The Scottish Parliament
Pàrlamaid na h-Alba

Rt Honorable Kwasi Kwarteng MP
Secretary of State for Business,
Energy and Industrial Strategy,
UK Government

By e-mail only

Net Zero, Energy and Transport Committee
c/o Clerk to the Committee
Room T3.40
The Scottish Parliament
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30 March 2022

Dear Secretary of State,

Carbon Capture, Utilisation and Storage

I am writing to you with some key questions for the UK Government about carbon capture, utilisation and storage (CCUS) from the Net Zero, Energy and Transport Committee. CCUS refers to a set of processes that capture carbon dioxide from waste gases produced at industrial facilities and either: (i) permanently store it in offshore geological storage sites (carbon capture and storage or CCS); or (ii) reuse it in industrial processes such as the production of chemicals, minerals, plastics and synthetic fuels (carbon capture and utilisation or CCU). CCS and CCU are increasingly being looked at in a joint way: Carbon Capture, Utilisation and Storage (CCUS).

Our questions arise from evidence gathered by the Committee in recent months as we considered what role CCUS has in achieving Scotland's target of being a net zero nation by 2045, in the aftermath of the UK Government's decision on "cluster sequencing", as discussed further below. The Scottish Government has also pledged to achieve net zero by way of a "just transition" that does not widen socio-economic divisions, and we also wanted to explore with witnesses whether CCUS technology can play its part in this.

- On 14 December 2021, we held a dedicated evidence session on CCUS with industry representatives and academic experts.
- On 21 December 2021, we held an evidence session with the UK Climate Change Committee (CCC), primarily to explore its recent report – Progress reducing emissions in Scotland - 2021 Report to Parliament – but also to follow up on points raised the previous week.

In addition to these evidence sessions, we agreed solicit further written evidence on CCUS from the Tyndall Centre for Climate Change Research at Manchester University, so as to ensure that our scrutiny rested on a robust and balanced evidence base, drawing on views from academia and industry. We are grateful to all who contributed to our scrutiny.

Both the UK and Scottish governments hope CCUS will play a crucial role in mitigating against climate change and helping the UK reach its net zero targets. Yet this evidence raised some significant questions, as discussed further below. These included questions about:

- the chief commercial barriers to developing CCUS;
- whether government has the right policy frameworks in place to support and incentivise its development;
- the technical, financial and environmental risks associated with CCUS, and
- fundamentally, whether we can rely on CCUS as a key element of the journey to net zero and, if so, under what conditions and in what circumstances.

The attached annexe provides a summary of the evidence heard, including links to written evidence received, with numbered questions for your consideration at appropriate parts of the text.

Another key theme to have arisen in our evidence-taking is the fundamentally cross-border and cross-government nature of CCUS. If this technology is to deliver, there must be cooperation and effective policy alignment. I am writing to the Scottish Government in similar terms, except that some questions are different, reflecting differing governmental responsibilities. This will shortly be available on the correspondence page [Correspondence | Scottish Parliament Website] of our website.

The Committee would welcome a response to the questions we raised below by Thursday 28 April.

Yours sincerely,

Dean Lockhart MSP
Convener
Net Zero, Energy and Transport Committee

Annexe A

Witnesses and evidence

On 14 December 2021, the Committee heard evidence from:

Panel 1:

- Erik Dalhuijsen, Director, Ocean Valley Ltd [Link to written evidence from Mr Dalhuijsen];
- Professor Stuart Haszeldine, Professor of Carbon Capture and Storage, School of Geosciences at the University of Edinburgh [Link to written evidence from Professor Haszeldine].

Panel 2:

- Colin Pritchard, Energy Business Manager, INEOS;
- Alan James, Chief Technology Officer, Storegga; and
- Mike Tholen, Director of Sustainability, Oil & Gas UK.

Sir Ian Wood, Chair of ETZ Ltd, was unable to attend but provided written evidence.

On 21 December 2021, the Committee heard evidence from the UK Climate Change Committee:

- Chris Stark, Chief Executive, Climate Change Committee; and
- Professor Keith Bell, Scottish Member, Climate Change Committee.

After discussing next steps on 1 February, we agreed to request written evidence on CCUS from the Tyndall Centre for Climate Change Research, University of Manchester. The request posed four questions:

- Whether CCUS has a role to play in helping the planet, and the UK and Scotland in particular, achieve net zero (with specific reference to Scotland's 2045 target);
- Whether CCUS will help achieve a just transition;
- Whether CCUS may, if anything, prolong fossil fuel dependence and, if so, whether there is any argument that this could be an acceptable short-term trade-off (for instance in pursuit of a just transition);
- Views if any, on whether the October 2021 decision to prioritise two other projects over the Scottish cluster appears to be a robust one, justified by the underlying scientific, logistical and engineering considerations, given the relevant information we have in the public domain about the different projects.

We received two responses from members of the Centre:

- From Dr Clair Gough and Dr Sarah Mander (10 March 2022);
- From Professor Kevin Anderson (13 March 2022).

Summary of evidence and questions

The role and robustness of CCUS

CCUS is new technology. At our two meetings, most of our witnesses strongly supported it as having a key role to play, both in helping meet net zero targets and in delivering a "just transition", by creating new skilled jobs, particularly in places hit by the decline of the fossil fuel industry. Importantly, this included not just industry representatives but also the Climate Change Committee, the UK and Scottish Government's independent adviser on climate change and net zero, as discussed further below.

We also heard that for many years North East Scotland has been considered as a prime site for the UK's first demonstration CCUS project. The Scottish Cluster is a cross-sectoral group of Scottish industrial CO_2 emitters (including whisky, transport, technology, infrastructure, chemicals, energy, real estate, manufacturing, and academia) and the Acorn CCS Project and Acorn Hydrogen Project which is based at the St Fergus gas terminal in North East Scotland. Acorn CCS aims to repurpose existing gas pipelines to take CO_2 directly to a storage site. The Hydrogen Project aims to take North Sea gas and reform it into hydrogen, with the CO_2 emissions removed and stored using the CCS infrastructure.

In his written submission, Sir Ian Wood states that 'Scotland is the most cost-effective place to begin CCUS in the UK given the capacity for CO_2 storage in the North Sea and the existing oil and gas infrastructure available to repurpose for CO_2 transport and storage.' Moreover, a recent report commissioned by Scottish Enterprise and the Scottish Government, CCUS Economics Impacts Study Delivering a roadmap for growth and emissions reductions for Scotland, states that:

- CCUS can play an important role towards Scottish Net Zero 2045 targets providing a carbon management economy, where CCUS is used not only to abate Scottish emissions, but also help other regions meet their decarbonisation goals

- CCUS could make a significant contribution to Scottish GDP through a mix of lowering costs towards net zero and CO_2 emissions as well as skills retention, increased economic output and jobs through deployment of CCUS projects.

There is however a strand of opinion that there is over-confidence in CCUS as a technology with Erik Dalhuijsen noting in his submission that:

> 'Contrary to much of the public discourse, CCUS is not proven or "oven-ready" technology. Regardless several decades of related history including study, near implementation and partial implementation, at present only two definite conclusions may be drawn from the experiences: it is costly to implement; and big drawbacks, uncertainties and risks remain with regards to both viability and implementation.'

The submission from Drs Gough and Mander said that the UK was “exceptionally well-placed” to be a “world leader” in CCS, with the right combination of skills, experience, infrastructure, and geology. It stated that:

> “CCS can provide significant emissions reduction this decade. Deploying CCS in existing high emitting industrial applications will enable drastic reduction in emissions during this decade.”

They argued further that the impact of the technology was “highly context specific, so it is essential that CCS deployment is evaluated on a case-by-case basis.” They saw a potential role for CCS both in decarbonising new renewables infrastructure and in relation to “blue hydrogen”,[1] which “may support the transition to establishing end-uses and hydrogen infrastructure before green hydrogen[2] becomes available at scale.” But they acknowledged that blue hydrogen’s role in domestic heating was “less clear”.

Professor Anderson’s evidence was more sceptical. It took as its starting point the first of the target-setting criteria set out in the Climate Change (Scotland) Act 2019 to not exceed “the fair and safe Scottish emissions budget [for] “holding of the increase in global average temperature to well below 2°C above pre-industrial levels, and pursuing efforts to limit the temperature increase to 1.5°C above pre- industrial levels”. From this, the evidence worked towards a conclusion that “there is little or no role for CCS in either power generation or blue hydrogen production”. Instead, use of the technology risked locking in emissions where renewable alternatives now exist. He said that, on current evidence, any role for CCS or CCUS should be limited to some industrial processes producing substantial CO2 emissions, such as cement production.

Some of the biggest backers of CCUS come from the fossil fuel industry, and we noted views that they also support developing new oilfields such as Cambo and maximising the economic recovery of oil and gas. Erik Dalhuijsen told us: ‘My main concern is that CCS might create a continuation of fossil fuel use where it should not be necessary.’ He argued that:

> ‘The top priorities are phasing out fossil fuels and maximising renewables growth. After those, the priorities are reducing energy use and wastage, adding storage, electrifying, driving modal shifts, and finding a solution for the unavoidables. For unavoidable emissions, such as those from cement manufacture, CCS technology would be useful. Anywhere else, alternatives would seem to be better.’

He added that, ‘ongoing investment in fossil fuel linked technology will delay investment in renewables and green-tech, postponing the energy transition, increasing cumulative emissions and reducing the availability of “green jobs”, which in turn prevents mobility of essential skills required to achieve the immense effort the transition entails.’

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[1] i.e. hydrogen energy obtained from the separation of hydrogen from natural gas. This is a process involving fossil fuels that releases carbon (in the form of CO2 when the hydrogen is also given off)
[2] i.e. hydrogen energy produced through water electrolysis. This process, on its own, releases no carbon alongside hydrogen, just oxygen.

During the evidence sessions, we explored ways in which CCUS could be deployed to tackle hard-to-decarbonise areas of the economy, including the potential of CCUS in relation to cement and waste incineration plants. The Scottish Government's Climate Change Plan update from 2020 discusses the deployment of CCUS technology in respect of energy from waste incineration plants. During the evidence session on 14 December, the Committee discussed the economics of retrofitting existing plants, particularly as there are numerous such plants in Scotland.

Questions:

1. It is clear that both the UK and Scottish Governments believe that CCUS technology has a role to play in achieving net zero by way of a just transition. Is there further information that can be put in the public domain to provide reassurance that proper risk analyses have been carried out and that the technology is viable, offers good value for money (to the extent that it is supported by public investment), and rests on a robust evidence base?
2. How do you respond to evidence and views that the viability of CCUS technology has never been satisfactorily proven and that it remains highly speculative as an effective method for achieving net carbon reduction?
3. How do you respond to views that large-scale adopting of CCUS may risk prolonging continuation of fossil fuel use?
4. The Committee notes a higher degree of consensus and hopefulness in evidence that CCS could form part of the pathway to net zero in relation to certain high-emission processes, such as cement production. There was less of a consensus on its role in relation to waste incineration. The Committee would welcome the UK Government setting out its thinking on the potential for future applications of CCUS technology in such areas and the extent to which this is being developed, in partnership with business or research bodies.
5. The Committee notes that the price of natural gas has spiked since last autumn. Whilst future price fluctuations are impossible to predict with certainty, it appears we may have entered a prolonged era of higher fossil fuel prices. We would welcome your assessment as to what this may mean in terms of future policy on CCS/CCUS. Does it make its use in relation to blue hydrogen production appear less viable? Conversely does green hydrogen production now look more within reach as an economically viable process?

The October 2021 decision and the future of the Scottish Cluster

In October 2021 an update on the UK's CCUS Cluster Sequencing Process revealed that HyNet North West (Wales) and the East Coast Cluster (North East England) would be prioritised for deployment in the mid-2020s, with the Scottish Cluster designated as a reserve project. This proved to be a key element of our evidence-taking.

Scotland has set a net-zero target for 2045, five years ahead of the overarching UK target. This was advised by the UK Climate Change Committee partly because of the much greater potential that could be offered by CCUS in Scotland. In written evidence to the Committee, Sir Ian Wood states:

> ‘The Scottish Cluster will draw upon 50 years of geoscience and reservoir engineering know-how from the Oil & Gas sector to accelerate the development of CCS. For example, a key focus of the Acorn project is to reuse the Goldeneye and Atlantic offshore pipeline and the Scottish Cluster proposes to re-purpose the onshore Feeder 10 pipeline between St Fergus and Grangemouth.’

The Scottish Government's update to the Climate Change Plan 2018 – 2032 sets out Scotland's path to achieving a 75% reduction in greenhouse gas emissions by 2030, and ultimately net-zero emissions by 2045. Negative Emissions Technologies (e.g. CCUS) are planned to start permanently removing carbon dioxide from the atmosphere by 2029, and to significantly ramp up emissions removal in the electricity and industrial sectors from 2030 onwards; equivalent to 23.8% of gross emissions by 2032. In evidence, we heard from Chris Stark that the decision on whether the CCUS facility in Scotland will go ahead will have a major impact on the achievement of the 2030 target, if the Scottish Government’s present plans remain the same.

We heard a range of questions about the Scottish Cluster being put on the reserve list. What does that mean for Scotland’s net zero targets, especially the 2030 target, and the UK’s overarching net zero target? What needs to be done about CCUS in Scotland now? As Alan James noted for example: ‘What is now needed with speed is clarity about the forward process with the UK Government and more detail about what reserve status really means with respect to the procurement process.’ Indeed, one of the clear messages that we heard was that if we want to get on with CCUS, we must do so quickly. According to Chris Stark:

> ‘…the question is not whether [the Scottish Cluster] should be developed but whether it will be available on time to have the impact that Scottish ministers would like it to have in the climate change plan update… there is a risk that Scotland might not be able to rely on greenhouse gas removals through carbon capture and storage. If that is what happens, we will need a clear decision from ministers. We make that point in our report: we recommend that a cut-off point for a decision be identified, which we say should be 2023 at the very latest.’

Professor Haszedline was amongst those to query the robustness of the decision. He told us that the two prioritised projects involve:

> ‘… geologically very similar—almost identical— sandstones. As a country, therefore, we are failing to test out the variability, the security and the performance of different types of geological storage. Acorn offers first access into a huge diversity of geological storage, offshore, in what is known as the central North Sea, north-east of Aberdeen. The UK Government may have chosen on cost, but it has introduced a systemic risk.’

Industry representatives remained hopeful that, from their perspective, the right decision on the Scottish Cluster would eventually be taken. They told us clarity and certainty will be needed going forward if the opportunities for the sector that it can provide are to crystallise. According to Mike Tholen, ‘there is no doubt that [for the

Scottish Cluster, it] is a matter of when, not if, and it would be preferable if it happened sooner— certainly not later. That message is getting back very loudly to the Scottish and UK Governments. Investors are certainly continuing to focus on the Acorn project as a vital part of the long-term decarbonisation strategy for Scotland and the UK.'

Questions:

6. We heard that stakeholders require clarity about what happens next on cluster sequencing, and more detail about what reserve status really means with respect to the procurement process. When will this be available?
7. In the view of the UK Government, what can now be done to ensure that the Scottish Cluster goes ahead in Phase Two. What could be improved, and in what ways did the Scottish bid not have an advantage?
8. How does the UK Government respond to Professor Haszeldine's view that prioritising projects with similar underlying geology has introduced systemic risk and that more diverse sites should have been favoured? What consideration was given to the underlying geology during the appraisal process, and as to the "systemic risk" to which he refers?

Jobs, training and the just transition

Most evidence agreed that there was the potential for CCUS technology to create a significant amount of new skilled jobs. For instance, Sir Ian Wood's written submission stated that:

- There is a "huge opportunity" for O&G firms and the wider supply chain to harness existing skills and expertise to "create many good, green jobs in the coming years and contribute significantly to the net zero ambition."

- Over 90% of the UK's oil and gas workforce, the majority of whom are employed in Scotland, have the necessary skills transferability into energy transition areas such as CCS.

- CO_2 shipping is a "significant enabler" of onshore and offshore jobs; within the UK, CO_2 transportation is critical to support the decarbonisation of other industrial regions.

In a recent statement to Parliament, the Cabinet Secretary for Net Zero, Energy and Transport noted that the Scottish Cluster estimates its projects can support an average of 15,100 jobs between 2022-2050, with a peak of 20,600 jobs in 2031.

The recent report commissioned by Scottish Enterprise and the Scottish Government, CCUS Economics Impacts Study Delivering a roadmap for growth and emissions reductions for Scotland, reiterates many of the points above, and sets out the following key findings:

- The growth of a CCUS supply chain would support a just transition for Scotland.

- Scotland already has the vital skills, expertise, and capability to build a CCUS supply chain.

- 10 to 22 million tonnes of CO_2 could be stored annually in Scotland by 2045.

- Scotland can benefit from a wealth of legacy oil and gas infrastructure to kick-start Scottish CCUS value chains reusing otherwise obsolete assets.

- St Fergus brings opportunities for CCS deployment though the development of Peterhead CCGT power station and Acorn Hydrogen.

As already noted, we also heard views (from Erik Dalhuijsen) that reliance on CCUS could prolong rather than abate fossil fuel reliance. The submission from Drs Gough and Mander noted the enormous potential for CCUS as a "suite" or "chain" of different technologies to help enable a just transition, in areas such as the jobs market, but said that it was "not a given" that the application of CCUS at scale would help achieve a just transition: it would depend wholly on the way in which this was brought about. A just transition would require an inclusive dialogue about the deployment of the new technology.

Questions:

9. What measures can the UK Government take to ensure that the north-east of Scotland, and Scotland more widely, can play a role in and benefit from the development of CO2 shipping?
10. What measures are the UK Government taking to enable a transfer of existing skills from other industries into CCUS so as to enable a just transition?
11. Should the Scottish Cluster not proceed, what are the implications for Scotland's ability to achieve a just transition, especially in the north-east Scotland?

Carbon Pricing

The Committee heard that the UK needs to keep the carbon price high so that the price of emitting becomes more expensive than the price of storing. The Committee heard how doing so would create a market in storage that would enforce, enhance and encourage storage and would not encourage enhanced oil recovery. According to Professor Haszeldine, the UK should aim to keep the carbon price high so that:

> 'the UK has a carbon emissions trading scheme, rather like the existing European trading scheme, under which big industrial emitters need to purchase permission to emit a tonne of CO2. With the move to net zero, that price has moved up from £20 a tonne to about £70 or £80 a tonne in the past year. That is important, because the price of emitting starts to come very close to the price of carbon capture, transport and storage. Storing is obviously much better than emitting, environmentally, and with that approach the financial difficulty starts to go away. It is in the UK's gift to try to keep that carbon price high. That will encourage decarbonisation of industries all around the UK, so it would be a sensible backdrop to do that.'

Questions:

12. Will the UK Emissions Trading Scheme be set up so as to ensure that the price of emitting CO2 is less competitive than capturing and storing it?

The Role of Direct Air Capture

Written evidence from Sir Ian Wood highlights the potential for a Direct Air Capture project in the future, and states:

> ‘This is a key component to decarbonising very hard to abate sectors such as major British airlines, and the financial and professional services sectors. Reaffirming the early progression of the Scottish Cluster would ensure the UK is home to the first and largest Direct Air Capture facility in Europe presenting huge manufacturing and export revenue potential for the UK.’

The Committee heard from Alan James that:

> ‘For building the direct air capture plant itself, we need to have a functioning transport and storage system. The capture piece and the transport and storage element are two separate components. The transport and storage system needs an economic and commercial licence in order to operate. That comes from BEIS [UK Government’s Department for Business, Energy and Industrial Strategy], and it is only available for track 1 businesses at the track 1 clusters at the moment. That work is therefore on hold until we can move things forward. That is an example of where we are not dependent on the money from the UK Government per se to move the work forward; we are dependent on the economic licence and the provisions for long-term storage liability, which the UK Government has as part of its track 1 process.’

Questions:

13. What is the UK Government’s view on whether or not to grant an economic license to the Scottish Cluster to allow it to advance its direct air captures capabilities?