



Briefing: Carbon capture and storage in Scotland

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Scottish Carbon Capture and Storage

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 deliver and benefit from carbon capture and storage (CCS). CCS has the potential to enable major Scottish emissions reductions towards the 2050 target – it can directly address over 50% of current total emissions from energy and industry.

1. Carbon capture and storage

- Carbon capture and storage (CCS) is a process in which CO₂ emitted from large point sources such as power plants, chemical works and industrial facilities is selectively captured, compressed, transported and injected into geological formations including depleted oil and gas fields or deep saline aquifers where it can be securely trapped for many hundreds of thousands of years.
- CCS is a critical technology for achieving decarbonisation of thermal power generation and industrial processes. The Intergovernmental Panel on Climate Change (IPCC) has 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 suggests that CCS should account for 14% of the global emissions reductions by 2050². The EU Energy roadmap 2050 suggests CCS contributing 19-24% of total EU emissions reductions³.
- Commercial scale CCS is deliverable using current technologies: projects on natural gas-processing facilities have been operating since 1996 in Norway and the US while projects on industrial facilities are in operation in the US and China. CCS on power plant is ready to operate on Boundary Dam coal plant (Canada) and to be built at the Texas Clean Energy Project (USA).
- CCS is behind schedule in the EU. Actions to deliver multiple operational projects before 2020 are essential to meeting de-carbonisation targets.
- Industrial processes that produce high concentration CO₂ emissions offer ‘low-hanging fruit’ opportunities to deploy CCS cheaply and rapidly and to develop strategic CO₂ transport and storage infrastructure.

2. CCS in Scotland

- The Scottish North Sea has extensive opportunities for CO₂ storage – in depleted oil and gas fields, and large saline aquifer formations with an estimated total capacity of ~ 50,000 million tonnes of CO₂⁴. This is the largest and best-qualified CO₂ storage resource in the

¹ IPCC AR5 2013 summary for policymakers http://www.climatechange2013.org/images/uploads/WGIAR5-SPM_Approved27Sep2013.pdf

² IEA technology roadmap – Carbon Capture and Storage

<http://www.iea.org/publications/freepublications/publication/TechnologyRoadmapCarbonCaptureandStorage.pdf>

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

⁴ Opportunities for CO₂ storage around Scotland - <http://www.scotland.gov.uk/Publications/2009/04/28114540/0>

EU with capacity for more than 50 years of current annual EU point source CO₂ emissions. This CO₂ storage has the potential to become a major industry worth many hundreds of millions of pounds per year to 2050 and beyond.

- Scotland currently hosts two proposed CCS power plant demonstration projects:
 - Peterhead (SSE, Shell): CCS retrofit on gas power plant, shortlisted for UK CCS commercialisation programme.
 - Captain Clean Energy Project (Summit Power, CO₂Deepstore): new build CCS coal power plant sited in Grangemouth, reserve project for UK CCS commercialisation programme.
 - Additionally – proposed projects in Teeside, and Yorkshire (Don Valley power project) plan to utilise CO₂ storage in the Scottish North Sea.
- Scotland's point sources of CO₂ emissions (both power plant and industry) are primarily clustered around the Forth and St Fergus. Analysis by SCCS⁵ shows that over 70% of Scottish CO₂ emission point sources (16 million tonnes of CO₂ per year) are located within 10km of the existing Feeder 10 gas pipeline. This pipeline is available for CO₂ transport and has been fully assessed for this purpose as part of the Longannet CCS project (cancelled by UK Government in 2011).
- CCS offers the potential to preserve major industrial sectors in emission-constrained policy frameworks – over 4,000 skilled jobs are associated with existing sites with high potential for CCS application. Scotland is ideally positioned to offer industry straightforward and timely connection to a CO₂ transport and storage network.
- CO₂ enhanced oil recovery (CO₂-EOR) offers the opportunity to extend the life of North Sea oil production and associated revenue from multiple fields. Analysis by SCCS shows that appropriately regulated CO₂-EOR can produce oil with lower carbon intensity than imported oil, with the co-benefit of developing CO₂ transport infrastructure and facilitating subsequent CO₂ storage⁶.

3. Actions to promote CCS in and for Scotland

The initial EU capital funding mechanisms created to support demonstration of commercial scale CCS have delivered little result through a combination of factors including the recession, lower than expected EU ETS price, uncertain energy investment climate and lack of Member State co-financing. These have all 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: it is expected that any new policy framework for the period to 2030 will explicitly consider CCS. The European Commission has recently consulted on a range of mechanisms to support and, where necessary, oblige CCS. Similarly the European Parliament is currently preparing its own proposals on CCS. Current options under consideration include proposals for significant CCS project co-funding and the creation of a CCS certificate system to finance CCS on industrial emitters as well as the power sector.

⁵ Industrial CO₂ source clusters in Scotland
<http://www.sccs.org.uk/news/2013/IndustrialCO2SourceClustersInScotland.pdf>

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

Regions around the North Sea are ideally placed to pioneer strategic cooperation on establishing CCS and secure EU support, with many opportunities for low-cost, high-value CCS projects - for example on gas processing (St Fergus), Ammonia (Teesside) and subsequently refineries (Grangemouth). Scotland would be ideally placed to capitalise on any such incentive measures.

In the light of this, SCCS made the following recommendations to the recent National Planning Framework 3 consultation:

Recommendation 1: The Peterhead and Grangemouth CCS projects should be designated as National Developments irrespective of progress with the UK's CCS Commercialisation Programme.

Recommendation 2: The CO₂ pipeline route from Grangemouth to St Fergus should be explicitly identified as a National Development in its own right, in support of the CCS projects at Peterhead and Grangemouth and the wider acceleration of CCS deployment across Scotland.

Recommendation 3: Explicit attention should be given to the opportunities for investment in CO₂ transportation via both shipping and pipelines in the St Fergus-Peterhead area, and for early action to develop a CO₂ capture cluster in support of storage characterisation efforts.

Recommendation 4: The Forth region should be designated as a National Development zone for CO₂ capture from industry and power generation.

Recommendation 5: The potential use of Feeder 8 for CO₂ transportation within the Forth region (and beyond into Northern England) should be identified in the Major Issues report, with a view to being accelerated to National Development status in the next NPF process.

Recommendation 6: Cockenzie and Longannet should maintain their National Development status as part of a strategy of accelerating deployment of CCS in support of a decarbonised power sector. Any permitting or development of new thermal power generation capacity at either location should be accompanied by specific actions to deploy CCS, ideally from the outset.

Recommendation 7: The development of offshore CO₂ infrastructure and storage locations should be identified as a key enabler of CCS deployment in NPF3, supporting current proposals for onshore investment in key hub locations such as St Fergus and Peterhead.

Recommendation 8: The SPP should explicitly incorporate consideration of CCS as a key enabler of the low-carbon economy, for both industry and power generation. Specific planning principles should be identified that advance the identification and deployment of CO₂ infrastructure in line with the intent of NPF3.

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