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Dear Philip,

Thank you for your letter of March 28, following the Environmental Audit Committee's Call for Evidence and two sessions exploring the role of Negative Emission Technologies (NETs), also known as greenhouse gas removal (GGR) technologies, in achieving net zero by 2050. My officials and I were impressed with the range of experts brought before the panel and the quality of the conversations held.

We recognise the role of GGRs in achieving net zero by 2050, which is why we set the ambition of deploying at least 5MtCO₂/yr of engineered removals by 2030, in line with Climate Change Committee (CCC) and National Infrastructure Commission assessments. We will develop markets and incentives for investment in GGR methods by consulting on our preferred business models to incentivise early investment in 2022.

My Department has developed a detailed response to your questions, answered by theme, which I attach.

Yours ever,

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Response to Environmental Audit Committee examination on Negative Emission Technologies (NETs)

The Contribution of NETs in Reaching Net Zero

Our priority is to reduce greenhouse gas emissions from human activities. The Net Zero Strategy, published in October last year, following a host of sectoral strategies, presents a comprehensive package to that end. Even with this action, our analysis shows that, in order to achieve net zero by 2050, greenhouse gas removal (GGR) methods will be required to balance residual emissions from some of the most difficult to decarbonise sectors, such as some parts of the agriculture and aviation sectors. This approach is supported by the Climate Change Committee, the Energy Systems Catapult, the National Infrastructure Commission and the National Grid ESO (the GB electricity system operator). Other countries are developing these technologies and the IPCC, while warning against overreliance, highlight their essential role in the recently published AR6 report.¹

The Net Zero Strategy presents a 'delivery pathway' as an indicative trajectory of emissions reductions across sectors which meets our targets up to the sixth carbon budget, while keeping a range of options open to net zero in 2050. This pathway includes negative emissions assumed from greenhouse gas removals, which balance residual emissions. Based on the current evidence base and projects in the pipeline, our analysis indicates that engineered GGRs would be expected to deploy from 0 MtCO₂ today to at least 5 MtCO₂ by 2030, around 23 MtCO₂ by 2035 and 75-81 MtCO₂ by 2050. Higher and lower deployment will depend on sector-specific and wider economy developments.

The pathway is based on our understanding now of the potential for each sector to reduce emissions, considering the balance between sectors that is optimal for the entire economy in terms of delivery and cost. As a general principle, it prioritises abatement where known technologies and solutions exist and thereby minimises reliance on the use of greenhouse gas removals to meet our targets. It is designed to drive progress in the short-term, while keeping options open and allowing us to adapt our approach over time. The *Embedding Net Zero* chapter of the Strategy sets out how we will monitor progress to ensure we stay on track for our emissions targets and respond to developments affecting our long-term goals, including the rate at which greenhouse gas removals are deployed.

Support for the rollout and development of NETs

As set out in the Net Zero Strategy, the Government recognises that one of the key barriers to investment in GGR technologies is the lack of an established market or stable customer demand for negative emissions. There will be an important role for the Government in de-

¹ <https://www.ipcc.ch/report/ar6/wg3/>

risking investment decisions for technology developers and providing the revenue certainty that will be required to construct large-scale 'First of a Kind' projects in the UK. We have therefore committed to consulting on business models for engineered GGRs in Spring 2022, which will aim to unlock private investment and enable deployment to take place from the mid-2020s.

To support this work, BEIS has commissioned an independent study exploring a range of commercial frameworks for Direct Air Carbon Capture and Storage (DACCS) and other engineered GGRs. The study has considered a wide range of contract-based and market-led approaches to catalysing investment, including contracts for difference and obligation schemes, engaging with a variety of stakeholders across industry, academia, and the finance community. The evidence from this study will help to inform the proposals in our consultation, which will be published in the coming months.

The UK Emissions Trading Scheme (ETS) Authority launched a call for evidence in March 2022 to understand the role the UK ETS could have as a long-term market for both engineered and nature-based GGRs. This was part of a wider consultation which considers proposals to develop the UK ETS. This call for evidence explores different eligibility criteria for GGRs' participation in the UK ETS, different types of market designs and phasing, and timings for inclusion. We will consider the responses received as part of this call for evidence to inform our future approach to whether and how the UK ETS could be expanded include GGRs.

We agree that effective deployment of engineered removals involves explicit consideration of public attitudes, both at the local and national levels. In 2021 we published our public dialogue on the role of CCUS in delivering Net Zero. This project engaged communities across the UK's industrial clusters and specifically considered attitudes towards engineered removals such as BECCS and DACCS². Participant support for these technologies was found to be conditional on them being cost-effective and not deterring the deployment of other technologies, such as renewables. We recognise that there is a particular challenge associated with effectively communicating the role of GGRs. This is why, in the Net Zero Strategy, we stated that GGRs must not be pursued as a substitute for decisive action across the economy to reduce emissions and made explicit reference to avoiding mitigation deterrence.

We will continue to engage the public as we develop our policy position on GGR deployment. For example, in March 2022 we launched a joint BEIS-Sciencewise public dialogue project on the uses and implications of biomass and BECCS. The overall aim of the project is to engage with a diverse group of participants on biomass and BECCS to gather views, perspectives, and any concerns on biomass sourcing (both domestic and imports) and use, including as part of BECCS. The findings will inform the forthcoming Biomass Strategy; specifically, we intend to include a plan for public engagement for the implementation of the Biomass Strategy. In addition, the findings of the project will influence any future sustainability criteria or regulations for biomass/BECCS, as well as inform BEIS of the areas where future public engagement is required.

Transport and storage Infrastructure

We recognise the importance of creating the right commercial frameworks to support the investment in carbon capture, usage and storage infrastructure and, of particular relevance to engineered GGRs, the development of CO₂ transport and storage networks.

² <https://www.gov.uk/government/publications/carbon-capture-usage-and-storage-ccus-public-dialogue>

That is why the UK Government is developing a Transport and Storage business model to support the deployment of T&S networks. The T&S regulatory investment ('TRI Model') is based on an economic regulation funding model. The T&S Regulatory Investment (TRI) Model is being designed to enable and support stable investment in CO₂ T&S projects over these long-life assets by providing investors with a clear sight of the long-term revenue model to ensure they can earn a reasonable regulated return on their investment. Further details on this model can be found on our website.³

Cluster Sequencing is the process used by BEIS to map a logical sequence for the deployment and allocation of T&S network capacity in the UK, initially by identifying and shaping the 'Track-1' CCUS clusters. The first phase of this process concluded in October 2021, and identified HyNet (Merseyside) and the East Coast Cluster (Teesside/Humber) as our Track-1 clusters, set to deploy in the mid-2020s, with the Acorn project (Grangemouth) held in reserve. Phase-2 of the process is currently underway and will shortlist prospective emitter projects seeking to connect to these clusters' T&S networks for commercial negotiations with government.

Phase-2 is scheduled to conclude with a confirmation of the final project shortlist from early Summer. BEIS will then enter into commercial negotiations with T&S operators and emitters from the Summer. We are currently refining the interim milestones for the delivery plan to reach commercial operation within the mid-2020s window. In parallel, we will continue to develop a future allocation process for additional 'Track-2' clusters, enabling us to reach our overall ambition of capturing and storing 20-30Mt CO₂ per year by 2030. In the Net Zero Strategy, we confirmed that 10Mt of this capacity will be delivered via Track-2 clusters; we will bring forward further details on the relevant allocation process in due course.

Monitoring, Reporting and Verification of GGRs

The Committee raises a number of general issues around MRV which are currently under active consideration, both within Government and in the private sector. In 2021, ahead of publishing the Net Zero Strategy, we established a 'GGR MRV Task and Finish Group' comprised of experts across government, industry, academia, and regulatory services. We published a summary report from this group alongside the Net Zero Strategy, which included recommendations on principles to guide our MRV approach and the future work required to advance the development of MRV policy for negative emissions. We stated that we will carefully consider the group's advice and build on their advice and evidence. We also acknowledged the complexity of ensuring that removals are properly verified, and that case-by-case scrutiny of the carbon intensity of project supply chains and long-term indirect emissions may be necessary in the near-term. We will consult on core MRV principles in our Spring GGR Business Models consultation.

Regarding the geological storage of CO₂ specifically, the North Sea Transition Authority (formally known as the Oil and Gas Authority) are the licensing authority for offshore CO₂ storage in the UK. The licensing regime ensures that all CO₂ storage sites are operated in accordance with strict safety standards and that monitoring of CO₂ at the storage site occurs over its entire lifecycle, including post closure, to provide assurance that the CO₂ is being permanently sequestered as expected.

The Committee raised a number of biomass and BECCS-specific questions. The Government recognises a key priority use for biomass with carbon capture utilisation or storage, where feasible, otherwise used only in hard-to-decarbonise sectors with limited or no low carbon alternatives. Government recognises that when undertaken sustainably,

³ <https://www.gov.uk/government/publications/carbon-capture-usage-and-storage-ccus-business-models>

BECCS can deliver negative emissions because carbon sequestered in biogenic material is captured and stored after combustion, resulting in a net removal of atmospheric CO₂. There are various potential routes for BECCS deployment, utilising a potentially large range of biomass feedstocks, and it is expected to play an important role as part of a suite of greenhouse gas removal options.

Government's Biomass Policy Statement⁴, published in November 2021, set out our position that BECCS deployment must be genuinely and credibly 'net-negative'. As set out above, last year, the Government convened a GGR Monitoring, Reporting and Verification (MRV) Task and Finish Group with the aim of understanding the current position on MRV for negative emissions in the UK, including for BECCS technologies.

We have also committed to publishing a Biomass Strategy in late 2022, and as part of this government will develop policies that ensure that BECCS only utilises sustainable biomass and results in genuine net-negative emissions. The current policy approach is that subsidies are only given to biomass that meets the sustainability criteria, irrespective of where it is sourced from. It is expected that the sustainability requirements for BECCS will build on the existing sustainability criteria operated under existing biomass support schemes and these criteria are in the process of review as part of the Biomass Strategy. The review will take into consideration the most up-to-date scientific evidence and extensive stakeholder engagement. Using these analyses, the Strategy will present options for ensuring any identified gaps within sustainability criteria, governance, and the regulatory landscape are addressed across sectors where biomass is used.

The UK's biomass sustainability criteria are already considered to be some of the most stringent in the world. They include specific requirements under the land criteria and greenhouse gas criteria. The land criteria consider a range of social, economic, and environmental issues, including protecting biodiversity and land use rights. The sustainability criteria are aligned to other government policies which govern biodiversity such as the UK Timber Procurement Policies and Environmental Permitting Regulations. The GHG criteria require that the full life cycle GHG emissions (including methane and nitrous oxide) from sourcing, processing and transporting biomass are accounted for, and do not exceed a given threshold.

The UK reports and accounts for biomass use in accordance with internationally agreed rules that follow guidance from the IPCC. We intend to take the same approach with BECCS, where under the IPCC any captured biogenic CO₂ is counted as a negative emission. However, like other biomass support schemes, we expect there will be GHG criteria that ensure that BECCS delivers net-negative emissions, including full life cycle emissions. We are currently reviewing what life cycle stages should be included in a BECCS-specific system.

NETs and other sectors

There are a range of GGR methods at early stages of development that may lead to negative emissions. As set out in the Net Zero Strategy, our overall ambition is to develop a technology-neutral supportive environment for GGRs. Technologies that re-use atmospheric and biogenic CO₂ may well have valuable uses in the creation of low-carbon products and in delivering net zero, though the extent to which they can be net-negative is still uncertain in some instances. Our current priority, via our work on business model development and research, is enabling the near-term deployment of the technologies that are most ready, whilst providing the necessary support for early-stage technologies to develop.

⁴ <https://www.gov.uk/government/publications/biomass-policy-statement-a-strategic-view-on-the-role-of-sustainable-biomass-for-net-zero>

Innovation, demonstration, and commercialisation of a range of GGRs are currently being supported in the UK through the Direct Air Capture (DAC) and Greenhouse Gas Removal Innovation Programme. This innovation programme which sits within a suite of related programmes in the Net Zero portfolio will help to ensure that technical improvements, cost reductions and efficiencies are demonstrated as well as the potential for scale up and commercialisation by the mid 2020s.

Neither the government's GGR innovation programme nor its GGR business models are intended for situations where enhanced oil recovery is part of the alternative use of CO₂.