

Oil & Gas diversification opportunities:

Carbon Capture & Storage



Carbon capture and storage (CCS) is a nascent technology with the potential to play a major role in reducing greenhouse gas emissions from power generation and carbon-intensive industries. There are currently sizable economic and legislative barriers to the large-scale deployment of CCS in the UK and Europe, however, the technology is viewed by many independent forecasters as being essential to meeting the Paris Climate Change Agreement. The Scottish oil and gas supply chain has a broad range of capabilities that could be applied within the CCS market.

Key Facts:

- Scotland has an extremely large CO₂ storage resource, estimated to be greater than the Netherlands, Denmark and Germany combined. Scotland's North Sea saline aquifers are estimated to have CO₂ storage potential equivalent to at least 200 years of Scotland's industrial output.
- Scotland's depleted North Sea oil and gas fields have been identified as potential sites for early CCS deployment.
- The UK Energy Technologies Institute (ETI) has estimated that it would be twice as expensive to achieve the UK's 2050 emissions target without CCS deployment.
- The ETI has calculated that it would cost £21bn - £31bn to deploy 10GW of CCS capacity in the UK by 2030.
- The International Energy Agency (IEA) describes CCS as being an 'essential technology' for achieving the 2°C warming limit set by the Paris Agreement.
- Under the IEA's 2°C warming scenario, CCS deployment could achieve a 12% reduction in CO₂ emissions by 2050 at an investment cost of £1.7 trillion in the power sector and several hundred billion in industry and other sectors.

UK Opportunities

Scotland's 50+ year history of oil and gas exploration and production has created much of the infrastructure and supply chain necessary to support the emergence of CCS in the UK. Scottish industry and academia have also built considerable expertise in CCS through participation in a wide range of studies and R&D projects, including detailed front end engineering & design for projects at Longannet and Peterhead. While the Longannet and Peterhead projects did not proceed, industrial research and feasibility work is ongoing for a proposed CCS equipped power station at Grangemouth. There are not understood to be any major technical barriers to the deployment of CCS in the UK, but the absence of strong policy and legislative drivers, and market support mechanisms akin to those afforded to renewable energy, makes it difficult to forecast the market for CCS in the UK.

International Opportunities

CCS deployment outside of the UK has also fallen short of initial expectations as governments have struggled to provide the necessary policy support and financial certainty to enable the adoption of the capital-intensive technology. Nevertheless, there are presently fifteen large-scale CCS projects in operation around the world and a further six projects under construction. The US is the leading market for CCS with seven operating projects, three in construction and two in scoping. Canada is the next largest market with three operational projects and two under construction. Norway, Brazil, Saudi Arabia, the UAE and Australia also have projects in operation or under construction. China has a pipeline of eight CCS projects at various stages of development and may emerge as an important market towards the end of the decade due to comparatively strong policy support and a heavy dependency on coal-fired power generation.

CCS Stage	Skills & Expertise Required
Capture	Gas Processing; Engineering Design; Construction; Operations & Maintenance; Hydrogen Generation from Steam Methane Reforming; Amine Technologies; and Membrane Technologies.
Transport	Pipeline (onshore and offshore); International Shipping; Road; Rail; Engineering Design; Construction; and Operations & Maintenance.
Storage	Enhanced Oil Recovery; Exploration; Appraisal; Environmental Impact Assessment; Construction; Operations & Maintenance; Monitoring, Measurement & Verification; Decommissioning; and Post-closure monitoring.

Market Entry

Policy and legislation are the principal factors that will determine the deployment of CCS as a climate change mitigation solution. The vast majority of the world's active CCS projects make use of the captured CO₂ for enhanced oil recovery, as despite the existence of several national and transnational carbon tax regimes, it is currently cheaper to emit CO₂ than install CCS. However, the recently ratified Paris Agreement may prompt governments to set up the necessary incentive frameworks to drive CCS deployment in the 2020s and beyond. Scottish oil and gas companies with an interest in CCS may wish to consider:

- Monitoring the evolution of CCS legislation and policy in the markets in which they operate;
- Joining CCS industry bodies and attending relevant conferences and events; and
- Becoming involved in CCS studies, R&D projects or demonstration projects in order to build their expertise in this sector.

Further Information & Support

Scottish Enterprise provides a range of information and support for oil and gas companies considering diversification opportunities. Further information is available from:

www.scottish-enterprise.com/industry-support/oil-and-gas

Additional information on CCS opportunities is available from:

- Scottish Carbon Capture & Storage:
www.sccs.org.uk
- Carbon Capture & Storage Association:
www.ccsassociation.org
- Global CCS Institute:
www.globalccsinstitute.com