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The Future of Regulation

SCCS response to the National Infrastructure Commission's call for evidence

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The Future of Regulation

Consideration of future energy infrastructure regulation must include infrastructure to distribute hydrogen for use in domestic and industrial heat, and transport; and infrastructure for transporting carbon dioxide (CO_2) to secure geological storage.

This will allow the decarbonisation of heat, transport, industry and fossil fuel power generation, and enable 'negative emissions' through the deployment of bioenergy with CCS and direct air capture.

1 Carbon capture and storage infrastructure

CCS is a set of technologies that tackles emissions of carbon dioxide (CO_2) at source to prevent them reaching the atmosphere.

The CCS process has three distinct parts: capture, transport and storage. In some industries, a pure stream of CO_2 is a by-product of the process and needs little additional treatment. However, in most processes, CO_2 is mixed with other gases when emitted and must be separated out before capture. Once captured, cleaned and compressed, the CO_2 is transported to a geological storage site to be permanently stored deep below ground.

Captured CO_2 is most commonly transported to a storage site by pipeline, but it can also be transported by road, rail or ship if smaller volumes are involved. The UK has a number of onshore and offshore pipelines that are currently used to transport gas from the North Sea: these could be repurposed to transport CO_2 in the opposite direction, from onshore sources to offshore storage sites. There will also be a need for new pipelines to complement this existing infrastructure.

Geological storage of CO_2 takes place offshore, in sites 1-2 km below the seabed, in layers of rock that are highly permeable and highly porous, such as depleted oil and gas fields and saline aquifers. CO_2 is able to move through the rock and fill the pore spaces within it, but is prevented from escaping to the surface by several layers of impermeable rock above.

While the approach to CO_2 capture will differ depending on the industrial process it is applied to, the infrastructure to transport and store CO_2 can be shared by any number of CO_2 producers. This CO_2 transport and storage infrastructure provides a CO_2 removal service in a way that is comparable to a solid waste management or sewerage service.

2 Call for evidence

The National Infrastructure Assessment outlined a number of changes and challenges in infrastructure to 2050. How might the scope, functions or activities of economic regulators need to adapt in light of future challenges?

The National Infrastructure Assessment (NIA) identified a number of infrastructure issues around decarbonisation of energy and improved waste management. One key recommendation implies that there will be a need for new or repurposed infrastructure for hydrogen distribution and CO_2 transport and storage:

> "Subject to the success of community trials, launching a trial to supply hydrogen to at least 10,000 homes by 2023, including hydrogen production with carbon capture and storage"[1]

Hydrogen

The assessment confirms that carbon capture and storage will be needed to support bulk production of hydrogen from methane, if the UK chooses to use hydrogen in the existing gas grid to provide low-carbon heat. It is looking increasingly likely that this will be the case, with the publication of BEIS' *Transforming Heating*[2], and the recruitment of new posts to work on hydrogen within BEIS[3].

Hydrogen, in fuel cells, is also an option for decarbonising transport, although the NIA does not really address this, and instead assumes that electric vehicles will be the replacement for fossil fuel cars and vans. For heavier vehicles, agricultural vehicles and mobile plant, battery electric systems may pose difficulties and hydrogen fuel cells may be more appropriate. If hydrogen vehicles end up having more of a market share than the assessment assumes, then there will be a greater need for hydrogen production and distribution, and associated infrastructure.

Carbon capture and storage

We consider that the assessment underplays the likely role of CCS in the future: where the NIA describes CCS's role in decarbonising industry and achieving negative emissions as "potential" we would consider it to be **essential** – particularly in light of the Intergovernmental Panel on Climate Change's report on getting to the 1.5°C ambition of the Paris Agreement[4].

Manufacturing in the UK includes cement, polymers, chemicals, paper and board mills, glass-making and food and drink, as well as the midstream oil and gas industry – such as refining and gas processing. These sectors have high CO_2 emissions, either due to a high demand for heat, which is met with fossil fuels, or because they generate CO_2 as an unavoidable part of their industrial process, or a combination of both. For many of these industries, CCS is the only option for deep decarbonisation – short of closure.

[1] National Infrastructure Commission (2018) *National Infrastructure Assessment 2018*. Available at: https://www.nic.org.uk/publications/national-infrastructure-assessment-2018/
[2] BEIS (2018) *Clean Growth – Transforming Heating.* Available at https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/766109/decarbonising-heating.pdf
[3] BEIS jobs advert: https://www.civilservicejobs.service.gov.uk/csr/index.cgi?SID=b3duZXJ0eXBlPWZhaXlmb3duZXI9NTA3MDAwMCZwYWdlYWN0aW9uPXZpZXd2YWNieWpvYmxpc3QmcGFnZWNsYXNzPUpvYnMmdXNlcnNlYXJjaGNvbnRleHQ9NzU0MDE3MzAmam9ibGlzdF92aWV3X3ZhYz0xNjI3Mzc2JmNzb3VyY2U9Y3Nxc2VhcmNoJnNlYXJjaF9zbGljZV9jdXJyZW50PTEmcmVxc2lnPTE1NTQxMjc4NjktOTlmYjQzZmU3ZGY1Yjg3ODNmYmI4NTIzZTFjZTcwODZhYTU3N2FlNw
[4] Intergovernmental Panel on Climate Change (2018) *Global warming of 1.5°C: Summary for Policymakers*. Available at: https://www.ipcc.ch/sr15/chapter/summary-for-policy-makers/

The Committee on Climate Change found that the UK will require at least 10 $MtCO_2$/year to be captured and stored by 2030, and 20 $MtCO_2$ in 2035, enabling the deployment of CCS at between at least 60, and potentially well over 100 $MtCO_2$/year in 2050.[5]

Although the NIA found that CCS will not be necessary to decarbonise the electricity grid, it is not clear whether this assessment took into account the increases in electricity demand for transport that will occur if the UK government chooses to take an all- or high-electric route to decarbonising this sector. It is also not clear if the assessment took into account the land use and nature conservation impacts of this high level of renewable electricity deployment. Once these issues are costed in, the case for the grid balancing services provided by despatchable fossil fuel power with CCS is likely to improve. It should also be noted that a new combined cycle gas power plant in Teesside has been granted a development consent order, with a requirement for it to be carbon capture ready.[6]

The industry-led CCUS Cost Challenge Task Force proposed the regulated asset base (RAB) model to fund the development of CO_2 transport and storage infrastructure.[7] However, there are other options: The Report of the Parliamentary Advisory Group on CCS (the Oxburgh Report) recommends a dedicated company that is initially publicly owned, but that can later be privatised.[8]

Another way of building a market for CO_2 capture, and developing CO_2 storage, is CO_2- enhanced oil recovery (CO_2-EOR). The CO_2-EOR Joint Industry Project, led by SCCS, has shown that CO_2-EOR, if managed correctly, and optimised for CO_2 storage, can store more CO_2 than is emitted from the extraction and use of the additional oil recovered[9]. The Global CCS Institute found that, of the 18 CCS project currently operational globally, 14 included enhanced oil recovery in their business model, and 7 used state-owned infrastructure.[10]

The Committee on Climate Change (CCC) have called on the Government to put in place a mechanism to support CO_2 transport and storage infrastructure by the end of 2021.[11]

In its *CCUS Deployment Pathway: an action plan*, the Government has committed to

> "reviewing the potential market-based frameworks that could best support investment in, and deployment of carbon dioxide transport and storage infrastructure in the UK, and will consult on emerging findings in the first half of 2019."[12]

Waste management

Although there may be some potential to use it in new products, CO_2 is generally a waste product, so the drivers for developing CO_2 transport and storage infrastructure are comparable to the drivers for developing waste management or sewerage infrastructure.

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[5] Committee on Climate Change (2018) *Reducing UK emissions – 2018 Progress Report to Parliament*. Available at: https://www.theccc.org.uk/wp-content/uploads/2018/06/CCC-2018-Progress-Report-to-Parliament.pdf
[6] ENDS Report (2019) England's biggest gas plant given go-ahead with carbon capture conditions. Available at: https://www.endsreport.com/article/1581351/englands-biggest-gas-plant-given-go-ahead-carbon-capture-conditions?ct=t(CCSA_Daily_Bulletin_Tuesday_25_April_2014_25_2017_)
[7] CCUS Cost Challenge Task Force (2018) *Delivering Clean Growth: CCUS Cost Challenge Taskforce Report*. Available at: https://www.gov.uk/government/publications/delivering-clean-growth-ccus-cost-challenge-taskforce-report
[8] Parliamentary Advisory Group on CCS (2016) *Lowest Cost Decarbonisation for the UK: The Critical Role of CCS*. Available at: http://www.ccsassociation.org/news-and-events/reports-and-publications/parliamentary-advisory-group-on-ccs-report/
[9] CO_2-EOR Join Industry Project reports available at: http://www.sccs.org.uk/expertise/reports/co2eor-joint-industry-project
[10] Global CCS Institute (2019) *Policy priorities to incentivise large scale deployment of CCS*. Available at: https://www.globalccsinstitute.com/wp-content/uploads/2019/04/TL-Report-Policy-prorities-to-incentivise-the-large-scale-deployment-of-CCS-digital-final-2019.pdf
[11] https://www.theccc.org.uk/wp-content/uploads/2018/06/CCC-2018-Progress-Report-to-Parliament.pdf
[12] BEIS (2018) *The UK carbon capture usage and storage deployment pathway: an action plan*. Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/759637/beis-ccus-action-plan.pdf

The emergence of CCS and the need for CO_2 transport and storage infrastructure gives the UK the opportunity to plan this infrastructure as a national development, rather than take the piecemeal approach that was taken with municipal solid waste.

CO_2 is a special case: it is a waste product, but it is also a gas. Should it be within the remit of a regulator that deals with waste? Or should it be regulated by the same body that deals with natural gas? Which of its qualities should have the most bearing on how it is regulated, if it is to be assigned to an existing regulator? Or does it need a brand new regulatory body?

Challenges and questions

We recommend that the Commission consider infrastructure for hydrogen distribution, for use in both heat and transport; and infrastructure for CO_2 transport and storage.

Some further questions that will need to be addressed are:

- Who will regulate hydrogen distribution?
- Will the regulator for hydrogen for heat be the same as the regulator for hydrogen for transport?
- Who will regulate CO_2 transport?
- Will the regulator for CO_2 transport onshore also regulate CO_2 transport offshore?
- Is there a regulatory regime in place to cover CO_2-enhanced oil recovery (CO_2-EOR) should this prove to be attractive to industry?
- Would CO_2 transport by pipeline be regulated by the same body as CO_2 transport by ship / train?

Where could regulators work together more consistently to meet future challenges, achieve efficiencies within the regulatory system or to promote better outcomes for consumers, investors or society?

The emergence of CCS and hydrogen as two new areas requiring regulation is an opportunity to explore the potential for efficiencies within the regulatory system, and design new infrastructure with a view to long term needs.

What changes to the existing regulatory framework would be necessary to promote greater collaboration and regulatory consistency? Are there functions that might better be provided on a multi-utility basis without the need for wider organisational change?

See our comments above – hydrogen and CCS are new areas that will need to be regulated, and there are a number of questions to explore to ensure that this regulation is fit for purpose and supports the development of this essential infrastructure.

Has there been a lack of clarity over strategic goals? What is the cause of this and what has been the impact on investment?

The Oxburgh Report found that investors are reluctant to lead on CCS. Although accepting that this reluctance is endemic to the structure of the CCS industry, the report found that this had been "exacerbated by the failure of successive governments to effectively execute their declared intentions with respect to CCS".

The Public Accounts Committee concluded, following the 2015 cancellation of the CCS Commercialisation Competition, that:

> "Halting CCS's deployment means that the UK will have to pay billions of pounds more to meet its decarbonisation targets, has missed opportunities to be at the forefront of a growing global industry, and has damaged investors' confidence in working with the government on CCS in the future."[13]

The Committee on Climate Change echoed this in their 2018 Progress Report, in which they called on the Government to "end the chopping and changing of policy", and stating that the cancellation of programmes such as the CCS Commercialisation Programme have "led to uncertainty, which carries a real cost."[14]

The UK's new Deployment Pathway action plan, part of its Clean Growth Strategy, has a vision:

> "to become a global leader in CCUS, unlocking the potential of the technology and securing the added value which it can bring to our industrial centres and businesses all across the UK."[15]

There has clearly been some learning from previous competitions:

> "The main barriers now are not technological: rather, government and the sector need to work together to build the frameworks to enable CCUS to deploy at scale."[16]

However, the plan, and particularly the funding associated with it, is still vulnerable to changes in Government policy. It will be crucial to get the right regulation in place, as that will help to provide certainty and continuity for CCS and hydrogen deployment.

[13] House of Commons Committee of Public Accounts (2017) *Carbon Capture and Storage*. Available at: https://publications.parliament.uk/pa/cm201617/cmselect/cmpubacc/1036/1036.pdf
[14] https://www.theccc.org.uk/wp-content/uploads/2018/06/CCC-2018-Progress-Report-to-Parliament.pdf
[15] https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/759637/beis-ccus-action-plan.pdf
[16] https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/759637/beis-ccus-action-plan.pdf