, "Is nuclear energy the answer to AI data centers' power consumption?", 23 January 2025. https://www.goldmansachs.com/insights/articles/is-nuclear-energy-the-answer-to-ai-data-centers-power-consumption

14 Jane Grey, "Electricity constraints forcing data centres to turn to gas grid", Utility Week, 24 April 2025. https://utilityweek.co.uk/electricity-constraints-forcing-data-centres-to-turn-to-gas-grid/

15 Matthew Field, "Britain's AI investments will need gas, Nvidia warns Miliband", The Telegraph, 17 September 2025. https://www.telegraph.co.uk/business/2025/09/17/britain-ai-investments-will-need-gas-nvidia-warns-miliband/

16 Spencer Kimball, "Microsoft is open to using natural gas to power AI data centers to keep up with demand", CNBC, 11 March 2025. Microsoft is open to using natural gas to power AI data centers to keep up with demand

present, leading industry figures warned of delays in making grid connections and the need to burn more fossil fuels on-site as at least an "interim" measure for energy supply.[17]

18. Claims by the industry to be using "100% renewables", or similar, have often relied on accounting methods that enable the use of fossil fuel power to be "offset" with purchases of renewable energy elsewhere. But these offsets can be entirely divorced from the actual greenhouse gas emissions produced by a data centre relying on fossil fuels. The use of "renewable energy certificates" by Microsoft, Meta, Google and Amazon has been criticised, in September 2025, by sixteen US attorney generals as using "environmental accounting gimmicks" to claim they are "100% renewable" – a claim the attorney generals note is at odds with their use of 60% fossil fuel grid power sources.[18]

19. In the UK, Renewable Energy Guarantee of Origin (REGO) certificates are issued by Ofgem to certify a renewable energy source. However, as in the US case, these can be " trade[d] and purchase[d]… without purchasing the renewably-sourced electricity - and, by stocking up on REGOs, companies can claim to offer 100% renewable energy tariffs without holding contracts with renewable producers."[19] Alternative arrangements, like Power Purchase Agreements, are promoted as better able to manage data centre demand for renewables. But without a robust, national framework for the accounting and management of greenhouse gas emissions, there will be only piecemeal progress at best.

20. And if data centres do take the available renewable generation capacity, which remains limited, then it will by default start to force other sectors to rely more heavily on fossil fuel generation.

21. Only limited data is available on the true GHG impacts of data centres in the UK, with few obligations for providers to supply verifiable information.[20] Foxglove and Global Action Plan undertook a survey of planning applications for larger (100MW or more) data centre proposals. This is necessarily only a partial list, and includes only those applications for which it was possible to identify a power demand and carbon emissions from the developers' application. There are currently over a hundred known planning applications in process for UK data centre constructions.[21]

22. To put this in perspective, the larger installations listed below will produce far greater carbon emissions than international airports. For example, Birmingham Airport produces annual emissions of 169,104 tCO_2e. Edinburgh airport produces 281,773 tCO_2e annually.[22]

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[17] Joseph Bambridge, "UK's AI ambitions clash with its climate goals", *Politico*, 11 August 2025.

18 Austin Knudsen, US Attorney General for Arkansas, et al., open letter to Microsoft, Meta, Google and Amazon, 24 September 2025. 2025-09-24 AG Letter to Tech Companies on REC_MO.pdf

19 David Watkins, "Carbon zero data centres - how the industry can deliver on its green commitments", BCS: the Chartered Institute for IT, 16 July 2020. Carbon zero data centres - how the industry can deliver on its green commitments | BCS

20 IBM, "What is a hyperscale data center?". https://www.ibm.com/think/topics/hyperscale-data-center

21 Foxglove/Global Action Plan, Big Tech Data Centres: a threat to UK decarbonisation, September 2025, p.4 https://www.foxglove.org.uk/wp-content/uploads/2025/10/2025_09_26-FINAL-Big-Tech-Data-Centres-Report-Website-Version.pdf

22 For Birmingham see part 5 of 'full GHG emissions inventory,' scope 1, 2 and 3 figures – this includes aircraft coming in to land and taking off at the airport, known as the 'LTO cycle.'

https://assets.ctfassets.net/qacv5m4pr8sy/1Y4M3vVTWhUUp7qME8OT9O/8906311b6f5a98ddcef65510358a8b31/BHX_GHG_Emissions_Report_23-24_FINAL_LOW_QUALITY-compressed.pdf. For Edinburgh, likewise see the tables in https://assets.ctfassets.net/2hwzhse7szu0/4hCP0sv83ExCbJIEKH9v1G/66ffab53771b7b164d53ef39463e3c23/QES_branded.pdf

Data Centre name, developer, application yr	Size (MW)	Status	Developer carbon emissions estimate (tC02e per year)
Cambois (QTS) (2024)	1100	Outline approved 03.2025	184,160
Elsham Tech (Greystoke) (2025)	1000	Pending outline	857,254
Humber Tech (Greystoke) (2024)	384	Approved	387,805
DC01 (2024)	320	Outline approved 02.2025	6,056
Thurrock (Google) (2025)	225 (estimated)	Pending	568,657
Virtus Saunderton (2022)	300	Under Construction	101,660
International Trading Estate (GTR) (2025)	256	Permission pending	219,031
G-Park Docklands (GLP) (2025 – RM)	210	Under Construction	1,148
North Weald (Google) (2025)	164	Under Consultation	419,427
103MW Court Lane (2022)	103	Approved	340
Total	**4137**		**2,745,538**

Source: Foxglove/Global Action Plan, Big Data Centres: a threat to UK decarbonisation, September 2025, p.5

23. Nonetheless, even this incomplete and extremely conservative picture points to very significant pressures on electricity sources, and on carbon targets. The developers' own figures indicate that just ten of the larger data centres in planning or construction will cause the UK's annual emissions to rise by equivalent to 2.75m tonnes of CO_2. This partial, conservative figure would all but wipe out the carbon savings expected in 2025 from the switch to electric cars (2.9m tonnes CO_2).[23]

24. If we speculatively scale the same emissions up to the whole set of known data centres planned, the implied CO_2 contribution is 27m tonnes, or about the same annual emissions as Denmark.

25. This is highly uncertain; but it is, if anything, liable to be an underestimate, given the limitations of self-reporting by the industry in planning applications, including an absence of figures in most applications surveyed; severe inconsistencies in estimates for GHGs between similar data centre sizes; and strong suggestions of persistent underestimates for the reported GHG emissions for individual data centre planning applications.

26. On the latter, Foxglove/GAP note that: "Data produced for the UK Government's Climate Change Agreements (CCA) scheme indicate that an existing, unknown data centre, run by Digital Realty, reported emissions of 408,041 tonnes CO_2 equivalent in 2021." Since average data centre size is rising, but this figure is already on the upper

23 Barney McIntyre, "Ten UK data centres could cancel EV emissions gain", The Observer, 4 October 2025. Ten UK data centres could cancel EV emissions gain

end of the emissions claimed above, it is likely that the self-reported emissions figures err towards the low side.

Government regulation is needed to protect emissions targets

27. The implication of the above is that industry level efficiency improvements alone will not deliver reduced energy demand, and that industry level initiatives will not deliver a reduced share of fossil fuel sources in their energy mix. The demands are too great and too specific for either to provide for credible control of GHG emissions.

28. Yet the official forecasts for dramatic increases in data centre energy demands, and the plausible expectation (as we are already seeing) that this will lead to further GHG emissions is not matched by the official system for the regulation of GHG emissions.

29. As far back as 2022, NESO highlighted "the current lack of a government agency tasked with tracking the GB data centre landscape."[24]

30. The most recent, seventh carbon budget from the Committee on Climate Change covers the period from 2038 to 2042 – precisely the point of maximum data centre energy demand implied in the NESO "Future Scenarios" forecasts.

31. Yet the same carbon budget contains not a single reference to data centres, nor any modelling of their likely impact on GHGs over this time period or, therefore, the potential consequences for decarbonisation efforts elsewhere. As we have seen, even the ten data centres for which GHG estimates have been provided would wipe out progress made in 2025 from EV use.

32. Similarly, the newly published Carbon Budget Delivery Plan pertaining to the sixth carbon budget makes no mentions of data centres. While acknowledging that artificial intelligence will have "a significant impact on emissions", it predicts that AI will improve energy efficiency and "sustainable practices" and that these "likely" future gains will more than offset the impact from increased energy demand for the AI itself, though it doesn't provide evidence on either front. Ultimately though it concludes that "these matters are not currently factored into the EEP baseline", i.e. it is not taking into consideration the impact of AI data centres.[25]

33. This can only be considered a serious oversight of a major, challenging new source for carbon emissions, and one that as a result imperils the entire progress of decarbonisation as made inside the carbon budget process.

34. It is essential, then, that:

    1. **The Committee on Climate Change resolves the patchy, incomplete and potentially inaccurate data availability for data centre GHG emissions with**

24 National Grid ESO, March 2022: https://www.neso.energy/document/246446/download#:~:text=Understanding%20the%20impact%20of%20data,a%20carbon%20free%20electricity%20system

[25] Department for Energy Security and Net Zero, *Carbon Budget Delivery Plan: Technical* Annex, https://assets.publishing.service.gov.uk/media/6901dfae71b575684c3cf78a/carbon-budget-and-growth-delivery-plan-technical-annex.pdf

comprehensive, empirically grounded modelling to supplement the energy demand modelling provided by NESO;

2. **That the carbon budget process makes explicit use of these models of data centre GHGs in considering the UK's permitted carbon allowances inside the carbon budgeting framework;**

3. **That government's planning for data centre expansion should make reference to the carbon budget, and its potential constraints.**

Opportunity Green is a not-for-profit organisation that uses legal, economic and policy knowledge to tackle climate change. We focus on hard-to-mitigate sectors including emerging challenges like rapid data centre growth. https://www.opportunitygreen.org/

Foxglove is an independent non-profit organisation that fights for a fairer tech future using litigation, campaigning and communication. Among Foxglove's areas of focus is the environmental impact of the tech sector – and specifically, the huge energy and water consumption of data centres. https://www.foxglove.org.uk/

Global Action Plan is a charity working to improve the health of people and the planet. We campaign for transparency regarding big tech's environmental impacts, and advocate for regulatory action to ensure the roll-out of digital infrastructure is consistent with the UK's climate commitments. https://www.globalactionplan.org.uk/