Transforming industrial clusters with CCUS and Hydrogen

BIEE conference
London, 22 September 2022

Ruth Herbert
Chief Executive
Carbon Capture and Storage Association
Contents:

1. About the CCSA
2. About CCUS
3. UK CCUS Delivery Plan 2035
The CCSA is the trade association accelerating the commercial deployment of Carbon Capture, Utilisation and Storage (CCUS) through advocacy and collaboration.
CCSA Members (89)

<table>
<thead>
<tr>
<th>CO₂ Storage</th>
<th>Power &amp; Industrial</th>
<th>Carbon Capture Developers</th>
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<tbody>
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A selection of keynote speakers from different markets confirmed for the conference:

- **Ben Rimmington**, Director General, Net Zero Buildings & Industry – BEIS
- **Sir David King**, former UK Government Climate Envoy
- **Dr Jennifer Wilcox**, Principal Deputy Assistant Secretary for the Office of Fossil Energy and Carbon Management – US DoE
- **Kevin O’Brien**, Director – Illinois Sustainable Technology Center
- **Claire Dorrian**, Head of Sustainable Finance, Capital Markets – London Stock Exchange Group
- **Zoe Forbes**, Deputy Director of Sector Skills – Department for Education
- **John Flint**, Chief Executive – UK Infrastructure Bank
- **Erik Rylander**, Head of Carbon Dioxide Removal – Stockholm Exergi
- **Jasper Heikens**, Chief Commercial Officer – Ecolog
Contents:

1. About the CCSA
2. About CCUS Clusters
3. UK CCUS Delivery Plan 2035
CCUS technologies

- **Capture CO$_2$, typically using solvents, from:**
  - Power generation
  - Industrial activity (cement, refinery, steel etc)
  - Hydrogen production
  - Bioenergy sources (BECCS) and the air (DACCS)
- **Transport CO$_2$ via pipeline or ship**
- **Store CO$_2$** in deep geological formations, e.g. depleted oil & gas fields or deep saline formations.
- **Use CO$_2$** in products, some of which can keep CO$_2$ from the atmosphere for long periods of time, and others that simply recycle the CO$_2$, with less climate benefit.

Different applications of CCUS technology can be deployed at sites located close together to take advantage of the economies of scale in the CO2 transport and storage network – referred to as “clusters”
CCUS Case Studies

Visit [www.ccsassociation.org](http://www.ccsassociation.org) for more examples.
CCUS is a global market estimated to be worth c. $2tn by 2050

By 2050, 7.6 Gt of CO₂ is captured per year from a diverse range of sources. A total of 2.4 Gt CO₂ is captured from bioenergy use and DAC, of which 1.9 Gt CO₂ is permanently stored.
Climate Change Committee: “CCUS is a necessity not an option for reaching net zero”

6th Carbon Budget Advice (2020)

- **CCUS reaches harder to decarbonise sectors** – it plays a critical role in multiple sectors of the economy that need to decarbonise by 2050:
  - Clean Hydrogen production
  - Greenhouse Gas Removals (BECCS & DACS)
  - Heavy Industry Decarbonisation
  - *Flexible* zero carbon power

- In the 6th Carbon Budget Balanced Net Zero Pathway, the UK requires **104Mt** of CO2 storage pa by 2050; with **22Mt** pa in 2030, **53Mt** pa in 2035

Progress Report (2022)

- “progress on developing CCS in manufacturing is now a year behind the Government’s deployment pathway”.

![Figure 2.9 Total amount of CO2 captured in the Balanced Net Zero Pathway](image)
UK Government CCUS Strategy

- Ambition to capture 20-30 MtCO$_2$ a year by 2030, rising to over 50Mtpa by 2035
- Committed to **four CCUS clusters** with at least two operating by the mid-2020s and at least another two by 2030

UK aims to capture **20-30 MtCO$_2$** 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

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

£100m in new R&D spending to develop DACCS and other GGR technologies in the UK

£170m Industrial Decarbonisation Challenge Fund

UK Government “CCUS Investor Roadmap”
CCUS Clusters in UK’s industrial heartlands

Government’s Cluster Sequencing Programme:

• **Track-1:** at least two clusters operational by the mid-2020s
  - **Phase-1:** Provisionally sequence clusters onto Track 1 (announced November 2021)
  - **Phase-2:** Determine which carbon capture projects within clusters will proceed into negotiations (announced in August 2022)
  - Future phases of access to Track-1 clusters not yet defined

• **Track-2:** two additional clusters to be operational by 2030
  - Potential selection process *not yet defined*
Shortlisted CO₂ capture projects in Track-1 clusters

3 power projects

**East Coast Cluster:**
• Net Zero Teesside Power
• Whitetail Clean Energy
• Keadby 3 Carbon Capture Power Station

4 hydrogen projects

**East Coast Cluster:**
• bpH2Teesside
• H2NorthEast
• Hydrogen to Humber (H2H) Saltend

**HyNet:**
• HyNet Hydrogen Production Project (HPP)

13 industrial capture projects

**East Coast Cluster:**
• CF Fertilisers Billingham Ammonia CCS
• Tees Valley Energy Recovery Facility Project (TVERF)
• Norsea Carbon Capture
• Redcar Energy Centre
• Teesside Hydrogen CO2 Capture
• Humber Zero – Phillips 66 Humber Refinery
• Prax Lindsey Oil Refinery Carbon Capture Project
• ZerCaL250

**HyNet:**
• Hanson Padeswood Cement Works
• Viridor Runcorn Industrial CCS
• Protos Energy Recovery Facility
• Buxton Lime Net Zero
• Carbon Dioxide Capture Unit – EssarOil UK
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CCSA’s response to the Net Zero Strategy: ‘CCUS Delivery Plan 2035’

The report recommends how to best achieve the UK Government’s 2035 CCUS ambition, in order to remain on track for Net Zero by 2050, based on the outcomes from the project:

- Stage 1: Profiling the recommended build-out rate of CCUS in the UK to reach the government’s 2035 ambition; and
- Stage 2: Members, industrial clusters across the UK, and external stakeholders were engaged in a series of workshops to identify the building blocks for a successful industry and the enabling actions required.
Build out rate analysis

Anonymised project data was aggregated from cluster leads and major emitters to identify current and potential build-out rates.

Emissions captured and stored to 2035 by CCSA scenario

- **UK ambition met plus additional stored CO₂ from other countries**
- **UK removes own CO₂ from the atmosphere earlier, avoiding the increasingly high cost of emissions**
- **Includes over 7GW of low carbon or carbon negative power generation and over 15GW blue hydrogen**
- **Government 2035 pathway for stored CO₂**
- **Late deployment to meet UK’s 2035 ambition**

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Green Infrastructure Week
Conclusions from modelling the CCUS deployment scenarios

Our Recommendations:

The UK should pursue an **accelerated capture and storage build-out rate to significantly reduce total costs of deployment** and ensure it can stay on a pathway to storing 50MtCO₂/yr by 2035.

To enable this, the **government must implement a set of 10 urgent actions in the next 12 months** to create the necessary environment for industry to continue their planned investments.

We believe this approach will maximise the benefits from UK CCUS leadership, providing:

- Certainty to enable the UK’s domestic supply chain to grow
- Reduced reliance on imported commodities, with low carbon products made in UK
- Creation of a new export industry and attracting inward investment
- Development of skills and the safeguarding of jobs
- Enhanced competitiveness of UK manufacturing
We recommend that **10 urgent actions** are prioritised by Government, industry and wider stakeholders over the next 12 months to enable the rapid scaling needed to achieve the 2035 ambition:

1. Hold regular funded contract allocation rounds
2. Finalise business models across the value chain
3. Launch of the next cluster selection process in the first half of 2022
4. Legislate a policy framework to enable projects to develop at pace
5. Gain consensus on UK strengths in product and skill areas to prioritise for investment
6. Set policy and regulation to incentivise UK content
7. Accelerate entry into the workforce to meet demand
8. Accelerate permitting and construction of the infrastructure
9. Rapidly bring additional storage capacity to a commercial level of readiness
10. Establish a strategy to support national, cluster and project-level communications

**Full report available at** [www.ccsassociation.org/resources](http://www.ccsassociation.org/resources)