



SCOTTISHPOWER

Retrofitting commercial scale carbon capture at Longannet Power Station

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Iberdrola Group and ScottishPower



ScottishPower is part of Iberdrola, a world leader in energy

Combined April 2007 to form one of the largest global energy companies

Operates in over 40 countries

Serves 30 million customers

43GW of installed capacity and a world leading 10 GW of renewables

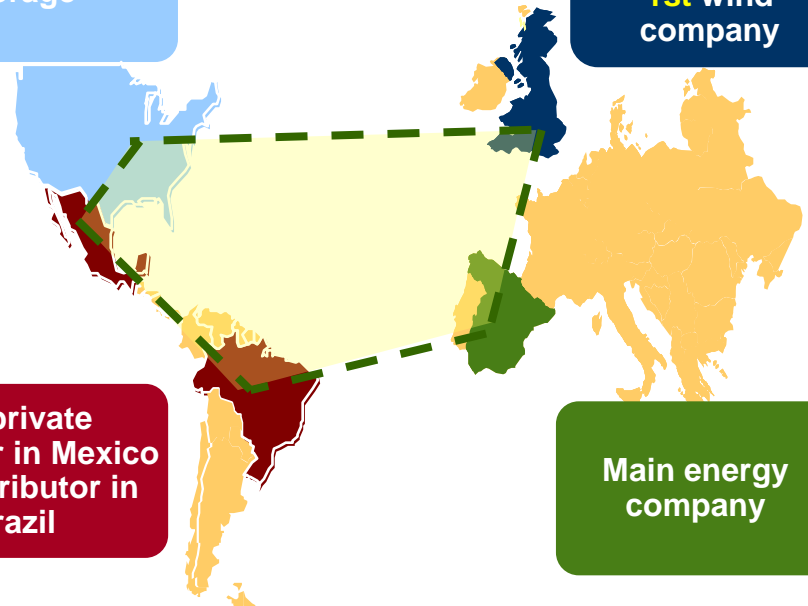
Over 5 million customers and 6GW of generation capacity across the UK

2nd wind company
3rd player in gas storage

One of the **six** largest generator / retailers
1st wind company

1st private producer in Mexico
1st distributor in Brazil

Main energy company



...with a clear focus on clean, sustainable energy provision

ScottishPower Overview



ScottishPower is one of the “Big 6” energy suppliers in the UK

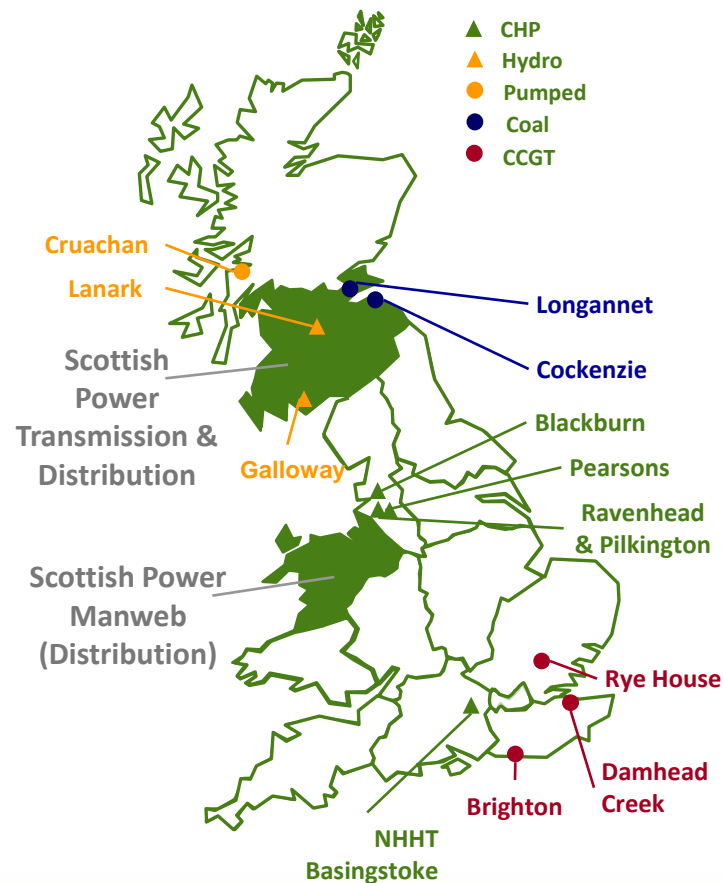
We supply 5.2 million customers

Over 8,000 employees

6GW of coal, gas & hydro generation across the UK

Distribution area of over 35,000 square kilometres

SP Renewables largest onshore wind operator in UK (800 MW)



Vertically integrated and geographically diverse energy business

Investing in an emerging industry



Collaborative Research

- CASSEM Aquifer Storage
- CO₂ Storage Study for Scotland
- World's first CCS Professorship
- OxyCoal/CO₂ in coal
- SOLVit
- ScottishPower Academic Alliance



EU CCS Demonstration

- Unsuccessful in application for €180m grant funding in EEPR
- Potential follow-on funding from EU ETS New Entrant Reserve



Mobile Test Unit

- ScottishPower and Aker Clean Carbon are deploying the Mobile Test Unit at Longannet
- An ongoing test programme focussed on capture chemistry



UK CCS Competition

- Competition to develop the UK's first commercial scale full chain CCS demo
- ScottishPower CCS Consortium is one of the final two bidders engaged in the competition process

Focus is on reducing the cost of capture and developing storage options

The ScottishPower CCS Consortium Demonstration Project



The ScottishPower Carbon Capture and Storage Consortium Project



A viable scheme capable of delivery by 2014

The ScottishPower CCS Consortium

A consortium of world leaders

Consortium Partners



- Part of the World's 4th largest energy group
- Strategic focus on sustainable energy provision
- Committed to making the UK a Global Centre of Excellence for CCS

nationalgrid

- Owns Britain's high pressure natural gas transmission system
- Designs, builds and operates gas pipelines



- Global group of energy and petrochemical companies
- Handling of gas and liquids above and below the surface
- Well placed to help deliver CCS

Working with



- Part of the Aker group with a presence in over 30 countries
- Over 16 years experience in CO₂ capture
- Contractor for design and construction of Sleipner



- Global knowledge business with operations in more than 50 countries
- Committed to delivering innovation
- Knowledge management and transfer at its core

Committed to understanding requirements for commercial scale CCS

Longannet Power Station - Overview



Second largest coal fired power station in UK – third largest in Europe

Located in the Firth of Forth - operational in 1970

2,400MW capacity – capable of powering over 2 million homes

Supplied from local and international coal resources

Opted into the LCPD in 2006

Progressing life extension options



Ideally situated for CCS CO₂ storage – close proximity to North Sea

Longannet Pathway to Clean Coal

Focussed on providing secure and sustainable energy

- Clear focus on sustainable energy provision
- World leader in Renewables
- Investing to meet emerging generation gap
- Balanced portfolio approach
- Strategy based on security, sustainability and affordability

Increasing efficiency and environmental performance



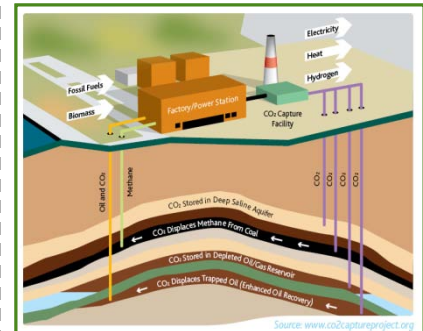
- 4 x 576MW coal units
- Ongoing efficiency improvements



- Reducing SO₂ emissions
- Flue gas desulphurisation



- Reducing NO_x emissions
- Life extension



- Reducing CO₂ emissions
- Carbon Capture and Storage

Energy security relies on a balanced portfolio of generating types

Challenges of CCS implementation

Significant challenges for what could a world first



*Mobile Test Unit,
Longannet Power
Station*

Flexible capture plant required to connect to a commercial station

Reducing the energy requirement and driving down costs

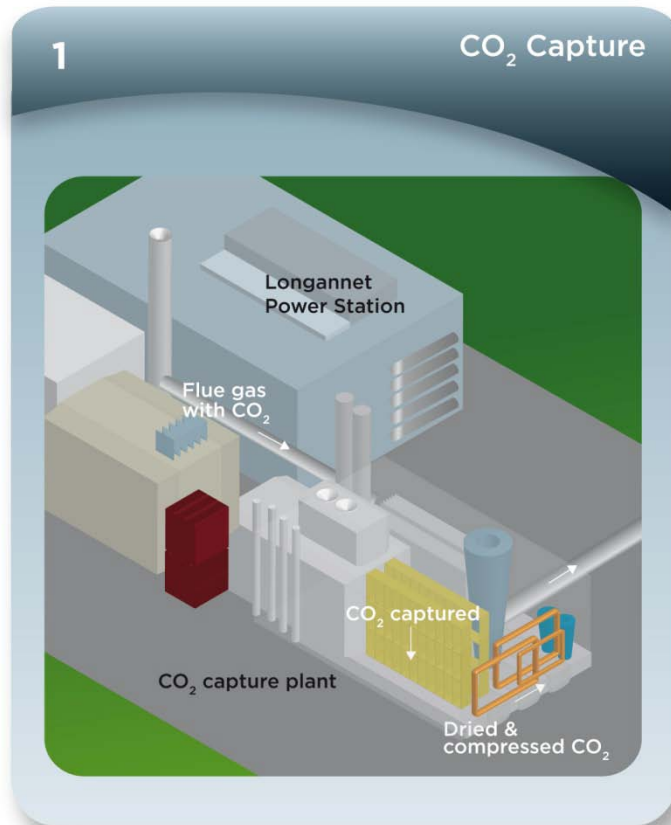
Mobile Test Unit at Longannet to prove the capture process

Integrating the capture plant with the rest of the CCS chain

Must tie-in with developing commercial & regulatory landscape

ScottishPower is taking the necessary steps to understand these

Taking the lead to make real progress towards delivery

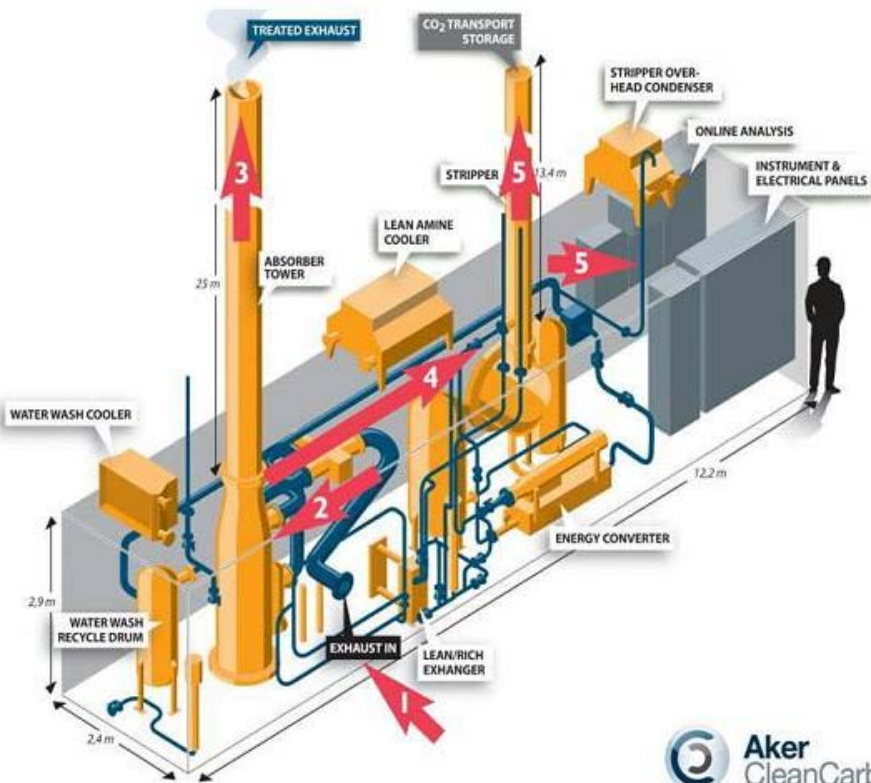


2007	Scheme concept developed
Spring 2009	ScottishPower joins SOLVit programme
Spring 2009	MTU arrival at Longannet
Summer 2009	Consortium formed with Shell & National Grid
Summer 2009	Stuart Haszeldine confirmed as ScottishPower CCS Professor
Spring 2010	UK Government awards SP CCS Consortium FEED contract
Autumn 2010	ScottishPower Academic Alliance commences

On track to be operational in 2014

The Mobile Test Unit

Bringing CCS out of the lab and into reality



Part of the SOLVit programme, to improve capture solvent performance

A cutting edge carbon capture research facility testing the CO₂ capture process

Small-scale replica of a commercial capture plant; first time fit to coal power station

Tests the complex chemistry in capturing CO₂ from coal fired power stations

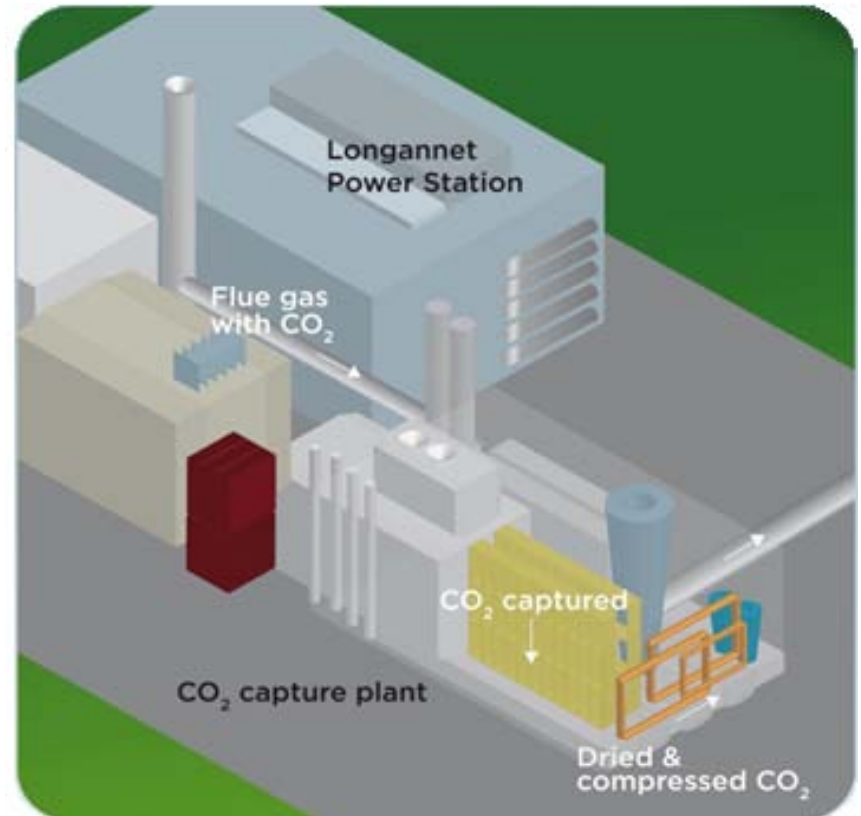
Ongoing programme with over 4000 hours of CO₂ capture to date

Essential step to achieving capture plant operating cost certainty

An essential step towards commercialisation of CCS

Summary

- ✓ Technical challenges of applying CCS at Longannet are becoming clearer
- ✓ Ongoing collaboration across CCS chain
- ✓ Actively engaging in UK CCS Demo competition
- ✓ We believe retrofitting CCS at Longannet is both feasible and desirable





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