

CCUS Investor Roadmap

Capturing Carbon and a Global Opportunity

April 2022

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CCUS Investor Roadmap

Capturing Carbon and a Global Opportunity

Carbon capture and storage is “a necessity, not an option” for the UK’s ambition to transition to net zero by 2050

The UK is well placed to lead in CCUS globally with:

- A worldwide reputation as an international centre of engineering excellence

- Extensive experience from the oil, gas and petrochemicals sector

- Substantial CO₂ storage potential and industrial infrastructure e.g. gas network

The UK is a first mover; we will support the establishment of at least two low carbon CCUS clusters by the mid-2020s and a further two by 2030 through which we aim to capture 20-30MtCO₂ per year

The UK has one of the world's most attractive business environments

World leading research institutions - the highest density of world class universities

The UK has an estimated **78Gt** CO₂ storage capacity, enough to support the UK's demands for 100s of years

Engineering employs **6.6bn** in the UK



Potential **£1.3bn** in GVA from UK CCUS exports by 2050

£220n committed to raise R&D to 2.4% of national GDP

280,000 employed in oil and gas industries

- Most active and deepest capital markets in Europe
- Stable regulatory market
- 2nd in G20 for ease of doing business
- 0% dividend withholding tax rate, as part of wider competitive tax regime
- The UK-EU Trade Cooperation Agreement post EU exit allows zero tariff market access with the EU
- Further UK Free Trade Agreements enable exports to the rest of the world (currently 70 plus EU)
- Super-Deduction - A new 130% first-year capital allowance for qualifying plant and machinery assets

Why invest in UK CCUS?

UK aims to capture **20-30 MtCO₂** per year by 2030

£8.3bn
In potential total UK captured turnover from CCUS by 2050

£1bn
To support the capital costs of CCUS infrastructure through the CIF

£170m
Industrial Decarbonisation Challenge Fund

Up to £100m
In new R&D spending to develop DCCS and other CCUR technologies in the UK

£140m
to set up the Industrial Decarbonisation Hydrogen Revenue Support scheme

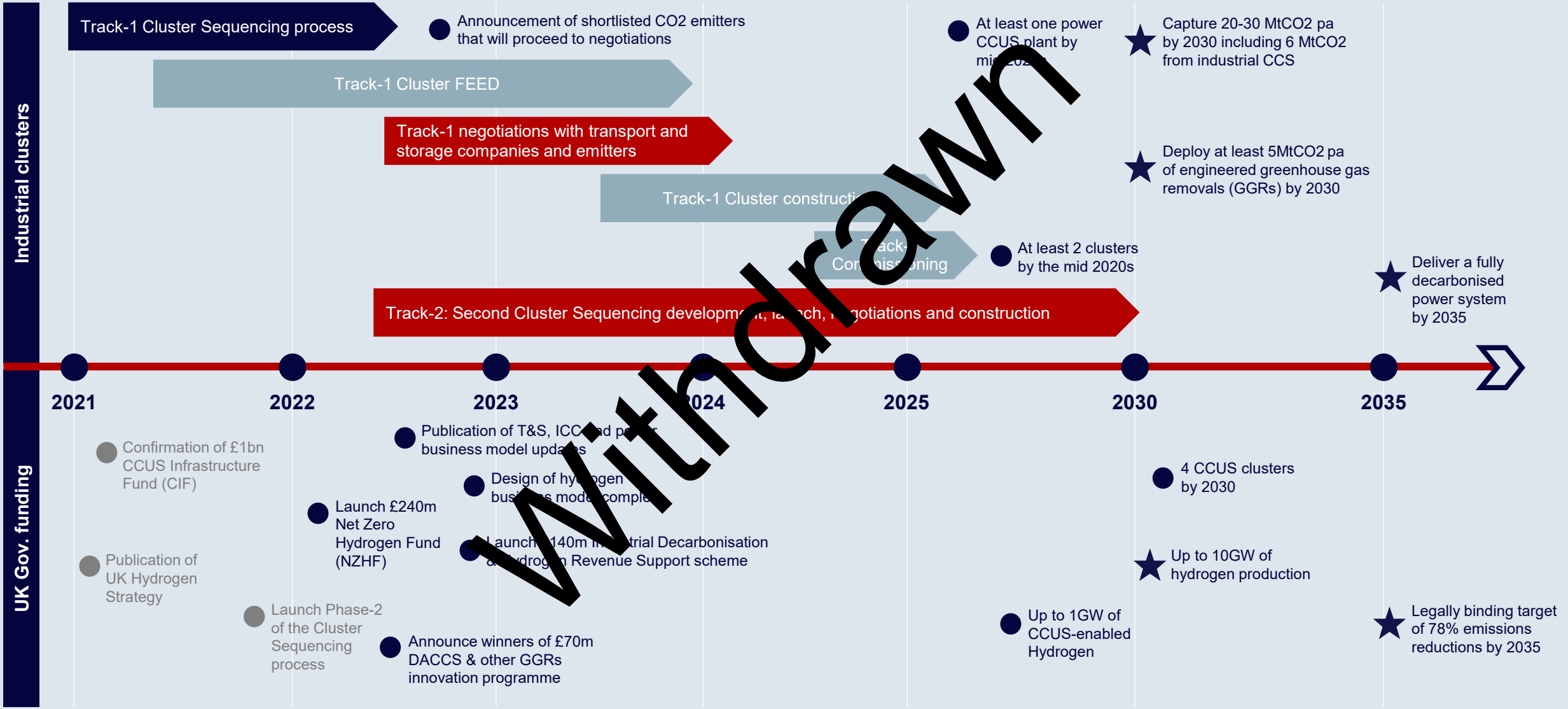
Opportunities in an advanced and growing sector:

- **Global player:** UK is in the top 5 countries globally for CCUS readiness. The UK has one of the largest potential CO₂ storage capacities in Europe
- **Project pipeline:** Funding for industrial carbon capture and hydrogen production projects will be announced later this year and allocated through the Cluster Sequencing process and hydrogen funding schemes
- **Regulatory environment:** Bespoke business models
- **Boost jobs:** CCUS-enabled clusters could support up to 50,000 jobs in the UK by 2030

Our 2035 Delivery Plan

Critical activities and milestones on a path to developing the UK CCUS sector

▶ Government activity
 ▶ Industry activity
 ▶ Joint government & Industry activity
 ● Key milestones
 ★ Government target



CCUS is crucial to decarbonisation in the UK

The role of CCUS in the UK's transition to net zero



The North Sea Transition Deal will commit to deliver investment of up to £14-16bn by 2030 in new energy technologies, of which £2-3bn is allocated to CCUS, £2-3bn to electrification and up to £10bn to hydrogen



We will ensure a second lease of life for the North Sea in low-carbon technologies by: Delivering on our £1bn commitment to 4 CCUS clusters by 2030, with the first two sites selected in the North East and North West currently proceeding through Track-1



By 2050, emissions associated with industry could need to fall by around 90% compared to 2018. Industrial CCUS will be fundamental to this



Power CCUS can provide non-weather dependent, dispatchable low carbon generation. This will be vital alongside system flexibility and energy storage to support a fully decarbonised electricity system by 2035



The North Sea Transition Authority (NSTA) are the regulator for the storage of CO2 on the UK Continental Shelf. When it receives an application for a storage permit, the NSTA is required by law to ensure (amongst other requirements) that the storage complex and surrounding area have been sufficiently characterised and assessed to ensure there is no significant risk of leakage.

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The UK's world class skills and infrastructure are gearing up to the transition

Energy, oil, and gas



280,000

employed in the oil & gas industries

£27bn

oil & gas turnover, c.40% through exports

90%

of oil and gas jobs have high or medium transferability

Chemicals



153,000

employed in the chemical industry

£19.2bn

Gross Value Added in 2018

£57.6bn

of chemicals exports in 2019

Engineering



5.6m

employed in the UK

£1.2tn

of total UK turnover, 21.4% UK total

5.1%

increase in employment over last 5 years

There are strong transferable capabilities from existing UK industries into CCUS:

- Worldwide reputation as an international centre of engineering excellence and world leading in the oil, gas, and petrochemicals sector
- Extensive experience in implementing large offshore infrastructure projects and investing in shared offshore infrastructure solutions
- Deep knowledge of subsurface technologies, geoscience and reservoir management
- Around half of the business opportunity for UK CCUS is associated with engineering, procurement and construction management (EPCm) services, a key strength for the UK

Government and industry working together

Collaborating to deliver CCUS in the UK

	<p>What we are delivering</p> <ul style="list-style-type: none"> ■ Set ambitious capture targets to support our long term ambition to get to net zero by 2050 ■ Set up the Cluster Sequencing process to establish CCUS deployment in the UK to decarbonise industrial clusters ■ Launched funding streams to support CCUS deployment 	<p>What we look to industry to deliver</p> <ul style="list-style-type: none"> ■ Establish two operational industrial clusters by the mid-2020s ■ The sector will invest £2-3bn to build the Transport & Storage infrastructure to help capture 20-30MtCO₂ per year of carbon by 2030
<p>Establishing a long term CCUS market</p>	<ul style="list-style-type: none"> ■ Incentivising scale up and promoting reliability through developing investable business models to provide long term revenue certainty and addressing 'cross chain' risk, and creating a regulated asset base ■ Initial drafting of CCUS Network Code, guided by government and driven by industry, enabling the development of network codes and standards 	<ul style="list-style-type: none"> ■ Support the development of the CCUS Network Code ■ Support the government to develop business models
<p>A stable, regulated market</p>	<ul style="list-style-type: none"> ■ Developing our green jobs and skills offer and reforming the skills system to ensure the development of key capabilities 	<ul style="list-style-type: none"> ■ Identify and support the rapid growth of competitive new capabilities to meet future energy needs ■ Create skilled, long-term jobs and a diverse workforce, demonstrating how they will fill any skills gaps
<p>Skills and capability</p>	<ul style="list-style-type: none"> ■ Published supply chain roadmap setting out how government and industry can work together to harness the power of a strong, industrialised supply chain ■ Working through the Energy Supply Chains Taskforce and CCUS Council to identify UK supply chain strengths 	<ul style="list-style-type: none"> ■ Build up robust transparent supply chains, with emphasis on local skills and capacity development ■ Share information on supply chain development
<p>Supply chains</p>		

Sources: See Appendix



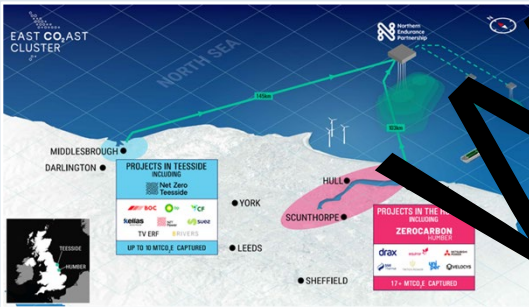
Establishing a long term CCUS market

Deploying CCUS in the UK through industrial clusters

Establishing a long term CCUS market

What we have done

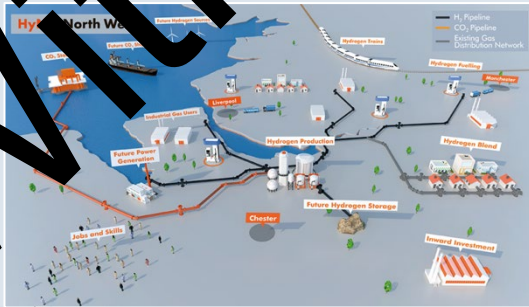
- Launched the Cluster Sequencing process. Confirmed HyNet and the East Coast Cluster as Track-1 clusters with Acorn as a reserve cluster
- Announced Cluster Sequencing Phase-2: eligible projects (power CCUS, hydrogen and ICC)



East Coast Cluster

What we are doing

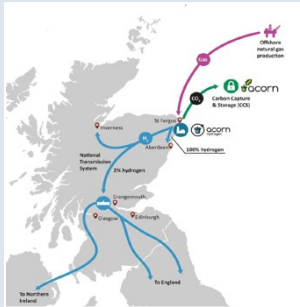
- Selecting the projects that will make up Track-1 clusters
- Engaging with industry on the development of a Track-2 process



HyNet

What we committed to

- Work with industry to achieve four low carbon industrial clusters by 2030 and at least one net zero industrial cluster by 2040
- Support Track-1 clusters to be operational in the mid-2020s



Acorn

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Establishing a long term CCUS market

Providing capital and revenue funding to support CCUS deployment

	What we have done	What we are doing	What we committed to
CCUS Infrastructure Fund (CIF)	<ul style="list-style-type: none"> Announced £1bn CIF to support the capital costs of strategic CCUS infrastructure Committed up to £40m of the CIF to support design work for offshore storage and onshore infrastructure through Industrial Decarbonisation Challenge, which is providing up to £171m across nine projects 	<ul style="list-style-type: none"> 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 	<ul style="list-style-type: none"> £1bn CIF to support the capital costs of strategic CCUS infrastructure, helping to create 'SuperPlaces' in areas such as the North East, the Humber, North West, Southern England, Scotland and Wales
Industrial Decarbonisation and Hydrogen Revenue Support (IDHRS)	<ul style="list-style-type: none"> Set up the £140m IDHRS scheme to fund our new hydrogen and industrial carbon capture business models 	<ul style="list-style-type: none"> We will announce a funding envelope in 2022 that will enable us to award the first contracts for CCUS-enabled hydrogen and industrial carbon capture facilities from 2023 	<ul style="list-style-type: none"> £140m to accelerate hydrogen projects and industry adoption of carbon capture and storage
Net Zero Hydrogen Fund (NZHF)	<ul style="list-style-type: none"> Consulted on the design of the NZHF and split the funding in 4 strands 	<ul style="list-style-type: none"> We are aiming to open the first funding window for Strands 1 and 2 in Spring 2022, with a potential of a further funding window in 2023/24. We intend to open strand 3 in summer 2022 	<ul style="list-style-type: none"> Up to £240m, delivered between 2022 - 2025, to support new H2 production in UK

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Creating a stable regulated market

UK Government is incentivising scale up and promoting reliability through developing investable business models and creating a stable regulatory base

	What we have done	What we are doing	What we committed to
Power CCUS - the “Dispatchable Power Agreement” (DPA)	<ul style="list-style-type: none"> Developed the DPA which builds on the UK’s expertise in Contracts for Difference for renewable energy. The DPA aims to provide long term revenue certainty and a stable investment environment for developers of power CCUS plants 	<ul style="list-style-type: none"> Publishing DPA full contract in Spring 2022 and consulting to further understand industry perspectives. Engaging industry later in 2022 with a call for evidence for future policy development for Power CCUS. Developing Decarbonisation Readiness 	<ul style="list-style-type: none"> A competitive allocation process in the 2020s for the next phase of Power CCUS deployment. Support at least one Power CCUS project for delivery by mid-2020s. Deliver a fully decarbonised power system by 2035
Transport and Storage (T&S) - the T&S Regulatory Investment (TRI) Model	<ul style="list-style-type: none"> Developed the TRI business model which supports stable investment by providing investors with a clear sight of the long-term revenue model for T&S. The model is designed to accommodate different potential network designs and growth profiles 	<ul style="list-style-type: none"> Working towards confirming a regulator and establishing a licensing regime. Developing economic licences, T&S codes and code documents with industry. Developing the TRI Model further to mitigate remote, specified risks and revenue risk; and establish a return commensurate with risk taken by T&S Companies 	<ul style="list-style-type: none"> Ambition to deploy at least 5MtCO2 per year from ‘engineered’ GGRs by 2030 to support the trajectory to Net Zero
Hydrogen Business Model	<ul style="list-style-type: none"> Publication of government response on business model design, alongside indicative Heads of Terms of the business model contract 	<ul style="list-style-type: none"> Developing detailed model design to provide producers with revenue support and help overcome operating cost gap between hydrogen and fossil fuels and an ROI 	<ul style="list-style-type: none"> Finalise the business model in 2022 Announce funding envelope in 2022 to support delivery of up to 1GW of CCUS-enabled hydrogen by mid-2020s

Withdrawal



Creating a stable regulated market

UK Government is incentivising scale up and promoting reliability through developing investable business models and creating a stable regulatory base



	What we have done	What we are doing	What we committed to
Industrial Carbon Capture (ICC)	<ul style="list-style-type: none"> The ICC contract provides a model to unlock investment by providing long-term revenue certainty for industrial users to achieve deep decarbonisation and is being adapted to support waste CCUS projects 	<ul style="list-style-type: none"> Publishing next business model update and full ICC contract in Spring 2022 and consulting to further understand industry perspectives Developing business models to enable waste CCUS projects to obtain access to funding 	<ul style="list-style-type: none"> Ambition to capture 20-30 MtCO₂, including 6MtCO₂ of industrial emissions, per year by 2030 and 9MtCO₂ per year by 2035
Existing infrastructure	<ul style="list-style-type: none"> An Expression of Interest for Greenhouse Gas Removal (GGR) projects, including DACCS and Power BECCS, closed in early 2022 which will provide visibility on market readiness Reports published on monitoring, reporting and verifying and commercial frameworks for power BECCS Response to GGR incentive framework consultation published as well as the biomass policy statement 	<ul style="list-style-type: none"> Developing first of its kind Power BECCS business model Running a £70m innovation competition for DACCS and other GGRs to bring down costs and support newly emerging efficiency improvements Developing robust sustainability criteria for BECCS to ensure delivery of genuine negative emissions Consulting on preferred GGR business models in spring 2022 	<ul style="list-style-type: none"> Ambition to deploy at least 5MtCO₂ per year from 'engineered' GGRs by 2030 to support the trajectory to Net Zero

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Strengthening supply chains

We are committed to the development of a CCUS supply chain including through realising export opportunities

Strengthening and promoting UK supply chain

What we have done

- Published the CCUS Supply Chain Roadmap to maximise the UK's potential
- Launched the UK Energy Supply Chain Taskforce - a joint enterprise working to maximise opportunities and mitigate challenges in the development of energy supply chains
- UK Export Finance, the UK's export credit agency, has enhanced its support to attract investment into CCUS supply chains and export capability

Existing infrastructure

- Identified existing infrastructure that could be transitioned to support CCUS deployment, e.g. oil and gas transportation

What we are doing

- Working with industry to map the capabilities of the UK CCUS supply chain to identify specific equipment, technologies and services where UK can become a global leader. Engaging with key stakeholders to facilitate new opportunities overseas for the UK's net zero supply chains
- Developing an Export CCUS programme to ensure UK-based companies are in the best position to compete for and win new CCUS contracts across the globe. Offering a suite of products to support the innovation to export pathway for CCUS supply chains

- Working with stakeholders to understand the requirements needed to transition and repurpose existing infrastructure and capabilities where appropriate

What we committed to

- Working with industry to harness the power of a strong, industrialised UK CCUS supply chain, whilst ensuring that the CCUS sector remains investible, cost effective and focused on delivery
- UK Export Finance is increasing its International Export Finance Executive network from 15 to 30 Country Heads to build a pipeline of opportunities for supply chains and secure investment for the UK
- Deploying a targeted UK offer utilising the full suite of Government finance and support to secure a 'first mover' export advantage
- Protecting existing legacy infrastructure and utilising the transferable capabilities developed in related sectors over the past five decades

Building our skills and research and innovation

Developing key capabilities and supporting the strong transferable skills the UK already has



Skills

What we have done

- Launched Green Jobs Taskforce, which published an independent report with recommendations that informed the Net Zero Strategy

What we are doing

- Reforming the skills system through Local Skills Improvement Plans. We are working with industry to support the deployment of CCUS that could help create 50,000 UK jobs by 2030

What we committed to

- Green Jobs Delivery Group will be a central forum through which government, industry and other key stakeholders support the development and delivery of green jobs and skills
- The North Sea Transition Deal has a commitment to deliver an integrated People and Skills Plan to ensure the highly transferable workforce is being tapped into throughout the energy transition.

Research and innovation

- Between 2004-2019 we provided over £330m public funding for CCUS Research and Innovation
- The Industrial Decarbonisation Challenge Fund provides up to £100m, matched by £261m from industry, supports low-carbon technology development
- Established the Industrial Decarbonisation Research and Innovation Centre

- In addition to the £70m DACCS and GGR competition, we are providing up to £25m of research and development funding to help develop and pilot next generation carbon capture technologies in the UK

- GGR technologies and Next Generation Carbon Capture are two of the top ten priorities of the £1bn Net Zero Innovation Portfolio

Withdrawal

Appendix: Sources

The UK - A reliable, stable place for business, leading the world for capital investments

- Oil and Gas Authority (2021) [Carbon Capture and Storage](#).
- BEIS (2019) [Energy Innovation Needs Assessment – Carbon Capture, Usage and Storage](#). To note, GVA considers market value estimates.

CCUS is crucial to decarbonisation in the UK and Why invest in UK CCUS

- BEIS (2022) [British energy security strategy](#)
- [Industrial Clusters Mission Infographic](#) (2019)
- BEIS (2018) [CCUS deployment pathway action plan](#).
- GCCSI (2018) [The Carbon Capture and Storage Readiness Index](#)
- Oil and Gas Authority (2021) [Carbon Capture and Storage](#)

Additional information:

- [Cluster Sequencing Phase-2: eligible projects](#) (power CCUS, hydrogen and ICC)
- [Business models](#)

The UK's world class technical skills and infrastructure

- BEIS (2019) [Energy Innovation Needs Assessment – Carbon Capture, Usage and Storage](#). To note, GVA considers market value estimates.
- Oil and Gas Authority (2020). [UKCS integration](#).
- Engineering UK (2019) [Key Facts & Figures](#)
- UK Government (2020) [UK Energy in Brief 2020](#)
- H2FC SUPERGEN (2020) [Opportunities For Hydrogen And Fuel Cell Technologies To Contribute To Clean Growth In The UK](#)
- Statista (2020) [Chemical Industry in the UK](#)
- Oil and Gas UK (2021) [Workforce Insight Report](#)



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