Right Hon Ed Miliband MP
Secretary of State for Energy Security and Net Zero
Department for Energy Security and Net Zero
55 Whitehall
London
SW1A 2HP

Cc: Lord Hunt of Kings Heath, Minister for Energy Security and Net Zero
Sarah Jones, Minister of State, the Department for Energy Security and Net Zero, and the Department for Business and Trade

3 October 2024

Dear Secretary of State,

RE: Carbon Capture and Storage, and Low Carbon Hydrogen Programmes

There is widespread acceptance globally, and particularly in the UK, that the deployment of Carbon Capture and Storage (CCS) and low carbon hydrogen technologies is essential in the trajectory to Net Zero[1][2]. We were therefore disappointed to note the letter addressed to you from the Campaign against Climate Change ('CampaignCC') dated 11th September 2024[3], and wish to take the opportunity to address a number of the points raised.

Context
The UK is a world-leader in tackling climate change. As the first country to set legally binding emissions reduction targets through the Climate Change Act (2008) and the adoption of Net Zero in 2019, the Government has committed itself to an ambitious programme of action. Emissions have fallen by approximately 50% from 1990 levels.

However, as we all know, much of the heavy-lifting of reducing emissions remains. Much of our success to date has been through the reduction in carbon intensity of electricity generation, coupled with de-industrialisation.

While much of our economy will be electrified, there is a limit to the rate and scale at which this can be achieved, and, fundamentally, maintaining a flexible energy system with electricity alone is technically and economically challenging. As such, there will be an ongoing need for other decarbonisation technologies, such as CCS and hydrogen, to provide system flexibility and to decarbonise sectors of the economy, such as parts of heavy industry and energy from waste (EfW) that cannot be decarbonised through electrification. Greenhouse Gas Removals (GGRs), such as Direct Air Capture with CCS (DACCS) and Bioenergy CCS (BECCS), and CCS-enabled production of Sustainable Aviation Fuel (SAF) are also essential to decarbonise sectors such as agriculture and aviation that do not have an alternative pathway to decarbonisation.

This has been consistently clear in the Committee on Climate Change's independent recommendations and successive Governments have recognised this in developing an institutional framework for the deployment of these technologies that is the envy of many

[1] Net Zero: the UK's contribution to stopping global warming, Climate Change Committee, May 2019 https://www.theccc.org.uk/publication/net-zero-the-uks-contribution-to-stopping-global-warming/
[2] Still in the mix? Understanding the role of Carbon Capture, Usage and Storage, Energy Systems Catapult, https://es.catapult.org.uk/report/still-in-the-mix-understanding-the-role-of-carbon-capture-usage-and-storage/
[3] Campaign Against Climate Change, September 2024

jurisdictions across the globe. The combination of the powers conferred under the Energy Act (2023), the business models and allocation frameworks that have been developed by DESNZ and HMT, and the regulatory structures built by many of the UK regulators has generated an investment environment that is very favourable while trying to ensure value for money for taxpayers. The Industrial Decarbonisation Challenge has sought to identify both clusters and projects that are best placed to lead to the world's first low-carbon and net-zero industrial clusters. A number of projects, led by Track-1 Clusters, have made significant strides forward and stand ready to make a significant contribution to the achievement of UK climate goals in parallel with generating real economic benefits.

The UK Government, working in close conjunction with industry, should be applauded for its progress to date and we urge completion of the final steps necessary to move Track-1 Clusters into construction.

Premise

Much of the CampaignCC letter's focus is on emissions associated with the power generation and CCS-enabled hydrogen projects within the Track-1 Clusters. It sets these out as emissions relative to a baseline of zero, which, fundamentally, we would argue is the wrong counterfactual.

The correct counterfactual is today's existing energy system and its emissions footprint. It is quite clear that a technology, whether it be gas-fired power generation with carbon capture, or CCS-enabled hydrogen production, which can capture 95+% of emissions that would otherwise have been emitted, is a substantial forward step in tackling climate change. In addition, supporting the deployment of CCS infrastructure shared and required by many sectors, including EfW, GGRs (DACCS and BECCS), and SAF, is fundamental to the UK's achievement of Net Zero.

Emissions

In almost all scenarios of energy use in 2050 there remains a diminishing role for fossil fuels[4]. In this context, CCS and low carbon hydrogen provide us with the technology necessary to support a renewable electricity grid, guaranteeing energy security, and decarbonising the power sector and industrial energy consumption, with 95%+ of the associated emissions stored in perpetuity.

Specifically, all CCS-enabled hydrogen projects are required to meet the Low Carbon Hydrogen Standard (LCHS)[5] in order to be eligible to receive payments under the Low Carbon Hydrogen Agreement (LCHA). As the capital in these projects is provided by the private sector, and a return is only generated if they operate in compliance with the LCHS, it can safely be assumed that the diligence undertaken by the shareholder investment committees will be robust in ensuring that only compliant projects are constructed and operated.

In addition, the LCHS is a very robust and tight standard, particularly in comparison to other jurisdictions. As the CampaignCC letter highlights, embedded emissions of methane feedstock for hydrogen derived from imported LNG is a valid concern. However, systems such as the National Atmospheric Emissions Inventory (NAEI) natural gas upstream emissions factor demonstrate the tightness of the LCHS and ensure that LCHS can act as a useful force to drive down the greenhouse gas intensity of gas used with CCS in the UK. Overall gas demand is projected to decline as the UK decarbonises, but a combination of

[4] https://www.neso.energy/document/321041/download

[5] UK Low Carbon Hydrogen Standard, UK Government, April 2022 https://www.gov.uk/government/publications/uk-low-carbon-hydrogen-standard-emissions-reporting-and-sustainability-criteria

CCS and stringent upstream standards can ensure the climate impact of this energy source is minimised.

Beyond 2050, we know that there will still be residual emissions that need to be mitigated. Having CO_2 transport and storage networks in place, will also enable the delivery of Greenhouse Gas removals (GGRs), which are critical in almost all energy scenarios to decarbonise sectors such as agriculture and aviation, and allow us to reach a full net zero economy.

Track Record

The track record of CCS deployment is clearly the subject of some debate. However, it is clear in the UK that lessons have been learnt from previous CCS competitions, as highlighted in the recent National Audit Office (NAO) Value for Money Report on the Carbon Capture, Utilisation and Storage (CCUS) Programme[6], and the institutional framework which has now been built is sufficiently robust to ensure compliant project delivery and operation.

For a comprehensive overview of the CCS track record, we would draw your attention to the Clean Air Task Force's recent report '*What can we learn from the project track record*'[7]. This illustrates that projects deployed globally in the past have been undertaken for a range of reasons, primarily commercial, but few have been undertaken to meet regulatory requirements. The report highlights that "several large-scale projects have … consistently met high levels of technical performance" and that "commonly cited 'large-scale' CCS projects represent a fraction of the many commercial technologies actively capturing, transporting and storing CO_2."

The fact remains that, to achieve Net Zero in the UK by 2050 we need to deploy CCS at scale, and we need to deploy it well. Not doing so could lead the UK to lose its status as a world leader in the space of tackling climate change, climate technology innovation, and a hub for investment for the energy transition. The framework put in place by Government ensures shareholders returns are only achieved if regulatory capture rates are achieved. The robust regulatory framework put in place by, amongst others; Ofgem, Low Carbon Contracts Company (LCCC), Environment Agency and North Sea Transition Authority (NSTA), ensures that we can be confident in successful delivery of CCS in the UK.

Storage and Transport

CO_2 storage in the UK is regulated by the NSTA. Before issuing a storage permit, a comprehensive, multi-year programme of assessment and appraisal is undertaken, often including new seismic data acquisition and exploratory wells. The permitting process demonstrates the safety and integrity regime for operations, and the Monitoring Measurement and Verification regime (MMV). This process in the UK has taken over three years of substantial scrutiny from the regulators, and this should give confidence to stakeholders that storage is safe and secure.

The CampaignCC letter expresses concern about the possibility of CO_2 leakage. Independent studies have demonstrated that well-designed and managed storage systems will retain storage integrity over geological timescales. The UK Government's review on this subject, published in February 2023[8], states "*Estimates of containment probabilities for two*

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[6] Value for Money Report on the CCUS Programme, National Audit Office, July 2024 https://www.nao.org.uk/reports/carbon-capture-usage-and-storage-programme/#downloads

[7] 'Carbon Capture and Storage: What can we learn from the project track record?' Clean Air Task Force, July 2024 https://www.catf.us/resource/carbon-capture-storage-what-can-learn-from-project-track-record/

[8] https://www.gov.uk/government/publications/deep-geological-storage-of-carbon-dioxide-co2-offshore-uk-containment-certainty

example sites modelled over 25 years of injection operations and 100 years of post-injection monitoring indicate that more than 99.9% of the injected CO_2 will be retained within the storage complex'. It goes on to set out "*The UKCS is a well-regulated environment, and a CO_2 storage site will only be granted a CO_2 storage permit if the NSTA is satisfied that under the proposed conditions of use of the storage site, there is no significant risk of leakage or harm to the environment or human health. This further reinforces the degree of confidence in CO_2 containment that may be placed in a storage site that has received a permit."*

Given that today, the industrial sites that we do not decarbonise have, in effect, a 100% leakage rate, as all emissions are emitted directly to atmosphere without the implementation of CCS, then a well-regulated system that ensures the long-term integrity of 99.9% of its injected CO_2 is clearly a sensible step forward in tackling climate change.

Health and Safety
The UK is home to a range of high hazard industries and has developed a safety regulatory regime that is world-class. Safety of CCUS projects will be regulated by the Health and Safety Executive (HSE) and the NSTA. Both of these regulatory bodies have a long track record of effectively regulating safety in the UK hydrocarbon sector. For example, the HSE regulates tens of thousands of kilometres of high-pressure gas pipelines across the UK that are used every day to transport natural gas to homes and businesses. CCUS cluster system designs are compliant with all relevant design codes and standards and will meet regulatory requirements. They are developed by highly competent organisations and have long-established safety systems in place for design assurance.

The CampaignCC letter draws attention to the 'underdeveloped' nature of CO_2 safety regulation in the UK. It is correct to acknowledge that the HSE do not, at this point, classify CO_2 as a dangerous substance under the Control of Major Accident Hazards Regulations 2015 (COMAH), although we understand that this may be the subject of forthcoming consultation. Nonetheless, Track-1 Clusters have designed their systems to be compliant with the Major Accident Hazard Pipeline requirements under the Pipeline Safety Regulations (PSR) and have undertaken all the associated quantitative risk assessments and dispersion modelling that is necessary under such an approach.

Conclusion
We believe that the deployment of CCS and low carbon hydrogen technologies at scale is not only essential for the transition to Net Zero, but that they provide a substantial economic opportunity for the UK to become a world-leader in these technologies as the UK's institutional framework and project development expertise is globally second to none. As highlighted in the recent National Audit Office report[9], the potential costs of delays or pursuing alternatives at this stage could be significantly higher than moving forward with CCS. Therefore, we urge the UK Government to remain on its current delivery trajectory.

Yours sincerely,

- **Professor Myles Allen** CBE, FInstP and FRS**,** Head of Atmospheric, Oceanic and Planetary Physics in the Department of Physics, University of Oxford, and Professor of Geosystem Science in the School of Geography and the Environment
- **Professor Niall Mac Dowell** CEng, FIChemE, FRSC, Professor in Energy Systems Engineering at Imperial College London
- **Tim Dixon**, Director and General Manager at IEAGHG

[9] Value for Money Report on the CCUS Programme, National Audit Office, July 2024
https://www.nao.org.uk/reports/carbon-capture-usage-and-storage-programme/#downloads

- **Professor Paul Fennell** FIChemE FRGS, Professor of Clean Energy at Imperial College London
- **Professor Stuart Haszeldine**, Professor of Carbon Capture and Storage at University of Edinburgh
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