



Department for
Business, Energy
& Industrial Strategy

CCUS Supply Chains: a roadmap to maximise the UK's potential

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Executive Summary

Carbon Capture, Usage and Storage (CCUS) is integral to the UK's Green Industrial Revolution.

That is why Government is investing up to £1 billion to support the establishment of CCUS in four industrial clusters, contributing to the creation of 'SuperPlaces' in areas such as the North East, the Humber, North West, Scotland and Wales.

Our ambition is to capture and store up to 10Mt of CO₂ per year by 2030.

As we deliver on our ambitions, it is vital that our economy and, in particular, our UK CCUS supply chain companies realise the economic benefits of this large-scale infrastructure programme.

Our aspiration is for:

- innovative and efficient UK CCUS supply chains, driving growth and seizing the commercial opportunities both domestically and abroad.
- open and competitive UK CCUS supply chains, enhancing productivity, skills and employment right across the UK.
- thriving and entrepreneurial UK CCUS supply chains, putting the UK at the forefront of new global markets.

The development of CCUS supply chains in the UK, however, is not something that can, or should, be resolved by government alone.

This roadmap sets out how government and industry can work together to harness the power of a strong, industrialised UK CCUS supply chain, whilst ensuring that the CCUS sector as a whole remains investible, cost effective and focused on delivery.

It is organised across four cross-cutting activities: supply chain mapping, capability development, skills and innovation, and finance and trade.

- **Supply Chain Mapping:** As part of our 2021 activity, we want to map the opportunities for, as well as the skills/capability gaps within, the UK CCUS supply chain from the anticipated domestic and global deployment of CCUS out to 2030. We want to identify those areas which are essential for achieving our net zero ambitions and where UK businesses can have an enduring, competitive edge.
- **Capability Development:** To ensure our UK-based companies are ready for the strategic deployment of CCUS, and are in the best possible position to compete for and win new CCUS contracts, we will develop a 'Fit for CCUS' programme. We aim to complete the initial phase of work by the end of 2021.
- **Capability Development:** As we move into the deployment phase for CCUS, we would expect potential clusters and project developers to identify supply chain opportunities,

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advertise them as early as possible, and begin meaningful engagement with UK CCUS supply chain companies.

- **Skills and Innovation:** To continue to create these companies of tomorrow, it is essential that the UK has the necessary skills and capabilities. We will work across Government and industry in 2021 to assess the skills and capabilities necessary to achieve our deployment ambitions for CCUS in the 2020s.
- **Finance and Trade:** Where UK-based companies (of whatever size) are competitive, it is essential that they have access to finance to build and grow. BEIS will continue to work with other government departments, particularly HMT, the Department for International Trade (DIT), the new UK Infrastructure Bank, UK Export Finance (UKEF) and the British Business Bank (BBB) to develop supply chain opportunities.

For example, consistent with its mission, UKEF will work with the sector as the market for CCUS develops, to ensure that no viable UK CCUS export fails for lack of finance or insurance from the private sector.

In addition, we will work with the sector to understand whether additional financial support or finance-based products might be required, consistent with the HMG Plan for Growth, the North Sea Transition Deal and the DIT Export Strategy.

We will continue, through our global UK trade networks, to promote the UK CCUS supply chain and build the global appetite for UK CCUS goods and services, particularly as we advance new Free Trade Agreements.

Next steps

This roadmap sets out the initial activities both government and industry need to undertake to realise the world-class potential of the UK CCUS supply chain, and to maximise the attractiveness of the UK as a place to do business.

It also marks the beginning of an ever-deepening partnership - between the government, project developers, potential clusters, projects in dispersed sites and the UK CCUS supply chain - as we harness the ambition of the Green Industrial Revolution to build back better.

Decarbonisation is a shared goal across all nations of our union. As such, we will continue to engage with the devolved administrations as we seek to deploy CCUS during this decade.

We intend to provide a further update on our approach to UK CCUS supply chains by the end of 2021. Building upon the lessons of offshore wind and noting the sector's commitment to increase UK content to 60% by 2030¹, and also noting the voluntary target of 50% UK content within the *North Sea Transition Deal*², that update may consider what further steps industry may wish to take to boost the UK CCUS supply chain.

¹ <https://www.gov.uk/government/publications/offshore-wind-sector-deal>

² <https://www.gov.uk/government/publications/north-sea-transition-deal>

Background

The past year has been a time of substantial economic challenge for many of our UK-based supply chain companies.

As industry accesses the range of cross-economy government support, it is now more important than ever that we focus on building a clean, resilient, and sustainable economy.

CCUS will be essential to that green economy, tackling climate change and meeting the UK's target to reach net zero emissions by 2050.

It also has the potential to deliver a stronger, greener UK by levelling up our industrial heartlands, supporting clean growth and providing new economic opportunities for UK-based companies across the world.

That is why Government announced its ambition to capture 10Mt of carbon dioxide a year by 2030, and to invest up to £1 billion to support the establishment of CCUS in at least two industrial clusters by mid-2020s, and four by 2030 at the latest³.

In addition, through our work on business models, we will create the sustainable commercial frameworks that investors need.

Alongside these new business models for CCUS, we will build on the UK's global reputation for regulatory stability and transparency by establishing independent economic regulation for CO₂ transport and storage (T&S) networks.

These commercial frameworks will allocate risk in a clear and efficient way to enable investment to come forward.

To support emerging clusters, we are also providing £171 million of funding, through the 'Deployment' strand of the Industrial Decarbonisation Challenge, for 'front end' project development activities, such as planning, design and preparation for project execution.

As part of this significant government investment in our green recovery, we also want to see a sustainable and efficient UK CCUS supply chain, proving its capability and increasing its capacity to win valuable export orders.

Catalysing the UK supply chain will be key to sustaining existing, and creating future, high skill, high value green jobs, supporting the development of regional economies and competing in clean energy export markets.

³ Government has published the Cluster Sequencing Process which details how at least two clusters and their associated capture projects will be sequenced by the mid-2020s alongside updates for power, industrial, and T&S business models, and an update on the CIF.

Harnessing the potential of the UK CCUS Supply Chain

The potential economic opportunities to the UK economy and for UK-based companies themselves are significant.

BEIS commissioned analysis for the Department's CCUS Energy Innovation Needs Assessment suggests that the global market for CCUS could be in the region of £260bn per annum in turnover by 2050, of which, the UK has the potential to capture up to £200bn in turnover⁴.

The UK is in an enviable position, having one of the greatest CO₂ storage potentials of any country in the world. It is estimated that the UK Continental Shelf could safely store 78 billion tonnes of CO₂, which is the equivalent of 200 years of the UK's annual CO₂ emissions⁵.

Unlocking this potential through the development of CO₂ transport and storage networks could generate strategic national assets that could have the potential to store both domestic, as well as internationally imported, CO₂. This market, according to government commissioned analysis, could be worth up to £54 billion by 2050⁶.

We are also home to a range of innovative and high value manufacturing companies; firms across the UK are developing cutting edge CCUS technologies. We also have world leading academic institutions, focused on solving key questions to reduce the costs of CCUS deployment.

The potential upside for UK based companies is manifest, right across the CCUS value chain:

- Supplying equipment and services from project initiation stage through to construction;
- Providing on-going services during operation;
- Supplying equipment and services to other countries as they seek to exploit the commercial potentialities of CCUS globally;
- The provision of storage capacity to other countries on the UK Continental Shelf; and
- Decommissioning and end of life services, including the provision of these services to other countries.

UK CCUS supply chains can also be the great incubator of green jobs. More widely, it is estimated that CCUS could support up to 50,000 jobs by 2050⁷. Importantly, many of these jobs will be well-paid and highly skilled and will be concentrated in the UK's industrial regions.

⁴ *Energy Innovation Needs Assessment: Carbon capture, utilisation, and storage*. (October 2019). Commissioned by the Department for Business, Energy & Industry Strategy and lead by Vivid Economics. Report available here: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/845655/energy-innovation-needs-assessment-ccus.pdf

⁵ <http://www.eti.co.uk/wp-content/uploads/2016/04/D16-10113ETIS-WP6-Report-Publishable-Summary.pdf>

⁶ *Energy Innovation Needs Assessment: Carbon capture, utilisation, and storage*. (October 2019).

⁷ *Ibid*

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Investing in these areas can help to transform the UK's industrial heartlands, revitalising and levelling up the local economy. This will be particularly important as the UK looks to start a green industrial revolution and begins to recover from Covid-19.

The UK CCUS Supply Chain Roadmap

Government cannot itself create a UK CCUS supply chain. The development of resilient, efficient, and capable UK CCUS supply chains will be a strategic, collaborative endeavour.

Potential clusters and project developers will need to collaborate with the UK CCUS supply chain to ensure long-term success. Government will need to collaborate with industry to solve problems in capability development, skills and innovation, and finance and trade.

This roadmap is intended to set out how government and industry can work together to harness the power of a strong, industrialised UK CCUS supply chain, whilst ensuring that the CCUS sector as a whole remains investible, cost effective and focused on delivery.

Mapping the UK CCUS Supply Chain

To unlock the potential of CCUS we first need to identify, map and understand the UK CCUS supply chain.

There is no one agreed definition, or model for a supply chain. Like the CCUS sector itself, UK CCUS supply chains are complex and multi-faceted. The Energy Industries Council has produced a map of CCUS supply chains in the Annex to this roadmap, illustrating this complexity.

The UK CCUS supply chain is not just a hierarchical chain of businesses, supplying tangible components to CCUS clusters.

The whole supply chain system also includes the functional areas of planning, design, purchasing, manufacturing, distribution, sales, legal, professional and financing services.

Understanding the whole system provides major opportunities for innovation and value creation. It also ensures that the right skills, leadership and process systems are in place, as well as the materials required, to deploy CCUS across the 2020s.

That is why, working in partnership with industry, academia, local and regional partners and devolved administrations, we want to undertake a comprehensive mapping exercise of the UK CCUS supply chain.

Our ambition is to identify the commercial potential of, as well as the skills/capability gaps within, the UK CCUS supply chain from the anticipated domestic and global deployment of CCUS out to 2030, prioritising those areas where UK industry can be at the forefront of global

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CCUS markets. We also want to understand the opportunities for those companies transitioning from high-carbon industries into net zero sectors.

In particular, we want to:

- Map the CCUS value chain and identify, against each element of that value chain, UK CCUS supply chain companies, or those UK companies with the potential to become a CCUS supply chain company;
- Identify the UK's comparative advantages in the development and deployment of CCUS globally;
- Identify which other countries hold comparative advantages in the development and deployment of CCUS globally; and
- Assess the current 'readiness' of the global and UK CCUS supply chains to meet the Government's ambition.

To drive progress in this area, we have established a new working group of the CCUS Council on UK supply chains, aiming to bring together relevant representatives such as from industry, supply chain companies, potential clusters, communities, government, academia, finance, and law.

Its objective is to inform government thinking by developing a range of considerations for maximising the economic value of the UK CCUS supply chain. It will begin to feed back its initial findings to government from the spring.

Capability Development

CCUS is a potentially huge global business opportunity for UK-based companies. BEIS commissioned analysis suggests that the global market could be worth £260 billion by 2050⁸.

CCUS is a First of a Kind (FOAK) technology in the UK. It has yet to be deployed at scale in complex industrial clusters anywhere in the world. This represents an exciting strategic endeavour for the UK, and its supply chain.

As in other sectors, such as nuclear and offshore wind, UK companies may not be aware of potential CCUS markets, nor the process by which they can comply with relevant regulations and bid for work.

To ensure UK-based companies are in the best possible position to compete for and win new CCUS contracts across the globe, we want to develop a 'Fit for CCUS' programme. Government will work with industry and other relevant partners in 2021 to develop the

⁸ Energy Innovation Needs Assessment: Carbon capture, utilisation, and storage. (October 2019). Commissioned by the Department for Business, Energy & Industry Strategy and lead by Vivid Economics. Report available here: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/845655/energy-innovation-needs-assessment-ccus.pdf

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programme. We will provide further details on the programme as part of our CCUS Supply Chains update at the end of this year.

Developing specific programmes to boost the UK CCUS supply chain will be important. Government and industry also have a role to play in adopting principles and behaviours that can support resilience and capability development in the UK CCUS supply chain.

Supply chains mature and grow in markets with a stable policy framework and a clear deployment pipeline. We want to see greater and more reliable line of sight of planned investments from industry. As a government, where possible, we want to provide more visibility around planned deployment cycles.

It is intended that these activities will increase the opportunity for suppliers to invest in long-term production infrastructure and training, and to nurture the UK CCUS supply chain.

Government has already set out its ambition of capturing and storing up to 10 Mt of CO₂ per year by 2030, equivalent to four million cars' worth of annual emissions a year.

We would expect potential clusters and project developers to set out their ambition for the UK CCUS supply chain, identifying potential supply chain contracts, advertising them as visibly and as early as possible, and beginning an ongoing and meaningful engagement with the UK-based companies.

As part of Phase-1 of the Cluster Sequencing process, where the cluster plans are evaluated, we have introduced proportionate criteria to incentivise project developers to develop regional skills and ensure all capable firms, including SMEs, can tender for work. The supply chain policies, assessment criteria and commercial negotiation requirements for Phase-2 of the Cluster Sequencing process, where the individual capture projects are evaluated, are being developed alongside this roadmap.

Indeed, we anticipate project developers will want to demonstrate pro-actively how they have involved the UK supply chain to date, and how they will be going forward.

Skills and Innovation

Government recognises the importance of innovative UK CCUS supply chain companies, particularly where the product or service improvement leads to significant cost reduction in, or quicker, more widespread deployment of, CCUS technology.

Between 2004-2019 the UK has provided over £330 million public funding for CCUS Research and Innovation. This has been crucial in understanding the fundamental science, developing improved capture processes and equipment, as well as training the next generation of subject matter experts in CCUS.

Innovation projects create future companies or products/services that will allow the UK to capitalise on this burgeoning international market for CCUS.

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To continue to create these companies of tomorrow, deliver net zero and our Ten Point Plan, it is essential that the UK has the necessary skills and capabilities.

As set out in DfE's recent *Skills for Jobs* white paper, we have existing programmes in place – including Apprenticeships, Skills Bootcamps, Traineeships, and T Levels – to help us grow future talent pipelines and deliver the skilled individuals we will need. There is also the Lifetime Skills Guarantee which will help people train and retrain at any stage of their lives and so develop the skills most valued by employers.

To build upon this work, in November 2020, we launched the Green Jobs Taskforce. Working in partnership with business, skills providers, and unions, we are developing plans for supporting new long-term good quality, green jobs by 2030 and assessing what support is needed for people in transitioning industries.

We are also mindful that CCUS could offer a fair and equitable transition for those currently working in high-carbon sectors, such as the oil and gas, as well the fossil fuel electricity generation sectors. Both these industries are expected to decline as the UK transitions to net zero and CCUS could provide them with good quality long-term jobs. The workforce in these transitioning sectors already possess many of the key skills that can help drive the CCUS industry forward.

We want to go further, however. In enabling the development of a flourishing UK CCUS supply chain, we want to ensure that is responsive to the employment needs of a diverse workforce.

Throughout 2021 and 2022, therefore, we intend to develop a coherent skills plan to ensure the UK has a sustainable CCUS skills base, delivering enhanced productivity, reducing skills shortages and supporting the deployment of new CCUS technologies.

In particular, we will consider the skills necessary for a dynamic UK CCUS supply chain, and consistent with the findings of the Green Jobs Taskforce and the North Sea Transition Deal, we will work with industry, education providers and local and regional authorities to understand how to ensure the effective up-skilling, re-skilling and retraining of workers.

In 2021 we also want to work with industry to set a quantified ambition on the inclusivity and diversity of the CCUS sector. We see no reason, at this stage, why CCUS cannot match the diversity ambitions contained within the Offshore Wind and Nuclear Sector Deals.

Finance and Trade

CCUS remains a First of a Kind technology in the UK with high upfront capital costs. The barriers to deploying CCUS projects in this country, and globally, are primarily commercial, rather than technical. These commercial barriers can increase the cost of financing projects, adding a “risk premium” to projects, and may prevent project developers from taking investment decisions.

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To help overcome these issues, Government is developing sustainable and enduring commercial frameworks. These frameworks will enable an appropriate and efficient allocation of risk and provide the confidence investors need.

In tandem with this significant government financial and regulatory investment, we want to increase the capability of the UK supply chain to bid for and win progressively larger major international projects.

Where UK-based companies (of whatever size) are competitive, it is essential that they have access to finance to build and grow. BEIS will continue to work with other government departments, particularly HMT, the Department for International Trade (DIT), the new UK Infrastructure Bank, UK Export Finance (UKEF) and the British Business Bank (BBB) to develop supply chain opportunities.

In addition, we will work with the sector to understand whether additional financial support or finance-based products might be required, consistent with the HMG Plan for Growth, the North Sea Transition Deal and the DIT Export Strategy.

UK Export Finance (UKEF) will have an important role to play here. UKEF's mission is to ensure that no viable UK export fails for lack of finance or insurance from the private sector. UKEF is committed to supporting the UK's growing CCUS sector and helping UK CCUS exporters realise opportunities. UKEF can offer the UK CCUS supply chain a package of support to help them:

- win contracts by offering attractive financing options to their overseas buyers, including through a £2 billion direct lending facility dedicated to clean growth;
- fulfil orders through guarantees on bank lending; and
- manage risks in challenging markets and get paid through export insurance.

As well as facilitating opportunities, UKEF can unlock international projects for smaller exporters through supplier fairs, procurement-led events to increase UK content in overseas projects. These events expose UK exporters and suppliers to opportunities that they may otherwise not know about.

Through investing in clean technologies – wind, carbon capture, hydrogen and many others – the UK will lead the world into a new Green Industrial Revolution. UKEF can support the UK CCUS Supply Chain by supporting development of export capability:

- UKEF's Export Development Guarantee (EDG), for instance, allows UKEF to provide a partial guarantee of up to 80% on commercial loans worth more than £25 million, with a repayment period of up to 5 years;
- UKEF's General Export Facility (GEF) is a flexible export guarantee scheme that allows UKEF to provide a partial guarantee to lenders of up to 80% of the credit risk on cash facilities on commercial loans worth less than £25 million which makes it suitable for SMEs within the UK CCUS supply chain.

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With an EDG and GEF, finance does not need to be tied to an individual export contract. Instead, it can be used to support a UK CCUS supply chain company's general export activities, for example R&D or investment in a new production line that supports exports.

UKEF has a network of regional and global specialists to identify opportunities for UK supply chain companies as early as possible. UKEF's international network works alongside HM Trade Commissioners and British Ambassadors to leverage business opportunities for UK exporters and suppliers, particularly in net zero technologies, and increase demand for procurement in the CCUS supply chain in the UK.

The Department for International Trade (DIT) is also well placed to support UK CCUS businesses and associated supply chains access global opportunities, working in 117 separate overseas markets.

DIT uses its local expertise, networks and Government-to-Government relationships to reduce market access barriers for UK businesses and connect businesses with overseas buyers. DIT can link UK-based engineering expertise to emerging global CCUS opportunities, providing intelligence on projects and advice on the supply chain value to the UK. It can also connect the UK industrial clusters to overseas projects.

Securing free trade agreements will further leverage export opportunities. Negotiations have begun with the US, Australia and New Zealand, and accession to the Comprehensive and Progressive Agreement for Trans-Pacific Partnership is a key government priority for 2021.

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