



Carbon Capture and Storage in Scotland and the European Union

Briefing paper for Members of the European Parliament

January 2014

Dr Vivian Scott, Policy Research Associate

Chris Littlecott, Policy Research Associate

Professor R Stuart Haszeldine, SCCS Director

Scottish Carbon Capture & Storage

Murchison House, West Mains Road Edinburgh EH9 3LA

Tel: +44 (0)131 650 0270 • www.sccs.org.uk

Introduction

Carbon capture and storage (CCS) is critical to decarbonising power sector and industrial emissions, and achieving climate mitigation targets. With world-leading decarbonisation targets, a large and mature hydrocarbon sector, existing pipeline infrastructure and extensive opportunities for geological CO₂ storage under the North Sea, Scotland is uniquely placed to both deliver and benefit from CCS. The technology has the potential to enable major emissions reductions towards the Scottish Government's 2050 target – it can directly address over 50% of current total emissions from Scotland's energy sector and industry. Geological CO₂ storage offshore Scotland represents a resource of European significance, which could securely contain many decades' worth of power and industrial emissions from across the European Union.

Carbon capture and storage

- CCS is a process by which CO₂ emitted by large point sources, such as power plants, chemical works and industrial facilities, is captured, compressed, transported and then injected into geological formations – depleted oil and gas fields or deep saline aquifers – where it can be securely trapped for many hundreds of thousands of years.
- It is a critical technology for achieving the decarbonisation of thermal power generation and industrial processes. The Intergovernmental Panel on Climate Change (IPCC) recently confirmed that **“limiting climate change will require substantial and sustained reductions of greenhouse gas emissions”**.¹ To limit global warming to no more than 2°C, the International Energy Agency (IEA) suggests that CCS should account for 14% of global emissions reductions by 2050.² The EU Energy Roadmap 2050 suggests that CCS could contribute 19-24% of total EU emissions reductions.³
- **Commercial-scale CCS is deliverable using current technologies.** Projects on natural gas-processing facilities have been operating since 1996 in Norway and the USA, and projects on industrial facilities are operating in the USA and China. CCS with power generation is soon to begin at the Boundary Dam coal-fired plant in Canada, and the Texas Clean Energy Project in the USA is on track for construction starting in 2014.
- CCS is behind schedule in the EU. Actions to **deliver multiple operational projects before 2020 are essential** to meeting decarbonisation targets.
- **Industrial processes that produce high concentration CO₂ emissions offer “low-hanging fruit” opportunities to deploy CCS** rapidly and at lower entry costs, and develop strategic CO₂ transport and storage infrastructure.

CCS opportunities in Scotland

- **The North Sea offshore Scotland has extensive opportunities for CO₂ storage** with an estimated total capacity of around 50 billion tonnes of CO₂.⁴ This is the largest and best qualified CO₂ storage resource in the EU, with capacity for at least 50 years' worth of current annual EU CO₂ emissions. The development of this resource has the potential to become a major industry worth many hundreds of millions of pounds per year to 2050 and beyond.

¹ IPCC AR5 2013 Summary for Policymakers, www.climatechange2013.org/images/uploads/WGI_AR5_SPM_brochure.pdf

² IEA Technology Roadmap: Carbon Capture and Storage, 2013 edition, www.iea.org/publications/freepublications/publication/TechnologyRoadmapCarbonCaptureandStorage.pdf

³ EU Energy Roadmap 2050, eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2011:0885:FIN:EN:PDF

⁴ Opportunities for CO₂ storage around Scotland, www.scotland.gov.uk/Publications/2009/04/28114540/0

- Scotland currently hosts two proposed power plant CCS demonstration projects:
 - Peterhead (Shell and SSE) – a CCS retrofit on gas-fired power plant, shortlisted for the UK CCS Commercialisation Programme.
 - Captain Clean Energy Project (Summit Power, CO₂Deepstore) – a new-build CCS coal power plant at Grangemouth, and a reserve project for the UK’s CCS programme.

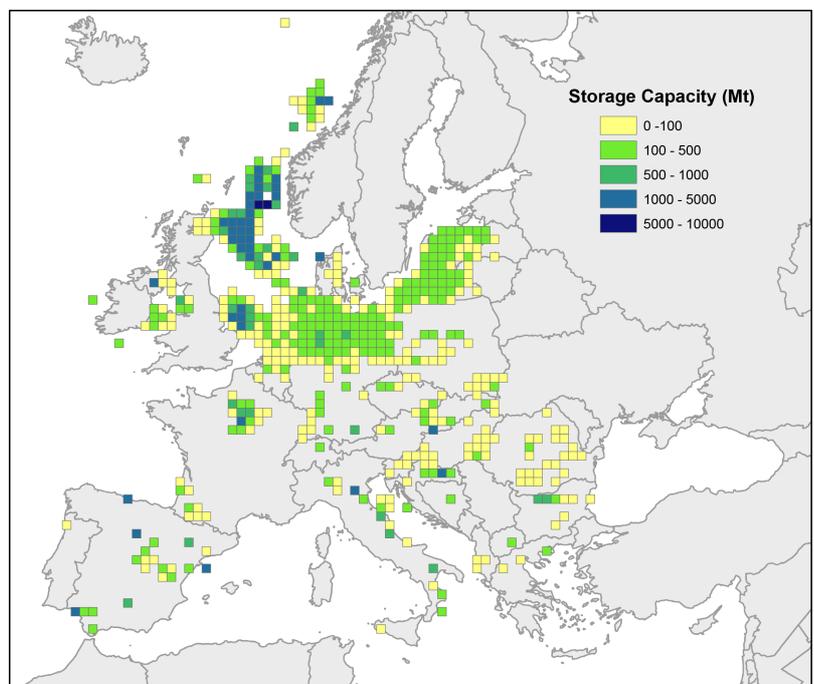
Additionally, proposed projects in Yorkshire (the Don Valley power project) and Teesside plan to utilise CO₂ storage within the North Sea offshore Scotland.

- Scotland’s large point sources of CO₂ emissions (both power plant and industry) are primarily clustered around the Forth Estuary and St Fergus in the North East. Analysis by SCCS⁵ shows that **over 70% of Scottish CO₂ emission point sources (16 million tonnes of CO₂ per year) are located within 20km of the existing Feeder 10 gas pipeline**. This pipeline is available for CO₂ transport and has already been fully assessed for this purpose as part of the Longannet CCS project (cancelled in 2011).
- CCS offers the potential to preserve major industrial sectors, which are constrained emissions-wise by policy frameworks. More than 4,000 skilled jobs are associated with existing sites that offer high potential for CCS application. **Scotland is ideally positioned to offer industry a timely and straightforward connection to a CO₂ transport and storage network.**
- Scotland’s oil and gas industries have skills, expertise and infrastructure that can accelerate CCS deployment, and grow and diversify the offshore and subsurface sectors.
- Enhanced oil recovery using CO₂ (CO₂-EOR) offers the opportunity to extend the life of North Sea oil production, and provide associated revenue, from multiple fields. Analysis by SCCS shows that **appropriately regulated CO₂-EOR could produce oil with lower carbon intensity than imported oil, with the co-benefit of developing CO₂ transport infrastructure and facilitating storage.**⁶

CCS in the EU

Initial EU capital funding mechanisms created to support the demonstration of commercial-scale CCS have delivered limited results through a combination of factors, including the recession, a lower than expected EU ETS price, an uncertain energy investment climate and a lack of Member State co-financing. These have combined to undermine the longer term business case for CCS in the absence of clarity on future carbon reduction targets.

However, CCS remains a cornerstone of EU emissions mitigation policy. Regions located around the North Sea are ideally placed to pioneer strategic cooperation on CCS and secure EU support, with many opportunities



The North Sea basin offers a CO₂ storage resource of strategic importance to Europe. Graphic: ARUP study, 2010

⁵ *Industrial CO₂ Source Clusters in Scotland*, www.sccs.org.uk/news/2013/IndustrialCO2SourceClustersInScotland.pdf

⁶ *Carbon accounting for CO₂ enhanced oil recovery in the North Sea*, presentation at All Energy 2013, www.all-energy.co.uk/_novadocuments/30261?v=635060237402400000

for low-cost, high-value projects – for example, on gas processing (St Fergus), ammonia production (Teesside) and, subsequently, refineries (Grangemouth). **Scotland would be ideally placed to capitalise on any such incentive measures.**

Current EU CCS policies

At present the EU has four mechanisms supporting CCS development:

- The *European Energy Programme for Recovery* (EPR) has awarded capital funding to six projects, two of which remain active: ROAD (Rotterdam) and Don Valley (Yorkshire). In 2013, the EC concluded that unspent funds could not be re-allocated to support CCS.
- The *New Entrants Reserve 300* (NER300): one project, White Rose (Yorkshire) has been submitted to the second funding round and is currently under assessment by the European Investment Bank.
- *Horizon 2020*: the first call for proposals under this research and innovation programme (launched in December 2013) includes CO₂ capture and storage from industrial facilities.
- The *Energy Infrastructure Package*: CO₂ transport is eligible for support as a Project of Common Interest. There were no CCS proposals in the first round. The second round is scheduled for 2015.

Future EU CCS activity and policy options

DG ENER is currently considering responses to the Q2 2013 consultation, *The future of Carbon Capture and Storage (CCS) in Europe*. In addition, CCS “will be featured” in the White Paper for the 2030 climate and energy policy framework, due for publication on 22 January, 2014.

The European Parliament implementation report, *Developing and applying carbon capture and storage technology in Europe* (2013/2079(INI)), suggests a number of EU policy options and measures to promote CCS, including:

- Considering the creation of an EU Industrial Innovation Investment Fund from hypothecated EU ETS revenues
- Seeking decarbonisation roadmaps from Member States, which clarify expected CCS contributions
- Exploring options for financial support derived from the production and import of fossil fuels through CCS Certificates
- Measures to promote the use of both renewables and CCS in the EU’s 2030 climate and energy framework
- Clarifying conditions for trans-boundary transfer of CO₂
- Revising the CO₂ storage directive to address concern over potentially excessive requirements relating to post-closure storage site management
- Establishing a 2030 milestone for EU tonnage of CO₂ stored
- Assessing the potential for CO₂-EOR

These suggestions support and echo many of the measures discussed in the DG ENER consultation and among Europe’s CCS stakeholders. We additionally highlight the following opportunities:

- For the EU to promote and support regional cooperation in the North Sea (building on the existing work of the North Sea Basin Task Force platform) and the Baltic region as strategic assets for the development of CCS, and to assist in the creation of Projects of Common Interest to develop these opportunities
- For the EC to examine how to develop a visible pathway of storage availability, which is sufficient to support the 20 to 40-year lifetime of commercial-scale facilities with CO₂ capture

SCCS welcomes the approach taken in the European Parliament report, and believes that a strong vote in favour will provide a positive indication to the EC and Member States that further efforts on CCS must be undertaken over the coming five years.

Further details

The recent SCCS report, *Unlocking North Sea CO₂ Storage for Europe*, is available for download from our website: www.sccs.org.uk/unlocking-north-sea

SCCS experts can provide additional advice and information. Please contact:

- Dr Vivian Scott, Policy Research Associate • +44 (0)131 650 7010 • vivian.scott@ed.ac.uk
- Chris Littlecott, Policy Research Associate • Chris.Littlecott@sccs.org.uk
- Professor R Stuart Haszeldine, OBE FRSE, Director • +44 (0)7791 035 320 • stuart.haszeldine@ed.ac.uk