David Fitzgerald, Doosan Babcock

Carbon Capture and Storage

What Role for R&D in Delivering Cost-Competitive CCS Projects in the UK in the 2020s

London, 15 October 2015

Strength in numbers

Doosan Group

A world leading ISB company

Turnover in 2014

US$ 17.8 billion

Employees

41,400

Global reach

38 countries

Doosan Heavy Industries & Construction

A global leader in power and water

Turnover in 2014

US$ 6.5 billion

Employees

8,388

Doosan Babcock

A pioneering technology and service provider in thermal power, nuclear, oil and gas, petrochemical and process sectors.

Doosan Lentjes

A global power in CFB combustion, waste-to-energy and air pollution control technology.

Doosan Škoda Power

A world leader in turbine technology and manufacture.

Doosan Babcock, Doosan Lentjes, and Doosan Škoda Power:

£780 million

combined turnover in 2014

6,000

employees worldwide

Doosan CO_2 Technology R&D Highlights

OxyCoal: Emissions Reduction Test Facility: 2008

OxyCoal: Clean Combustion Test Facility: 2010

PCC: Emissions Reduction Test Facility: 2010

OxyCoal Burner Trial: Vattenfall Oxyfuel Pilot Plant, Schwarze Pumpe : 2011

PCC: CCPilot100+, Ferrybridge Power Station: 2013

Current Doosan Babcock CCS R&D Projects

- **Reliable and Efficient Combustion of Oxygen/Coal/Recycled Flue Gas Mixtures (RELCOM): EU FP7**
  - CIUDEN 20MW$_t$ test programme
  - Furnace and boiler performance modelling

- **Optimisation of CO_2 Capture Technology Allowing Verification and Implementation at Utility Scale (OCTAVIUS): EU FP7**
  - On-line solvent and emissions analysis

- **Low-Energy Solvents for Carbon Dioxide Capture Enabled by a Combination of Enzymes and Vacuum Regeneration: US DOE**
  - Techno-economic assessment
  - Environmental, Health and Safety Risk Assessment

CCS R&D Priorities – Doosan Babcock View

- **CAPEX Reduction**
  - Repeat projects – benefits of experience
  - Reduced plant size – improved processes
  - Materials of construction
  - Alternative ASU designs
- **OPEX Reduction**
  - Reduced PCC solvent regeneration energy
  - Increased PCC solvent life
  - Reduced PCC solvent inventory
  - Alternative ASU designs
- **Industrial CCS**
  - Optimum capture technology
- **CO_2 Capture Clusters**
  - Logistics
  - Business models
- **On-Line Analysis**
  - Process control
  - Compliance monitoring
- **Phases 1, 2 and 3 CCS Deployment**
  - Supporting R&D
- **Waste Stream Minimisation and Water Use**