

Annex – Detailed responses to Net Zero, Energy and Transport Committee Commission questions on CCUS

The role and robustness of CCUS

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?

Governments across the world are looking to carbon capture utilisation and storage (CCUS) as a means to decarbonise. Globally, carbon capture and storage (CCS) projects already sequester over 40Mtpa of CO₂, and the Global Carbon Capture and Storage Institute (GCCSI)¹ report an active pipeline of projects that would deliver globally 111 Mtpa. The GCCSI intelligence database 'CO2RE' identifies 29 operational CCS facilities worldwide that are capturing and storing carbon permanently, economically, and from a variety of applications². There are many more facilities already operating on a pilot or demonstrator basis, or that are at advanced stages of development.

Globally CCS has been utilised by steel and fertiliser production as well as in the oil and gas industry. CCS has operated in Norway for over 25 years with the Sleipner and Snøhvit CCS projects being the pioneers³. Norway is now developing a national scale CO₂ storage service to take and store industrial CO₂ from countries around the North Sea and Baltic for profit. The Netherlands is about to licence offshore CO₂ storage, and Denmark seems likely to follow. All these projects have undergone full risk assessments industrially and financially⁴. An International Energy Agency commentary found that unprecedented momentum behind CCUS last year, with over 100 new CCUS facilities announced between January and November 2021⁵. CO₂ capture has been operational in Scotland since the 1970s, 'sweetening' the North Sea gas that comes ashore at St Fergus⁶. It has also been used in the North British Distillery in Edinburgh, to capture CO₂ from the whisky fermentation process.

CCUS is not new technology but, due to previous cancelled UK Government CCS competitions, has yet to be rolled out on the regional cluster scale necessary to deliver industrial decarbonisation to the degree required by our emissions reductions targets. However, the technology is viable and operational around the world today.

Scotland has great capacity for CO₂ storage, with an estimated 46 Gt of potential in the Scottish North Sea. This world-class storage resource provides a route for much of the UK's emissions to be safely stored in well-characterised sites deep

¹ GCCSI, Global Status of CCS 2021

² [Facilities - Global CCS Institute \(co2re.co\)](https://www.co2re.co)

³ Scottish CCS, [CCS in action \(sccs.org.uk\)](https://www.sccs.org.uk)

⁴ Information provided by Scottish Carbon Capture and Storage (SCCS)

⁵ [Carbon capture in 2021: Off and running or another false start? – Analysis - IEA](#)

⁶ Information provided by Scottish Carbon Capture and Storage (SCCS)

below the North Sea. The Acorn CCS project is currently Scotland's only proposed storage project and completed Front End Engineering Design (FEED) studies in 2021. Risk analysis has also been carried out for the project; we note that full risk assessment is required as a precondition of any licensing or permit application through the UK regulators.

In 2020 the Scottish Government commissioned academic research consortium Scottish Carbon Capture and Storage (SCCS) to undertake a rapid evidence assessment of risks associated with CO₂ transport and storage. This stated that *“the academic literature overwhelmingly concludes that the probability of leakage, or of harm to human health, the environment, or greenhouse gas emission associated with these risks exists within acceptable or manageable levels”*. Published and peer reviewed work from a Marine Scotland Science CCS monitoring review concludes that *“the probability of CO₂ leaks from offshore CCS schemes in shelf sea waters is low. If they do occur their spatial scale of impact is small, and the potential environmental impact is low.”*⁷ In the Peterhead and White Rose Yorkshire CCS projects, which sought UK Government funding during the cancelled competition in 2015, detailed risk assessments were performed, which are in the public domain and available for scrutiny; at least the same standard of risk assessment is to be expected from all future proposed projects⁸.

Technology readiness level (TRL) assessments conducted by the International Energy Agency (IEA)⁹ show that there are technologies at all stages of the CCS chain at TRL 8 (first of a kind commercial) or above and that new technologies are being developed and moving up the TRL scale. For comparison, the IEA's analysis finds onshore wind to be at TRL 9-10, offshore floating wind at TRL 8, and tidal stream power generation to be at TRL 5.

Funding for CCUS projects will be derived from a mix of private investment funding, and through public revenue support and investment. Delivery of CCUS projects is not a fully devolved competency. The UK Government has developed and initiated its package of support to developing CCS clusters in the UK via the CCUS Cluster Sequencing Process^{10,11,12}. This provides capital support via the £1 billion CCS Infrastructure Fund (CIF); revenue support via emerging business models; and underwriting of low-probability high-impact risks relating to CO₂ transport and storage through a Government support package.

The £1 billion CCS Infrastructure Fund (CIF) will primarily support capital expenditure on CO₂ transport and storage networks and industrial carbon capture projects selected for Track-1 of the cluster sequencing process. Clusters sequenced

⁷ Turrell, W.R., B. Berx, E. Bresnan, P. León, S. Rouse, L. Webster, P. Walsham, J. Wilson and P. Wright (2021) A review of national monitoring requirements to support offshore Carbon Capture and Storage (CCS)

⁸ Information provided by Scottish Carbon Capture and Storage (SCCS)

⁹ [ETP Clean Energy Technology Guide – Analysis - IEA](#)

¹⁰ [Carbon capture, usage and storage: market engagement on cluster sequencing - GOV.UK \(www.gov.uk\)](#)

¹¹ [Cluster sequencing for carbon capture, usage and storage \(CCUS\) deployment: Phase-1 - GOV.UK \(www.gov.uk\)](#)

¹² [Cluster sequencing for carbon capture, usage and storage \(CCUS\) deployment: Phase-2 \(closed to applications\) - GOV.UK \(www.gov.uk\)](#)

onto Track-1 also have the first opportunity to be considered for support through the CCUS business models for transport and storage, power, industrial capture, low carbon hydrogen and, potentially, bio-energy with CCS (BECCS). The business models are designed to support initial investments and ensure stability of revenues in order to enable the transition to a private sector driven steady state. Other support Track-1 clusters are eligible for includes access to a Government support package for protection of transport and storage operators from specified low probability but high impact risks not fully covered by commercial insurance. Although the business models are still being developed by the UK Government, it has indicated that value for money for the consumer and the taxpayer will be considered when awarding capital funding and revenue support through the business models.

With regards to the costs of decommissioning of CCUS assets, decommissioning of offshore CCUS installations and pipelines is regulated by the Offshore Petroleum Regulator for Environment & Decommissioning (OPRED)¹³. One of OPRED's key responsibilities is to protect the taxpayer from decommissioning liabilities and it has a risk assessment regime in place and powers to take mitigating actions to enable this.

The Scottish Government has offered financial backing of up to £80 million capital from the Emerging Energy Technologies Fund (EETF) to help the development of Scottish Cluster carbon capture projects essential to Scotland's just transition to net zero. The Scottish Government has offered this investment to support the UK Government to seek opportunities to accelerate development of the decarbonisation projects within the Scottish Cluster.

In terms of offering value for money, economic analysis commissioned by Scottish Enterprise and the Scottish Government that concludes that the uptake of CCUS in Scotland has a positive impact on the Scottish economy. In 2045, Scottish GDP can be 1.3-2.3% (£3.8 billion -£6.7 billion) higher in scenarios with CCUS, than without. Even with modest CCS uptake, the GDP increase in 2045 could reach up to 1% (£2.9 billion). Furthermore the assessment indicated that the comparative scenario to deliver net zero without CCS was hypothetical and generally not credible, reflecting and reaffirming the position with the Climate Change Plan Update that net zero cannot be delivered without utilising CCS.

The UK Climate Change Committee, the IPCC and the IEA have all publicly confirmed the urgent need for CCS deployment. The International Energy Agency has estimated that by 2050, the cost of tackling climate change without CCUS could be 70% higher. They also estimate that to reach a 50% cut in global CO₂ emissions by 2050 (widely believed to be equivalent to limiting the increase in global temperature to 1.5 degrees), CCS will need to contribute nearly one fifth of emissions reductions – across both power and industrial sectors.

In conclusion, the large number of CCS projects that are planned or already operating safely worldwide, the assessment of the current evidence on storage risks, the availability of high TRL technologies at all stages of the CCS chain, the recent economic analysis work commissioned by us and the current or developing

¹³ [Carbon Capture, Usage and Storage: an update on the business model for transport and storage \(publishing.service.gov.uk\)](https://publishing.service.gov.uk)

processes for providing financial support and regulatory permits for CCUS projects in the UK gives the Scottish Government confidence that our support for CCUS rests on a robust evidence base that covers its technological viability and value for money and adequately considers its risk.

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?

With reference to the response to the Committee's first question there are 29 operational projects globally with the oldest of these, Sleipner in Norway, having operated for over 25 years. This example is well documented, has been the subject of international study and peer review, and has reduced emissions by around 1MT/yr over a period of 25 years.

The need for large scale climate mitigation has never been so acute. If we are to achieve this within a framework of providing Scotland with economic stability for our industrial and manufacturing sectors and a just transition in traditional employment sectors to new opportunities that utilise similar skills experience and supply chains, then CCUS must be part of our route to net zero, in fact it is mission critical.

As highlighted recently by GCCSI¹⁴, some of the world's foremost climate and energy experts recognise CCS as a necessary and viable technology to help reach net-zero, including:

- Dr Fatih Birol, Executive Director of the International Energy Agency: *“CCUS is a necessary bridge between the reality of today’s energy system and the increasingly urgent need to reduce emissions. Not only can it avoid locking in emissions from existing power and industrial facilities, it also provides a critical foundation for carbon removal or negative emissions”*;
- Dr. Sally Benson, Deputy Director for Energy and Chief Strategist for the Energy Transition at the White House Office of Science and Technology Policy: *“Over the last 20 years, the role of carbon capture and storage [as a climate solution] has evolved from ‘nice to have’ to ‘necessary’”*;
- Prof Jin Hongguang, Member of China Academy of Sciences, Chair Commissioner, CCUS Professional Committee, Chinese Society of Environmental Sciences: *“CCUS is proven to deliver massive emission reductions. It provides a pathway for the low-carbon utilisation of fossil fuels and to achieve negative emissions, and will also make a significant contribution to clean energy production, such as hydrogen... CCUS is not only essential for CO₂ emissions reduction, but is an indispensable technology to build a resilient, versatile, and complementary future energy mix”*; and
- Lord Nicholas Stern, IG Patel Professor of Economics and Government, and Chairman of the Grantham Research Institute on Climate Change and the Environment at the London School of Economics: *“We have long known that CCUS will be an essential technology for emissions reduction; its deployment across a wide range of sectors of the economy must now be accelerated. Low-carbon technologies, including renewables and CCUS, point toward a*

¹⁴ [What the Experts Say About CCS \(Factsheet\) - Global CCS Institute](#)

viable pathway for achieving net-zero GHG emissions by 2050, even in sectors that were considered “too difficult” to decarbonise just a few years ago, such as steel, cement, aviation, and long-distance transportation”.

CCS projects, like any new industrial scale technologies, may experience challenges in construction and operation. This is normal and to be anticipated, will be project specific, often relating to engineering, and expected to decrease as more projects are built and knowledge and experience shared. The global experience so far has demonstrated that such challenges can be managed. This is not a reason not to deploy CCS, nor to consider the technology ‘not proven’.

The deployment of CCS projects is also impacted by the need for a financial motive or business model in most jurisdictions to reduce rather than release greenhouse emissions into the atmosphere. This highlights the importance of continuing to support the UK Government’s efforts to establish a functioning regulatory framework and set of business models that support the much needed private investment in this space.

Whilst CCS is not new and is already an operational technology, it does provide opportunities for new technologies that will help our decarbonisation. For example, negative emissions can be provided via direct air capture (DAC), an emerging technology that has been successfully piloted in Switzerland and in Iceland where the First Minister visited the Carbfix project in 2021. The Scottish Cluster includes a Carbon Engineering/Storegga DAC project that would immediately sequester 0.5Mtpa of CO₂ easily and swiftly scalable to 1Mtpa. Negative emissions technologies (NETs) are essential to balance unavoidable emissions in other sectors within the Climate Change Plan.

3. How do you respond to views that large-scale adopting of CCUS may risk prolonging continuation of fossil fuel use?

Existing and future oil and gas infrastructure will, to some extent, operate in conjunction with these essential enabling technologies if the oil and gas sector is to credibly contribute to a just transition that supports highly paid, high-skilled jobs and provides long term energy security in Scotland. The development of CCUS technology will have a crucial role to play in achieving Scotland’s net zero targets. Critically CCUS is viewed by experts such as the UK Committee on Climate Change (CCC) the International Energy Agency and the UN Intergovernmental Panel on Climate Change as being necessary to achieving Scottish, UK and international climate emissions targets. This is a significant opportunity for the domestic energy supply chain to take advantage of and develop this new technology at scale, with many of the companies who are involved in oil and gas currently possessing the skills, capabilities and technologies to develop this technology which can then be exported internationally.

The Scottish Government’s position is clear that unlimited extraction of fossil fuels is not consistent with our climate obligations and we have called on the UK Government, who have the power to act in this instance, to urgently re-assess all approved oil licenses where drilling has not yet commenced against our climate commitments. Our position on offshore oil and gas licensing is supported by the UK

and Scottish Government's statutory advisers on climate change; the CCC agree that any effective and credible checkpoint must extend beyond new licensing rounds to also cover those fields that have already been consented but are not yet in production – this includes fields such as Cambo. That is why, as outlined in the Bute House Agreement, we have committed to undertake a programme of work and analysis to better understand our energy requirements as we transition to net zero and how this aligns with our climate change targets and the goal of the Paris Agreement to limit global warming to well below 2, preferably to 1.5 degrees Celsius, compared to pre-industrial levels. This will ensure an approach that supports and protects our energy security and our highly skilled workforce whilst meeting our climate obligations, recognising also that we must reduce our own reliance on our domestic production of oil and gas – noting the dependency on the development of new alternatives. This analysis will also provide a balanced and informed analysis of the role that technologies such as hydrogen and carbon capture can play in our just transition to net zero – with a focus on the potential of the sector, and its infrastructure and assets.

It is clear that we must focus on how to accelerate the development of new sources of energy, with associated new jobs so that we can move away from oil and gas more quickly, with a presumption as far as possible against new development. We recognise also that the oil and gas also provides feedstock to support the petrochemical and fertilizer industries; and raw materials for plastic industrial chemical and pharmaceutical industries. As referenced above, we recognise that we must reduce our own reliance on our domestic production of oil and gas – noting the dependency on the development of new alternatives, with a presumption as far as possible against new oil and gas offshore developments. It is also clear that CCUS will also play a role in reducing emissions in hard to decarbonise industrial sectors that cannot electrify their industrial processes. This view is supported by the IEA which recognises that CCUS is one of the most cost-effective solutions available for large scale emissions reductions.

Furthermore, the Bute House Agreement confirmed the Scottish Government's support for CCUS as part of the energy transition and in particular it remains committed to supporting the delivery of the Acorn project at St Fergus, Aberdeenshire, a key element of the Scottish Cluster. The Agreement was struck that the strategy for deployment of CCUS must enable decarbonisation at pace and cannot be used to justify unsustainable levels of fossil fuel extraction or impede Scotland's just transition to net zero.

CCUS can deliver decarbonisation at pace. The Acorn CO₂ storage project could commence within three years of final investment decision (FID) and enable carbon capture and transport projects within the Scottish Cluster to develop swiftly. Importantly, this also enables the delivery of negative emissions including direct air capture (DAC) and bioenergy with CCS (BECCS) which can help to balance hard to abate emissions across the economy and deliver net zero.

CCUS is costly and large-scale deployment can benefit from significant economies of scale, delivering better value for money. Economic analysis commissioned by Scottish Enterprise and the Scottish Government acknowledges that the clustering of neighbouring emitters can help to achieve economies of scale and hence de-risk and

justify the development of costly new or repurposed infrastructure. Scenarios explored in the economic analysis experienced improved economies of scale with higher CO₂ volumes.

The development of strategically-located CCUS infrastructure in Scotland's industrial clusters in Grangemouth and the North East will play a pivotal role across the decarbonisation strategies of key sectors such as heat, industry and power, playing a role in Scotland's energy transition and the decarbonisation of industries that are unable to electrify. However, the UK Government's cluster sequencing decision (which designated the Scottish Cluster a reserve cluster in the Track-1 process) risks delaying the industrial decarbonisation of Scotland and creating an un-level playing field across the UK. This is why we have repeatedly called on the UK Government to reverse this decision and to accelerate the Scottish Cluster to full Track-1 status without delay. To this end, we are working constructively with the UK Government to ensure the Scottish Cluster has the certainty it needs to continue its development and have offered £80 million from our Emerging Energy Technologies Fund to accelerate the Scottish Cluster's deployment.

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 Scottish 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.

The Scottish Government recognises that the development of strategically located CCS infrastructure in Scotland's industrial clusters in Grangemouth and the North East could protect and ensure the just transition for important domestic industries into a low-carbon future, protecting jobs and utilising existing skills. The Climate Change Plan update therefore prioritises and highlights the essential role of Carbon Capture and Storage (CCS) in decarbonising industry, power, and heat, underpinning the production of low carbon hydrogen and enabling negative emissions technologies (NETs).

We see potential for our negative emissions envelopes to be achieved through a variety of technologies including Direct Air Capture (DAC) and forms of Bioenergy with Carbon Capture and Storage (BECCS) such as Energy from Waste with CCS (EfW CCS). Approximately 50% of the emissions from waste incinerators arise from the biomass component of the feedstock, meaning that its capture and permanent sequestration results in negative emissions. Several pieces of work are being prepared to expand our evidence base and consider the potential suitability of EfW CCS for Scotland.

In November 2022, the Minister for Green Skills, Biodiversity and Circular Economy appointed Dr Colin Church to act as independent chair of a review of the role of the waste hierarchy in Scotland. Dr Church set out in the Call for Evidence for this Review his intention to commission a further piece of work, since he believed an assessment of the options to decarbonise the existing residual waste treatment

infrastructure, including waste incineration, in Scotland would take longer than the intended timescale for the Review. This further work will consider CCS as one such decarbonisation option.

Additionally, we are preparing to commission a feasibility study into the deployment of negative emissions technologies in Scotland, as committed to in the Climate Change Plan update. In a manner complimentary to the incineration review, this will examine a broader suite of technologically advanced NETs, including EfW CCS, and consider which offer implementable and effective options for achieving our negative emissions envelopes.

Finally, the Scottish Government's aim is to see bioenergy used where it has the greatest value in reducing emissions. We are therefore currently working to review the availability of sustainable biomass and the most appropriate use of these finite resources across the whole energy system in Scotland. We intend to publish a Bioenergy Action Plan in 2023.

Regarding partnership with business and research bodies, the Scottish Government's aim of advancing of Scottish CCS infrastructure is shared and supported by North East CCUS (NECCUS). NECCUS is an industry-led alliance amongst which are leaders from many energy-intensive industrial sites who are committed to finding ways to abate emissions, including Tarmac who operate Scotland's only major cement production facility. The group emerged out of a need to create a formal entity to coordinate and promote CCUS in Scotland at a Scottish, UK and European level and was provided £300K start-up funding and continued financial support by the Scottish Government.

We also have a well-established working relationship with Scottish CCS (SCCS), the largest CCS research group in Europe, who have undertaken a number of research projects with government funding.

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?

As advised in response to question 3 we are currently undertaking analysis to better understand Scotland's energy requirements and its uses as we transition to net zero, ensuring an approach that supports and protects our energy security and our highly skilled workforce whilst meeting our climate obligations. We recognise also that we must reduce our own reliance on our domestic production of oil and gas – noting the dependency on the development of new alternatives. It is clear that we must focus on how to accelerate the development of new sources of energy, with associated new jobs so that we can move away from oil and gas more quickly, with a presumption as far as possible against new development. The IPCC's recent reports starkly show that the impacts of climate change are even worse than previously thought, and that business as usual is not an option.

As noted by the Committee, future price fluctuations are impossible to predict with certainty. However, it is clear that hydrogen (green or blue) is likely to confer benefits when considered in the wider energy system with the potential to provide more overall system flexibility, storage capacity and better utilisation of existing infrastructure. Our policies continue to support the production of blue hydrogen and green hydrogen in the most cost competitive way possible.

The October 2021 decision and the future of the Scottish Cluster

6. In what way, if any, have the Scottish Government adapted plans to compensate for the Scottish Cluster being placed on the reserve list? Have the Scottish Government modelled a “point of no return” where it will be too late for the project to be implemented in time to meaningfully contribute towards achieving the 2045 target?

The Prime Minister’s 10 Point Plan for a Green Industrial Revolution announced in November 2020 included a commitment to support two carbon capture clusters in the UK by the mid 2020’s and a further two clusters by 2030, with an ambition to capture 10 MtCO₂ per year by 2030¹⁵. The UK Government’s Net Zero Strategy, published in October 2021, went even further by setting out an ambition to capture 20-30 MtCO₂ per year across the economy by 2030¹⁶. The 2035 Delivery Plan in the UK Government’s recently-published CCUS Investor Roadmap indicates a mid-2022 to 2030 timeline for cluster sequencing Track-2 development through to project construction¹⁷, although it does not indicate when Track 2 will open for applications or the successful clusters announced. We believe that the Scottish Cluster’s Acorn CCS project is uniquely placed to be the least cost and most deliverable opportunity to deploy a full chain CCS project in the UK. The Scottish Cluster is supported by the Acorn T&S network, which is one of the most mature and cost effective T&S systems in the UK. The Acorn project has already completed the necessary Front End Engineering and Design (FEED) studies and has indicated an approximate timeline of three years from Final Investment Decision to completion of construction, provided necessary work around licensing is commenced in advance. Therefore, we believe that the Scottish Cluster, which has been selected as a Track-1 reserve cluster that *“met the eligibility criteria and performed to a good standard against the evaluation criteria”*¹⁸, is well-placed in the UK Government’s cluster sequencing process and remains in a strong position to deploy CCS in Scotland well in advance of 2045 and contribute towards Scotland’s net zero targets.

However, the Scottish Cluster CCS project’s many potential benefits are numerous and include supporting a just transition to net zero, supply chain growth and economic benefit in Scotland. For example, by deploying CCUS, hydrogen and direct air capture technologies in Scotland, the Scottish Cluster could support an average of 15,100 jobs between 2022-2050, with a peak of 20,600 jobs in 2031. Therefore, we are continuing to engage with the UK Government to advocate for the Cluster

¹⁵ [The ten point plan for a green industrial revolution - GOV.UK \(www.gov.uk\)](https://www.gov.uk/government/long-term-views/ten-point-plan)

¹⁶ [Net Zero Strategy: Build Back Greener - GOV.UK \(www.gov.uk\)](https://www.gov.uk/government/long-term-views/net-zero-strategy)

¹⁷ [Carbon capture, usage and storage \(CCUS\): investor roadmap - GOV.UK \(www.gov.uk\)](https://www.gov.uk/government/long-term-views/carbon-capture-usage-and-storage-ccus-investor-roadmap)¹⁸ [Written statements - Written questions, answers and statements - UK Parliament](https://www.parliament.uk/written-questions-answers-statements/)

¹⁸ [Written statements - Written questions, answers and statements - UK Parliament](https://www.parliament.uk/written-questions-answers-statements/)

and have offered £80 million from our Emerging Energy Technologies Fund to accelerate the Scottish Cluster's deployment. We are currently working with the UK Government to explore the potential for our funding offer to achieve this goal. We are also continuing to call for the elevation of the Scottish Cluster to full Track-1 status, the acceleration of Track-2 of the cluster sequencing process and the recognition of key design criteria that will help maintain a level playing field in Track-2, as described in the response to question 7.

7. In the view of the Scottish Government, what can 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?

The Scottish Cluster bid included CO₂ captured from a range of diverse sources (e.g. from existing industrial sites at St Fergus and Grangemouth, from a new build gas power station, from blue hydrogen manufacture), Direct Air Capture and CO₂ imported by ship from UK and European emitters generating export revenue). However, the power and industrial emissions in the proximity of the Acorn T&S landfall point at St Fergus are currently small, despite it being the location where 35% of the UK's carbon emissions arising from natural gas arrive in the country. As Professor Haszeldine noted in his submission to the Committee (Q14)¹⁹, the Scottish Government also believes that the UK Government's Track-1 process was tilted towards total emissions criteria, to the detriment of other important considerations. The scoring process included two heavily-weighted criteria (emissions reduction and cost considerations) that were scored proportionally and total emissions were key to a high score in both instances, leading to a double-counting that favoured large clusters. This double-counting, proportionate scoring and the credibility factoring applied to diverse emissions had the effect of distorting the assessment in favour of large industrial emitters to the detriment of smaller clusters with novel approaches and diverse emitters. Furthermore, we also agree with Professor Haszeldine that this focus on total emissions further skewed the competition when two clusters (Teesside and Humberside) were allowed to join together to form a single cluster (the East Coast Cluster) after the criteria were consulted upon and finalised, giving them a significant advantage and making it more difficult for other clusters to compete.

We are in agreement with Professor Haszeldine's assessment that key advantages of the Scottish Cluster bid such as scalability of storage capacity, access to geologically diverse storage types and the ability to provide UK network resilience through CO₂ shipping were either not considered or not weighted sufficiently in the Track-1 evaluation process. Sir Ian Wood, in his written submission to the Committee²⁰, has highlighted that the ability to receive shipped CO₂ allowed the Scottish Cluster to offer focussed export revenue potential (by storing European industrial emissions), another benefit that was not sufficiently recognised by the assessment process. The storing of international emissions, while not contributing to UK climate change targets, can also lead to early capacity increases in the CO₂ transport and storage network, which can reduce the cost of network development, benefitting domestic emitters.

¹⁹ [20211210-submission-stuarthaszeldine.pdf \(parliament.scot\)](#)

²⁰ [*20211206-ccus-submission-etz.pdf \(parliament.scot\)](#)

We therefore believe it would be beneficial for the Track-2 process to give due consideration to the above factors, as well as others that Professor Haszeldine has noted, including geographic considerations such as enabling the decarbonisation of outer regions of the UK (and thereby avoiding market exclusivity and the stranding of Scottish emitters with no clear route to decarbonisation) and valuing the ability to facilitate a just transition to net zero. Other important local considerations include Scotland's statutory emissions targets and security of electricity supply. We also hope that the ability to deliver in the mid-2020s will not be disadvantaged and cluster development will not be artificially slowed down by Track-2 of the cluster sequencing process as delays could lead to the continuation of unabated emissions and missed opportunities for the UK in international markets for CO₂ storage. To maintain a level playing field, the Track-2 design process should also be mindful of any first mover advantages conferred on Track-1 projects through their Track-1 status; and CCUS business models should aim to avoid any disproportionate impacts based on cluster geography and emitter locations, particularly when considering transport and storage fees.

We are keen to work with the UK Government to help build on the learnings from the Track-1 process to improve the Track-2 process, particularly in relation to the above factors and key considerations of particular importance to Scotland. We have conveyed this to the UK Government in our ongoing engagement with them.

We also hope that our £80 million funding offer from our Emerging Energy Technologies Fund will help accelerate the Scottish Cluster's development and contribute towards securing its future. In addition to this, we are working with the Scottish Cluster and Scottish industrial emitters to help support an improved Track-2 bid that addresses any areas for improvement identified during the Track-1 evaluation process. Work is already underway to improve the overall CCS readiness of Scottish Industry within the Scottish Central Belt in preparation for Track 2²¹. Cost reduction opportunities and value engineering benefits from the St Fergus emitters and the T&S system would also be beneficial and the Scottish Cluster have confirmed that work is ongoing to deliver this. The Scottish Cluster have said: "We are focussed on continually improving the Scottish Cluster. We are also continuing to work closely with BEIS and other stakeholders as they develop and define the economic and regulatory regime that will apply to all Clusters. We remain committed to successful delivery of the Scottish Cluster and the environmental, job creation and broader benefits this will deliver".

Industrial operators both across the central belt of Scotland, and more widely across the country, have much to gain from pooling their collective expertise and carbon abatement requirements. It may be that the participation of additional industrial emitters with the Scottish Cluster can strengthen Scotland's offering in the next stage of the Cluster sequencing process. In turn, a successful Track-2 bid for Scotland offers clear benefits for existing and potential future industrial decarbonisation projects, and we are keen to explore what other partners could be engaged in this effort.

²¹ [INEOS at Grangemouth announces plans to construct a Low-Carbon Hydrogen Manufacturing Plant](#)

However, clarity on the Track-2 process and timelines remains crucial for mitigating any negative impacts of the Track-1 decision on Scottish industry and we continue to call on the UK Government to provide this as a matter of urgency, as well as accelerating Track-2 so that the readily-deployable Scottish Cluster's deployment is not artificially held-back.

A Plan B for Scotland?

8. Does the Scottish Government agree with the Climate Change Committee's timescale of 'no later than 2023' for a contingency plan?

The Scottish Government has committed to bringing forward a draft of the statutory Climate Change Plan by November 2023 at the latest. This will contain policies and proposals that meet emissions reduction targets from 2024 to 2039 or 2040, and will take in to account the most up-to-date evidence for CCUS.

The UK Government has committed to supporting four CCS clusters in the UK by 2030 at the latest. However, it has yet to set out the timetable for Track-2 of its cluster sequencing process through which it will announce the remaining two CCS clusters to be progressed with UK Government support. The Scottish Government continues to press for greater and immediate clarity on the Track-2 timetable to give this much needed clarity and certainty.

Given the criticality of CCS, the Scottish Government has already engaged with the UK Government to press for greater clarity on the Track 2 timetable and to work collaboratively with them to find solutions to accelerate the deployment of CCS in Scotland, and will continue to do so.

9. What is the Scottish Government's Plan B if the Scottish cluster does not proceed?

The Climate Change Committee describes CCS as a "necessity, not an option" to achieve net-zero emissions. This is due to the importance of negative emissions technologies (NETs) in achieving Scotland's targets which rely on the availability of CCS technologies to store sequestered carbon.

The update to the 2018 Climate Change Plan (CCPu), finalised in March 2021, introduced a chapter on NETs, and accompanied this with a commitment to review progress for developing NETs. Policies in this chapter place a focus on developing the evidence base for NETs to be deployed at the end of the decade, and assessing the feasibility of various technologies.

We are making progress on developing our evidence base as we work towards the next full Climate Change Plan.

We will continue to review our progress and evidence as we work towards the next full Climate Change Plan, a draft of which we will make available to Parliament by November 2023 at the latest.

10. What alternative mitigation options can deliver emissions reductions to the scale necessary to offset CCUS, should the Scottish Cluster not go ahead within the planned timescale. What work is being done now to scale these up?

As mentioned in response to question 9, we are in the process of developing our evidence base as we work towards the next full Climate Change Plan, a draft of which we will make available to Parliament by November 2023 at the latest. This will include exploration of mitigation pathways required to ensure Scotland is progressing towards its emissions reduction targets.

We are confident of the Scottish Cluster's prospects of success in Track-2 of the UK Government's cluster sequencing process, noting that the Cluster demonstrated full suitability for Track-1 status based on the competition criteria. It is clear that CCUS will play an important role in helping us to reach net-zero emissions. Advice from the Climate Change Committee describes CCUS as a "necessity, not an option" to achieve net-zero emissions. We remain committed to supporting the continued growth and development of the Scottish Cluster to ensure that Scotland reaches its net zero goals by 2045.

11. The Committee notes the £80m financial backing that the Scottish Government have potentially offered business should the Scottish Cluster get the green light. Will this ensure that it could proceed at the same rate as the Phase One clusters in England? What level of support from the UK Government is this £80 million investment contingent upon?

The Scottish Government is committed to working constructively with the UK Government to ensure the Scottish Cluster has the certainty it needs to continue its development. To this end, we have offered £80 million from our Emerging Energy Technologies Fund to accelerate the Cluster's deployment.

Ultimately, the Scottish Government does not hold all the necessary legislative and regulatory levers needed to stand up a CCS cluster alone. Capital funding is only one part of the equation. UK Government support including access to BEIS business revenue support and underwriting of liabilities is also essential to accelerating CCS in Scotland. The Scottish Government is currently engaging with the UK Government to better understand the level of BEIS business revenue and underwriting support that is required to operationalise a CCS cluster. Granting the Scottish Cluster access to these other types of support within the cluster sequencing process is an option that is available to / within the remit of the UK Government as per the published Track-1 guidance, which gives the UK Government the flexibility and discretion to "*alter the provisional Track-1 sequencing under certain circumstances*" including "*if the government's capital and revenue affordability envelopes could support additional clusters*".

Our offer of support was made on the basis that the Scottish Cluster is given certainty of its due status within the UK cluster sequencing process. The Scottish Cluster demonstrated full suitability for Track-1 status based on the competition criteria, but has been designated as a 'reserve' cluster. If successful in Track-2, it would be one of two additional clusters the UK Government has committed to bringing online by 2030.

Jobs, training and the just transition

12. What measures can the Scottish 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?

Scotland's significant CO₂ storage potential and the presence of the Scottish Cluster provides an economic opportunity for Scotland to be at the centre of a European hub for the importation and storage, via shipping, of CO₂ from Europe.

Research commissioned by the Scottish Government and Scottish Enterprise concluded that Scotland can offer competitive CO₂ storage services, both within Scotland and as a carbon management provider through CO₂ shipping imports. This advantaged position to import CO₂ is possible in part due to Peterhead port's envisaged CO₂ infrastructure capacity and offshore pipeline infrastructure, both capable of accommodating high CCUS growth prospects in order to realise economies of scale and increased asset utilisation.

The Scottish Government has commissioned a study on CO₂ shipping opportunities for Scotland which is anticipated to be finalised in June 2022. Preliminary results from this study indicate there are a unique range of technical, regulatory and economic challenges which require consideration to maximise the potential of CO₂ shipping as part of the CCS supply chain.

The results of this study are preliminary and subject to change. However, literature review by Scottish Government officials confirms the importance of technical work to address many of these challenges, such as supporting the standardisation of CO₂ shipping requirements and ensuring the UK ETS supports the movement of CO₂ via shipping. Many of these challenges require UK-wide responses, highlighting the importance of UK Government support for the development of viable CO₂ shipping opportunities.

We would like to see Track-2 of the UK Government's cluster sequencing process better reflect the key selling points of the Scottish Cluster. This includes the value that CO₂ shipping could play in developing a European carbon storage hub in Scotland. We will continue to engage with the UK Government on this ahead of further clarity on the timing and assessment criteria for Track-2 being made available.

The Scottish Government is also supporting the energy transition in the North East and Moray through a range of funding, including our £500 million Just Transition Fund. The Fund will accelerate a just transition for the region and will create new and exciting opportunities for those that live and work there, including in the energy industry. Further detail on the Just Transition Fund is provided in response to questions on the importance of just transition below. These collective efforts will provide impetus for the development of CO₂ shipping in Scotland.

There are a range of other important steps being taken to support the development of CO₂ shipping opportunities in Scotland. For example, the industry-led Scotland's Net Zero Infrastructure (SNZI) Project was awarded £31 million through the UK

Government's Industrial Decarbonisation Challenge, and includes as one of its deliverables the development of a "fabrication yard ready" design of a new class of ship which can service the needs of coastal CO₂ emitters around the UK for delivery at Peterhead port.

13. What measures are the Scottish / UK Government taking to enable a transfer of existing skills from other industries into CCUS so as to enable a just transition?

The knowledge and experience of the oil and gas sector and its supply chain will be very important for developing and investing in essential low carbon technologies, such as CCUS – a technology that is seen by experts such as the UK Committee on Climate Change and the International Energy Agency as being vital to achieving Scottish, UK and international climate emissions targets. A review last May undertaken by Robert Gordon University on the UK Offshore Energy Workforce Transferability Review forecasts that around 200,000 people will be required by 2030 to underpin the developing offshore wind, hydrogen, CCUS as well as ongoing oil and gas activities in the UK offshore energy sector. This compares to around 160,000 people directly and indirectly employed in the UK offshore energy sector in 2021. The review notes that there are currently 80% are engaged in traditional oil & gas but within ten years 65% of them will be in low carbon energy.

In 2021, we commissioned research with Scottish Enterprise on the economic impacts of CCUS in Scotland²². A key finding of this research is that Scotland does not have any major technical skills gaps to build a CCUS supply chain in Scotland, with responses indicating Scottish companies can utilise existing approaches to oil and gas in CCUS. Although CCUS is a nascent industry, it is essentially still a heavy engineering industry and therefore can utilise skills and expertise from the oil and gas supply chain.

The Scottish Government has taken tangible and direct actions to support workers on their transition journey. The Scottish Government published the Climate Emergency Skills Action Plan in December 2020²³, identifying the immediate and long term actions needed to ensure our workforce has the skills required to support Scotland's transition to net zero. As a priority action and within the first 100 days of this Parliament, we launched the Green Jobs Workforce Academy in August 2021, providing individuals of all ages with advice, support and training opportunities to help them enter into or progress in good, green jobs. Through the Academy, we are committed to supporting workers within the energy transition including oil and gas, on and offshore wind, hydrogen, electricity, carbon capture and storage. This includes the delivery of a skills guarantee for workers in carbon-intensive sectors, such as oil and gas, that will be designed with stakeholders as part of our initial response to the Just Transition Commission.

There is already a range of upskilling and retraining support available including through the National Transition Training Fund that was introduced in 2020/21 to

²² https://energycentral.com/system/files/ece/nodes/518377/ccus-economic-impact-assessment-report_1.pdf

²³ [climate-emergency-skills-action-plan-2020-2025.pdf](https://www.skillsdevelopmentscotland.co.uk/climate-emergency-skills-action-plan-2020-2025.pdf) (skillsdevelopmentscotland.co.uk)

provide support for individuals and sectors affected by the economic impact of Covid-19 and develop skills for a just transition to net zero.

- In Year One, NTTF succeeded in helping provide support to over 9,000 individuals, with certain projects focussing on green skills. Construction Scotland Innovation Centre (CSIC) delivered Scotland's first National Passivhaus standards training programme for low carbon construction to over 800 people.
- In Year Two, NTTF has broadened its ambitions to address emerging skills needs to support the transition to net zero. Up to £20 million is supporting 31 projects across Year Two, many of which will boost the supply of skills for sustainable green jobs.

Securing a just transition and supporting people's jobs and livelihoods is a priority for the Scottish Government. As such, we are creating new opportunities for workers through our £500 million Just Transition Fund for the North East and Moray. The Fund will accelerate a just transition for the region and will create new and exciting opportunities for those that live and work there, including in the energy industry. We continue to call on the UK Government to match our funding commitment to the region, particularly in light of the over £300 billion that has flown to the UK Treasury from North Sea oil since the 1970s. As our first Just Transition Plan, our Energy Strategy and Just Transition Plan will also set out what is needed to deliver a just transition sector, in line with our just transition approach. This includes an outcome to equip people with the skills, education and retraining required to support retention and creation of access to green, fair and high-value work.

OPITO, with Scottish Government support through the Energy Skills Alliance (ESA), is making excellent progress towards the creation of:

- A skills transition plan (a commitment within the North Sea Transition Deal) which will set out how industry will support and enable the transition of the offshore workforce, including supporting skills diversification; and also
- The enabling of a skills passport to ensure that the workforce's skills and competencies are mutually recognised across energy sectors enabling easier job transferability.

In the coming months, ESA will publish their skills transition plan which will set out progress to date and next steps – there has been great progress in the area of skills recognition that will support the offshore workforce in their transition journey. As part of this, OPITO have been working with a range of industry stakeholders including GWO, IMCA, ECITB, and the STUC and trade unions – with UNITE a core member of ESA, holding over 30 workshops to date to understand the complex requirements of delivering such a mutual recognition of safety and technical standards offshore, including what a digital system will need to deliver – with the goal of delivery of an offshore skills passport system in 2023. ESA have also been developing the All Energy Apprenticeship (AEA) project which aims to provide additional qualifications that link multiple energy technician - with credit rated units in renewable technologies including offshore wind, hydrogen, carbon capture and oil and gas having been created. This work will offer wraparound qualifications which will allow technicians from oil and gas to supplement their skills and knowledge while ensuring that safety standards and workforce mobility remain paramount.

14. 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?

We remain confident that the Scottish Cluster will proceed. However, we continue to call on the UK Government to reverse its Track-1 cluster sequencing decision, and to accelerate the Scottish Cluster to full Track-1 status without delay.

CCUS can play a pivotal role in achieving a just transition for our workforces, capitalising on existing skills and expertise to create many good, green jobs in the coming years. The Scottish Cluster alone, by deploying CCUS, hydrogen and direct air capture technologies in Scotland, could support an average of 15,100 jobs between 2022-2050, with a peak of 20,600 jobs in 2031.

Economic analysis commissioned by Scottish Enterprise and the Scottish Government also concludes that the uptake of CCUS in Scotland has a positive impact on the Scottish economy. In 2045, Scottish GDP can be 1.3-2.3% (£3.8 billion - £6.7 billion) higher in scenarios with CCUS, than without.

These potential benefits would be lost if the Scottish Cluster were not to proceed, delaying and jeopardising the opportunity for the sector to deliver a just transition for our workforces in the North-East.

Securing a just transition and supporting people's jobs and livelihoods is a priority for the Scottish Government. As set out in more detail in response to question 13 above, we are creating new opportunities for workers through our £500 million Just Transition Fund for the North East and Moray. These efforts are not contingent on the success of the Scottish Cluster in Track-2 of the UK's cluster sequencing process.

Additionally, the Scottish Government's £75 million Energy Transition Fund (ETF) will support our energy sector and the North East, over the next 5 years, to make progress on energy transition as we move toward a net zero society by 2045.

The projects that are supported under the ETF are:

- The Global Underwater Hub
- The Energy Transition Zone based in Aberdeen
- Aberdeen Hydrogen Hub
- Net Zero Transition Technology Project led by NZTC's Net Zero Solution Centre

The Energy Transition Zone is funding delivery of the National Energy Skills Accelerator - A 'one stop shop' to access a wide range of energy courses, skills development programmes and R&D capabilities in the partner institutions (Robert Gordon University, University of Aberdeen, North East Scotland College and Skills Development Scotland).

Carbon Pricing

15. What representations have you been making to UK Government counterparts about ensuring that the UK Emissions Trading Scheme incentivises carbon storage over carbon emitting?

The Scottish Government launched, with UK Government and the other Devolved Administrations, a consultation on Developing the UK Emissions Trading Scheme on 25 March 2022, which will run until 17 June. As part of this consultation, we have launched a call for evidence on the role of the UK ETS as a potential long-term market for Greenhouse Gas Removals technologies. We are still at an exploratory phase for the inclusion of carbon storage into the scheme.

More generally, the UK ETS incentivises decarbonisation by placing a market-determined price on carbon emissions. The scheme is currently one of the key policy mechanisms to decarbonise Scotland's industrial sector. The Scottish Government continues to work closely with the UK Government and other Devolved Administrations through the new UK ETS Authority to ensure the scheme drives ambitious decarbonisation while providing stability for business and ensuring a Just Transition.