Department for
Business, Energy
& Industrial Strategy

The Carbon Capture and Storage Infrastructure Fund

An Update on the Design of the CCS Infrastructure Fund

May 2021

Any enquiries regarding this publication should be sent to us at:
enquiries@beis.gov.uk

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Introduction

In November 2020, the government published the Ten Point Plan for a Green Industrial Revolution[1], with commitments focused on driving innovation, boosting export opportunities, and generating green jobs and growth across the country to level up regions of the UK. Last month government accepted the Climate Change Committee's (CCC) Carbon Budget 6 recommendation. This is a significant step in the UK's global climate leadership, and Carbon Capture, Usage and Storage (CCUS) and hydrogen will be critical to meeting these commitments. The government has therefore set its agenda for a clean, resilient, and sustainable economic recovery, as the UK builds back from the impacts of Covid-19.

Included in the Ten Point Plan was a commitment to deploy CCUS in a minimum of two clusters by the mid-2020s, and four clusters by 2030 at the latest, with an ambition to capture 10MtCO_2/year by 2030. In February this year, BEIS published a consultation[2] seeking input on a potential approach to determine a sequence for locations to deploy CCUS in order to meet this commitment.

The Carbon Capture and Storage Infrastructure Fund (CIF) was first announced at Budget in March 2020, and its allocation of £1bn was confirmed at the Spending Review in November 2020.

This document is being published alongside the Cluster Sequencing for Carbon Capture Usage and Storage Deployment: Phase 1 document, and the updates to the Business Models to set out current plans for the design of the CIF. The CIF forms an important part of the package of government support that is expected to be allocated to clusters through the proposed Cluster Sequencing process, along with:

- business models for Transport & Storage (T&S), power, industrial carbon capture (ICC), low carbon hydrogen and potentially bioenergy with carbon capture and storage (BECCS), which include:
    - a revenue mechanism to bring through private sector investment into ICC and hydrogen projects;
    - an economic licence that grants the licensee a regulated revenue stream facilitated by the right to charge a regulated fee (the 'T&S fee') from completion of construction; and
- capital expenditure for CCUS-enabled 'blue' hydrogen projects from the £240m Net Zero Hydrogen Fund (NZHF). Funding for electrolytic 'green' hydrogen projects will be allocated through a separate process.

Support for power CCUS will be funded by consumer subsidies, as announced at the spring 2020 budget.

[1] The Ten Point Plan
[2] CCUS: market engagement on cluster sequencing

We expect the package of support offered by government, delivered through a combination of capital investment and sustainable business models, to leverage significant investment by the private sector. The oil and gas sector are anticipated to invest £2-3 billion in T&S infrastructure by 2030[3].

The purpose of this document is to set out initial detail on the CIF, which will primarily support capital expenditure on T&S networks and ICC projects. The final design of the CIF will develop alongside the Cluster Sequencing process, the design of the business models and the finalisation of related funding streams.

Any decision to award CIF funding is subject to government satisfaction that subsidy control requirements have been met, government is comfortable with any balance sheet implications, all relevant statutory consents have been completed, and government is comfortable that CIF funding represents value for money for the consumer and the taxpayer in the context of other government support mechanisms.

The proposals are not final and are subject to further development by the government, and approval by Ministers, in consultation with relevant regulators and the devolved administrations, as well as the development and Parliamentary approval of any necessary legislation, and completion of necessary contractual documentation. We reserve the right to review and amend all provisions within the document, for any reason and in particular to ensure that proposals provide value for money and are consistent with the current subsidy control regime.

[3] North Sea Transition deal

Background

The CIF represents £1bn of investment in CCUS in the UK and it is an important element of the government's support of an emerging sector with significant potential.

With greenhouse gas emissions being reduced by 40% between 1990 and 2018, the UK has already made significant progress in the effort to reduce CO_2 emissions[4]. However, this progress must be accelerated if we are to meet our 2050 net zero commitment, and CCUS will be a significant contributor to that effort. Underlining this point, the CCC have stated that CCUS will be essential in reaching net zero emissions, advising that multiple CCUS clusters will need to be operational by the mid-2020s to enable the UK to meet our target[5].

To enable the establishment of a new CCUS sector, we are seeking to develop CCUS clusters with T&S networks acting as the enabling infrastructure for a range of capture projects, including gas power plants, industry, low carbon hydrogen production, bioenergy, and direct air capture (DAC).

The importance of CCUS in meeting the net zero target should not be underestimated, but the advantages of developing a self-sustaining CCUS industry in the UK extend beyond that. Our geography means that the UK has one of the largest CO_2 storage potentials of any country in the world. It is estimated that the UK Continental Shelf could safely store 78bn tonnes of CO_2, which is the equivalent of 200 years of the UK's annual CO_2 emissions[6].

This puts the UK in a good position to fulfil our climate commitments as we develop strategic national assets through our CO_2 T&S network. Economic benefits include:

- Supporting the long-term competitiveness of UK industry and the economic transformation and levelling up of our industrial regions by supporting 50,000 jobs by 2030[7].
- Offering economic opportunities for UK business. CCUS can help support markets for low carbon products such as clean steel, low carbon chemicals, low carbon cement and other industrial applications.
- Supporting the development of, and UK leadership in, a globally significant technology - the international importation of CO_2 could be worth £14bn by 2050[8].

[4] Committee on Climate Change Progress Report to Parliament
[5] Committee on Climate Change Report on Net Zero: The UK's Contribution to Stopping Global Warming
[6] Pale Blue Dot: Progressing Development of the UK's Strategic Carbon Dioxide Storage Resource
[7] BEIS internal analysis based on the published EINAs (2019). The figures include jobs supported through power, industry and transport and storage related roles. They exclude jobs supported through CCUS hydrogen production.
[8] Energy Technologies Institute LLP: taking stock of UK CO_2 storage

Rationale for Government intervention

The government's support for CCUS should be viewed in the context of the wider green recovery plan which is outlined in the Ten Point Plan. This will mobilise £12 billion of government investment, potentially three times as much from the private sector, and utilise a wide range of technologies to facilitate the UK's transition to a net zero economy. CCUS is one of those innovations, but offshore wind farms, nuclear power plants, and new hydrogen technologies are other examples of measures the government is supporting to accelerate our progress in reducing CO_2 emissions.

The fundamental technology which facilitates CCUS is proven and there are many international examples of projects isolating CO_2 from exhaust streams for use and storage. As that technology improves and the demand for long term carbon storage increases, the UK stands to benefit from a growing worldwide market and meet our net zero commitment. However, due to several market failures the private sector is unlikely to deploy CCUS at the pace or scale which is required to meet the net zero target. These are described below:

- The presence of negative externalities – CO_2 emissions.
    - The full cost of an economic activity which results in the emission of CO_2 is often not paid in full by the parties to that transaction. Some of the burden of that transaction will fall on wider society as a negative externality in the form of pollution. The Emissions Trading System and the Carbon Price Floor are two current policy mechanisms which go some way to rectifying this situation. However, carbon prices are not high enough or stable enough in the near term to fully reflect the true societal cost. Even if they were, there are several other barriers which would prevent firms abating emissions through CCUS.
- Coordination failure with regards to the T&S network.
    - The T&S network is the infrastructure which will connect all emitters to pipes which transport and store captured CO_2. Without government intervention, it is highly unlikely that private firms would coordinate their investment decisions such that a T&S network which is suitably sized for anticipated future demand would be developed in time to achieve net zero emissions by 2050. Investors and developers would not have any sight or guarantee of future use and as a result the benefits would not be realised.
- First mover disadvantage.
    - The first developers of CCUS plants are likely to face some costs and challenges which subsequent investors will not have to pay, and other costs which will be higher across the board. This might include higher upfront capital costs, a limited user base and difficulties associated with the development of a First Of A Kind (FOAK) cluster. Coupled with a broader failure to coordinate, there could be an incentive to hold back investment in the hope that competitors will make the first move from which they can benefit through learning, lower costs, or efficiency improvement.

- Private investor incentives.
    - The government's net zero commitment is a huge challenge which requires significant changes. For a number of businesses, capturing CO_2 is far removed from their core business objective and there is little direct incentive to consider the net zero commitment when taking investment decisions. Government can take a wider view in supporting CCUS.

Taken together, these market failures make it highly unlikely that CCUS would be rolled out to the levels necessary to reach net zero emissions by 2050 without government intervention. As such, the government has committed to provide tailored support to enable the private sector investment and deployment needed to establish CCUS at the pace and scale required.

CCUS Funding Streams and Support Mechanisms

Each of the areas of CCUS (T&S, power, industrial carbon capture, bioenergy with carbon capture and storage and low carbon hydrogen) will be supported differently and business models are being designed which will provide bespoke commercial frameworks for each area.

We expect the CIF to primarily contribute to the capital costs of establishing T&S infrastructure and early industrial capture projects, and that this will be supported by a mechanism to provide revenue support. Further details on the revenue mechanism for industrial and hydrogen projects via the business models will be set out later in 2021. Power CCUS will be supported through a Dispatchable Power Agreement (DPA), funded by levies on energy consumers. Hydrogen projects may also be able to access capital funding through the separate NZHF.

We aim to deploy CIF funding to enable the strategic deployment of the infrastructure and facilities necessary to capture a significant volume of carbon emissions in the near future, with a view to ramping that up across the economy from the 2030s to help deliver net zero by 2050. The CIF will be allocated to projects, alongside the other government support mechanisms outlined, via the two-phase cluster sequencing process. Further detail is provided in the CIF allocation section of this document.

Transport and Storage

The T&S network is a common requirement for all emitters who wish to transport and store carbon. Without a way of moving captured CO_2 to somewhere that it can be safely stored (or utilised), there is little or no benefit to carbon capture technology. As such, all emitters will potentially benefit from a well-functioning and appropriately sized T&S network and it is therefore appropriate for the government to support its development as we help establish a new CCUS sector. Those benefits will not be cost-free to the private sector. An economic licence will grant the licensee a regulated revenue stream (the ‘Allowed Revenue’) facilitated by the right to charge a regulated fee (the ‘T&S fee’) to users.

This is the basis of the ‘User Pays’ revenue model, which will underpin the T&S business model that the CIF will support. Revenue will be made up of payments from those who use the T&S network to have their captured CO_2 transported and stored.

Due to the inherently monopolistic nature of the T&S network, we are establishing a framework (the Economic Regulatory Regime (ERR)) which provides an annual allowed revenue to a company licensed to provide transport and storage services (T&SCo), reflecting efficient costs and a reasonable rate of return. We expect that demand for the T&S network in the future will far exceed the capacity required for early-stage users. The T&S business model is being designed with this future in mind, and the network is expected to be initially oversized in anticipation of future demand. This means that the T&S network capacity may not be fully

utilised for some time, resulting in T&SCo collecting less revenue from its users than its allowed revenue. The difference between allowed and actual revenue is referred to as the revenue gap.

We believe an upfront capital contribution via the CIF could be an effective tool in reducing the revenue gap by lowering the capital cost to the T&SCo, which in turn lessens the revenue required to recoup its allowed revenue. We are considering the different forms of funding which the CIF could utilise, with grants the leading option. However, the government has not ruled out alternative funding arrangements in this area, including loans, equity, or loan guarantees. In every case this is subject to government satisfaction that subsidy control requirements have been met, government is comfortable with any balance sheet implications, all relevant statutory consents have been completed, and government is comfortable that CIF funding represents value for money for the consumer and the taxpayer in the context of other government support mechanisms.

Industrial Carbon Capture

The deployment of CCUS in industry is vital to decarbonising industries, supporting clean growth around the UK, generating new jobs and economic opportunities, and incentivising investment in new facilities and sectors. Despite these wide-ranging benefits, the obvious barrier to broad implementation of ICC is that it increases costs without a corresponding increase in the value of the product to the consumer. There are benefits through avoidance of carbon pricing and taking advantage of the low carbon products market, but ultimately the cost increase is currently unlikely to be passed on to the consumer.

As a FOAK application in the UK, ICC will initially have higher capital costs and a risk premium may be attached to it which creates further risks and uncertainties for potential investors. To help overcome this, the CIF may be used to provide capital co-funding, most likely in the form of grants, for the capture components of the industrial application of carbon capture and storage.

The ongoing costs to business of ICC deployment include: operational expenses, T&S fees and repayment of capital investment. As outlined, these costs will not be met by a corresponding increase in revenue (although the cost of emitting CO_2 may in the future outweigh the costs of abating the emissions through carbon capture technology). Ongoing revenue support to ICC projects via the ICC Contract will be funded by the Exchequer.

The revenue mechanism and potential access to the CIF are part of the commercial offer from government to business. They are two parts of the wider ICC business model which we believe will give the private sector sufficient sight of future returns and bolster confidence in early investment going forward.

The two support mechanisms are closely linked – an increase in the government's share of capital co-funding would reduce the ongoing return to private capital investment. The shape of capital support on offer, which will take into consideration issues such as funding intensity, rate

of return provisions and possible accelerations of return to maximise efficient use of capital, is currently under consideration alongside the revenue mechanism. We will look to bring forward more details on the revenue mechanism later this year.

The Industrial Energy Transformation Fund (IETF) will also be available to support the capital expenditure for on-site ICC projects around the UK. The £315m Industrial Energy Transformation Fund is supporting industry on the pathway to net zero by supporting the uptake of technologies that improve efficiencies and reduce the carbon emissions associated with industrial process. £289m will be spent in England, Wales and Northern Ireland, with the remainder to be spent by the Scottish Government through their own Scottish Fund. The Fund is technology neutral but aims to de-risk key technologies such as ICC by providing support for feasibility and engineering studies as well as support for early movers to complete on-site carbon capture projects. Phase 2 of the IETF, which will expand the scope of the scheme to include decarbonisation deployment projects, will be launched this summer[9].

While projects may be eligible to receive funding from the IETF or the CIF, if successful in receiving funding from one fund, they will not be eligible to apply to another fund for the same set of eligible costs and will need to comply with any relevant subsidy control requirements. We will continue to work through the subsidy control requirements in relation to the interaction between the IETF, CIF and business models. More detail on the IETF will be available this summer, but any business with questions about which fund will be most appropriate should contact the Department for Business, Energy & Industrial Strategy.

Power CCUS

Deployment of power CCUS plants will be funded by consumers through a Dispatchable Power Agreement (DPA). This mechanism will consist of two payments: an availability payment for low carbon generation capacity and a variable payment. The former provides investors with a regular amount based on the availability of low carbon generation capacity, and the latter is designed to incentivise the contracted plant to generate ahead of an unabated equivalent plant.

Private sector investment will be the driving force behind the deployment of large-scale power CCUS plants. We expect that the design of the DPA, which provides revenue certainty to mitigate CCUS development risks, will be an attractive proposition to investors.

Therefore, direct CIF support will not be extended to this sector, although the emitters may be able to connect to the T&S networks which may be developed with the support of CIF funding.

Hydrogen

Hydrogen in the UK is primarily used as a feedstock in certain industrial processes and is not low carbon. In future, hydrogen produced via low carbon technologies has potential for a wide

[9] The Industrial Energy Transformation Fund (IETF)

range of additional uses, such as mobility, high temperature process heat in industry, heat in buildings, energy storage and electricity generation.‘Green’ hydrogen is produced by splitting water through electrolysis, producing hydrogen and oxygen. ‘Blue’ hydrogen is produced using natural gas, with the emissions captured by CCUS technology.

The government has committed to enabling up to 5GW of hydrogen production, supported by the £240m NZHF. CCUS-enabled ‘blue’ hydrogen projects will draw on the NZHF to support an element of capital expenditure, while a return on private sector capital and operating expenditure will be supported through a hydrogen business model which is currently under development. Work on the hydrogen business model is progressing at pace and we will be consulting on the government’s preferred hydrogen business models by the end of Q2 2021.

As hydrogen projects will have a separate capital fund to draw from, capital support through the CIF support will not be extended to this sector. However, CCUS-enabled ‘blue’ hydrogen projects may benefit from the CIF-supported T&S network.

CCUS Policy objectives

The government's policy objectives with regards to CCUS were set out in the update to the business models, published in December[10]. The CIF, alongside the other government support mechanisms outlined in this document and the private sector investment leveraged, will aid in delivering all of these:

- Establishing a new CCUS sector.
    - The CIF is expected to contribute to the capital costs of T&S networks, working with the T&S business model to ensure the network has sufficient capacity for the anticipated expansion of the user base in the future. It is also likely to support the capital costs of initial ICC projects. These are essential first steps in the formation of a sustainable CCUS sector.
- Enabling low-cost decarbonisation in multiple sectors.
    - CIF support will contribute to the development of the enabling infrastructure for capture projects in a range of sectors including: gas power plants, industry, low carbon hydrogen production, bioenergy, and direct air capture. It will be designed to complement other funds and support mechanisms available for different areas of the sector.
- Developing a market for carbon capture.
    - CIF support could enable the T&S network to be initially oversized to meet anticipated future demand for CO_2 transport and storage capacity (with the ability to further increase).

Given the diverse range of activity and innovation that CCUS covers, the CIF will be one part of a much broader package which we are designing for the entirety of the CCUS sector. Those measures will work in tandem, alongside private sector investment, to move the UK to a point where the market failures described in the previous section give way to a rapid expansion in the use of CCUS across a wide array of industries.

[10] https://www.gov.uk/government/publications/carbon-capture-usage-and-storage-ccus-business-models

CIF Allocation

Cluster Sequencing process and allocation of the CIF

We expect the majority of CIF funding to be allocated through Phase-2 of the Cluster Sequencing process.

Here, we set out a summary of how we expect CIF funding to be allocated through the proposed sequencing process, which will be executed across two Phases:

- Phase-1: government will provisionally sequence those which are most suited to deployment in the mid-2020s onto Track-1;
- Phase-2: government will receive applications from individual projects across capture applications to connect to the Track-1 clusters.

During Phase 2, government may make specific awards of funding, including the CIF, to individual projects within the clusters sequenced onto Track-1 in Phase-1. A distinct package of government support is offered for each individual CCUS application – T&S, industry, power, hydrogen – and as such we will run distinct Phase-2 allocation processes.

It is expected that the following would be eligible to apply for CIF funding, if required:

- Track-1 clusters' T&S proposals: there will only be one transport and storage proposal included within each Cluster Plan. However, a 'Phase-2' would still be required for the Track-1 T&S projects, pursuant to which, government would conduct detailed due diligence and agree the specific amount of funding support required;
- Industrial capture projects: will submit one application for Phase-2 selection and will be considered for capex co-funding from the CIF and business model support through the industrial carbon capture contract.

Being sequenced onto Track-1 does not guarantee that CIF funding will be awarded, nor do we expect that all early clusters will need to draw from the CIF. Any decision to award CIF funding is subject to government satisfaction that subsidy control requirements have been met, government is comfortable with any balance sheet implications, all relevant statutory consents have been completed, and government is comfortable that CIF funding represents value for money for the consumer and the taxpayer in the context of other government support mechanisms.

For further detail on the cluster sequencing process, including timing of the call for applications and eligibility criteria, please refer to the Cluster Sequencing for CCUS Deployment: Phase-1 guidance document.

Track-2 clusters and the CIF

The delivery of at least two CCUS clusters by the mid-2020s is not the extent of our ambition; we have committed to support four clusters by 2030 at the latest. Government is also clear that in order to reach net zero *all* industrial clusters will need to decarbonise, and CCUS will play a key role in enabling this. After identifying the clusters most suited to deployment in the mid-2020s, government will continue to work with industry to map and support a logical sequence for future CCUS deployment.

This effort will commence with the announcement of further details on a process for identifying 'Track-2' clusters, which we will bring forward when the sequenced Track-1 clusters are announced, expected in October this year. This update will provide further detail in relation to Track-2 timelines, as well as early considerations around Track-2 eligibility and evaluation criteria and future project allocation processes. Accordingly, government will aim to conclude negotiations with projects within the Track-2 clusters in time to enable them to take Final Investment Decisions (FID) from 2024 to then be operational from 2027.

We will continue to progress the design of the CIF alongside the development of Cluster Sequencing and the process to identify 'Track-2' clusters.

Allocation of CIF funding to the Industrial Decarbonisation Challenge

As outlined above, the CIF will primarily be allocated through the Cluster Sequencing process to contribute to the capital costs of the T&S network and ICC projects. In order to maximise participation, diversity and resilience in the Cluster Sequencing process, we have also committed up to £40m of the CIF to support early-stage design work in industrial clusters via the existing Industrial Decarbonisation Challenge (IDC) Fund.

An essential preliminary stage of cluster development is for clusters to enter Front-End Engineering Design (FEED) which is required to take place ahead of Final Investment Decisions (FID). The IDC, delivered by UK Research and Innovation (UKRI), was launched in 2019 to help kickstart decarbonisation activity in industrial clusters and funded initially by £170m from the Industrial Strategy Challenge Fund (ISCF) Wave 3. £131m of this funding was allocated to the Phase 2 Deployment strand of the IDC – to co-fund FEED studies in the clusters.

The allocation of up to £40m of CIF funding to the IDC will enable UKRI to fund FEED work in all successful clusters. UKRI announced the outcome of the challenge on 17 March[11]. Nine projects will be supported with the increased allocation of £171m, which will leverage private sector co-funding.

[11] UKRI awards £171m in UK decarbonisation to nine projects

The early investment to enable clusters to carry out design work now is an important first step in meeting the delivery schedule set out in the Cluster Sequencing process and deploying the CIF and related CCUS funding streams. This transfer from the CIF to the IDC also helps to create greater optionality and resilience - increasing the number of projects in the deployment pipeline in turn creates greater opportunity for reducing costs over time, meaning better value for money, by enabling more projects to come through at the FEED stage and transfer learning and innovation benefits.

This publication is available from: www.gov.uk/government/publications/design-of-the-carbon-capture-and-storage-ccs-infrastructure-fund

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