

Written evidence submitted by The Carbon Capture and Storage Association (CCSA) (IND0026)

The Carbon Capture and Storage Association (CCSA) is pleased to provide a response to the Energy Security and Net Zero (ESNZ) Committee inquiry: [Industrial strategy for clean power](#). The CCSA brings together a wide range of specialist companies across the spectrum of Carbon Capture, Utilisation and Storage (CCUS) technology, as well as a variety of support services to the energy sector. The CCSA exists to represent the interests of its members in promoting the business of CCUS and to assist policy developments in the UK, EU and internationally to support the commercial deployment of CCUS.

1. Summary Response

- 1.1. The CCSA welcomes this inquiry from the ESNZ Committee and the focus on emerging or less developed energy technologies and associated supply chain development.
- 1.2. Building on the response the CCSA submitted to the previous [Securing the Domestic Supply Chain](#) inquiry (included as appendices for the committee's reference), several additional points have been noted.
- 1.3. The CCSA strongly reiterate that CCUS and Low-Carbon Hydrogen (LCH) are critical emerging technologies, and the UK is well placed to capture a significant proportion of the global opportunity presented by these industries.
- 1.4. In order to capture this opportunity, the rate at which CCUS is deployed across the UK needs to increase. This requires several actions to be taken, including urgently providing long term certainty and commit funding to deliver the selected Track-1, Track-2 and Track-1 Expansion projects, alongside other CCUS projects delivering along the same timescales.
- 1.5. Delivering demand certainty – i.e., a sustained project deployment pipeline for CCUS - remains the most important action Government can take to realise the supply chain opportunities that are on offer, as this will enable the supply chain to pivot activity and scale to match demand.
- 1.6. There is also an urgent need to protect and develop the existing UK supply chain for CCUS and hydrogen; de-risk supply chain investments and back early movers in 'High Value' areas; support sector wide initiatives and 'Best Practice'; and continue to engage with the supply chain as the CCUS sector develops.
- 1.7. The CCSA reiterate our previous conclusions that the UK's supply chain and skills resources, needed to deliver the clean energy transition, are limited and constrained. However, significant progress has been made over the past year in terms of understanding the workforce demand for CCS projects, the transferability of oil and gas supply chains to CCS, CCUS project developer ambitions in the supply chain.
- 1.8. A thriving domestic supply chain could help to retain many of the clean power opportunities at risk of relocation within the UK, as project developers confidence increases in their ability to deploy in the UK.
- 1.9. Without a domestic supply chain energy security; the future of numerous CCUS and LCH projects; as well as Government net zero targets could be under threat.

2. How can UK plc capture its fair share of the economic potential of emerging or less developed energy technologies?

- 2.1. Please see Appendix A for the CCSA's response to the previous inquiry.
- 2.2. The CCSA strongly reiterate that CCUS and LCH are critical emerging technologies, and that the UK is well placed to capture a significant proportion of the global opportunity presented by these industries.
- 2.3. In order to capture the economic opportunity on offer, the rate at which CCUS is deployed across the UK needs to increase. Therefore, the following actions should be delivered:
 - 2.3.1. Following the securing of Government funding for early CCUS deployments¹, and the signing of contracts for projects located in the East Coast Cluster², **the Government needs to continue to work with Industry to secure FIDs for the other projects in the Track 1 process.**
 - 2.3.1.1. Delivering the first projects will enable cost savings through 'learning by doing' and provide confidence to investors and the wider CCUS sector.
 - 2.3.2. **Provide long term certainty and commit funding to deliver the selected Track-2 and Track-1 Expansion projects, alongside other CCUS projects delivering on the same timescales. To do this Government should:**
 - 2.3.2.1. Commit to an average annual support envelope to deliver these projects.
 - 2.3.2.2. Provide a **clear and predictable timetable** for future allocation rounds
 - 2.3.2.3. Advance progress on **enabling Non-Pipeline Transport (NPT)** based projects to be able to take part in CCS allocations.
 - 2.3.2.4. It is essential to establish future contract allocation rounds to enable the expansion of existing clusters, as well as the development of future clusters. A transparent future allocation framework will provide clear signals to developers and investors of the scale and timing of future opportunities, incentivise greater collaboration and optimisation of the cluster network, and seek the optimal level of risk sharing to bring down the levelised cost of capture.
 - 2.3.3. **The Government needs to deploy public finance through GB Energy (GBE) and the National Wealth Fund (NWF) to address specific areas of high risk.** For example, underwriting initial project operational risk, or focusing investments of supportive infrastructure, which will significantly reduce once operational, and performance has been established.
 - 2.3.4. **The Government should work to enable cross-border CO₂ transport and storage (T&S) to kickstart the CCUS industry across Europe and further enhance economic opportunities.** Research carried out on behalf of the CCSA³ identified that EU emitters would see average savings of around 20% if they stored their CO₂ in UK stores rather

¹ Government Press Release (2024): Government reignites industrial heartlands 10 days out from the International Investment Summit. [Link](#)

² Government Press Release (2024): Contracts signed for UK's first carbon capture projects in Teesside. [Link](#)

³ CCSA (2024): Accelerating a Europe-wide CO₂ storage market. [Link](#).

than Norwegian stores, while UK emitters would benefit from the savings attributable to having a more resilient and efficient T&S network. The UK supply chain is another area which could benefit strongly from this international trade of CO₂

- 2.3.4.1. There are several key barriers to deploying cross-border CO₂ T&S, including being prohibited under the London Protocol without amendments to legislation or bilateral agreements, and the EU Emissions Trading Scheme (ETS) disincentivising emitters from storing their CO₂ in the UK. Potential solutions to these barriers are; include EU/EEA-UK cross-border CO₂ T&S in the EU-UK Trade and Cooperation Agreement, unbundle T&S, and allow stores to operate on a merchant basis and identify EU countries that would benefit from storing their CO₂ in the UK and pursue agreements with them under the London Protocol Amendment 6.

2.3.5. **The Government also needs to continue to make policy progress in several other areas, including the CCUS Vision workstreams⁴ .**

- 2.3.5.1. **There is a need for fit-for-purpose regulations**, clear guidance from and between the regulators and resource to properly assess CCUS applications.
- 2.3.5.2. The **allocation of risk** throughout the project deployment process and through Government allocation needs to be explored in greater detail to reduce the systemic cost of deploying CCUS.
- 2.3.5.3. The introduction of a **UK Carbon Border Adjustment Mechanism (CBAM)** is a positive step towards protecting UK industries, however further clarity is needed on the inclusion of sectors such as refineries (which are currently excluded from the CBAM but subject to the ETS regime), and how the risk of carbon leakage will be mitigated. Further clarity is also needed on the interaction of the CBAM with other policies, namely the UK ETS free allocations and implementation of the EU CBAM.
- 2.3.5.4. **Developing a comprehensive and international carbon market that creates greater long-term certainty is also needed for the sector.** Government should provide clarity on the evolution of the UK ETS and seek alignment or equivalence with the EU where possible.
- 2.3.5.5. In addition to accelerating the awarding of economic licences to other T&S clusters, as well as the expansion of existing clusters, **non-pipeline transport (NPT) and cross-border trading policy needs to be developed to show how the sector can progress from isolated clusters to a connected and international sector.**
- 2.3.5.6. Greater connection of **dispersed emitter sites with NPT** options needs to be explored to offer decarbonisation options to industries which are not located within clusters and clusters which are not located close to storage sites.

⁴ DESNZ (2023): Policy paper. Carbon capture, usage and storage: a vision to establish a competitive market. [Link](#)

3. What more can the Government do to encourage greater domestic supply chain investment in the energy industry by 2035, including through the Contracts for Difference scheme?

- 3.1. Please see Appendix B for the CCSA's response to the previous inquiry.
- 3.2. Building on the conclusions to the previous inquiry, the CCSA highlight the following as the immediate areas which the Government should focus on in order to deliver a thriving UK CCUS supply chain.
- 3.3. **Deliver 'Demand Certainty'**
 - 3.3.1. Delivering demand certainty for CCUS - i.e., a sustained project deployment pipeline - remains the most important action which Government can take to capture the opportunities on offer.
 - 3.3.2. Demand certainty can free up a significant amount of Government resources by enabling the supply chain to pivot activity itself. Moreover, with demand certainty, the supply chain can better plan and scale to match demand.
- 3.4. **Protect what already exists**
 - 3.4.1. It is imperative to protect the existing UK manufacturing and service supply chain where possible, as these businesses have long-standing experience of the UK market and are likely best placed to transition and build extra capacity to deliver the domestic CCUS programme and export to global markets.
 - 3.4.2. Utilising existing capacity within the UK represents a significant potential cost saving, as the UK can both build upon existing capabilities/capacities and encourage new investment. As discussed in greater detail below (section 4.5-4.6), roughly 80% of the CCS value chain is targetable by the UK oil and gas supply chain⁵.
 - 3.4.3. Timing is critical, and it is essential to build momentum in the CCUS supply chain now so that the UK does not lose out to international competitors and transition opportunities – most notably the transition of oil and gas supply chains to new low-carbon opportunities.
- 3.5. **De-risk supply chain investments, and back early movers in 'High Value' areas.**
 - 3.5.1. A clear statement of intent of the Government's commitment to support companies who are willing to invest in CCUS could help to realise many of the economic and wider societal benefits. Government has made progress with the NWF, GBE and CCUS funding announcements to date, however there is still some ambiguity around if/how Government support will be allocated, and to which areas of the supply chain.
 - 3.5.2. The Government should build on existing evidence, and target support to 'high value' strategic opportunities where the UK has a competitive edge^{6,7,8,9,10,11,12}. The Green Industries Growth Accelerator¹³ is an example of the kind of strategic funding which is

⁵ Rystad Energy & OEUK (2024): UK oil and gas supply chain and opportunities in the energy transition. [Link](#)

⁶ CCSA (2021): Supply Chain Excellence for CCUS. [Link](#)

⁷ WSP (2023): Industrial CCUS UK Supply Chain Capabilities. [Link](#)

⁸ Wood (2022): Supply Chains to Support a Hydrogen Economy. [Link](#)

⁹ Nuclear AMC (2022): CCUS supply chain intervention strategy. [Link](#)

¹⁰ OEUK (2023): Harnessing the Potential – Supply Chain Roadmap. [Link](#)

¹¹ Arup (2023): Opportunities for economic growth in the UK's CCUS industry. [Link](#)

¹² Rystad Energy & OEUK (2024): UK oil and gas supply chain and opportunities in the energy transition. [Link](#)

needed to help the UK supply chain realise the opportunities on offer. Additionally, as noted above, the UK has considerable expertise in the ‘offshore’ supply chain, and incentivising these areas offers a strategic and ‘high value’ opportunity for the UK^{14,15}.

- 3.5.3. Early insights from the initial round of reporting on supply chain ambitions from CCUS project developers reiterates that there is a huge amount of risk associated with deploying these first-of-a-kind projects, and there is a need for further support if greater local content ambitions, especially in advanced manufacturing, are to be realised¹⁶.
- 3.5.4. Furthermore, the Government needs to urgently clarify upcoming supply chain investments through the NWF, GBE or a separate standalone supply chain fund.

3.6. **Back Sector Wide Initiatives and Best Practice**

- 3.6.1. The CCSA’s Good Practice Guidance Document¹⁷ sets out a CCUS industry ambition of 50% or more local content by 2030, and an initial round of benchmarking of ambitions was completed in July 2024¹⁸. The Government needs to support initiatives such as these to demonstrate that industry action – i.e., to benchmark ambitions, share best practice, and invest holistically and more sustainably in the domestic supply chains – is matched by enabling Government action.
- 3.6.2. With the implementation of the ‘Clean Industry Bonus’ in CfD Allocation Round 7¹⁹, there is scope for similar initiatives to be developed for other low-carbon sectors, this would help stimulate domestic investments and foster a level playing field for UK energy projects.
- 3.6.3. Additionally, flexibility in bilateral negotiations on cost and delivery dates for CCUS projects is required where there is an opportunity to secure higher local content²⁰.

3.7. **Continue to Engage**

- 3.7.1. It is critical to recognise that opportunities will continue to emerge as CCUS is deployed in the UK and abroad. Maintaining a dialogue with the supply chain is crucial for Government to refresh its awareness of the changing landscape.
- 3.7.2. From original equipment manufacturers (OEMs), to engineering procurement and construction and service providers (EPCs), to all contracted tiers of the supply chain - it is critical for the Government to ensure clarity and alignment on policy objectives and shared goals across all stakeholders.

¹³ Government Call For Evidence (2024): Green Industries Growth Accelerator: hydrogen and CCUS supply chains. [Link](#)

¹⁴ OEUK (2023): Harnessing the Potential – Supply Chain Roadmap. [Link](#)

¹⁵ Rystad Energy & OEUK (2024): UK oil and gas supply chain and opportunities in the energy transition. [Link](#)

¹⁶ CCSA (2024): CCUS Supply Chain Initial Forecast Report. [Link](#)

¹⁷ CCSA (2023): CCUS Supply Chain Good Practice Guidance. [Link](#)

¹⁸ CCSA (2024): CCUS Supply Chain Initial Forecast Report. [Link](#)

¹⁹ Government Guidance (2024): Contracts for Difference (CfD) Allocation Round 7: Clean Industry Bonus framework and guidance. [Link](#)

²⁰ CCSA (2023): CCUS Supply Chain Good Practice Guidance. [Link](#)

4. Does the UK have the supply chain capacity to deliver the required energy infrastructure by 2035, including an expanded electricity network?

- 4.1. Please see Appendix C for the CCSA's response to the previous inquiry.
- 4.2. **The CCSA reiterate our previous conclusions that the UK has constrained supply chain and skills resources, needed to deliver the clean energy transition, however significant progress has been made over the past year.**
- 4.3. Regarding equipment and service provision capacity, two notable reports were published since the last inquiry was completed.
- 4.4. **Firstly, an initial round of benchmarking of supply chain ambitions was completed in 2024 by CCUS project developers²¹.** Notable headline findings include:
 - 4.4.1. The CCUS industry has a strong commitment and aspiration to deploy CCUS in a manner which is beneficial to the UK.
 - 4.4.2. Growth benefits are clearly aligned to UK Plc with factors such as investment in skills, UK jobs, fabrication and operations procurement and wider economic benefits featuring highly in developer aspirations and commitments.
 - 4.4.3. There is a need to move at pace to address areas of supply chain concern. Whilst this report represented a snapshot of industry pre-FID, for some of the concerns and low-scoring areas such as Local Content and Skills, there is still time to address these gaps as many strategies and policies are yet to be finalised. This will avoid them turning into more significant inhibiting factors for the industry.
- 4.5. **Secondly, in 2024, Rystad Energy published a report²² which demonstrated the transferability of existing UK supply chains to emerging energy sectors.** Notable headline figures include:
 - 4.5.1. 80% of the CCS value chain is targetable by the oil and gas supply chain.
 - 4.5.2. Growth of UK CCUS exports could support £4.3 billion in GVA by 2050. The export growth is driven by the export of Engineering, procurement and construction management (EPCm) services and capture and pollution control components, worth £2.1 billion and £1.5 billion in GVA per annum by 2050 respectively.
 - 4.5.3. Projected targetable expenditure for the UK supply chain is expected to increase from just over £1.6 billion annually in 2030 to approximately £2.6 billion in annual spending by 2040. Notably the two segments, equipment/materials and engineering/construction, are estimated to collectively constitute around 60% of the addressable expenditure.
- 4.6. Regarding capacity of skilled individuals, significant progress has been made to address data gaps and develop solutions to the identified challenges since the last inquiry was completed.
- 4.7. In terms of data knowledge:
 - 4.7.1. The Energy Skills Intelligence Hub²³ and ECITB's Labour Forecasting Tool²⁴ showcase the demand and variety of different skills/jobs that will be needed for the future

²¹ CCSA (2024): CCUS Supply Chain Initial Forecast Report. [Link](#)

²² Rystad Energy & OEUK (2024): UK oil and gas supply chain and opportunities in the energy transition. [Link](#)

²³ Energy Skills Intelligence Hub 2023. [Link](#)

²⁴ ECITB. Labour Forecasting Tool. [Link](#)

energy sector, and the engineering and construction workforce respectively. The ECITB also recently published its workforce census for the engineering and construction industry²⁵.

- 4.7.2. The Government published an assessment of the clean energy skills challenge in support of the Clean Power 2030 Action Plan²⁶.
- 4.7.3. For the CCUS sector specifically, the CCS Task and Finish Group report noted that direct workforce [asset owners and tier 1 supply chain, for T&S only] could peak at approximately 2,500-3,000 roles, in the period to 2030, based on four T&S projects in development. Factoring in 20-30% of direct labour being associated with T&S activities, direct roles within the wider CCS sector (including deeper supply chain jobs and associated cluster projects), could peak as high as ~15,000 direct roles by 2030²⁷.
- 4.8. Regarding solutions to barriers to getting enough skilled workers to enable the energy transition:
 - 4.8.1. The establishment of Skills England and the office for Clean Energy Jobs are vital steps in providing targeted actions to resolve skills challenges for the Clean Energy Sector.
 - 4.8.2. Furthermore, Government focus on reform to the Apprenticeship Levy, the Skills Passport, and the Youth Guarantee to training are valuable areas of progress.
 - 4.8.3. The CCS Task and Finish Group report²⁸ noted clear next step recommendations to resolve skills challenges faced by the CCUS sector, including:
 - 4.8.3.1. Decisive, collaborative action and investment by industry: involving joint initiatives that raise awareness of opportunities in CCS and galvanise action on training and skills development.
 - 4.8.3.2. Enabling structure and policies around the industrial clusters to foster skills development: involving the creation of a policy environment that supports appropriate investment in training and skills development and addresses broader factors to deliver the right workforce, in the right place, at the right time.
 - 4.8.3.3. Long-term policy certainty with focused governmental support: involving skills and training measures that reduce risk, in the context of a clear and long-term commitment to CCS projects.
 - 4.8.4. Additionally, the CCSA would highlight the following resources as useful summaries of the progress made to date to resolve challenges, and the key next steps required to tackle workforce/skills challenges:
 - 4.8.4.1. The CCSA's response to the ESNZ Committee inquiry into Workforce planning to deliver clean, secure energy²⁹.
 - 4.8.4.2. The CCSA's response to the Industry and Regulators Committee inquiry into Skills for the Future³⁰, and the subsequent response by Baroness Taylor of Bolton³¹.

²⁵ ECITB (2024): Workforce Census. [Link](#)

²⁶ DESNZ (2024): Research and analysis - Clean Power 2030 Action Plan: Assessment of the clean energy skills challenge. [Link](#)

²⁷ Green Jobs Delivery Group - CCS Task and Finish Group (2024): Findings and recommendations of the group. [Link](#)

²⁸ Green Jobs Delivery Group - CCS Task and Finish Group (2024): Findings and recommendations of the group. [Link](#)

²⁹ Committees – UK Parliament (2024): Workforce planning to deliver clean, secure energy - Committees - UK Parliament. [Link](#)

5. To what extent would growing the domestic supply chain bolster UK energy security?

- 5.1. Please see Appendix D for the CCSA's response to the previous inquiry.
- 5.2. **The CCSA reiterate that CCUS, when applied to the power sector, provides flexible dispatchable energy to make up the shortfall when renewable generation is low, enhancing energy security, reducing overall emissions, and offering cost savings. Since the last inquiry was published:**
- 5.2.1. In its Clean Power 2030 advice to Government³², the National Energy System Operator noted the need for up to 2.7GW of power CCS and hydrogen to power capacity, and up to 4.0GW of Biomass/BECCS capacity, by 2030 to deliver a clean power system. The plan also states that these **dispatchable low-carbon technologies “add significant value to the system”, with even relatively small levels of operational capacity materially reducing the overall challenge for the rest of the clean power programme.**
- 5.2.2. The Government has since set a target of delivering 2.0-7.0GW of **Low Carbon Dispatchable Power capacity to achieve a clean power system by 2030**³³.
- 5.3. A thriving domestic supply chain could help to save many of the clean power opportunities at risk of relocation in the UK, as project developers could feel secure in their ability to deploy in the UK.
- 5.3.1. **Without a domestic supply chain energy security; the future of numerous CCUS and LCH projects, as well as the Government's net zero targets, could be under threat.**

6. What are the key concerns with respect to the availability of raw materials in the supply chain and how might those be addressed?

- 6.1. Please see Appendix E for the CCSA's response to the previous inquiry.
- 6.2. No further evidence presented by the CCSA at this time.

³⁰ Committees – UK Parliament (2024): Skills for the future: apprenticeships and training - Committees - UK Parliament. [Link](#)

³¹ committees.parliament.uk/publications/45405/documents/225136/default/

³² National Energy System Operator (2024): Clean Power 2030. [Link](#)

³³ UK Government (2024): Clean Power 2030 Action Plan – A new era of clean electricity. [Link](#)

Appendix A

1. How can UK plc capture its fair share of the economic potential of emerging or less developed energy technologies?

CCUS and Low-Carbon Hydrogen (LCH) are critical emerging technologies, and the UK is well placed to capture a significant proportion of the global opportunity presented by these industries. Since 2022, the UK CCUS project pipeline, looking to deploy between now and 2035, has grown from 73Mtpa to 94Mtpa³⁴ (Figure.1). Globally, the capacity of Carbon Capture and Storage (CCS) projects in development, construction, and operation in 2023 was 361Mtpa, an increase of almost 50% compared to that reported in 2022³⁵.

In the UK, if government and policy development can effectively stimulate the industry to achieve its ambitions, deployment of CCUS could lead to **inward private investment of around £40bn by 2030**, create up to 70,000 new jobs and safeguard another 77,000 existing jobs³⁶. These technologies will not only secure the future of many of our UK-based industries, but also help to secure long-term energy security and supply. **This is all 'potential'** however, as the industry has yet to be awarded a single construction contract for any CCUS project. The supply chain for project delivery is yet to begin in earnest as it needs long-term certainty of a forthcoming CCUS industry and the UK pipeline keeps moving to the right, as it has done for the last 25 years.

In order to capture this economic opportunity, **five key urgent actions**³⁷ need to be realised:

- **Enable timely cluster delivery.** Now that the first four CCUS clusters have been selected, a clear focus must be on delivering them in a timely fashion. This must include allocating the £20bn from the 2023 Spring Budget and committing to regular funding allocation rounds. Government should set out clear processes and adhere to timelines to ensure all Final Investment Decisions are taken in the next two years. Government should also look to make progress on primary and secondary legislation to facilitate deployment.

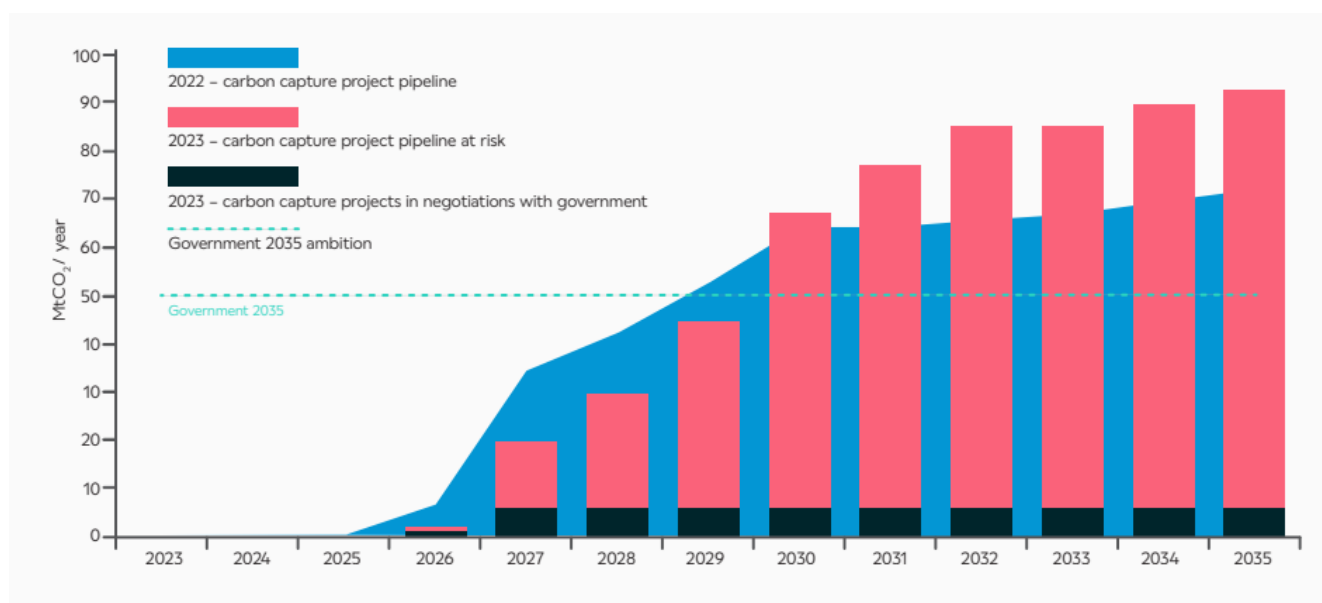


Figure.1: Projects in negotiation and at risk against Government 2035 ambitions.

³⁴ CCSA (2023): CCUS Delivery Plan Update. [Link](#)

³⁵ Global CCS Institute (2023): Global Status of CCS. [Link](#)

³⁶ CCSA (2023): CCUS Delivery Plan Update. [Link](#)

³⁷ CCSA (2023): CCUS Delivery Plan Update. [Link](#)

- **Deliver on the CCUS Vision and deployment plan for CCUS.** To maintain investor confidence, prevent the loss of economic opportunities and meet net zero targets, the government, working closely with industry, must make progress on their deployment plan to 2035 and vision beyond 2050³⁸.
- **Accelerate permitting and consenting.** Industry is still encountering challenges in permitting and consenting, both in terms of the time it takes, and the number of agencies involved. Government must take the lead in understanding, resourcing and streamlining regulatory pathways for projects and ensure that this is communicated to stakeholders.
- **Deliver an able supply chain and skilled workforce.** Industry is in progress of implementing annual reporting of local content commitments in line with the CCSA's Good Practice Guidance³⁹. Increased engagement with the UK supply chain will however only be successful in driving up local content if government also provides some targeted interventions to supply chain companies in 'high value' opportunity areas. This will increase capacity in areas where the UK has comparative strengths. A concerted effort needs to be taken to map the demand, determine the challenges, and find solutions to ensure there are enough skilled workers available to deploy CCUS projects.
- **Build public support.** Government and industry need to work more closely together, with academia and civil society, to educate the public about CCUS and LCH.

The project pipeline has experienced strong growth in the past few years (Figure.1). However, with only eight capture projects currently in negotiations with Government⁴⁰, most of the project pipeline is at risk. **Without progress on the above actions and project pipeline certainty**, the UK will miss out on this clear economic opportunity.

³⁸ DESNZ (2023): CCUS - A Vision to Establish a Competitive Market. [Link](#)

³⁹ CCSA (2023): Supply Chain Good Practice Guidance. [Link](#)

⁴⁰ Cluster sequencing Phase-2: Track-1 project negotiation list. [Link](#)

Appendix B

2. **What more can the Government do to encourage greater domestic supply chain investment in the energy industry by 2035, including through the Contracts for Difference scheme?**

To deliver a resilient domestic supply chain, the Government should look to make progress in the following areas.

1. **Deliver Project Pipeline Certainty**

Project developers have so far invested approximately £814 million in developing UK CCUS projects. Yet, 29% of over 90 capture project developers in the UK would consider relocating their projects abroad if they cannot access CO₂ transport and storage infrastructure or are unsuccessful in accessing revenue support⁴¹. In recent CCSA analysis⁴², supply chain companies noted the need for project certainty and support for the first projects to move ahead, as a key driver behind any move into CCUS equipment manufacturing and service provision. **Delivering project pipeline certainty**, enabled by the key actions outlined above, is therefore one of the most critical actions Government must take to both keep project developers in the UK and incentivise the supply chain towards further domestic investment.

The UK has some natural advantages for CCUS however, a number of countries, predominately advanced economies in Europe, North America and Asia, are developing the technology at pace⁴³. The UK cannot afford to go slowly. Industries that depend on CCS as a critical decarbonisation pathway need to decide whether to keep production in the UK or go elsewhere. The later the UK delivers its first projects and provides longer-term certainty to 2035 and beyond, the greater the likelihood of relocation decisions being taken in the absence of confidence in a UK CCUS industry.

2. **Target support to 'High Value' opportunities**

The CCUS value chain is extensive and covers a wide variety of technologies, all with distinct supply chains (a CCS specific taxonomy was recently developed⁴⁴). In preliminary analysis, conducted by the CCSA and the Energy Industries Council⁴⁵, it was noted that there are global shortages in the number of manufacturing facilities which can produce critical CCUS components. Moreover, no country except the USA can fulfil their project pipeline with domestic suppliers alone. **Targeting support to 'high value' and strategic opportunities** is therefore key for developing domestic capacity and capability where the UK has a competitive edge. Foresight on what these opportunities are is extensive, with several reports identifying this for CCUS and LCH^{46,47,48,49,50}. See Figure.2 for a recent matrix summary⁵¹.

⁴¹ CCSA (2023): CCUS Delivery Plan Update. [Link](#)

⁴² Unpublished CCSA report; submitted for the 2023 Autumn Budget.

⁴³ Global CCS Institute (2023): Global Status of CCS. [Link](#)

⁴⁴ Arup (2023): Opportunities for economic growth in the UK's CCUS industry. [Link](#)

⁴⁵ Unpublished CCSA report; submitted for the 2023 Autumn Budget.

⁴⁶ CCSA (2021): Supply Chain Excellence for CCUS. [Link](#)

⁴⁷ WSP (2023): Industrial CCUS UK Supply Chain Capabilities. [Link](#)

⁴⁸ Wood (2022): Supply Chains to Support a Hydrogen Economy. [Link](#)

⁴⁹ Nuclear AMC (2022): CCUS supply chain intervention strategy. [Link](#)

⁵⁰ OEUK (2023): Harnessing the Potential – Supply Chain Roadmap. [Link](#)

⁵¹ Arup (2023): Opportunities for economic growth in the UK's CCUS industry. [Link](#)

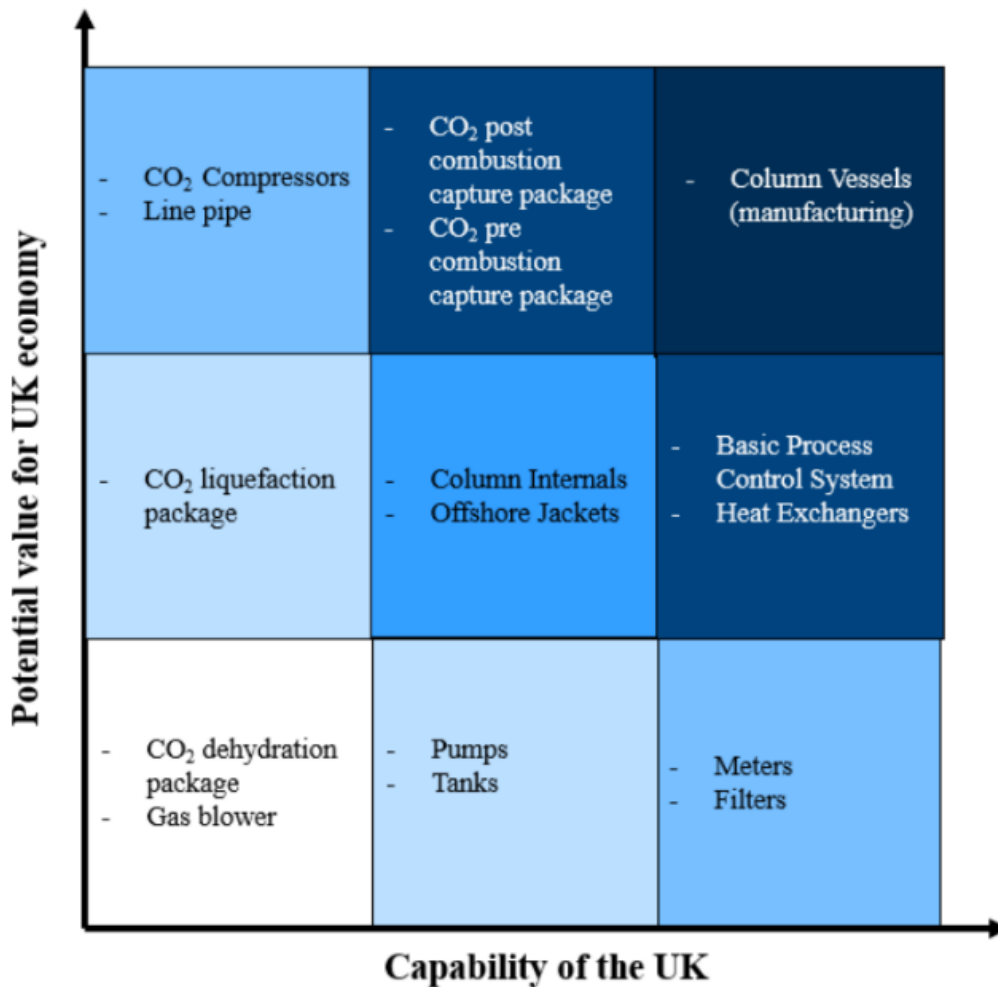


Figure.2: Matrix of high value opportunities for the UK CCUS supply chain.

The recent Government announcement of £4.5bn for advanced UK manufacturing is a welcome investment. However, only £960 million being allocated to the [Green Industries Growth Accelerator](#) to support clean energy manufacturing across several key sectors, including hydrogen and CCUS, it is unclear whether this will constitute sufficient incentive. Government needs to urgently announce details of how this funding will be allocated to ensure support can have a timely impact.

In recent CCSA analysis⁵², supply chain companies noted the ‘levers’ which would be most useful in helping to secure domestic investment in CCUS supply chains:

- **Project pipeline certainty** and support for the first projects to move ahead to enable independent supply chain investment decisions.
- Tailored grants, loans, or tax breaks for investing in new facilities, new equipment, workforce training, R&D or export opportunities.
- Fiscal incentives and legislative regimes, which are modelled to the **Inflation Reduction Act (IRA)** in the USA, would bring quick progress towards local investment in the CCUS supply chain.

⁵² Unpublished CCSA report; submitted for the 2023 Autumn Budget.

- Further measures to enhance **local content rules and legislative adoption of CCUS and LCH technology** would drive technological adoption, galvanise the sector and promote innovation and investment.
- Continuing commitments to **apprenticeship funding and transition training programmes** to ensure sufficient trained workers are available for both project developers and manufacturing companies.

Investments in strategic opportunities will also help grow the wider CCUS and LCH industry by creating momentum for supply chain companies to continue to invest further afield and embed benefits in the wider economy.

Crucially however, delivery of CCUS and LCH is predominately going to be handled by Engineering, Procurement and Construction (EPC) companies. For the supply chain to become embedded in the UK, EPC companies need to be made aware of the UK's manufacturing base **and incentivised to use it**. Raising awareness, embedding UK supply chain companies in pre-approved vendor lists and increasing visibility of local opportunities to international EPC's^{53,54}, is a fundamental part of encouraging further supply chain investment.

3. Promote Sector Wide Initiatives

The CCSA Good Practice Guidance Document⁵⁵ set out a CCUS industry ambition of **50% local content target, over the project lifespan, by 2030**, subject to the Government delivering i) a committed forward allocation programme for capture projects, ii) flexibility in bilateral negotiations on cost and delivery where there is an opportunity to secure higher local content and iii) targeted financial support for building capacity. It also iterated a set of further voluntary commitments and established a reporting framework for project developers to forecast, benchmark and track their supply chain commitments to promote best practice and help capture the economic benefits of a UK supply chain.

The CCSA initiated the first reporting round in November 2023. The initial insights, from developers looking to invest in the UK market, will be critical to target investment in areas where there are gaps that the UK could competitively look to capture. **The Government needs to add its weight to initiatives such as these** and demonstrate that industry action to invest holistically in the domestic supply chain, is matched by supportive Government action.

4. Focus on Skills

Availability of a skilled workforce to build and service the energy transition, is essential to a domestic supply chain. This is discussed in greater detail in question 3.

⁵³ Unpublished CCSA report; submitted for the 2023 Autumn Budget.

⁵⁴ WSP (2023): Industrial CCUS UK Supply Chain Capabilities. [Link](#)

⁵⁵ CCSA (2023): CCUS Supply Chain Good Practice Guidance. [Link](#)

Appendix C

3. Does the UK have the supply chain capacity to deliver the required energy infrastructure by 2035, including an expanded electricity network?

Supply Chain Capacity: Equipment and Service Provision

The UK has considerable expertise, and foresight of the CCUS opportunities^{56,57,58}, which will be essential to deliver the required energy infrastructure by 2035. Recent CCSA analysis^{59,60} however, noted **there is insufficient capacity to deliver the CCUS project pipeline** with domestic suppliers alone, and there is little to no surplus capacity in terms of UK manufacturers. Key reasons for this include:

- the gradual decline of UK manufacturing capabilities and capacities over several decades;
- full order books for existing energy transition and oil and gas projects;
- the uncertainty around project pipelines for CCUS and other energy transition technologies.

It is vital that business models and project developer procurement strategies are robust and stable, to make the best use of whatever resources can be mustered. This can be supported by creating longer term programmes rather than individual projects, by increased standardisation and securing longer lead time items early. When designing market models, it is crucial to consider the impact on the supply chain.

There are multiple large infrastructure and energy projects planned to commence in the UK on similar deployment timelines to those of the CCUS and LCH sectors. These projects will all utilise the same supply chain, similar materials/equipment, and skilled workforce⁶¹. Without forward project visibility and planning, projects that are progressing at a faster pace will likely use up the available capacity of UK supply chains and resources. In this scenario, some projects will have no choice but to import from abroad.

There is theoretical capability of UK supply chains⁶² to supply CCUS projects, however their ability/willingness may not be (in terms of project support, project visibility, capacity of production, technical capability, and inter-sectoral and market competition). The UK needs to move quickly to establish its supply chain capabilities, competence, and capacity⁶³. A clear **statement of intent** of the UK's strengths and the UK Government's commitment to back companies who are willing to invest in opportunities in the UK could help to realise these opportunities. Export potential would also be aided by this strategy.

Supply Chain Capacity: Skilled Individuals

The energy transition will require a significant increase in the numbers of available skilled individuals. For the offshore energy sector, direct and indirect employment will need to increase from approximately 150,000 in 2022 to 350,000 by 2050⁶⁴. The National Grid have estimated that

⁵⁶ Nuclear AMC (2022): CCUS supply chain intervention strategy. [Link](#)

⁵⁷ WSP (2023): Industrial CCUS UK Supply Chain Capabilities. [Link](#)

⁵⁸ Arup (2023): Opportunities for economic growth in the UK's CCUS industry. [Link](#)

⁵⁹ Unpublished CCSA report; submitted for the 2023 Autumn Budget

⁶⁰ Unpublished CCSA report; submitted for the 2023 Autumn Budget.

⁶¹ Unpublished CCSA report; submitted for the 2023 Autumn Budget.

⁶² Unpublished CCSA report; submitted for the 2023 Autumn Budget.

⁶³ Nuclear AMC (2022): CCUS supply chain intervention strategy. [Link](#)

⁶⁴ North Sea Transition Deal (2022): Integrated People and Skills Strategy. [Link](#)

the net zero energy workforce will need to recruit 400,000 new people by 2050 (260,000 being new roles, and 140,000 being existing workforce replacements)⁶⁵. While modelling suggests over 100,000 existing offshore energy workers could transition to new energy opportunities by 2030⁶⁶, it is clear the UK **does not currently have enough skilled individuals** to deliver the required energy infrastructure.

The CCUS sector faces numerous challenges including an ageing workforce; inter-sectoral competition for specialist workers; a lack of opportunity awareness for new entrants and existing workers; a need to increase training, retraining, and upskilling provision; and an uncertain foresight of overall employment demands⁶⁷. These challenges are also common to many other net zero critical sectors. The skilled workforce will go where it is easiest to do business, so **building capacity across the board is needed now**.

While initiatives including the Green Jobs Delivery Group, [extra funding for apprenticeships](#), and various actions being undertaken by stakeholders and industry are welcome additions to tackle these challenges, the current skills market is struggling for capacity. To tackle this issue:

- **Government** needs to identify a cross-sector coordinating body for skills and training to drive investment and ensure quality of jobs over the longer-term⁶⁸.
- **Government and stakeholders** need to review existing training availability/effectiveness and develop cross-sectoral mechanisms to build capacity and capability and promote worker mobility⁶⁹.
 - Skills provision cannot continue to be viewed from a sector perspective, as net zero professions are not typically unique to individual sectors, and the level of demand can only be tackled through collaborative action.
- **Government, industry and training providers** need to broaden new-entrant pathways with clarity on career progression to stimulate greater uptake of net zero careers⁷⁰.
 - Targeted recruitment measures need to reach more diverse workforce demographics and build inclusivity into net zero communication plans⁷¹.
- **Government** could look to simplify the Apprenticeship Levy Fund, to ensure increased apprenticeship uptake and availability with a view to expand and create a fund for general skills training⁷².

⁶⁵ National Grid (2020): Building the Net Zero Energy Workforce. [Link](#)

⁶⁶ Robert Gordon University (2023): Powering up the Workforce. [Link](#)

⁶⁷ CCSA (2023): Workforce and Skills Position Paper. [Link](#)

⁶⁸ CCSA (2023): Workforce and Skills Position Paper. [Link](#)

⁶⁹ CCSA (2023): Workforce and Skills Position Paper. [Link](#)

⁷⁰ CCSA (2023): Workforce and Skills Position Paper. [Link](#)

⁷¹ CCSA (2023): Workforce and Skills Position Paper. [Link](#)

⁷² CCSA (2023): Workforce and Skills Position Paper. [Link](#)

Appendix D

4. To what extent would growing the domestic supply chain bolster UK energy security?

The Climate Change Committee (CCC) notes, dispatchable power with CCS, and LCH will be essential for a secure and resilient electricity system of the future⁷³. The Government's target for a net zero power system by 2035 could require at least 10GW of power generation with CCUS, potentially requiring around 18MtCO₂/yr of carbon capture capacity⁷⁴Error! Bookmark not defined.. Additionally, analysis suggests, that an additional 5GW of Gas CCS could displace [5GW] of nuclear capacity **resulting in a £7.5bn system cost saving over the 2021-2050 period**⁷⁵. Power CCS and hydrogen power generation would complement a renewables-led energy system, helping to fill extended periods when these technologies cannot satisfy demand with intermittent generation.

Currently, we only have one power CCS project in bilateral negotiations with Government (equating to approximately 2MtCO₂/yr), despite having a pipeline of over 22MtCO₂/yr⁷⁶Error! Bookmark not defined.. Similarly, the CCUS enabled hydrogen production projects currently in negotiation only correspond to 17% of the Government's 5GW 2030 ambition, and only around 5% of the total pipeline. These projects, as noted above, may also relocate if investors do not see a clear strategy for the UK as a world-leading hydrogen economy⁷⁷.

In order to deliver secure and dependable low-carbon power in the UK, the domestic supply chain will need to grow at scale, both in terms of capacity and capability. Creating an environment where secure, resilient and well understood UK supply chains are easily accessible, will enable the CCUS and LCH project developers to make decisive investment decisions, help capture the opportunities on offer, and **promote energy security in the process**. Clear investment signals are needed for hydrogen and low-carbon power; together they will help deliver UK energy security.

A thriving domestic supply chain could also help to keep many of the opportunities at risk of relocation in the UK, as project developers could feel secure in their ability to deploy in the UK. Without a domestic supply chain energy security; the future of numerous CCUS and LCH projects; as well as Government net zero targets could be under threat.

⁷³ Climate Change Committee (2023): Progress in reducing UK emissions. 2023 Report to Parliament. [Link](#)

⁷⁴ CCSA (2023): CCUS Delivery Plan Update. [Link](#)

⁷⁵ SSE: Net zero power without breaking the bank. [Link](#)

⁷⁶ CCSA (2023): CCUS Delivery Plan Update. [Link](#)

⁷⁷ CCSA (2023): CCUS Delivery Plan Update. [Link](#)

Appendix E

5. What are the key concerns with respect to the availability of raw materials in the supply chain and how might those be addressed?

For the CCUS and LCH sectors, the key concern is the impact that the unavailability of critical raw minerals would have to **project pipeline timelines** and the impact of rising costs on the **business case for these sectors**. CCUS and LCH are exposed to significant cross-chain risk, given their extended supply chains and interdependencies of individual organisations delivering different parts of the value chain. CCUS is noted by the CCC as a critical technology for net zero⁷³, and so without a stable and secure supply of critical minerals the Governments net zero ambitions, and global temperature targets, could be under threat.

The CCSA supports the preliminary work that the government initiated in March 2023 with the publication of the [UK's Critical Mineral Strategy](#), and the creation of the [independent Critical Minerals Taskforce](#) to investigate the dependencies and vulnerabilities across UK industry sectors and opportunities for industry to promote resilience in its supply chains. The CCSA would push for the outputs of this work to be developed as a matter of priority. In addition, the UK Research and Innovation's £15 million [Circular Critical Materials Supply Chains](#) fund, and the £65.5 million Accelerate-to-Demonstrate Facility, under the umbrella [Clean Energy Innovation Facility](#) (CEIF) platform, are useful initiatives when beginning to map and understand the scope of the key concerns around raw mineral availability. **Further funding could help to unlock some of the lingering knowledge gaps.**

The Government has accelerated its collaboration this year on critical minerals with international partners, including partnerships agreed with [Canada](#) and [South Africa](#) and engagement through the Minerals Security Partnership, International Energy Agency and G7. However, more could be done to **build further collaboration**, especially with the EU and other international mineral producers to tackle the growing concerns around critical mineral availability.

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