

South Yorkshire low carbon energy supply chains: Carbon Capture, Utilisation and Storage (CCUS) sector summary



January 2022

1. INTRODUCTION

This sector summary focuses on the potential and challenges for the Carbon Capture, Utilisation and Storage (CCUS) sector. Whilst the focus is on opportunities in South Yorkshire, the limited number of CCUS firms across the whole of the UK necessitates analysis of the stakeholders across the country. The report sets out existing UK policy on CCUS and outlines the current state of the sector, before exploring supply chain, employment and skills issues. It is based on findings from a review of policy literature and in-depth interviews with five CCUS industry stakeholders.

We found that whilst it is unlikely that there will be any major CCUS projects directly in South Yorkshire, there will be significant opportunities to access a range of employment opportunities that will be created in Yorkshire and nationally. CCUS also has the potential to secure jobs in South Yorkshire in existing carbon intensive industries.

However, CCUS projects are already struggling with skills and labour shortages, which will only worsen as nationally significant CCUS projects start to be implemented. This will require skills in engineering, project management, equipment, maintenance and construction, for which more strategic national, regional and local approaches will be required.

2. WHAT IS CCUS AND WHY IS IT SIGNIFICANT?

CCUS is the process of capturing and storing carbon dioxide (CO₂) before it is released into the atmosphere.¹ CCUS can capture up to 90% of CO₂ released by burning fossil fuels in electricity generation and industrial processes.²

Currently CCUS is the only technology that can help reduce emissions from large industrial installations and is therefore seen as an important technology for tackling global climate change, safeguarding energy-intensive industry and generating low carbon energy. CCUS can generate 'negative emissions' when combined with bioenergy.

There are currently only around 20-30 large-scale CCUS projects in operation internationally because the technology has been in development and the process of extracting, pumping and compressing the CO₂ has previously been expensive (and higher for cement production and power generation where CO₂ has to be separated from other energy streams). However, CCUS projects are set to increase significantly because of improved technology, significantly reduced costs, carbon legislation and governmental support.

The International Energy Agency has called for a tenfold increase in CCUS capacity by 2025 to meet current climate targets and the Global CCUS Institute estimates that 2,500 CCUS facilities would need to be in operation by 2040 worldwide. The

1 There are different methods for capturing CO₂: post-combustion – where CO₂ is removed from the flue gases generated from burning fossil fuels; pre-combustion – carried out before burning the fossil fuel (by converting the fuel into a mix of hydrogen and CO₂); Oxyfuel technology – produces CO₂ and steam by burning fossil fuels with almost pure oxygen. Post-combustion and oxyfuel solutions can be fitted to new plants or retrofitted. Pre-combustion methods require large modifications and are more suitable for new build.

2 LSE (2018) What is carbon capture and storage and what role can it play in tackling climate change? Grantham Research Institute for Climate Change and the Environment. <https://www.lse.ac.uk/granthaminstitute/explainers/what-is-carbon-capture-and-storage-and-what-role-can-it-play-in-tackling-climate-change/>

risk of CO2 leakage from storage sites is felt to be low if they are adequately selected, managed and monitored.

Fluctuating policy support for CCUS has previously limited its development in the UK. For example, the withdrawal of spending on CCUS in 2015 led to the cancellation of the two main demonstration projects. However CCUS is now a key pillar of policy to decarbonise the economy in the UK, with strong policy support from the UK government and also from the SNP in Scotland. In 2020 the UK government established a £1bn CSS Infrastructure Fund to support the development of at least two UK CCUS clusters (the first to be built by the mid-2020s, the second to follow by 2030). The UK Government also announced that it plans to support at least one CCUS gas power station by 2030. The UK Government now sees CCUS as a key climate mitigation technology and the UK is seen as having the potential to be a global leader in CCUS. The UK Government has also said that by 2025 it will phase out 'unabated coal' – coal burnt in power plants not fitted with CCUS.

There are currently a number of large-scale CCUS projects at different stages of development and one BECCUS project in the UK, drawing on various

sources of public funding and private investment. These include Acorn CCUS, Caledonia Clean Energy, Clean Gas project, HyNet North West, H21 North West of England, Net Zero Teesside, and a BECCUS pilot plant at Drax Power Station.

In addition the oil company BP is leading alliances of international energy companies to develop storage facilities for industry clusters in Teesside and the Humber, which could store around half of the UK's industrial emissions (17m tonnes) by 2026.

In November 2019, the Drax Group plc (Drax) announced its ambition to become the world's first carbon negative energy company by 2030. To achieve this, it is looking to convert its four existing biomass operations at Drax Power Station to carbon capture and storage. This technology, also known as BECCUS, would generate up to 16 million tonnes of 'negative emissions' per year – equivalent to the total industrial emissions from the Humber region today. The Zero Carbon Humber partnership, comprised of 12 leading companies and organisations across the Humber including Drax, have recently submitted a joint public-private sector funded bid worth around £75m to support the deployment of CCUS and hydrogen technologies in the region.

Figure 1: The UK's Largest Clusters by Industrial Emissions



Source: <https://www.drax.com/carbon-capture/capture-for-growth-zero-carbon-humber-report/#chapter-1>

There is currently carbon storage development activity and proposals in many sites across the UK, including the North West, Teesside, South and North Humber, South Wales, Thames, Solent, Black Country and Scotland.

3. EMPLOYMENT IMPACTS OF CCUS

CCUS can support a range of direct, indirect and induced employment, including the following.

Direct:

- Installation of CCUS equipment in production facilities.
- Operation and maintenance of CCUS equipment in production facilities.
- Construction of CCUS pipelines and storage facilities.
- Transportation of CO₂.
- The manufacture of CCUS equipment.
- CCUS consultancy and R&D.

Indirect:

- Safeguarding and extending employment in existing carbon intensive industry plants that would otherwise be unviable because of carbon legislation.
- Supporting the development of existing or new carbon intensive industry facilities that depend on CCUS.

High-level estimates by the UK government suggest that CCUS has the potential to create 50,000 jobs in areas such as the Humber, Teesside, Merseyside, Grangemouth and Port Talbot, mainly in construction. In operation it is estimated that the planned CCUS clusters supported by current UK government policy create up to 6000 high-skilled, high-waged low-carbon jobs in areas such as Teesside, Humberside, Merseyside and St-Fergus in Scotland.

More detailed studies of the impact of CCUS are starting to be produced. The CCUSA/TUC Report on 'The Economic Benefits of CCUS to the UK' estimates that around 1000-2500 jobs are created

during construction in each new power plant CCUS installation, with a further 200-300 jobs created in operation and maintenance and the associated supply chain (40-100 jobs in the plant itself).³ This is reflected in job creation at the first power plant CCUS installation at Boundary Dam in Canada.

Vivid Economics (commissioned by Drax) has sought to quantify the social and economic benefit of deploying BECCUS at Drax Power Station and provide an estimate for Drax of the socio-economic benefits of deploying CCUS and hydrogen technologies at scale across the wider Humber industrial cluster, albeit mainly focusing on construction.⁴ It is estimated that up to 49,700 direct, indirect and induced jobs will be created as a result of deploying CCUS and hydrogen technologies in the Humber region and these could be realised as early as 2024, peaking at 49,700 jobs in 2027. These jobs include up to 25,200 high quality jobs in construction (such as welders, pipe fitters, machine installers and technicians), with a further 24,500 supported across the supply chain and wider economy. Developing BECCUS at Drax would support on average 10,500 direct, indirect and induced jobs per year during construction between 2024 and 2031, peaking at 16,800 jobs in 2028. CCUS projects offer the opportunity to create high quality jobs in the region and Vivid Economics highlight a range of skills gaps that will need to be addressed to meet a range of employment needs associated with CCUS. Drax has made a commitment to improve green skills, education, employability and opportunity for one million people over the next five years. The 'Mobilising a Million' initiative aims to boost the "social mobility" of people and improve their employability as part of its Opportunity Action Plan. The range of job opportunities in the medium- to longer-term were set out by one of our interviewees:

"Engineers are number one, you need lots of technical, competent people who can develop the project, you need strong project managers, you need very strong leaders. Then you want to bring through younger talent and people at the start of their career so they can learn from [those] that are getting towards the end of their career ... You also obviously need an industrial workforce but most of the projects at the moment are in the development phase ...

3 CCUSA/TUC (2020) The Economic Benefits of CCUS to the UK. <https://www.tuc.org.uk/sites/default/files/carboncapturebenefits.pdf>

4 Vivid Economics (2020) Capturing carbon at Drax: Delivering jobs, clean growth and levelling up the Humber. <https://www.vivideconomics.com/wp-content/uploads/2020/11/Capturing-Carbon-at-Drax-Delivering-Jobs-Clean-Growth-and-Levelling-Up-the-Humber.pdf>

So most of it is around the management, the design process, the consenting process, people who can do stakeholder engagement, people who can manage the health and safety position, environmental advisors. Then once you go to project development you're moving more into the construction level workforce where you need welders and construction workers and pipe fitters and mechanical assembly experts. So basically what you're doing, the skills endure and what you find is direct and indirect jobs in the construction phase, so indirect across the supply chain, the direct are direct to the project, are probably 50/50 whereas actually in the operations phase it's about 85% indirect, so supported by the supply chain and they're ranging from, the direct are probably more the managers who are managing the plants etc with a few industrial guys with the indirect being people who provide parts etc." (CC 02)

"I think drawing a much more coordinated plan together now would be helpful, albeit some of it may be too late, as I said before I think a system architecture way of approaching this would be the best way." (CC 01)

"If you do it this way you've got four projects say working in parallel with different teams, potentially resourcing through their own private mechanisms and contracting mechanisms which means if you don't get a commonality, unless you get a national skills academy that allows these people to coordinate, which is a potential solution and which is something I definitely advocate, but you've still got that availability question. So how do you attract those people now and how do you put together the training plans now that allow you to make sure that they've got the right skills to come out with when you're actually designing the projects now." (CC 01)

There are opportunities to reskill workers in oil and gas for CCUS, especially as some of the CCUS projects will use the offshore pipeline infrastructure of oil and gas as those sectors decline.

4. POTENTIAL SKILL SHORTAGES

The interviews undertaken for the project revealed concerns about a range of potential skills shortages as CCUS projects are developed around the same time (and as construction competes for labour with other construction work in the UK). This includes engineering and construction jobs. Labour shortages are likely to slow the pace of CCUS projects and increase their cost:

"It's always tough, because CCUS, at least in the UK, is a relatively new market, finding people within the UK with the skills is quite difficult. I think it's probably easier for the oil and gas majors to access this because they're multi-nationals and extraction of hydrocarbons or injection of CO₂ is a reversal of the process so the offshore operations teams, the offshore construction teams they have already access to but it tends to be within their market sector, so outside of that it's very difficult to find those skills and that's why on a lot of the projects there are consortiums built with the likes of ourselves working with offshore majors" (CC 01)

Emphasis was placed on the urgent need for an integrated approach to skill development and re-skilling nationally and within regions based on what is known about future employment demand:

5. LOCATIONAL DIMENSIONS OF CCUS AND SOUTH YORKSHIRE

When CO₂ has been captured it is compressed into liquid and transported by pipe, ship or road to an underground storage facility, such as depleted oil and gas reservoirs, coalbeds, deep saline aquifers where the geology is suitable. The UK government has mapped potential sites for CCUS on the basis of geology, with the North Sea and Morecambe Bay identified as the best sites in the UK. The North Sea is seen as a global hotspot for CCUS, with projects initiated in Norway, Denmark and the Netherlands as well as the UK. Captured CO₂ could also be used to create commercial products (Carbon Capture Storage and Utilisation).

Although captured CO₂ can be transported to storage sites, the CCUS policy focus in the UK has tended to focus on the clusters of CCUS in the North East, Yorkshire and the Humber and Scotland linked to storage facilities in the North Sea (including the infrastructure linked to depleted reservoirs of gas). It also reflects the opportunity to create a shared infrastructure of storage for regions that are the main source of CO₂ emissions in the UK.

CCUS will create similar employment opportunities for any area that has significant high carbon industry, and this includes the concentrations of industry in South Yorkshire. There will be scope for all regions to support skills and careers that allow residents to work on projects across the UK:

“I do expect there to be some guidance set on local job creation and that’s really important and should be happening. I think at the moment most of these clusters are aiming for 50-60% local content, but to be honest whilst there is local employment to be had the supply chains are extensive for all these different regions and cover most of the UK in one form or another. So Scotland will be accessing expertise in Sheffield and Devon and Reading and all over the place, whether that’s in pipe laying or survey or economics or finance or insurance so it’s going to touch all parts of the UK.” (CC 04)

Although there will not be major CCUS projects in South Yorkshire, there are significant opportunities to make links with the storage infrastructure and jobs created by CCUS in the Humber region. South Yorkshire could also develop specialisms in CCUS equipment manufacture and consulting given its existing manufacturing and R&D strengths. Existing studies of employment generation from CCUS could provide a basis for estimating the employment impacts in South Yorkshire and help to make the case for policy support and government investment in CCUS. The Sheffield City Region Draft Energy Strategy highlights the potential for South Yorkshire to build on and support the CCUS storage infrastructure being developed through Zero Carbon Humber project.

It is also important to recognise that CCUS will create opportunities to consolidate and perhaps develop existing carbon-intensive industries in South Yorkshire.

6. POLICY RECOMMENDATIONS

6.1. Implications for South Yorkshire

- Although there will not be major CCUS projects in South Yorkshire, there will be significant opportunities to access a range of employment opportunities that will be created by CCUS projects in Yorkshire and nationally. In terms of employment impacts for South Yorkshire, CCUS will also help to ‘hold down’ and perhaps

increase jobs in existing carbon intensive industries. That employment impact could be significant and should be part of economic strategy.

- CCUS projects are already struggling with skills and labour shortages and that will worsen as planned CCUS projects start to be developed. There is a need for more strategic national, regional and local approaches to meeting future skills needs across a range of sectors in engineering, project management, equipment, maintenance and construction.

6.2. Policy intervention in South Yorkshire

- Government investment in skills for CCUS needs to be more systematic and coherent to give longer-term certainty, but there are opportunities for the South Yorkshire to take the lead in developing a long-term strategic approach given the future jobs pipeline.
- There is a scope for systematic mapping of planned CCUS projects within travel to work distance of South Yorkshire and the skills, training and employment needs that might be relevant to South Yorkshire.
- Skills mapping might identify overlaps with employment opportunities in other infrastructure and green economy sectors to maximise the value of investment in skills and training.
- There is an urgent need for a quick response given the range of job opportunities and concerns about skills shortages and recruitment difficulties.

Other Reports

- [Low Carbon Energy Supply Chains, Employment and Skills in South Yorkshire: Headline Findings](#)
- [South Yorkshire low carbon energy supply chains: Heat Networks sector summary](#)
- [South Yorkshire low carbon energy supply chains: Heat Pumps sector summary](#)
- [South Yorkshire low carbon energy supply chains: Hydrogen sector summary](#)
- [South Yorkshire low carbon energy supply chains: Insulation sector summary](#)
- [South Yorkshire low carbon energy supply chains: Nuclear sector summary](#)

Authors

Will Eadson, Phil Northall, Andrew Johnston, Stephen Parkes, Peter Wells, Aidan While

Further information

CRESR, Sheffield Hallam University, Olympic Legacy Park, 2 Old Hall Road, Sheffield, S9 3TU.

0114 225 3073 / cesr@shu.ac.uk
www.shu.ac.uk/cesr
[@CRESR_SHU](https://twitter.com/CRESR_SHU)