The Evaluation of Options for CO₂ Extraction from Existing & New Coal-fired Power Plants

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M. McDonald, Director, Research & Technology, TransAlta Corporation
W.A. Campbell, Project Manager, Canadian Clean Power Coalition
The Canadian Clean Power Coalition

- A national association of coal and coal-fired electricity producers

- Represents over 90 per cent of Canada’s coal-fired electricity generation

- Our objective is to secure a future for coal-fired electricity generation by actively addressing environmental issues
Coalition Participants

• ATCO Power Canada Ltd.
• EPCOR Utilities Inc.
• Luscar Ltd.
• Nova Scotia Power Inc.
• Ontario Power Generation Inc.
• Saskatchewan Power Corporation
• TransAlta Corporation
• EPRI (expression of interest)
The CCPC proposal:

A public-private initiative to:

• Research and develop clean coal technology
• Build a full-scale demonstration project for the removal of Carbon Dioxide and other emissions from an existing coal-fired power plant by 2007
• Develop clean coal technology for new power plants - demonstration by 2010
• Determine the costs of achieving the highest environmental performance standards with new technology
Why do this?

• Coal is vital for electricity generation nationally and internationally – for the long term.
• We must address the pressing air quality issues associated with coal-fired generation.
• Technology is the long-term solution – we can’t do it alone.
• Potentially for transferable and exportable technology.
Current CO₂ Related Demonstrations:

- Gas fired Solid Oxide Fuel Cells with CO₂ extraction (Shell Hydrogen and Siemens-Westinghouse)
- CO₂ capture from coal syngas (Prairie Gasification for the Weyburn Enhanced Oil Recovery project)
- CO₂ use for coalbed methane (Alberta Research Council in Alberta and BP Amoco in the U.S.)
- CO₂ sequestration in saline aquifers (IEA et al Sleipner project)
- CO₂ use in enhanced oil recovery (Pan Canadian Weyburn project)
- CO₂ sequestration in deep ocean (Hawaii project of the US DOE, IEA et al)
CCPC Proposal: CO₂ Extraction From Power Plants

• A joint public-private initiative be established:
  – To construct and operate a full-scale demonstration project to remove greenhouse gas and all other emissions of concern from an existing coal-fired power plant by 2007
  – To demonstrate a low emission technology for new power plants by 2010
  – Range of fuels – bituminous, sub-bituminous, lignite
Project Funding

• Coalition Participants

• Confirmed
  • Province of Alberta
    • Alberta Energy Research Institute (AERI)

• Under negotiation
  • Federal Government of Canada (NRCan)
  • Provincial Governments
    • Saskatchewan (SEM)
    • Ontario
# Retrofit Project Schedule

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First Step: Feasibility Studies

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Total Cost: $5,000,000
CO$_2$/O$_2$ Combustion: Retrofit Option

Air Nitrogen

Air Separation

Flue Gas (~97% CO$_2$)

Recycle ~75%

Boiler

Flue gas ~97% CO$_2$

Drier

Oxygen

Compressor

Water

Coal

Oxygen

Generator

Turbine

Feed Pump
ZECA Process: New Technology Option

Coal → HYDROGASIFICATION → GAS CLEANING (Synthesis Gas) → REFORMING & CARBONATION → Hydrogen Recycle to Gasifier → Power Generation (SOFC) → Electricity

Water → Hydrogen

Air → CO₂

CaCO₃ → CaO

Synthesis Gas → Power Generation and CO₂ Compression

CO₂ at 1000 psig
In summary:

There is a need in the industry

  • Regulations will be imposed to reduce emissions
  • Industry will be forced to meet regulations
  • Cannot meet demands individually

There is an industry response

  • Canadian Clean Power Coalition
  • Coordinated comprehensive program
  • Private-public support
  • Demonstration by 2007/2010

Stay tuned:  www.canadiancleanpowercoalition.com