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
**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.

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**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 Burner Trial: Vattenfall Oxyfuel Pilot Plant, Schwarze Pumpe: 2011
- OxyCoal: Clean Combustion Test Facility: 2010
- PCC: Emissions Reduction Test Facility: 2010
- PCC: CC Pilot 100+, 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$_1$ 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

- CO₂ 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