

The Vital Role of Advanced Coal Technology Solutions in Queensland Power

**Meeting the twin challenges of
Greenhouse Emissions and
Growing Energy Demand in
Queensland**

**Bede Boyle - Convener
AustCoal Consulting Alliance**

We will cover

- **Global Perspective on CO2 Emissions**
- **Australian Perspective on CO2 Emissions**
- **Advances in Coal- fired Technology**
- **Coal21**
- **ZeroGen**
- **FutureGen**
- **Advanced Coal Technology Solutions**

“ Most energy supply scenarios project that supply of primary energy will continue to be dominated by fossil fuels until at least the middle of the century.”

**UNEP Report on CO2 Capture and Storage
Intergovernmental Panel on Climate Change**

Globally, about 40% of CO2 emissions are from the generation of electricity

- 70% is contributed by coal-fired plants**
- 20% from natural gas- fired plants**
- 10% from oil-fired plants**

- **About 81% of energy needs in 2030 will be provided by fossil fuels**
- **70% of growth in CO2 emissions to 2030 will occur in developing countries**
- **Emissions from developing countries will overtake emissions from OECD countries by about 2010**
- **China will account for about 40% of rise in global emissions**

IEA Report 8 November 2006

- **Coal and natural gas produce about 90% of Australia's electricity and**
- **Contribute 34% of Australia's greenhouse emissions**
- **Australia's demand for electricity will more than double before 2050**
- **Most of this additional capacity will need to be generated by Advanced Coal Technology with near zero greenhouse emissions**

Fortunately Queensland has Abundant Thermal Coal Inventory of 25 Bt

Coking Coal	- Open cut	4 Bt
	- Underground	7 Bt
Thermal Coal	- Open cut	18 Bt
	- Underground	7 Bt

**Measured + Indicated Status
QLD Bureau of Mining and Petroleum**

- **Improvements in Thermal Efficiency in Coal Fired Power Stations Reduces CO₂ / tonne of coal**
 - **5% efficiency in 1900**
 - **38% efficiency with modern pulverised fuel**
 - **45% by employing supercritical technology**
- **Every 1% increase in efficiency reduces CO₂ emissions by 2-3%**
- **Advanced materials may enable efficiencies of 55% to be achieved in future**

- **99% of fly ash can be removed by Electrostatic Precipitators and/or fabric filters**
- **90-95% of SO_x can be removed by Flue Gas Desulphurisation**
- **80-90% of NO_x can be removed by selective catalytic reduction**

- **COAL21 National Action Plan**
 - **March 2004**
 - **Identified key emerging technologies**
 - **Identified potential abatement targets for 2030**
- ***COAL21 Fund***
 - **Provides \$300 million to demonstrate promising technologies**

- 1. Coal gasification for either electricity or liquid fuel**
- 2. Oxy – fuel combustion aimed at reducing cost of CO₂ capture**
- 3. Post – combustion capture and storage of CO₂**
- 4. Capture and permanent geological storage of CO₂**
- 5. Advanced clean coal preparation technologies**

- **Compression and Transportation to injection wells in deep underground geological formations for secure storage**
- **Potential to reduce CO₂ emissions by 80-90%**
- ***“Has potential to reduce overall mitigation costs and increase flexibility in achieving greenhouse emission reductions”***

Intergovernmental Panel on Climate Change

- 1. Offshore Sleipner natural gas project in Norway**
- 2. Weburn Enhanced Oil Recovery project in Canada**
- 3. In Salah natural gas project in Algeria**

Integrated Coal Gasification Combined Cycle (IGCC)

- Efficiencies greater than 50%**
- Lower SO₂, NO_x and CO₂ emissions**
- 99% of sulphur present in coal can be recovered for sale**
- CO₂ capture increases cost of electricity 20-55%**

Shell and Anglo American plan to apply advanced drying and proven gasification technologies to brown coal to produce synthetic diesel fuel

- **Shell's proprietary gasification process will be applied to Anglo American's brown coal from Victoria's Latrobe Valley to produce virtually zero sulphur synthetic diesel fuel**
- **Potential sites have been identified for CO₂ storage in deep geological formations**

Synthetic diesel may eventually replace Australia's dwindling crude oil reserves

- **Oxy – fuel combustion is in the demonstration phase and uses high purity oxygen**
- **And results in higher CO₂ concentrations in the gas stream (80% by volume) and, hence, in easier separation of CO₂.**

- **Post-combustion capture of CO₂ from flue gasses is economically feasible from a number of existing power plants.**
- **CO₂ capture increases cost of electricity 40-85% for a supercritical Pulverised Fuel plant.**

- Produces UCC with less than 1% ash**
- Alternative fuel to heavy oil and gas**
- 53% efficiency with direct injection in gas turbine with combined cycle**

UCC technology is an initiative of White Mining Limited with the CSIRO and has attracted both Federal Government and State Government support

- **ZeroGen is a subsidiary of Stanwell Corporation in collaboration with Shell, a leader in CO2 capture and sequestration**
- **100MW project**
- **Test drilling program in northern Denison Trough in Central Queensland**
- **Declared a 'project of significance' by Coordinator-General Queensland**

- **Supports a Technology-based climate change strategy**
- **Is a US1 billion PPP Investment towards Zero-Emission Coal Fired Plant Technology with globally transferable results**
- **American Electric Power – Anglo American – BHP Billiton – China Huaneng Group – CONSOL Energy – E.ON. - Foundation Coal – Kennecott Energy - Peabody – Rio Tinto Energy - Southern Company + Xstrata Coal**

www.FutureGenAlliance.Org

www.austcoalconsulting.com

- **FutureGen will demonstrate the integration of clean coal and carbon sequestration technologies at a commercial scale by 2012**
 - **Commercial scale 275 MWe Plant**
 - **Coal Gasification is the core technology driving FutureGen**
 - **1 Mtpa CO₂ capture and sequestration in deep saline formations**
 - **Co-production of H₂ and electricity**

“FutureGen is the most advanced coal-fuelled electricity generation technology development in the world and we are pleased to be involved with other forward-thinking global companies in the development and deployment of this technology solution to climate change concerns.”

**Peter Coates, Chief Executive, Xstrata Coal
– December 2006**

“ We want Germany’s first CO₂ – free power station to be running in 2015 and CO₂ free power stations to be standard by 2020”

Social Democratic Party

RWE plans to commission a 450MW power station in 2014, which will use coal or lignite gasification and carbon capture and storage technology.

**McCloskey’s Coal Report
- October 2006**

Alliances such as Coal 21, ZeroGen and FutureGen are mobilising the financial and scientific resources necessary to develop innovative ways to solve the complex problems with coal utilisation.

Advanced Coal Technology Solutions will provide the answer to climate change concerns whilst responding to the 60% growth global energy demand over the next 25 years.

“With 300 years supply of coal in Queensland, the state’s economy would be undermined if there was a move away from it to nuclear power.

The big challenge for us is to ensure that we develop clean coal technologies It’s a gasification process – that’s the answer to global warming, not nuclear power ...which does have long-term problems and long term risks.”

Queensland Premier Peter Beattie

Advanced Coal Technology Solutions will play a vital role in meeting the twin challenges of Greenhouse Emissions and Growing Energy Demand in Queensland

My Conclusion is Based on Facts

- ***Fact 1*** - Queensland has abundant reserves of economically viable thermal coal
- ***Fact 2*** - Advances in Coal Fired Generation Technology has provided cheap electricity to drive Queensland's development whilst responding to changes in environmental legislation and public concerns
- ***Fact 3*** – Major investment is being made by the global coal and power industries to address the twin challenges of greenhouse emissions and growing energy demand

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