

CCUS Net Zero Investment Roadmap

Capturing carbon and a global opportunity

April 2023



HM Government



The UK is leading the charge towards a net zero, nature-positive future



The UK has the potential to be one of the greatest CO₂ storage bases in Europe, with billions of tonnes worth of storage - opening up economic growth and exciting global investment opportunities.

Rt Hon Grant Shapps MP – Secretary of State for Department for Energy Security and Net Zero



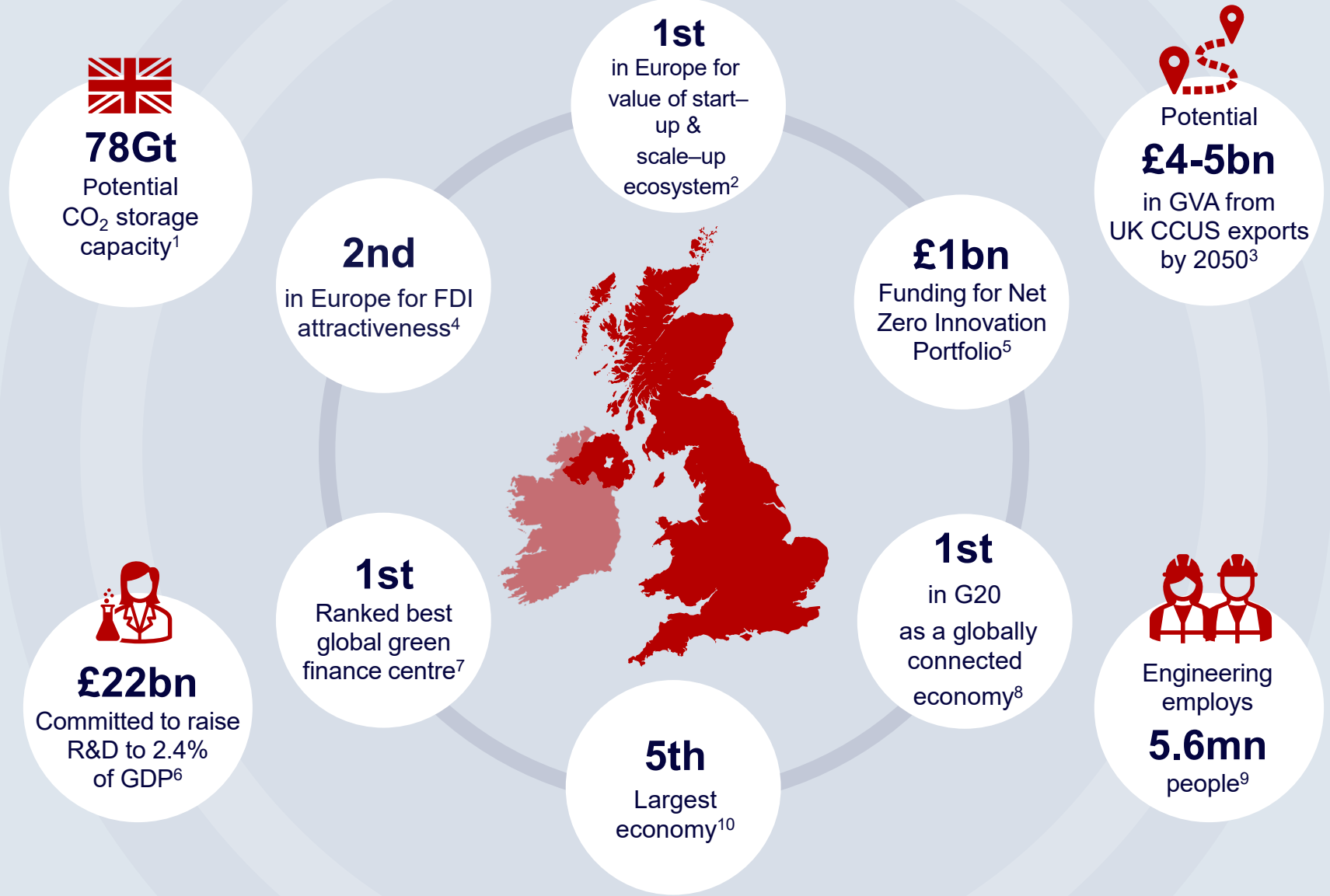
Carbon capture, usage and storage (CCUS) will play a critical role in the transition to net zero by 2050.

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

The UK is a first mover; we are aiming to support the establishment of two 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 and investment environments



- Open, liberal economy
- Stable regulatory regime with independent legal system
- Globally competitive and transparent tax regime
- Generous R&D and patent tax relief
- The UK-EU Trade and Cooperation Agreement allows zero tariff market access with the EU
- Flexible labour market
- World class professional services sector supporting businesses with insurance and finance

References :¹Pale Blue Dot Report (2016); ²Dealroom (2023); ³Energy Innovation Needs Assessment (2019); ⁴EY attractiveness survey (2022); ⁵Net Zero Innovation Portfolio (2023); ⁶UK Innovation Strategy (2021); ⁷The Global Green Finance Index 10 (2022); ⁸Global Connectedness Index (2022); ⁹Workforce trends (2022); ¹⁰Official statistics converted at market exchange rates as a source.

Why invest in UK CCUS?

A sector with ambitious targets and major opportunities for growth

£20bn
for the early deployment of CCUS¹

Up to **£210mn**
Industrial Strategy Challenge Fund²

Up to **£115mn**
in new R&D spending to develop CCUS & Carbon Removal techs in the UK³

Up to **£8bn**
of potential turnover captured by the UK from global turnover of the CCUS industry in 2050⁴

Up to **£18bn**
private financial capacity available from UK Infrastructure Bank for sectors including H2/CCUS⁵

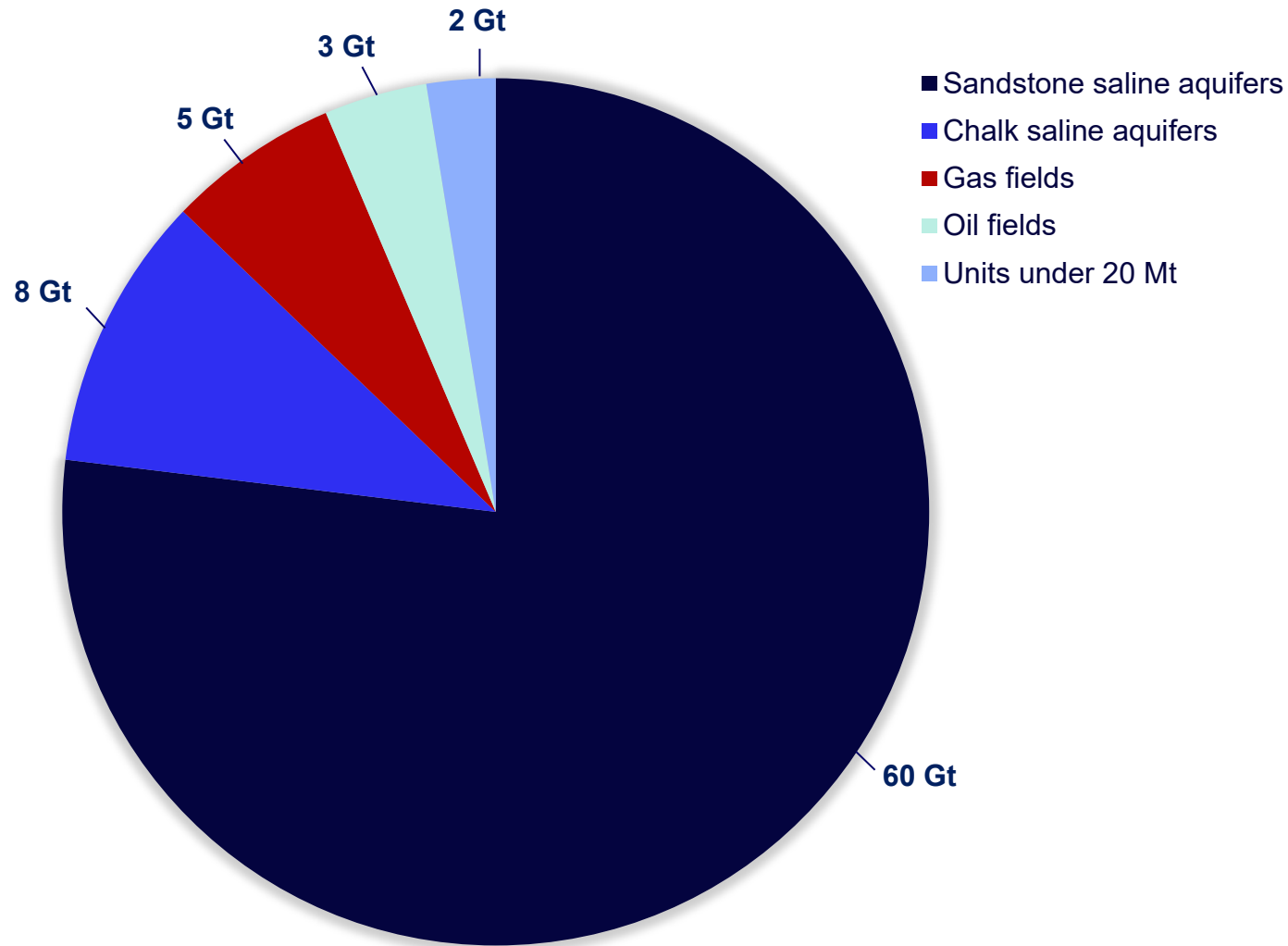
UK aims to capture **20-30 MtCO₂** per year by 2030

Opportunities in an advanced and growing sector:

- **Global player:** the UK is in the top 5 countries globally for CCUS readiness⁵
- **CCUS clusters:** The government is committed to deploying two CCUS clusters by the mid-2020s and a further two by 2030 through which we aim to capture 20-30MtCO₂ per year
- **Regulatory environment:** Bespoke business models
- Could support **50,000 jobs in 2030**⁶

Sources: ¹Spring Budget (2023); ²Industrial Strategy Challenge Fund (2023); ³Net Zero Innovation Portfolio; ⁴Analysis based on Energy Innovation Needs Assessment (2019); ⁵UKIB Strategic Plan (2022); ⁶CO2RE (2023); ⁷Energy Innovation Needs Assessment (2019)

UK CO₂ storage capacity by store type



Overall UK CO₂ storage capacity in offshore geological formations by type of store

Source: Based on Bentham et al. (2014) [CO₂ Storage Evaluation Database](#)

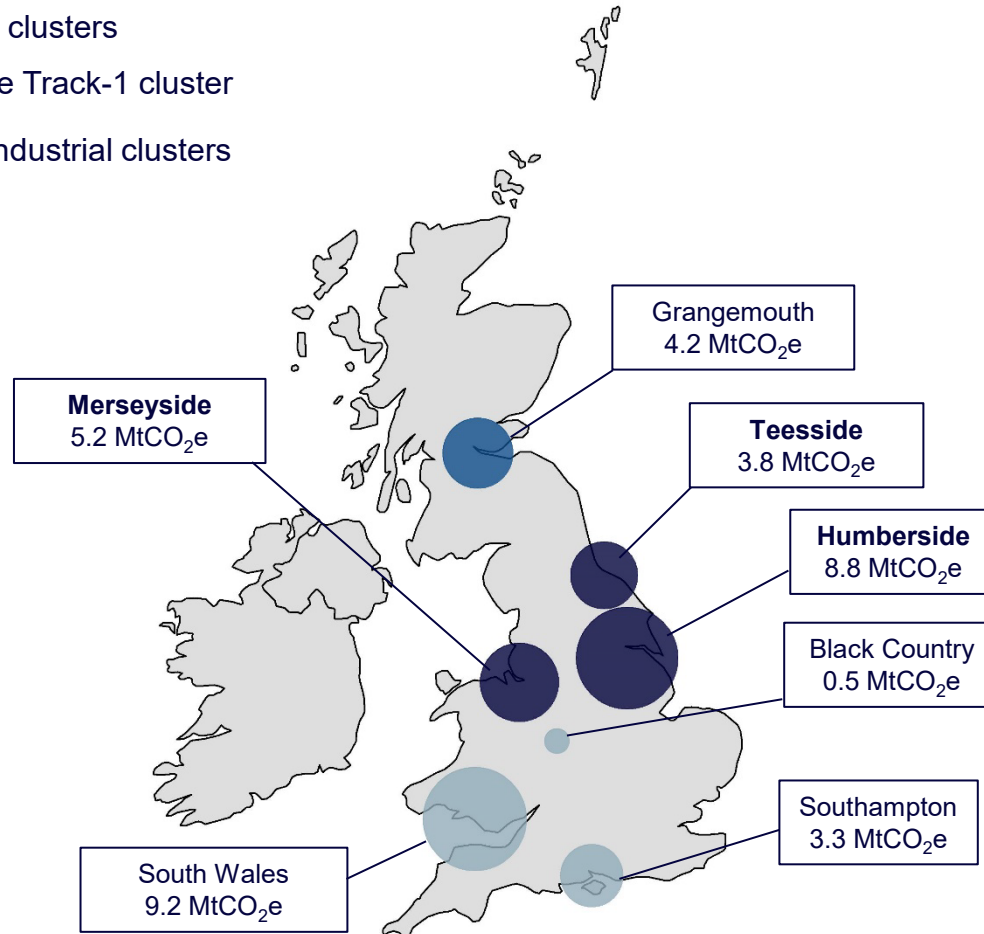
The UK can lead the world in the provision of CO₂ transport and storage services with:

- An estimated 78 billion tonnes of theoretical CO₂ storage capacity in the UK continental shelf
- One of the largest potential CO₂ storage capacities in Europe

Building the market

Major UK industrial cluster emissions

- Track-1 clusters
- Reserve Track-1 cluster
- Other industrial clusters

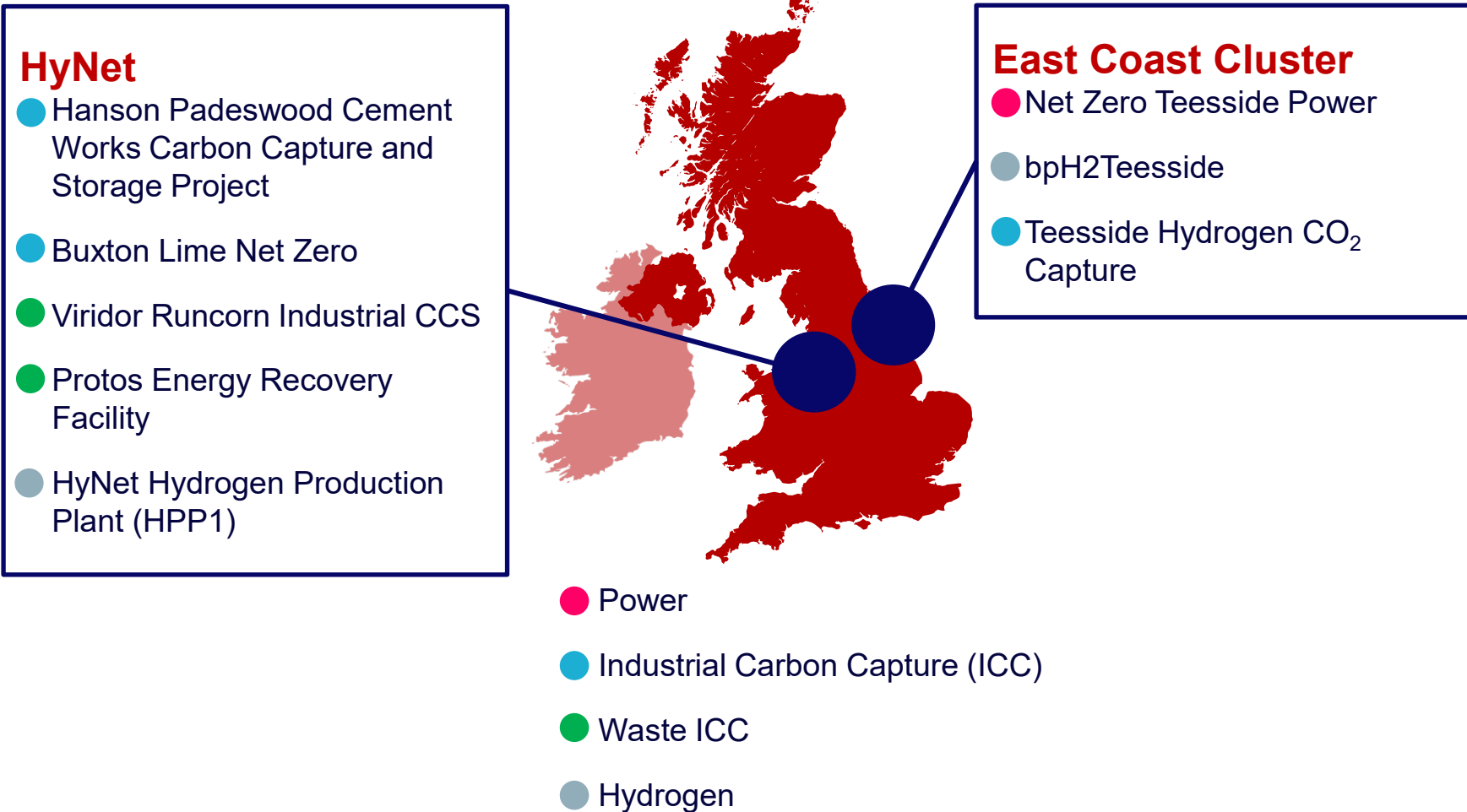


Map of major UK industrial cluster emissions from large point sources
There are other areas of industrial activity across the UK with an interest in developing CCUS.
Source: [NAEI](#) 2019 data. Annual emissions. Does not capture non-ETS emissions in a cluster.

- Industrial CCUS clusters can be the starting point for a new carbon capture industry with a sizeable export potential
- The cluster sequencing process maps a logical path for CCUS deployment in the UK. Clusters sequenced for the mid-2020s are 'Track-1' and those by 2030 are 'Track-2'
- This approach will help drive investment across the sector. We remain committed to helping all industrial clusters to decarbonise as we work to reach net zero emissions by 2050.
- The CCUS sector could support up to 50,000 jobs in the UK in 2030.

Track-1 CCUS clusters for the mid-2020s

Delivering first of a kind carbon capture projects in the UK



- The Track-1 Project Negotiation List includes 8 projects selected through the cluster sequencing process to progress to negotiations to form the start of the CCUS clusters, based in HyNet and the East Coast Cluster
- This is a significant step towards the UK's first operational CCUS networks, underlining the government's commitment to delivering our Net Zero ambitions

Opportunities for investment

Track-1 cluster expansion and Track-2 clusters

Track-1 expansion

- The Government will launch a process, later in 2023, to enable further expansion of Track-1 clusters beyond the initial Track-1 deployment, identifying and selecting projects within HyNet and East Coast Cluster – including the Humber – and their associated stores as they become viable, to be operational by 2030.
- The expansion of the Track-1 clusters is expected to include greater utilisation of the initial HyNet storage capacity and the development of the Bunter Closure stores for the East Coast Cluster to 2030, subject to further assessment and value for money.
- Government will work to identify projects that could be potential alternatives to any of the initial Track-1 projects, if any are unable to agree contracts within the criteria and timelines required. The Government will continuously monitor the value for money offered by the Track-1 shortlist, to ensure only the best and most cost-effective capture projects reach FID.
- Subject to criteria under development, the Government is minded to enable engineered greenhouse gas removals (GGRs) to apply to Track-1 expansion and Track-2.

Track-2

- Government has launched Track-2 of the CCUS cluster sequencing process to establish two further CCUS clusters.
- At this stage, Government is seeking to identify two Transport and Storage (T&S) systems that can deliver Government's objectives for Track 2 and considers the Acorn and Viking T&S systems as able to meet the Track-2 eligibility criteria, and best placed to deliver on the objectives for Track-2, subject to due diligence and value for money assessments.
- Other T&S systems that are able to meet the eligibility criteria have the opportunity to express an interest in being considered for Track-2. The deadline for submitting an expression of interest (EoI) is 28 April 2023.
- We intend to provide an update in summer 2023, following closure of the EoI process.



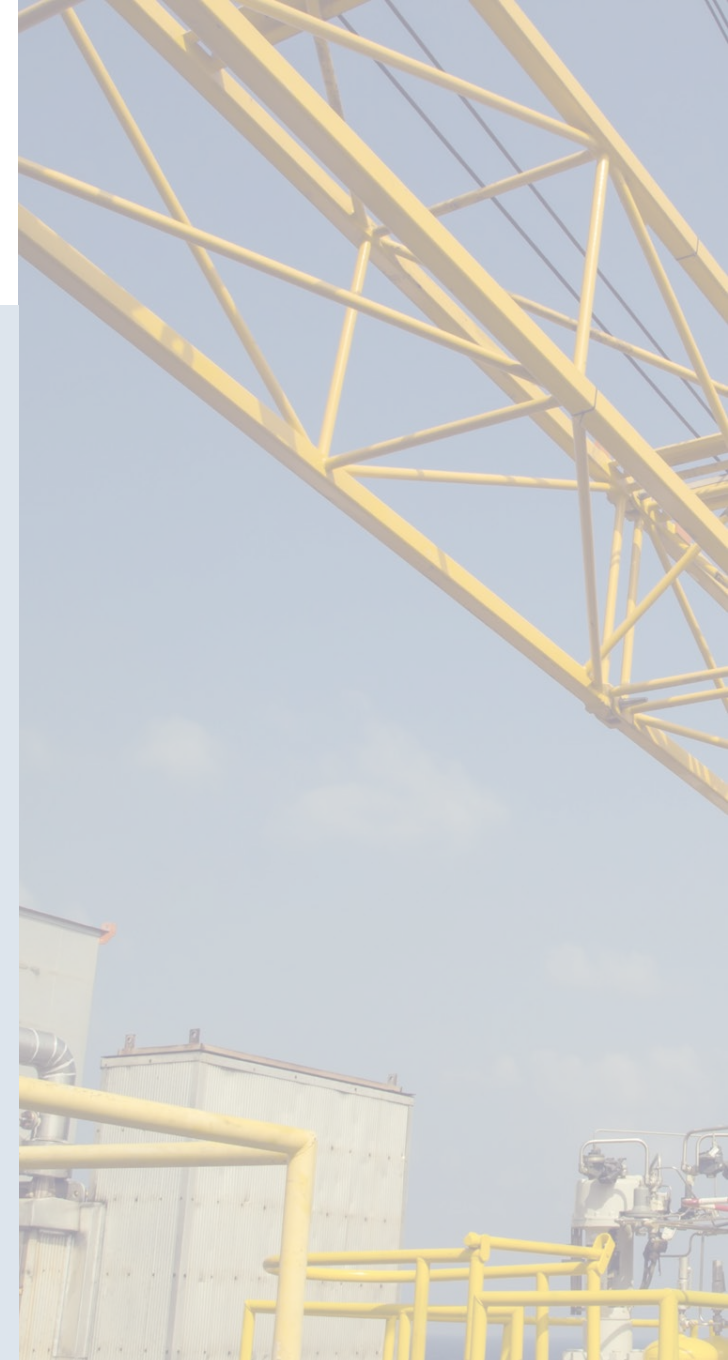
Incentives to invest

Addressing commercial barriers to investment through world leading commercial frameworks and capital and revenue funding

Business models for CCUS deployment

- **Industrial Carbon Capture (ICC) Business Models (including the Waste ICC Business Model)** are designed to incentivise the deployment of carbon capture technology for industrial users who often have no viable alternatives available to achieve deep decarbonisation.
- The **Dispatchable Power Agreement (DPA)** will incentivise the mobilisation of private finance to enable power CCUS to play a valuable mid-merit role in our generation mix.
- For **Power Bioenergy CCS (BECCS)** we are designing a first of a kind Power BECCS business model to incentivise private finance enabled projects that will provide negative emissions and firm low carbon electricity.
- **Greenhouse Gas Removals (GGRs) Business Model** is being developed to attract private investment in a portfolio of engineered GGR technologies including Direct Air Carbon Capture and Storage (DACCS).
- **Transport and Storage (T&S) Regulatory Investment (TRI) Model** is based on the successful regulated asset base model. It has three key objectives: to attract investment in the T&S network to establish a new CCUS sector; enable low-cost decarbonisation in multiple sectors; and develop a market for carbon capture – a long-term vision.
- The **Hydrogen Production Business Model** will provide revenue support to producers to overcome the operating cost gap between low carbon hydrogen and high carbon counterfactual fuels.
- **£20 billion investment in the early deployment of CCUS**, including the **£1 billion CCUS Infrastructure Fund** to support the capital costs of strategic CCUS infrastructure, T&S networks, and ICC projects.
- **Industrial Decarbonisation and Hydrogen Revenue Support** scheme to fund business models for low carbon hydrogen production and industrial carbon capture that give investors the long-term revenue certainty they require.

Capital and revenue funding available

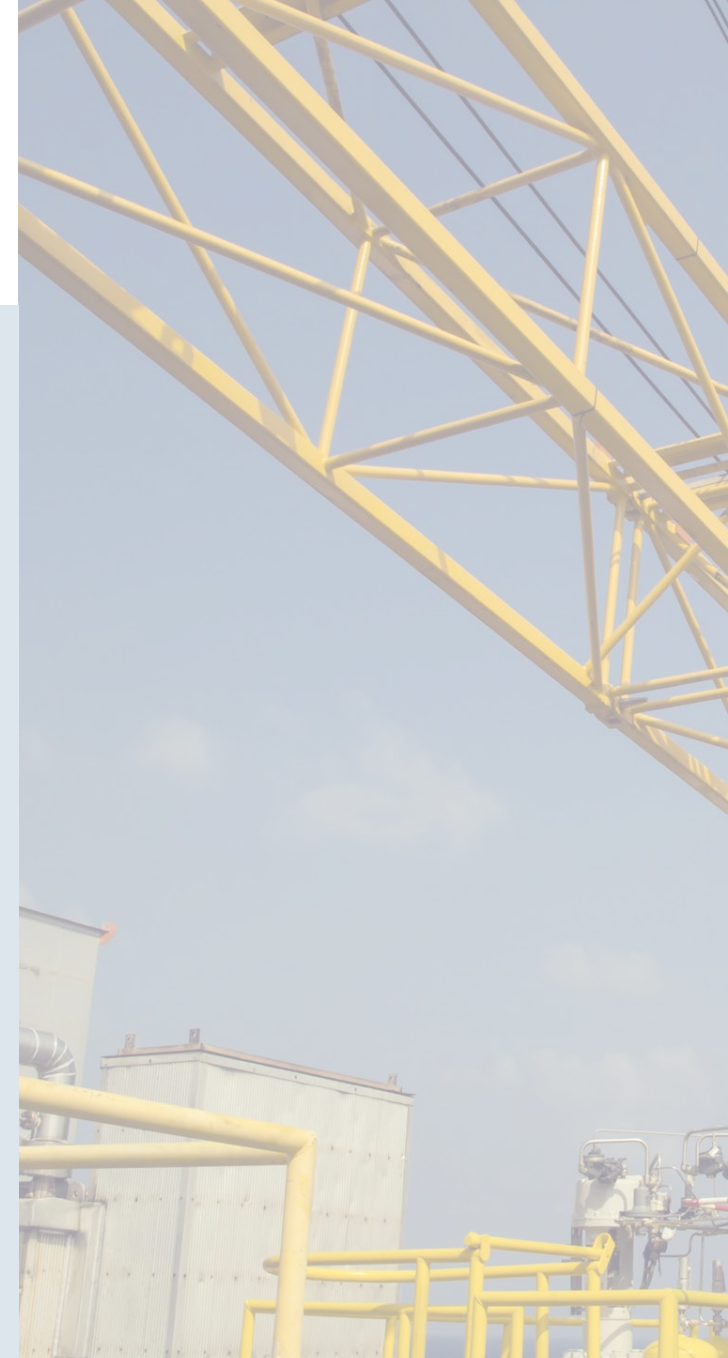


Incentives to invest

Creating a supportive regulatory environment

- The **Energy Bill** establishes the legislative framework, subject to Royal Assent, for the economic regulation of CO₂ Transport and Storage, Industrial Carbon Capture, and low carbon hydrogen business models. The framework is designed to attract private finance and remove market barriers to investment, providing long-term revenue certainty needed to establish and scale up these industries across the UK.
- **Powering Up Britain** builds on our ambitions in the British Energy Security Strategy and the Net Zero Strategy. The package sets out how the government will enhance our country's energy security, seize the economic opportunities of the transition, and deliver on our net zero commitments.
- The **Green Finance Strategy** will strengthen the UK's leading position at the forefront of the global green finance market and provide the financing needed for our energy security, net zero, and environmental targets. The Strategy sets a framework for the UK's ambition to become the world's first Net Zero-aligned Financial Centre.

Supportive
regulatory
environment



Supply chains

Developing strong supply chains to put the UK at the forefront of global CCUS markets

Building infrastructure and supply chains

- **CCUS Supply Chain Strategy** is being developed by industry through the CCUS Council. The strategy will act as a supply chain guidance/charter document for Track-1 and successive CCUS clusters. Developers will sign up to a voluntary industry-wide process to share best practice and publish and track progress against supply chain ambitions.
- **Increasing visibility of CCUS across the supply chain** after government worked with industry to organise a successful “Meet the Specifier” event for the Transport and Storage portion of a CCUS project in 2022. We will organise future events around the country to continue raising awareness of procurement opportunities and ensure the supply chain is ready to deliver our ambitious deployment programme.
- **Collaborating to deliver a strong, industrialised UK CCUS supply chain** by government working with industry to maximise the economic opportunity presented by CCUS, identify skills requirements, attract investment, and facilitate new export opportunities through UK Export Finance, the Department for Business and Trade, and the Foreign, Commonwealth & Development Office overseas networks.



Skills and innovation

Building on the UK's existing industrial and technological expertise

Skills & capability

- We are supporting **Institutes of Technology** across England with £120 million for institutes specialising in delivering higher technical education and developing green skills.
- **Free Courses for Jobs** supports eligible adults to gain high value Level 3 (A level-equivalent) qualifications, many of which can help them to transition to or specialise in roles in the green economy.
- We are reforming the skills system through **Local Skills Improvement Plans**. We have instituted a **Lifetime Skills Guarantee** supporting workers to gain the skills they need to transition to the green economy, including through targeted support for retraining.
- In England, Department for Education is **investing an additional £3.8 billion in skills** by 2024-25. This includes funding for programmes to support green skills, including apprenticeships, T levels, and Skills Bootcamps.
- The **Green Jobs Delivery Group** has been established as the central forum through which government and industry are working together to accelerate the supply of a skilled workforce for our low carbon sectors.
- **The North Sea Transition Deal** has developed an integrated People and Skills Plan to ensure the highly skilled oil and gas workforce with skills transferability to adjacent energy sectors can be deployed to develop our CCUS industry.
- Between 2004-2021 we provided **over £346 million public funding for CCUS Research and Innovation**.
- The **Industrial Strategy Challenge Fund** provides up to **£210 million** through the **Industrial Decarbonisation Challenge, including £170 million**, matched by £261 million from industry, to support low-carbon technology development in UK industrial clusters.
- **Industrial Decarbonisation Research and Innovation Centre** has been established.
- **£1 billion Net Zero Innovation Portfolio** is providing up to £115 million grant funding to support the research and development of CCUS and Greenhouse Gas Removal technologies.

Support for world leading innovation



Addressing barriers to investment

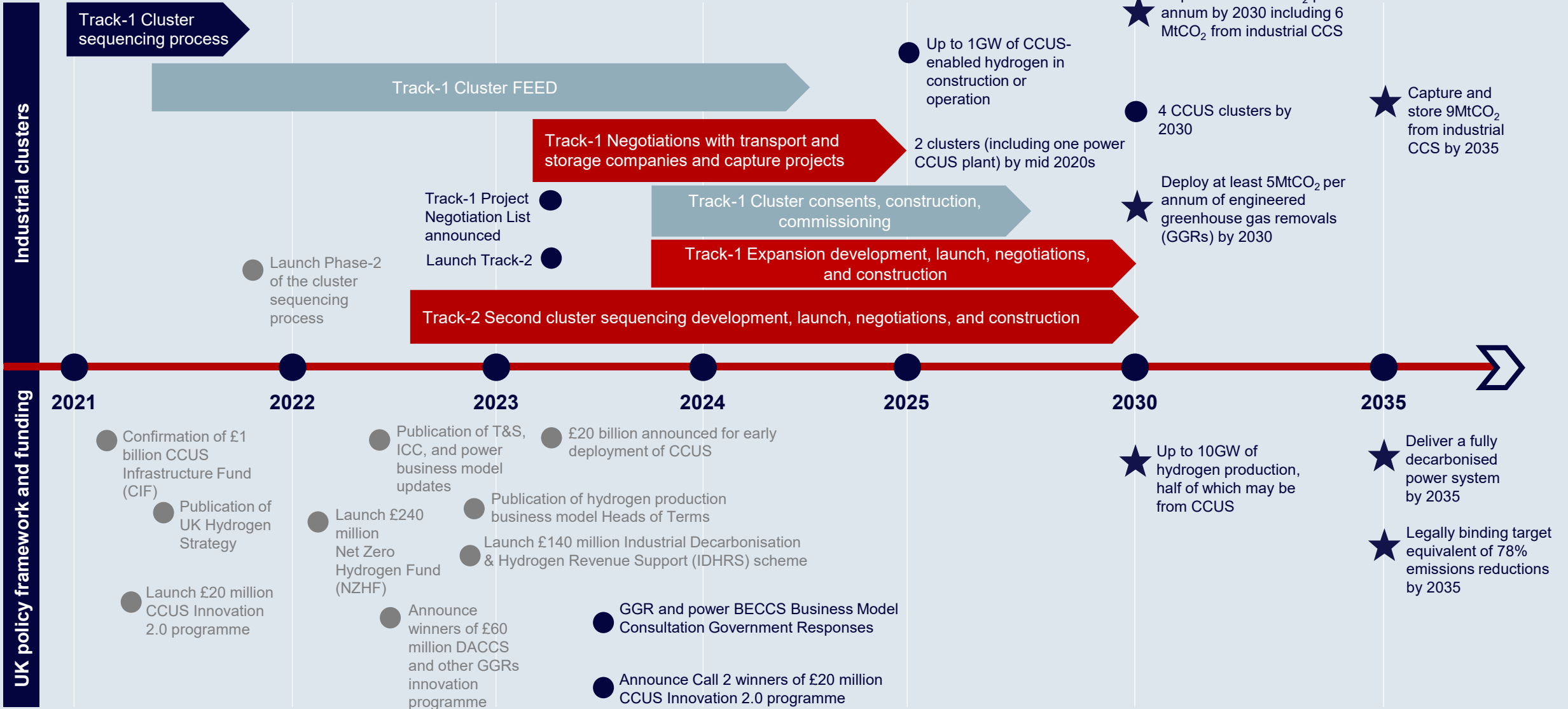
<p>Creating a coherent pathway to storage permitting</p>	<ul style="list-style-type: none"> Working with the North Sea Transition Authority to further our understanding of geological CO₂ storage potential and to ensure sufficient CO₂ stores are available to deliver net zero.
<p>Providing timelines for non-pipeline transport (NPT) of CO₂</p>	<ul style="list-style-type: none"> Working with industry and clusters located away from pipeline transport solutions to develop an NPT strategy. Continuing to engage with industry and international counterparts on their NPT position to learn from the approach of others and understand NPT requirements.
<p>Providing certainty on CCUS deployment pipeline</p>	<ul style="list-style-type: none"> We have now published the Track-1 Project Negotiation List which includes 8 projects which we have selected through the Cluster Sequencing Process to progress to negotiations to form the first two CCUS clusters, based in HyNet and the East Coast Cluster. We have launched Track-2 of the CCUS cluster sequencing process to establish two further CCUS clusters and we will launch a process within 2023 to enable further expansion of Track-1 clusters. We will set out a vision for the UK CCUS sector, setting out how CCUS will support our net zero ambitions to raise confidence and improve visibility for investors.
<p>Ensuring workforce availability to deliver CCUS</p>	<ul style="list-style-type: none"> The Green Jobs Delivery Group acts to upskill and train the green workforce of the future. Integrated People and Skills Strategy launched to highlight the benefits of a just and managed energy transition for the workforce, the industry, governments and communities.
<p>Internationally competitive</p>	<ul style="list-style-type: none"> The UK's bespoke cluster sequencing process will be the starting point for a stable, regulated and investable CCUS industry. The Energy Bill will, subject to Royal Assent, provide the legislative framework for business models for CCUS, providing investors with the long-term revenue certainty to establish and scale up the CCUS industry across the UK.



Our 2035 Delivery Plan

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

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



Further ways we help you invest and develop in the UK

The UK's commitment to support global investment is unparalleled

The Department for Business and Trade (DBT)

DBT supports businesses to invest, grow, and export, creating jobs and opportunities across the country.

Office for Investment (OFI)

OFI is a joint DBT and No.10 team that provides a single front door to Government for high-value and high-impact investors, facilitating with access and insights through a concierge offer. The OFI works across departments to drive increased investment in line with the Government's Net Zero agenda.

UK Export Finance (UKEF)

The UK's export credit agency has enhanced its support to attract investment into supply chains and building export capability.

UK infrastructure Bank (UKIB)

The UKIB can invest across the capital structure (senior debt, mezzanine, first loss, debt guarantees, and equity) to help crowd private finance into net zero infrastructure. The Bank has identified CCUS as an investment opportunity, and projects are encouraged to contact UKIB about their financing needs.

Support moving a tech business

The Global Entrepreneur Programme (GEP) helps high-growth overseas companies relocate to the UK.

Economic development agencies

There are a number of organisations with significant experience in delivering public sector investment packages. For example, Scottish National Investment Bank is a mission-led development bank that provides patient capital to build a stronger, fairer, more sustainable Scotland.

Helpful guides

Guidance on expanding to the UK, including visas and migration; tax and incentives; regulatory and business planning; staff recruitment, retention, and training; and immigration.

Links to key organisations

In addition to centres of excellence and industry clusters, we will facilitate introductions to universities, Local Enterprise Partnerships (LEPS) and Enterprise Zones.

Find a UK specialist

The UK Investment Support Directory allows you to find companies with skills and experience in helping overseas businesses set up or expand in the UK.

Visit [great.gov.uk](https://www.great.gov.uk)