Right Hon Ed Miliband MP
Secretary of State for Energy Security and Net Zero
Department for Energy Security and Net Zero
55 Whitehall
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Cc: Rt Hon Lord Hunt of Kings Heath, Minister of State (Minister for Energy Security and Net Zero)
Sarah Jones, MP, Minister of State (Minister for Industry)

11 September 2024

Dear Secretary of State

We warmly welcome your commitment to decarbonising the UK's power supply and our industrial processes. As you take investment decisions which will have consequences for the UK for decades to come, we are writing to urge you to ensure that these important decisions are based on accurate information about technologies' climate impact and whether they will actually help or hinder the UK reaching net zero. Putting the UK on the wrong pathway could be catastrophic.

In the Track 1 carbon capture (usage) and storage (CCUS) programme which you have inherited from the previous government, final investment decisions are expected in September for the Net Zero Teesside Power, bpH2Teesside and Teesside Hydrogen CO2 Capture in the East Coast Cluster, and HyNet Hydrogen Production Plant 1 in the HyNet Cluster in Liverpool Bay. These are gas-CCS power stations and facilities to produce 'blue' hydrogen from natural gas with carbon capture.

We strongly urge you to pause your government's policy for CCUS-based blue hydrogen and gas power, and delay any investment decision into the Track 1 programme until all the relevant evidence concerning the whole-life emissions and safety of these technologies has been properly evaluated.

Currently, this policy would lock the UK into using fossil fuel based energy generation to well past 2050. In particular given declining North Sea gas supplies it would lock the UK into increasing Liquefied Natural Gas (LNG) imports.[1] This raises serious concerns, which we have set out below:

1. **Upstream emissions**

It seems certain that methane leaks from the UK's North Sea oil and gas operations have been significantly under-estimated. The UK's National Atmospheric Emissions Inventory

[1] DESNZ (2023) The role of gas storage and other forms of flexibility in security of supply: Energy security plan update

(NAEI) reports these at 52 Gg in 2019. However an independent analysis[2] using the best available data to estimate methane emissions from flaring, combustion, processing, venting, and transfer found a total of 289 Gg (uncertainty range 112 to 1181 Gg). The emissions for venting alone, as taken from oil and gas operators' own reports to the North Sea Transition Authority, were 112 Gg.[3]

Even more concerning are the very high upstream emissions, from methane leaks, transport and processing, from LNG imported from the USA and other countries given the increased imports of LNG which would be required to meet demand under current proposals. Most natural gas production in the United States is shale gas, with energy intensive extraction and high methane emissions as revealed by satellites or remote sensing. Based on these estimates of methane leakage, blue hydrogen produced in the US from shale gas was estimated to have a greenhouse gas footprint greater than burning gas or coal, due to the increased demand for natural gas to power the carbon capture.[4] This does not include additional emissions from liquefaction and shipping to the UK.

The recent report from Carbon Tracker "Kind of Blue" examines the impact of these upstream emissions on whether gas projects can claim to be low carbon.[5] It concludes that the proposed blue hydrogen production at H2 Teesside would have lifetime's emissions of around 15 to 25 million tonnes of CO2e, much higher than the 10 million tonnes reported by the developer in its environmental statement for planning. The report finds that "*even with the best technology, blue hydrogen from imported LNG could emit up to 2.5 times more than the UK's low carbon hydrogen standard*".

2. Short term impact of methane emissions

Comparing methane emissions to their CO2 equivalent is traditionally done by averaging both out over 100 years, but this was an arbitrary decision when the contribution of methane (responsible for around 30% of current warming)[6] was not well understood. Since almost all of methane's impact occurs within the first couple of decades, a 20 year timescale is now widely considered to be a more appropriate comparison. Limiting greenhouse gas emissions during this timeframe is crucial to avoid triggering climate tipping points. Over 20 years, methane has a global warming potential around 84 times that of CO2.[7] Recalculating the Carbon Tracker figures on this basis would nearly triple the climate impact of methane leaks.

3. Hydrogen leakage

Potential leaks of hydrogen during production and distribution are currently excluded from climate impact calculations. But hydrogen is a potent indirect greenhouse gas. Over the

[2] Riddick & Mauzerall (2022) Likely substantial underestimation of reported methane emissions from United Kingdom upstream oil and gas activities Energy Environ. Sci., 2023, 16, 295-304
[3] Uncertainty range 78-146 Gg allowing for inaccuracy in measurements of gas volume released
[4] Howarth & Jacobson (2021) How green is blue hydrogen? Energy Science and Engineering 9(10) 1676-1687
[5] Sani (2024) Kind of Blue Carbon Tracker
[6] IEA (2022) Global Methane Tracker
[7] European Commission EU Energy Policy website: Methane emissions

crucial 20-year timeframe it is estimated to cause around 37 times more warming per tonne than CO_2.[8] The inevitability of some leakage should clearly be taken into account.

4. Carbon capture's track record

Carbon capture projects have a consistent track record of over-promising and under-delivering. The majority of current CCUS capacity is within natural gas processing facilities, where CO_2 must be separated from hydrocarbons to produce marketable products. Almost 80% of the CO_2 captured is re-injected into oil fields to facilitate oil extraction.

The track record of adding carbon capture to power generation is much worse, with the vast majority of projects abandoned. Just two commercial-scale coal-fired power plants are operating with CCUS: Boundary Dam in Canada and Petra Nova in the US. Both have experienced consistent underperformance, recurring technical issues and ballooning costs.[9] Notably, the challenge of capturing CO_2 at lower concentrations from the flue gases of gas turbines is even greater than for coal-fired power plants.

5. Storage and transport

The assumption is that there will be no leakage of CO_2 from transport and storage. This is an unsound position to take with an emerging technology where difficulties have already been documented. There are only two undersea storage sites in the world (the Norwegian Sleipner and Snohvit fields). Both these projects are far smaller than the UK proposals, with 1.45 to 1.7 million tonnes of CO_2 per annum (mtpa) injected combined,[10] while the Northern Endurance Field is expected to reach 23mtpa and the Viking Field 10mtpa. They are also far less complex since the CO_2 is from only one source (gas refining). However, both have run into problems:[11] the CO_2 in the Sleipner field has leaked from the rock stratum where it was expected to be sealed, and the Snohvit one turned out to have far smaller capacity than geological modelling predicted. However well studied the undersea geology is, there is no certainty that CO_2 will not leak, with the risk of ocean acidification, ecosystem harms, and accelerating global heating.

6. Health and safety

CO_2 is an asphyxiant, heavier than air, which may not disperse readily in the event of a leak. Any pipeline leak would be a serious health risk, potentially fatal. In Satartia, Mississippi, in 2020, at least 45 people were hospitalised due to a CO_2 pipeline leak.[12]

Regulations and standards for safe pipeline transportation of CO_2 are underdeveloped, as acknowledged by the Health and Safety Executive.[13] In the case of projects such as the East

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[8] Parkes (2023) Hydrogen is a more potent greenhouse gas than previously reported, new study reveals Hydrogen Insight
[9] Sani (2024) Curb Your Enthusiasm: Bridging the gap between the UK's CCUS targets and reality Carbon Tracker
[10] Hauber (2023) Norway's Sleipner and Snøhvit CCS: Industry models or cautionary tales? IEEFA
[11] Hauber (2023) Norway's Sleipner and Snøhvit CCS: Industry models or cautionary tales? IEEFA
[12] Simon (2023) The U.S. is expanding CO2 pipelines. One poisoned town wants you to know its story NPR website 25/9/23
[13] Health and Safety Executive Pipeline design codes and standards for use in UK CO2 Storage and Sequestration projects

Coast Cluster, having multiple sources of CO_2 with varying pressures and contaminants is a factor which is acknowledged to increase the risk of pipeline corrosion, or other system failure caused by wear and tear.

There is also uncertainty about the extent to which technology developed for burning methane can control the higher levels of nitrogen oxides (NOx) produced when burning hydrogen or blended hydrogen/natural gas. NOx pollution is a well recognised public health issue, increasing the risk of respiratory conditions.

Questions have also been raised about the cumulative impact of the release of amines from multiple carbon capture operations in the same locality and how safe levels will be determined.

7. Monitoring and enforcement

At almost every stage in the process there is uncertainty about the technology and consequent emissions: the accurate assessment of upstream emissions, the reliability of carbon capture, the security of long-term geological storage, the safety of pipelines and the management of air pollution. Developers will inevitably give optimistic forecasts for all of these, but how will these processes and consequent emissions be independently monitored?

Safety precautions and measures to reduce emissions have a financial cost. Can we trust companies to operate to the highest standards and transparency when doing so has a direct impact on profits? We might consider UK water companies and their failure to prioritise controlling pollution over profit. However, unlike raw sewage, these emissions are invisible and occur over an immense and often inaccessible area.

When government funding is used to support large-scale private enterprise with significant risk of failure to achieve the intended outcome (in this case, genuinely low-carbon energy generation) questions need to be asked about who bears the risk if things go wrong.

8. Better alternatives for investment

A wide range of uses have been promoted for hydrogen, but not all are practical or competitive. The claim that hydrogen should have a significant role in heating buildings has been comprehensively disproved,[14] while direct electrification is increasingly emerging as a better solution for industrial process heating.[15]

While not denying that both carbon capture and green hydrogen may be needed for specific uses in a zero carbon economy, we have concerns about the harms that could be done by locking the UK into a fossil-fuel based pathway with inevitable upstream emissions, displacing genuinely zero or low-carbon electricity generation.

Instead of investing billions in large scale versions of unproven technologies, we urge your Government to prioritise funding for alternative flexibility technologies to enable a more rapid transition to renewables. There is increasing evidence that energy security can be achieved from a grid that is almost 100% supplied by renewable energy with a range of storage

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[14] Rosenow (2023) A meta-review of 54 studies on hydrogen heating Cell Reports Sustainability 1(1)
[15] Agora Industry (2024) Direct electrification of industrial process heat

technologies alongside demand reduction measures such as insulation and low energy heating systems.[16]

In summary we ask you to (1) review UK CCUS and hydrogen policy (2) delay any investment decision on Track 1 CCUS projects (3) expand funding for flexibility, grid storage technologies and retrofit of homes.

Yours sincerely

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Pascoe Sabido, Researcher and Campaigner, Corporate Europe Observatory
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Professor Peter Strachan, independent researcher, Energy Transition & Public Policy

[16] Breyer et al (2022) On the History and Future of 100% Renewable Energy Systems Research IEEE Access, 2022, p78176-78218.