

Carbon capture, usage and storage (CCUS)

COSTAIN

Meeting the decarbonisation challenge with technical and economic evaluations, conceptual and front-end design, innovative technology and project delivery.

Challenges

The Paris Climate Change Agreement established global consensus on the need to reduce carbon emissions. In the UK, the Climate Change Act 2008 provides a legislative target of an 80% reduction in carbon emissions by 2050, compared to 1990 levels. Between 1990 and 2016, carbon emissions reduced by 42% while GDP rose by 67%. Changes in electricity generation, a decline in energy-intensive manufacturing and energy efficiency improvements contributed to this reduction, but much more needs to be done to meet the 2050 target. CCUS is expected to play a critical role in this, particularly for decarbonisation of the industrial sector, and enabling the use of hydrogen to decarbonise the gas network. To meet this need, CCUS needs to be commercially viable and operate on a large scale, supported by innovative technology, plant integration, and appropriate policy and regulation.



High plant reliability and availability with minimal environmental emissions realised using best available technologies.

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Grant has over 20 years' experience in the delivery of projects in international gas processing and cryogenics.

Our approach

Costain has a wealth of experience in the design of systems for CO₂ production, including recovery, purification, compression, dehydration, liquefaction and underground gas storage. We have worked on a wide range of carbon capture projects, for both CCS and utilisation.

We engage with the industry to seek out projects with the opportunity to strengthen the UK's position in CCUS. Our ability to evaluate project requirements and provide robust cost estimates enables our clients to select solutions that are viable both technically and financially.

Our technology offering includes patented processes for CO₂ removal from oxyfuel flue gas and synthesis gas, low temperature fractionation technology for processing carbon dioxide rich gas to produce high purity liquid CO₂ and processing of recovered CO₂ for enhanced oil recovery.

Recent carbon capture projects include:

- Delivery of conceptual design and economic assessments to support the business case for a UK carbon capture and utilisation study,
- Assessment of CO₂ capture, transportation and sequestration needs to identify strategically important offshore storage sites in the UK continental shelf,
- Design and project management of carbon capture demonstration projects in Abu Dhabi for enhanced oil recovery.

Our services

- Specialist capability in project evaluation, conceptual and front end design and project execution.
- Process design and optimisation techniques for innovative, energy efficient and reliable plant designs.
- Suite of patents for semi-permeable membranes, low temperature distillation and cryogenic gas processing.

Benefits:

- Innovative technology solutions which minimise machinery costs, reducing power consumption, transport costs and overall project cost.
- Experienced front end solutions specialists and full multidisciplinary engineering capability with extensive knowledge over a wide range of industry sectors.
- Outstanding record of proven project execution and completion.

Example project experience

IEA GHG, UK – CO₂ recovery in baseload LNG plants

Techno-economic evaluation and cost assessment of CO₂ capture technologies for treatment of flue gases from gas turbine exhausts for LNG baseload plants.

Solution

Feasibility studies and technical evaluation of alternative CO₂ capture technologies including assessment of the effects of key aspects influencing liquefaction plant efficiency and fuel gas consumption.

Outcome

- CO₂ capture using proven chemical absorption technology, designed to minimise process complexity and risk of disruptions to LNG production.
- Demonstrated achievable cost savings on process heating through use of waste heat recovery.

National Grid, UK – Longannet carbon capture and storage project

Conversion of a 36-inch 230km natural gas pipeline for transport of dense phase CO₂ following compression at St. Fergus.

Solution

Feasibility studies, front end engineering design, detailed design and construction management.

Outcome

- Design incorporates CO₂ capture from flue gases, CO₂ compression and transportation via new 17km pipeline and existing onshore and offshore pipelines.
- Engagement with key stakeholders and the UK and Scottish governments for agreement on legislation and planning permissions for change of use of existing pipeline.

Masdar Clean Energy, UAE – ESI carbon capture and storage project

Design of 0.8 million tonnes per annum carbon capture facility (CCF) and delivery of dense phase CO₂ for use in enhanced oil recovery.

Solution

Delivery of technical and engineering assessments, detailed engineering design, procurement, construction and project management, for the UAE's first carbon capture and storage project.

Outcome

- Design of 45km 8-inch pipeline and associated facilities to deliver captured CO₂ for utilisation.
- CCF design encompasses CO₂ compression, dehydration and metering, cold vent relief, control systems and relevant infrastructure.

Energy Technologies Institute – Strategic UK CO₂ storage appraisal project

Selection of strategic portfolio of offshore CO₂ storage sites and full field development plans for wells, offshore hosts, transport, lifetime economics and long term monitoring.

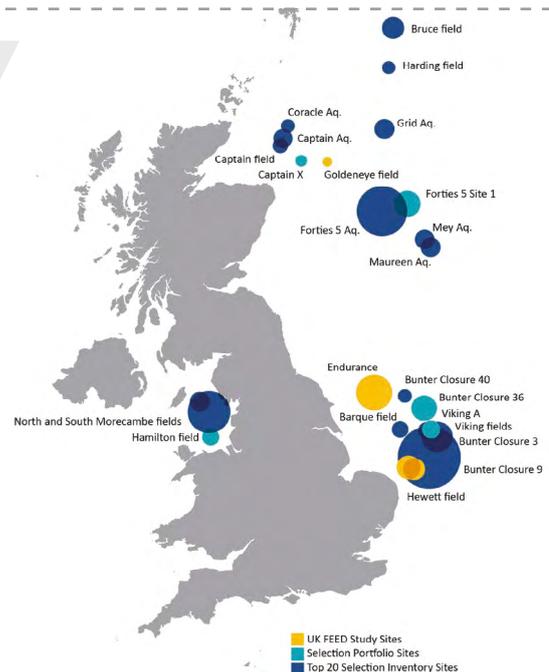
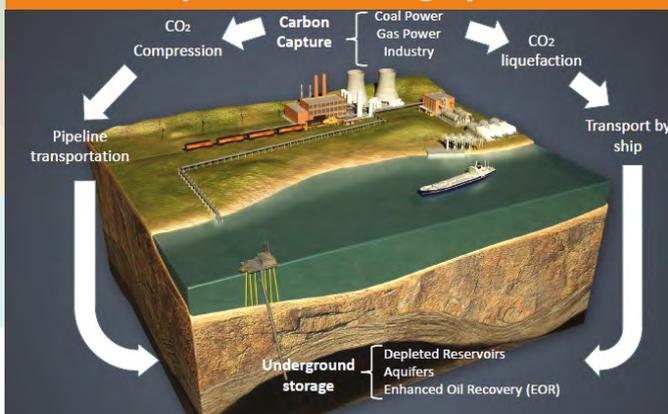
Solution

Full development appraisal, planning and delivery, through collaboration with project partners.

Outcome

- Discovery of large strategic CO₂ storage capacity potential from 20 specific CO₂ storage sites.
- estimated at about 78,000 million tonnes.
- Full life cycle costs and economic forecasts on field development for the five best storage sites.

Carbon capture and storage process



Note: areas of the circles are indicative of CO₂ storage resource potential.