

# Greening Britain through CCUS

## SCCS evidence

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July 2019, Scottish Carbon Capture & Storage

Scottish Carbon Capture & Storage (SCCS) is pleased to submit evidence to the All-Party Parliamentary Group on Carbon Capture and Storage (CCS) inquiry, *Greening Britain through CCUS*.

SCCS is a research partnership of the British Geological Survey (BGS), Heriot-Watt University, the University of Aberdeen, the University of Edinburgh and the University of Strathclyde with associate member the University of St Andrews. SCCS researchers are engaged in innovative applied research and joint projects with industry and government to support the development and commercialisation of CCS as a climate change mitigation technology.

We address the inquiry questions below.

**The Committee on Climate Change sees a role for CCUS in decarbonising a) power b) transport and c) heavy industry. Which of these do you see as delivering a) the biggest environmental benefits and b) the biggest economic benefits to the UK?**

CCS will be needed in all of the above applications and more. In many industry and manufacturing sectors, CCS is the only option for decarbonisation so, without CCS, businesses will be forced to close or relocate overseas. By enabling bulk production of hydrogen through steam methane reformation, CCS can contribute to decarbonisation of transport and heating. That provides an alternative to electrification and thus reduces the expensive investment necessary in renewable energy, grid strengthening and energy storage to meet the needs of heat and transport.

There remains a potential role for CCS in power generation, particularly in the short to medium term. It would enable the UK to decarbonise power more quickly than relying on renewables alone and provide dispatchable electricity that can meet peak demand. This will ensure energy provision is resilient to demand fluctuations and is delivered cost-effectively and in line with emissions targets. However, in the long term, the biggest impact will be on heavy industry, which can only be decarbonised with CCS.

CCS will also be needed to deliver negative emissions, which will be crucial to meet a net zero target. Bioenergy with CCS (BECCS) is well understood; in addition, CCS applied to other existing biogenic sources of CO<sub>2</sub> can achieve negative emissions without the need for new, dedicated BECCS facilities. Direct air carbon capture, using CCS infrastructure (DACCS) for storage, is also likely to become essential in a cost-effective pathway to develop net-negative emissions.

The biggest environmental benefits are in the ability to decarbonise hard-to-treat areas, such as industry, heat and transport, and the ability to offset residual emissions through BECCS or DACCS.

The economic benefits for CCS in a regional economy fall broadly into four categories:

- Retention of manufacturing industries and jobs by enabling low-carbon production;
- Meeting peak electricity demand along with renewables, reducing the need for the expense and disruption of grid strengthening and energy storage;
- The opportunity to commercialise and export CCS research and expertise;
- The opportunity to provide a profit-making service storing CO<sub>2</sub> from countries that are not able to develop CO<sub>2</sub> storage of their own.

### **CCS and negative emissions: SCCS research**

SCCS has carried out a review of the existing sources of biogenic CO<sub>2</sub> emissions in Scotland, which could be captured and stored once CO<sub>2</sub> transport and storage infrastructure is in place, delivering negative emissions rapidly, with minimal change and at low cost.<sup>1</sup> A similar review could be carried out across the rest of the UK, to provide an estimate of the immediate opportunity for greenhouse gas removal in UK.

The review found that approximately 3.6 million tonnes a year of CO<sub>2</sub> (Mt-CO<sub>2</sub>/yr) is currently emitted in Scotland from biogas, biomass combustion and the fermentation industry for alcohol production. Some 60% – 2.1 Mt-CO<sub>2</sub>/yr – is emitted at 29 larger sites of a scale where CO<sub>2</sub> capture would be practical. This work confirms that there is a sizeable potential to achieve negative CO<sub>2</sub> emissions in Scotland through the use of CCS technology on existing biogenic CO<sub>2</sub> emissions in the energy and industrial sectors, and this would also be the case for new developments in these sectors. The review makes the following recommendations:

- Improve consistency and coverage of reporting of biogenic CO<sub>2</sub> emissions to allow better quantification of the opportunity for negative emissions;
- Consider incentives and/or policies specifically to encourage capture of biogenic CO<sub>2</sub> emissions;
- Support early project development to demonstrate CO<sub>2</sub> capture from biogenic sources at appropriate scales (smaller than previous CO<sub>2</sub> capture proposals);
- Initiate and/or support further work to define better the options for smaller-scale CO<sub>2</sub> transport modes, both technically and commercially, including the integration of such modes with trunk transport of CO<sub>2</sub>;
- Maintain support for existing proposals that aim towards development of CO<sub>2</sub> transport and storage infrastructure in Scotland; such infrastructure is clearly a pre-requisite for achieving significant negative CO<sub>2</sub> emissions.

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<sup>1</sup> SCCS Working Paper WP SCCS 2018-08, *Negative Emission Technology in Scotland: carbon capture and storage for biogenic CO<sub>2</sub> emissions*, available at [http://www.sccs.org.uk/images/expertise/reports/working-papers/WP\\_SCCS\\_2018\\_08\\_Negative\\_Emission\\_Technology\\_in\\_Scotland.pdf](http://www.sccs.org.uk/images/expertise/reports/working-papers/WP_SCCS_2018_08_Negative_Emission_Technology_in_Scotland.pdf)

See also *The potential for implementation of Negative Emission Technologies in Scotland*<sup>2</sup>, which found that Scotland is exceptionally well suited to using land-based negative emissions technologies (NETs) and has the potential to abate 90-100% of emissions in this way.

### How essential is CCUS for the UK to meet net zero emissions by 2050?

The Committee on Climate Change (CCC) has described CCS as “a necessity, not an option” for the UK to achieve its net-zero ambitions<sup>3</sup>: this is consistent with the findings of the Intergovernmental Panel on Climate Change’s special report on 1.5°C.<sup>4</sup>

All analyses, including the Parliamentary Advisory Group on CCS found that it is the lowest cost means of decarbonising the economy.<sup>5</sup>

Given the Government’s stated intention to meet the net-zero target in the timescale suggested by the CCC, CCS will be essential and early investment and support for its deployment crucial.

### What role can CCUS play in a coordinated regional industrial renaissance?

CCS has a number of roles in a regional industrial renaissance:

- Retaining jobs in existing industries and manufacturing with high CO<sub>2</sub> emissions;
- Retaining jobs and expertise from the declining oil and gas sector;
- Attracting new industries to areas where they can rely on a CO<sub>2</sub> takeaway service;
- Developing a supply chain for CCS that can be exported around the world.

The Business, Energy and Industrial Strategy (BEIS) Committee found that:

“CCUS could play a significant role in supporting productivity growth outside London and the South East, offering a route to redress some of the regional imbalance evident in the Government’s Industrial Strategy. Of the five clusters identified as well-suited to early CCUS deployment, four are in regions with below-average productivity, and witnesses from all five consider CCUS to be critical to future operations.”<sup>6</sup>

The East Coast Study, *Clean Air, Clean Industry, Clean Growth*, used HM Treasury methodology to assess the benefits of collaboration on CCS from St Fergus to the Thames. It found that collaboration between different CCS clusters could create or retain an estimated total of 225,000 jobs, with benefits dramatically outweighing the costs<sup>7</sup>

<sup>2</sup> Alcalde, J, Smith, P, Haszeldine, RS & Bond, C (2018) *The potential for implementation of Negative Emission Technologies in Scotland*. In: International Journal of Greenhouse Gas Control. Volume 76, September 2018, p 85-91. Available at: <https://www.sciencedirect.com/science/article/pii/S1750583617310794>

<sup>3</sup> Committee on Climate Change (2019) *Net Zero – The UK’s contribution to stopping global warming*. Available at: <https://www.theccc.org.uk/publication/net-zero-the-uks-contribution-to-stopping-global-warming/>

<sup>4</sup> 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/>

<sup>5</sup> 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/>

<sup>6</sup> BEIS Committee (2019) *Carbon capture usage and storage: third time lucky?* Available at <https://publications.parliament.uk/pa/cm201719/cmselect/cmbeis/1094/1094.pdf>

<sup>7</sup> Summit Power (2017) *Clean Air, Clean Industry, Clean Growth*. Available at: <http://www.ccsassociation.org/news-and-events/reports-and-publications/clean-air-clean-industry-clean-growth/>

CCS will need to be applied to all industrial areas in some form over the next thirty years, otherwise some areas will be forced into decline as greenhouse gas emissions become more restricted. Its deployment also needs to be coordinated, with common standards, so Government needs to support action across the country, rather than pick winners in a competition that pitches regions against each other.

**What opportunities are there for the UK to play a world-leading role in the development and export of CCUS e.g. technology, equipment, green industrial products, and policy and regulatory frameworks?**

There is a wealth of expertise in Scottish Universities that can be capitalised on in partnership with industry players in order benefit from the export of CCUS technology, methodologies and other knowledge.

SCCS is the largest CCS research group in the UK, representing broad expertise across a number of world-leading research institutes. The SCCS partnership provides a single point of coordination for all aspects of CCS research, ranging from capture engineering and geoscience to social perceptions and environmental impact through to law and petroleum economics.

SCCS has access to cutting-edge experimental and analytical facilities, expertise in field studies, modelling and simulation, key academic and research personnel to accelerate the development of CO<sub>2</sub> transportation, capture and subsurface storage.

We undertake strategic fundamental research and also consultancy work. In addition, we perform a key role in providing impartial advice to industry, the public sector, government agencies, and policy makers.

Founded in 2005, SCCS is a partnership of the British Geological Survey, Heriot-Watt University, the University of Aberdeen, the University of Edinburgh and the University of Strathclyde working together with universities across Scotland. SCCS is one of the host organisations of the Europe-wide CCUS Projects Network<sup>8</sup>, and has a long track record of involvement in joint industry and EU-funded CCS/CCUS projects<sup>9</sup>.

The UK is a leader in global CCS development, through its involvement in the Carbon Sequestration Leadership Forum, Clean Energy Ministerial, North Sea Basin Task Force and the International Energy Agency Greenhouse Gas R&D Programme. It is also home to companies developing CCS technology, which can form a key part of the supply chain for global CCS deployment, and companies with significant transferable experience in the oil and gas, and chemicals, industries.

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<sup>8</sup> <http://ccusnetwork.eu>

<sup>9</sup> Including CO<sub>2</sub>MultiStore (<http://www.sccs.org.uk/expertise/reports/co2multistore-joint-industry-project>); CO<sub>2</sub>-EOR (<http://www.sccs.org.uk/expertise/reports/co2multistore-joint-industry-project?id=237>); ALIGN CCUS (<https://www.alignccus.eu>); ACT Acorn (<https://actacorn.eu>); STRATEGY CCUS, an ambitious project funded by the European Union to support the development of low-carbon energy and industry in Southern and Eastern Europe. Funded by the European Union's Horizon 2020 research and innovation programme.

### What action is required from Government over the upcoming Spending Review period to ensure three CCUS clusters are operational by the mid-2020s?

The UK Government needs to provide incentives to industry to develop these clusters. These could include funding for front-end engineering and design (FEED) work; support for complex project management; a clear, long-term regulatory framework; and willingness to take over responsibility for monitoring and maintaining CO<sub>2</sub> stores in the long term. These will go some way to helping industry with the 'irreducible risks' identified by the CCUS Cost Challenge Task Force<sup>10</sup>; however, most important is for Government to regain the trust of the industry.

### Given the timelines for CCUS project development, how can long-term policy continuity be ensured that stretches beyond individual Government terms?

Long-term policy requires cross-party commitment to CCS, and this requires public support. Public understanding of climate change is growing, with climate change now among the top three issues concerning voters, which has helped to drive greater commitment to emissions reduction from governments around the world.

Public demand for climate change action is in no way matched by enthusiasm for CCS, and this means that there is little to drive politicians to support this essential climate technology. There is a role for both government and civil society to build the case for CCS as the lowest cost climate change mitigation tool, which can decarbonise hard-to-treat sectors, such as heat and transport as well as industry. Government needs to demonstrate leadership on CCS, to show that it is taking its climate change commitments seriously: this includes investing in CCS deployment. In addition, Government needs to communicate the value to the UK economy of deploying CCS – and climate change action in general – and make clear that it stands fully behind the technology. It also needs to emphasise that risks can be controlled.

SCCS researchers<sup>11</sup> have proposed Government should set a trajectory and annual targets for carbon to be stored in the UK. A requirement to store CO<sub>2</sub> would create a market and a price for carbon storage and, as a result, enable industry investment.

Scottish Carbon Capture & Storage would be happy to answer any questions or provide further information. We have a wealth of research – produced by our partner research institutions and by the SCCS team – that we would be happy to share.<sup>12</sup>

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<sup>10</sup> CCUS Cost Challenge Task Force (2019) *Delivering Clean Growth*. Available at

<https://www.gov.uk/government/publications/delivering-clean-growth-ccus-cost-challenge-taskforce-report>

<sup>11</sup> Haszeldine, R, Flude, S, Johnson, G & Scott, V 2018, *Negative emissions technologies and carbon capture and storage to achieve the Paris Agreement commitment*. Available at

[https://www.research.ed.ac.uk/portal/files/57718125/Negative\\_emissions\\_technologies\\_and\\_carbon\\_capture\\_and\\_storage\\_to\\_achieve\\_the\\_Paris\\_Agreement\\_commitments\\_Philosophical\\_Transactions\\_A\\_Royal\\_Society\\_.pdf](https://www.research.ed.ac.uk/portal/files/57718125/Negative_emissions_technologies_and_carbon_capture_and_storage_to_achieve_the_Paris_Agreement_commitments_Philosophical_Transactions_A_Royal_Society_.pdf)

<sup>12</sup> See <http://www.sccs.org.uk/expertise/reports> , <http://www.sccs.org.uk/expertise/reports/working-papers> , <http://www.sccs.org.uk/expertise/publications>