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# Oxy Fuelling Approach

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# Oxyfuel Firing - Introduction

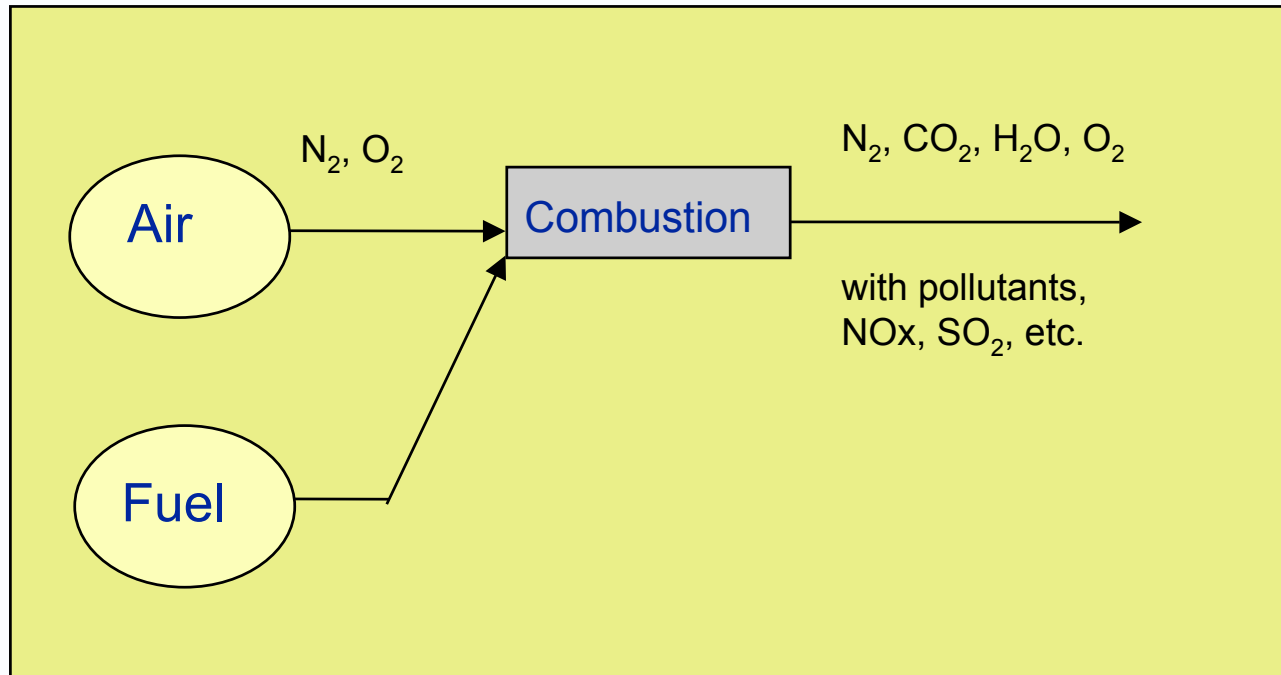
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- The combustion of fuel in an oxygen rich atmosphere, and/or where the Nitrogen in the air is replaced with CO<sub>2</sub>
- Typical CO<sub>2</sub> concentration with conventional 'air' firing
  - Gas 4%
  - Oil 8%
  - Coal 14%
- Achievable CO<sub>2</sub> concentration with Oxyfuel 90+%

# Introduction (2)

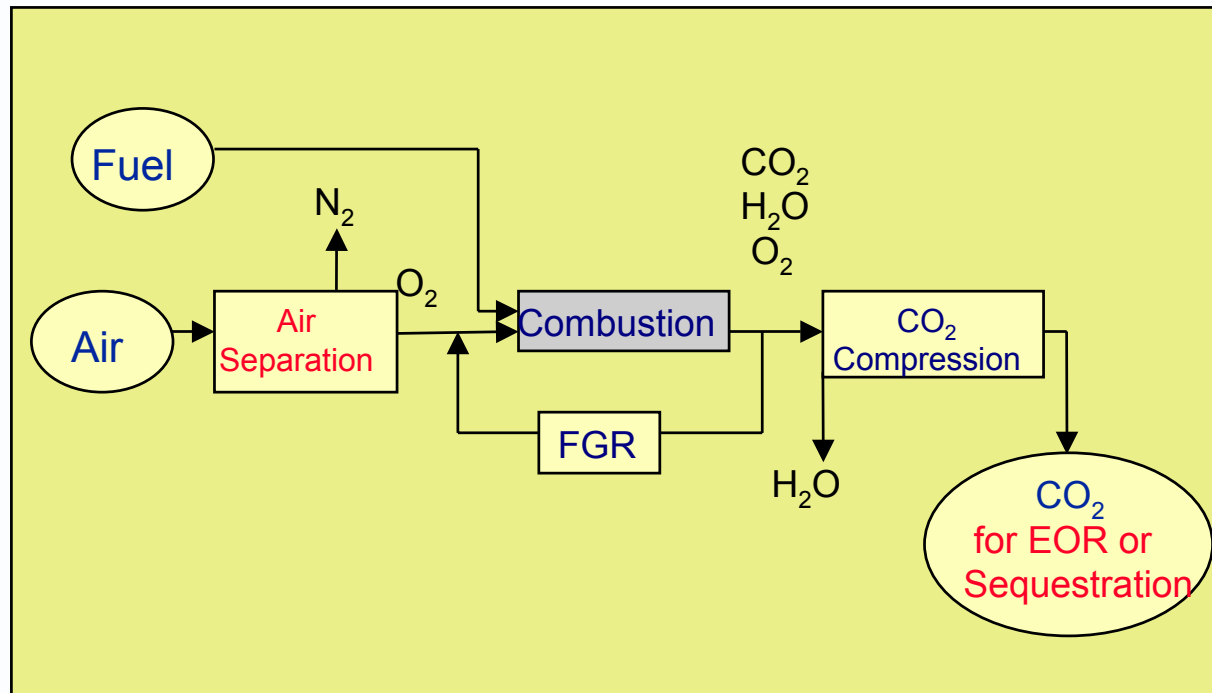
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- Conventional air firing



# Introduction (3)

- Oxyfuel firing



Flue gas composition CO<sub>2</sub> and H<sub>2</sub>O

# Introduction (4)

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- Oxyfuel firing provides an alternative to
  - Pre-combustion IGCC
  - Post combustion alternatives of chemical absorption, physical adsorption, membrane separation and cryogenic separation, and future 'novel' technologies
- Produces a pure (or nearly pure) stream of CO<sub>2</sub> for storage/sequestration
- Can be applied as retrofit or for new-build

# Oxyfuel firing Issues

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- Boiler performance
- Air entrainment
- CO<sub>2</sub> Quality
- Auxiliary Plant power (ASU)
- CO<sub>2</sub> and pollutant removal

however...

- Oxyfuel fuel firing is a viable concept, with pilot plant test work already being completed in Canada and the UK, but requires demonstration

# Operational & Practical issues

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- In retrofit application, boiler plant performance has to match pre-conversion performance
  - O<sub>2</sub> concentration ~ 25-30% to burner (i.e.  $\frac{2}{3}$ rds recycle gas rate)
- For new build O<sub>2</sub> level could be higher
- Boiler leakage (ambient air ingress) issues will dilute CO<sub>2</sub> concentration and increase duty on the CO<sub>2</sub> separation plant
- CO<sub>2</sub> quality according to sequestration/design of boiler plant

## Operational & Practical issues (2)

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- Additional auxiliary plant power consumption, for the ASU and compression plant, could be ~30% of the unit output. This issue in particular is a major challenge.
- CO<sub>2</sub> and pollutant removal – requirements depend upon the method of sequestration, however for aquifers, all pollutants could be sequestered with the CO<sub>2</sub>, with savings on FGD plant

# Progress in US

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- The BP Carbon Capture project is one of many initiatives being supported by the DOE. This is a \$10m project (over 3 years).
- \$2bn DOE spending over 10 years - Clean Coal Power Initiative, to demonstrate emerging technologies. Precursor to Vision 21. For CO<sub>2</sub> capture it aims to have in 2004 an integrated 100MWe Power/sequestration project underway, and a portfolio of commercially ready technologies ready for 2012 assessment.

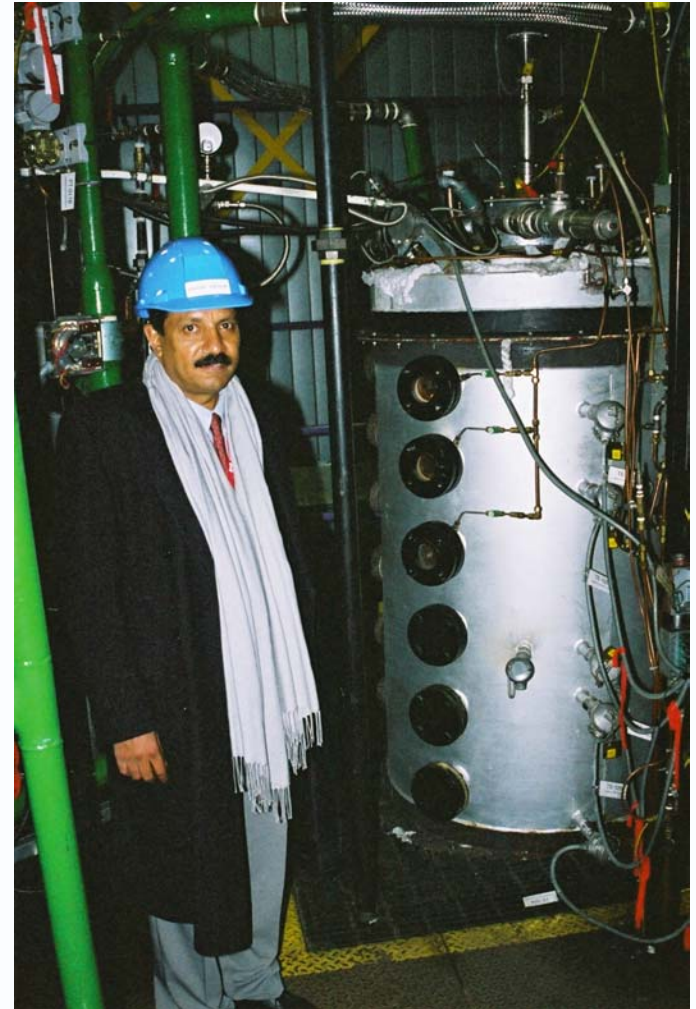
# Progress in Canada

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- Lead by the Canadian Clean Power Coalition (partnership between industry and Government, including US DoE)
- Aims to have
  - Full scale demonstration of CO<sub>2</sub> Capture (retrofit) by 2007 (Boundary Dam?)
  - New full scale CCP demonstration, with CO<sub>2</sub> capture by 2010
- For retrofit plant, choice is between Amine scrubbing and oxyfuel. Techo/economic review is due to report mid 2003, variety of coals, boiler designs

# Canadian Initiatives

- Other projects, involve pilot testing of oxyfuel firing on a 300kW pilot plant
- Development of a oil/gas fired mobile oxyfuel fired boiler for testing of CO<sub>2</sub> sequestration at various sites



# Summary

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- US and Canada have demonstration projects planned for CO<sub>2</sub> capture from existing coal fired power plant, with oxyfuel firing as a serious option for the retrofit plant at least.
- Choice of capture technology will be very site specific, also the method of downstream sequestration.
- UK could benefit by helping to support UK industry involvement in the Canadian initiatives
- Oxyfuel firing is viable, needs demonstration.