



OVERCOMING BARRIERS TO CARBON CAPTURE AND STORAGE THROUGH INTERNATIONAL COLLABORATION

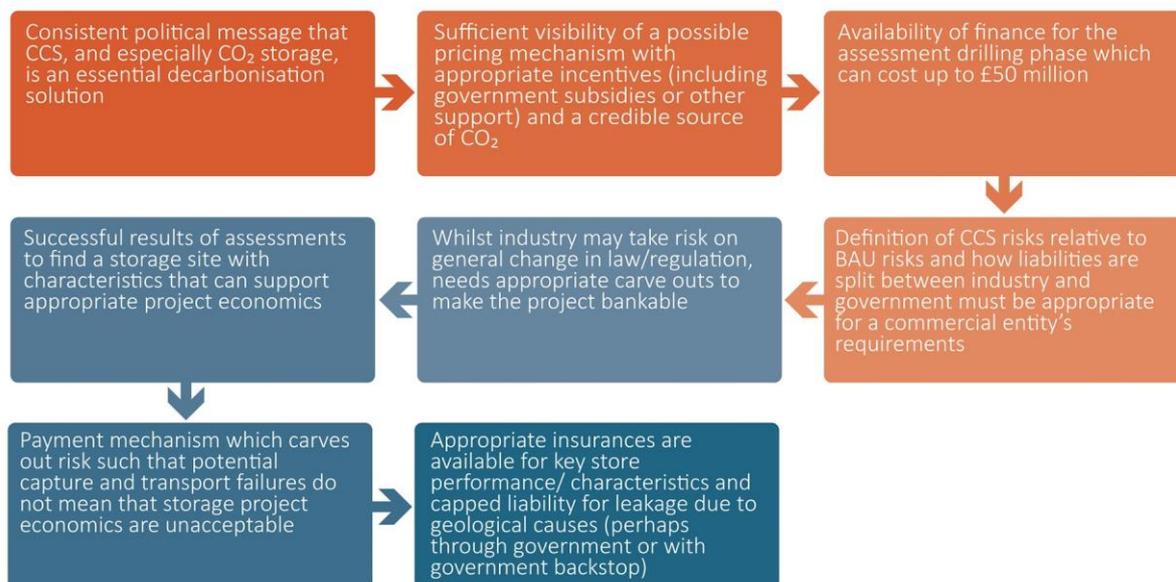
CCS DEPLOYMENT IS SLOWING

Carbon capture and storage (CCS) has been widely recognised as an essential technology for decarbonisation at least cost to society, and a number of countries have pursued programmes to demonstrate CCS at large scale over the last two decades. Although 21 large projects (equivalent to around 38 MtCO₂/y) are now operating or under construction worldwide, there is a serious shortage of projects in the pipeline, with only one positive final investment decision taken in the last four years. As for many low-carbon technologies, the cost of demonstration plant is much higher than can be expected for successive installations, which will benefit from economies of scale, standardised manufacturing, reducing project contingencies, lower-cost financing, and shared CO₂ transport and storage infrastructure.

BARRIERS TO CCS INVESTMENT

As a technology aimed exclusively at climate change mitigation, CCS is fundamentally reliant on government climate policy to provide some form of incentive to store CO₂. In the absence of adequate climate-based incentives, the majority of successful projects to date have used captured CO₂ for enhanced oil recovery (EOR), and many are based on relatively straightforward removal of CO₂ from natural gas. Where direct incentives for CCS have been introduced, such as storage credits or fixed power prices, there is insufficient political will to meet the high costs of most first-of-a-kind CCS plant using these mechanisms alone. Inconsistent political backing for these measures has often also contributed to weakening investor interest.

The financial shortfall between the cost of CCS demonstration and available incentives is exacerbated by a number of unique risks facing the technology, which the private sector is reluctant to bear with the prospect of limited and uncertain revenues. These are primarily associated with the need for an extensive new infrastructure for CO₂ transport and storage (*see* Figure). Characterisation of suitable storage geology is time-consuming and costly, and the unknown cost of CO₂ leakage can pose an uninsurable risk under some regulatory regimes. While transport and storage infrastructure would be optimally designed to cater to multiple CO₂ streams, developers will not provide such ‘common good’ infrastructure without guaranteed sources of CO₂. Optimising the costs of CCS deployment is therefore likely to require a greater role for government in distributing and bearing some of these infrastructure risks and costs, for example, by regulating for a fixed revenue to CO₂ storers and funding characterisation of storage sites.



Barriers to investment in CCS (BAU, business-as-usual) (Goldthorpe and Ahmad, 2017)

THE ROLE OF INTERNATIONAL COLLABORATION

The success of CCS is intimately linked to co-ordinated international commitments to decarbonisation, and many of the challenges faced by the emerging CCS industry suggest further benefits can be gained from international co-operation. A number of formal collaborations between national governments and industry have been implemented to engage in activities such as:

- building mutual trust on collective climate action and commitment to CCS;
- promoting CCS-favourable policy and regulations in new regions;
- ‘capacity building’ – developing CCS-related skills and resources through training and knowledge sharing;
- raising the public and political profile of CCS through communication initiatives;
- collaborative R&D, including sharing resources, funding, and data;
- enabling and encouraging CCS technology providers to invest in new regions; and
- sharing experience from operating projects.

International organisations

The Carbon Sequestration Leadership Forum (CSLF), International Energy Agency (IEA), and the Global Carbon Capture and Storage Institute (GCCSI), are high-profile international organisations which have prominently campaigned for greater political action on CCS deployment – often in close co-operation. They have particularly focussed on promoting large demonstration CCS projects, as well as capacity building in non-OECD countries and raising public and political awareness. The CSLF and IEA were instrumental in driving early political action on CCS, epitomised by the 2008 G8 target to launch 20 demonstration projects by 2010. At a regional level, the Zero Emissions Platform is a European stakeholder group which has performed a similar role in driving CCS policy and deployment targets. These organisations have worked to keep CCS on the political agenda, particularly through raising its profile at other international forums such as the United Nations Climate Change Conferences (COP) and the Clean Energy Ministerial, and played a key role in developing strategies to overcome barriers to CCS.

Bilateral initiatives with China

A number of bilateral initiatives have also been set up between China and countries such as the USA, EU, UK, and Australia with the goal of encouraging CCS development in the world’s largest CO₂ emitter, while

opening up new markets to manufacturers, and broadening opportunities for researchers. Many of these initiatives have explicitly targeted the deployment of a major demonstration project, but with little success to date. Protection of intellectual property and barriers to foreign manufacturers in China have posed challenges to such ventures, but they have ultimately suffered from insufficient funding from the participating governments to progress to demonstration. Nevertheless, they can be credited with building CCS project capacity in China, raising the status of the technology with policy makers, and greatly contributing to the characterisation of storage geology.

Pooling international funds towards one large project may be an important route towards CCS demonstration in China or other non-OECD countries, and could follow models adopted by the successful Petra Nova project or the short-lived FutureGen International Partnership.

Research networks and knowledge sharing

Many countries have devoted funding towards CCS research, including efforts to reduce the cost of CO₂ capture and characterising local geological potential for CO₂ storage. The IEA Greenhouse Gas R&D Programme (IEAGHG) has led the way in bringing together the global CCS research community through conferences and expert networks, while providing technical input to governments and other stakeholders. Other international research networks have facilitated knowledge sharing between pilot projects and pooled geological data or expertise.

DRIVING THE RECOVERY OF CCS POLICY

Early international efforts to accelerate CCS deployment have faced challenging circumstances and met with little tangible success, as the global financial crash dampened global commitment to decarbonisation. Nevertheless, CCS currently appears to be returning to the political agenda in many regions, and the inclusion of CCS in the Mission Innovation commitment to increase research funding is a significant step. Membership of international initiatives fosters shared responsibility, and creates some potential for political embarrassment should states fail to act on CCS. However, international activity to date has arguably focused to too great an extent on the role of research in improving the economics of CCS, when there is a much more fundamental need for political action to encourage private investment in large demonstration projects.

IEA Clean Coal Centre is a collaborative project of member countries of the International Energy Agency (IEA) to provide information about and analysis of coal technology, supply and use. IEA Clean Coal Centre has contracting parties and sponsors from: Australia, China, the European Commission, Germany, India, Italy, Japan, Poland, Russia, South Africa, Thailand, the UAE, the UK and the USA.

Each executive summary is based on a detailed study undertaken by IEA Clean Coal Centre, the full report of which is available separately. This particular executive summary is based on the report:

Overcoming barriers to carbon capture and storage through international collaboration

Toby Lockwood

CCC/284, ISBN 978-92-9029-608-9, 91 pp, March 2018

This report is free to organisations in member countries, £100 to organisations in non-member countries for six months after publication, and free thereafter.