

Digging deep for carbon reduction

A new, comprehensive 'how-to' guide will help power plant operators successfully plan and manage carbon storage in saline rock formations deep beneath the UK coastline.



The need

The UK energy and heavy industries will need to implement commercial carbon capture and storage (CCS) to achieve UK emission reduction targets by 2020. Over 90% of the UK's capacity for geological CO₂ storage lies in deep offshore underground rock formations (saline aquifers). Commercial CCS technologies are fast emerging. However, methodologies for transporting and storing CO₂ – steps two and three in the supply chain – are not yet fully developed. A low-risk approach to this is needed to ensure public confidence and commercial success.

The results

The CO₂ Aquifer Storage Site and Evaluation Monitoring (CASSEM) project has developed workflows and methodologies for power plant operators to identify CO₂ stores in saline aquifers. It provides advice not only on the technology of successfully utilising CO₂ storage, but also on the public perceptions, financial modelling and risks involved. The project has resulted in a commercial 'best-practice' guide for CCS newcomers that takes them through complex project design, from specification, routing and operational criteria for pipeline transport to the screening and appraisal of storage options.

Managed by the Technology Strategy Board, and funded by the Engineering and Physical Sciences Research Council (EPSRC), the CASSEM project was led by ScottishPower in partnership with four industrial companies and four research institutes. CASSEM uses two near-shore example UK storage sites with contrasting geological complexity. Both are situated within 100 km of coal-fired power plants to model the full CCS value chain. CASSEM establishes a robust methodology and costing model from CO₂ capture and injection into the well, to monitoring and looking after of the site, and communicating with stakeholders.

The model quantifies uncertainty at each stage and allows CCS processes and procedures to be tailored. This enables risk mitigation to be identified and costed, an essential factor to ensure a viable business model and investor confidence. The workflows developed within CASSEM

incorporate decision points that allow continuation, deferment or acquisition of new data. Uniquely, a workflow is incorporated that engages with the local population, recognising that possible public opinion can delay CCS projects or even stop them all together.



ScottishPower's Longannet Power Station on the Firth of Forth



Focus groups enabled understanding of public concerns

'Guidance and reports from CASSEM are now core competency documents for AMEC's activities in carbon capture and storage'

**ALASTAIR RENNIE,
PROJECT DIRECTOR, AMEC PLC**

Next steps

The current results are being published and two follow-on projects are planned. CASSEM II will appraise an actual commercial offshore UK saline aquifer and CASSEM III will obtain the necessary licences to drill, inject and monitor the stored CO₂. New laboratory analyses have already enabled critical unknowns to be quantified and multiple scenarios have been investigated to produce robust conclusions that are informing future CO₂ storage rock tests and modelling. In addition, the CASSEM partners are further developing their know-how and in-house expertise in understanding and communicating CCS across businesses.



The UK's first slipstream capture plant on an operational coal-fired plant has been operating at Longannet, Scotland

Project no. Q3059F

Project partners

ScottishPower Ltd
SSE
AMEC Group Limited
Schlumberger Oil UK plc
Marathon Oil UK Limited
Scottish Carbon Capture & Storage (University of Edinburgh, Heriot-Watt University and the British Geological Survey)
Tyndall Centre for Climate Change Research (University of Manchester)

Public investment (EPSRC)

£1.7 million

Total project investment

£2.3 million

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Technology Strategy Board Driving Innovation

Collaborative research and development projects are one of the tools that the Technology Strategy Board uses to drive innovation in the UK. The Technology Strategy Board is a business-led executive non-departmental public

body, established by the Government. Its role is to promote and support research into, and development and exploitation of, technology and innovation for the benefit of UK business, in order to increase economic growth and improve the quality of life. It is sponsored by the Department for Business, Innovation and Skills (BIS).

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