

COAL BASED OXY-COMBUSTION for CARBON CAPTURE and STORAGE: *status, prospects, research needs and roadmap to commercialisation*

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Abstract

Conventional pf coal-fired boilers use air for combustion in which the nitrogen from the air dilutes the CO₂ concentration in the flue gas. During oxy-combustion, a combination of oxygen (typically of greater than 95% purity) and recycled flue gas is used for combustion of the fuel. A flue gas with a concentration of CO₂ ready for sequestration is generated, with the recycled flue gas used to control flame temperature and make up some of the missing N₂ to ensure there is enough gas to carry the heat through the boiler.

As one of the three major carbon capture and storage (CCS) technologies, oxy-fuel technology is currently undergoing rapid development with a number of demonstration projects commencing in the development towards commercialization.

The presentation provides a comprehensive overview of current and projected pilot plants and demonstration projects being progressed in the US, EU, Asia and Australia. Current research on coal combustibility, furnace heat transfer, and emissions is also detailed, with an emphasis on the difference between air-firing and oxy-fuel.

Aspects of a roadmap for the future deployment of oxy-fuel CCS technology for commercialization are provided, together with details of emerging regulations in for CCS which influence the required CO₂ gas quality from oxy-fuel.

Bio

Terry Wall is Professor of Engineering at the University of Newcastle, Australia. He has contributed in most technical areas related to coal combustion, including flame aerodynamics, coal ignition and burnout, ash formation, collection and deposition, pollution control and fuel characterisation and, recently, novel research developing technologies for CO₂ capture involving IGCC and oxyfuel technology. He has published more than 200 papers in international journals and supervised more than 50 PhD students.

Terry is a member of the editorial board of the international journals - *Combustion Science and Technology* as well as *FUEL* and the *IFRF ONLINE COMBUSTION JOURNAL*. He has been guest editor of special editions in *FUEL* on gas cleaning and *Fuel Processing Technology* on coal quality impacts in power generation. The June 2005 edition of *FUEL* was dedicated to Professor Terry Wall. He presented an invited plenary lecture at the 31st International Symposium on Combustion in Heidelberg on Combustion and Carbon Capture, currently is heavily involved in oxy-fuel research and heads up the Asia-Pacific Partnership Oxy-fuel Working Group.

Terry has been awarded the ESSO Award for excellence in Chemical Engineering, the Bryers Award of the Engineering Foundation, the John Chipman Award of the Iron and Steel Society (US) and the Pitt Award for Innovation in Coal Conversion of the University of Pittsburgh. He was also awarded Membership (AM) of the Order of Australia for 'service to the coal industry as a researcher in the coal sciences, particularly in the technical areas related to combustion, and to education' and is a Fellow of the Australian Academy of Technological Sciences and Engineering.

Professor Wall has spent periods at Imperial College, the Marchwood Laboratories of the Central Electricity Generating Board, at MIT (as a Fulbright Scholar), and the International Flame Research Foundation (IFRF) in Holland, at the SANDIA Laboratories of the Department of Energy in Livermore, California and at the University of North Dakota.

