

UKCCSC response to the Department of Energy and Climate Change call for evidence on long term development of CCS infrastructure

This document is a response from the UK Carbon Capture and Storage Community Network (UKCCSC) to the Department of Energy and Climate Change call for evidence on long term development of CCS infrastructure. The UKCCSC is a collective of over 300 engineering, technological, natural, environmental, social and economic academic members, whose biannual meetings and other knowledge sharing events and activities are funded by a grant from the Research Councils UK Energy Programme. The text has been discussed and drafted by a self-selected group of UKCCSC academics and researchers, each contributing according to their own particular interests and expertise, and also submitted to the whole membership for further comments. The final version was then circulated for members to sign up to if they wished; it should be noted that signatories below are signing as individuals.

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DECC Call for Evidence: Long term development of infrastructure

The consultation document sets out assumptions and uses language based on a decentralised, strongly market-oriented approach to infrastructure development. In addition to answers to the specific consultation questions below, we wish to highlight some broader concerns that arise when taking such an approach. These are related to (A) challenges in predicting CCS deployment and (B) concerns about the effectiveness of market-led approaches.

A. Predicting CCS deployment

The consultation appears overly optimistic about how feasible it will be to predict ('anticipate') CCS deployment, for the purpose of infrastructure planning. What limits the usefulness of prediction may not be just the efficiency of making predictions as stated in the consultation document, but the very feasibility of doing so. This is especially the case for a technology like CCS that is not yet established and mature in many of the contexts where its use is proposed. This isn't to say that investment in additional infrastructure capacity is wrong, just that the knowledge base on which decisions can be made is necessarily limited.

The level and timing of CCS deployment, especially beyond the initial demonstration phase, is highly uncertain. CCS deployment studies (e.g. ARUP/SCCS¹, One North Sea², CO2Europipe³) have suggested that while the general location of CO₂ sources is likely to remain similar for both low and high deployment scenarios, there is a very large difference in the volumes of CO₂ requiring transport and storage. It should also be noted that planning CO₂ infrastructure is not just about anticipating power plants, but also other industries including steel and cement. For example, work has been done on CO₂ clusters on Teesside, on the Humber and in Scotland.

A conclusion reached in many CCS deployment studies is that relatively low levels of deployment might best be served by un-linked (regional) infrastructures that exploit storage (mostly in depleted oil and gas fields) convenient to sources. By contrast, a high deployment level is expected to require a national network within the UK utilising the potentially much greater storage available in North Sea saline formations. High deployment networks are also shown to involve a degree of integration with CCS infrastructure in continental Europe, especially if onshore storage does not prove politically acceptable, even in the longer term. This illustrates the difficulties involved in anticipating the need for infrastructure.

It is, of course, also important to note that early actions could have a significant role in shaping if and how CCS is deployed. For example, sizing of initial infrastructure investment is a topic of significant ongoing debate. If pre-investments are made in CO₂ infrastructure in a limited number of regions then this could be expected to lead to CCS

¹ http://ec.europa.eu/energy/coal/studies/doc/2010_10_co2_infrastructures.pdf

² <http://www.element-energy.co.uk/wordpress/wp-content/uploads/2010/08/OneNorthSea.pdf>

³ <http://www.co2europipe.eu/Publications/D2.2.1%20-%20CO2Europipe%20Report%20CCS%20infrastructure%2009%202010.pdf>

deployment in the short to medium term being mostly or entirely focussed on these areas. This may prove to be cost-effective, but also raises concerns that CCS deployment in other regions may be overlooked.

Developing technical understanding to support regulation and permitting of CCS infrastructure is also crucial. Initial commercial-scale demonstration of CCS, and subsequent widespread deployment, require that robust approaches and frameworks for CCS infrastructure development are created on an appropriate timescale. Delay in establishing a framework that can be used with confidence by industry and regulators is likely to have a significant impact on if, when, and how CCS is deployed in the UK.

The challenge we face is not to anticipate the future, but to shape that future. Decisions and actions are needed in the short term which shape the future rather than mechanically respond to predictions about it. The difficulty in anticipating future infrastructure need is not an argument against planning ahead. The fact that the possibility for anticipation is limited, means that to produce many potentially desirable outcomes a degree of risk-taking is needed. The Government should, therefore, consider making budgetary provisions for supporting early infrastructure development.

B. Effectiveness of market-led approaches

Many members of the UKCCSC membership do not share the consultation document's assumption that a decentralised market led approach "will be as effective" in anticipating demand for CCS infrastructure in the UK as a more centralised approach. As above, CCS is not an established technology in the low carbon energy mix. As with other emerging technologies, commercial costs have not been discovered, the policy context is uncertain and scientific and engineering challenges remain. There is presently no market for CCS infrastructure development beyond that needed for demonstration projects. Additionally, most commercial actors currently have limited expertise dedicated to CCS projects, and some have concerns about lack of standards and routines to assess CCS.

Arguably more importantly, the consultation's assumptions regarding the effectiveness of the market do not highlight the key role of Government policy in the development and deployment of CCS. Commercial-scale CCS will not happen without political will translated into strong policy drivers – as expressed through appropriate policy instruments. As a result, policy makers are at least as well informed as market actors about potentially the key shaping factor of the future of CCS. Indeed, the Government may be in a uniquely advantageous position to predict and deliver infrastructure demand, as such demand is likely to result primarily in response to policy decisions, at least in the short to medium term.

The consultation document argues that a public body/authority would have a negative impact on market efficiency, and that the market is the default solution for infrastructure development elsewhere in the economy. Given both the status and scale of CCS, many UKCCSC members question these views and feel that a Government-led approach is likely to be better able to deliver. Factors informing these views include:

- as detailed above there is as yet no market for CCS, and particularly CO₂ infrastructure, and the creation of one is very likely to require Government action;
- existing infrastructures that are currently operating under market regimes typically had significant Government intervention during their initial development;

- direct Government involvement in initial development of CCS infrastructure could have a beneficial impact on the costs of the capital needed, especially during the crucial stage of early commercial development;
- given the long lead times (typically 5-10 years) associated with major infrastructure development, and the critical contribution to emissions reductions that CCS is expected to deliver, Government may not want to *risk* leaving it to market forces; and
- providing CO₂ storage for continental Europe is potentially a major industry worth billions of pounds per year to the UK economy. Government-led action in delivering an initial infrastructure that establishes a basis for efficient access to UK storage potential from continental Europe is likely to be critical for this industry to develop successfully.

5. Do you think any of the measures suggested in the NERA Report would make the regulated decentralised model more effective in encouraging the development of CCS infrastructure that anticipates future demand? Can you provide evidence that would help us assess their likely costs and benefits to CCS?

While the NERA recommendations might enable some additional infrastructure development, their effectiveness in encouraging ‘anticipatory’ capacity depends on assumptions about the degree to which early investors have confidence in any future demand. Many UKCCSC members would suggest that developing such confidence in the investor community is, at best, challenging (as outlined above).

For example, given that volumes from an initial source are likely to stay constant or increase (at least in the short to medium term), obliging interconnection is of practical use only if additional (probably somewhat speculative) capacity is made available in the original infrastructure. This is reliant on the original investor having sufficient confidence that they will obtain a reasonable return on this speculation. Similar thinking applies to the other NERA recommendations.

6. Are there any further steps we should consider that would make the regulated decentralised model more effective in encouraging the development of CCS infrastructure that anticipates future demand? Can you provide evidence that would help us assess their likely costs and benefits to CCS?

A possible addition to the NERA recommendations that could have greater impact on the potential to increase capacity would be the encouragement (mandating) of extended width way-leaves for initial developments, enabling more straightforward installation of additional parallel pipeline capacity along major routes.

7. What are your views on the creation of a centrally controlled approach to CCS infrastructure? Do you think you think we have identified the main advantages and disadvantages in this document? Do you see any advantages or evidence to support a public sector approach compared with a regulated private monopoly?

As detailed in Section B above, many UKCCSC members do not share the consultation’s optimism for a market-led approach and feel a centrally controlled approach would better guarantee delivery of the required CCS infrastructure development.

Implementing a centralised approach would present an opportunity to introduce an open, clear and longer-term strategy, encouraging both emitters and storage facility operators to invest in delivering the assets needed to develop CCS chains. By contrast, while private actors can be required to offer 'open season' on concrete investment plans, their longer term strategy is commercially very sensitive. It is, therefore, unlikely that Government could require them to be revealed without seriously hampering competition. An organisation along the lines of the National Carbon Storage Authority⁴ proposed by the Oxburgh working group to the UK Conservative Energy Group in 2010 should be considered as part of any effort to coordinate infrastructure delivery and ensure sufficient capacity is available where and when needed.

The consultation document suggests that a centralised approach would hamper market efficiency. While this might occur in a situation where technology is mature and the market is well established, many UKCCSC members would argue that this is not a significant concern for the current stage of CCS where the market requires creation (as outlined previously). Governing innovation processes is different from governing mature technologies. Should market efficiency be hampered in the long run, a central authority could be decentralised/deregulated/privatised as appropriate.

In addition to the advantages noted here, we also want to highlight one drawback of a centrally controlled approach using a body such as a National Carbon Storage Authority that is not mentioned in the consultation document. A central authority can be seen to be a classical case of a 'technocratic governance arrangement'. In other words, technical and commercial expertise would be operating at arm's length from Government. This style of governance brings with it a risk that accountability is weak and responsiveness to the needs of other actors is limited. To counter this, such an authority would need to be well regulated to offer responsiveness to Government policy as well as the promised transparency for contracting parties in the CCS value chain.

Finally, it is important that any approach used to govern development of CCS, including CO₂ infrastructure, is transparent to and inclusive of a wider set of actors and interests. There may, for example, be interest from civil society in CO₂ infrastructure with regard to safety, environmental impacts, etc. While pipeline developments would likely be subject to approval by regulators (e.g. HSE, Environment Agency) a wider set of objectives should, be reflected in the mandate of a CO₂ transport authority. For example, if an organisation like the National Carbon Storage Authority proposed by the Oxburgh working group was formed, the Board (or equivalent) could contain representatives of a broad range of societal interests.

8. Are there other funding and financing models we should be considering for the development of CCS infrastructure? Please include the advantages and disadvantages of these models in your response.

Some UKCCSC members have suggested that it may be useful to review approaches taken to organise take-back of waste products (tyres, electronic goods, packaging, etc.) in other sectors. Such a study might reveal alternative business models that operate along cooperative lines and that could provide useful insights for CCS and particularly CO₂ infrastructure development.

⁴ http://www.ucl.ac.uk/ccip/pdf/Oxburgh_thinkpiece-1.pdf

If further work was carried out in this area, a number of issues would need to be considered including:

- Technical characteristics of transport solutions for solid goods can be expected to be very different to CO₂;
- Costs associated with collection and disposal of waste, as a fraction of revenues, are likely to vary significantly between sectors;
- CCS infrastructure is not yet in place so it is important to distinguish between costs for development, deployment and longer term use; and
- CO₂ capture is necessarily distributed (since it occurs at the same location as CO₂ production) and this may limit comparison with industries where waste processing at a centralised facility is more appropriate.