



CCS and the future of Coal-based Power Generation in Australia

- **Road Map to Commercialisation**
 - **Bede Boyle**

- **Global Perspective**
- **The Vital Role of CCS**
- **Garnaut Interim Report**
- **CCS Technology Maturity Roadmap**
- **Advances in Coal-fired Technology**
- **Australia *Coal21***
- **Eight CCS Projects in Australia**
- **CCS Risk Management Maturity Analysis**

“ 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**

CCS involves capture, compression and transportation

of CO₂ to injection wells in deep underground geological formations for secure storage

- Potential to reduce CO₂ emissions by 80-90%
- ***CCS “Has potential to reduce overall mitigation costs and increase flexibility in achieving greenhouse emission reductions”***

Intergovernmental Panel on Climate Change

“ Coal is the low cost mainstay of both the developed and developing world.

Carbon capture and storage is the critical enabling technology because it allows significant reduction in carbon dioxide emissions while allowing coal to meet future energy requirements”

The Future of Coal - March 2007

Massachusetts Institute of Technology

Risks to Coal Mining and Coal-based

Power Generation - “ *There is no question that, in the absence of commercially successful CCS, some coal-mining and coal-based generating firms in Australia would be negatively affected by the introduction of an ETS, and may struggle to operate profitably in a carbon-constrained economy.*”

However there are real opportunities

“On the other hand, commercially successful CCS could turn the coal and coal-based electricity generating areas into regions of strong expansion and prosperity”

CCS Technology Maturity Roadmap

Source: CLET, IPCC SAR, Citi Investment Research, DCC

	Research Phase	Demonstration Phase	Economically Feasible under specific conditions	Mature Market
Capture		Oxy-fuel Combustion	Post Combustion Pre Combustion	Industrial Separation
Transport			CO2 Pipeline Transport for CCS	CO2 Pipeline Transport for EOR
Storage	Mineral Carbonation Ocean Storage	Enhanced coal bed methane	Gas and oil fields Saline formations	Industrial Utilisation Enhanced Oil Recovery

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

Most importantly these schemes each capture and store about 1Mtpa CO₂ per year and have not detected CO₂ leakage of any kind.

- Improvements in Thermal Efficiency have reduced CO2 emissions / tonne of coal
 - 5% in 1900
 - 38% with modern pulverised fuel
 - 45% with supercritical technology
 - 50% may be achieved in future by
 - ultra supercritical technology
 - and IGCC
 - 55% R&D
- Every 1% increase in efficiency reduces CO2 emissions by 2-3%

- **COAL21 National Action Plan - March 2004**
 - Identified key emerging technologies
 - Identified potential abatement targets for 2030

- ***COAL21 Fund***
 - Provides A\$1 billion of industry funds to demonstrate promising technologies

Eight Australian CO2 Storage Projects Announced from 2008-2015

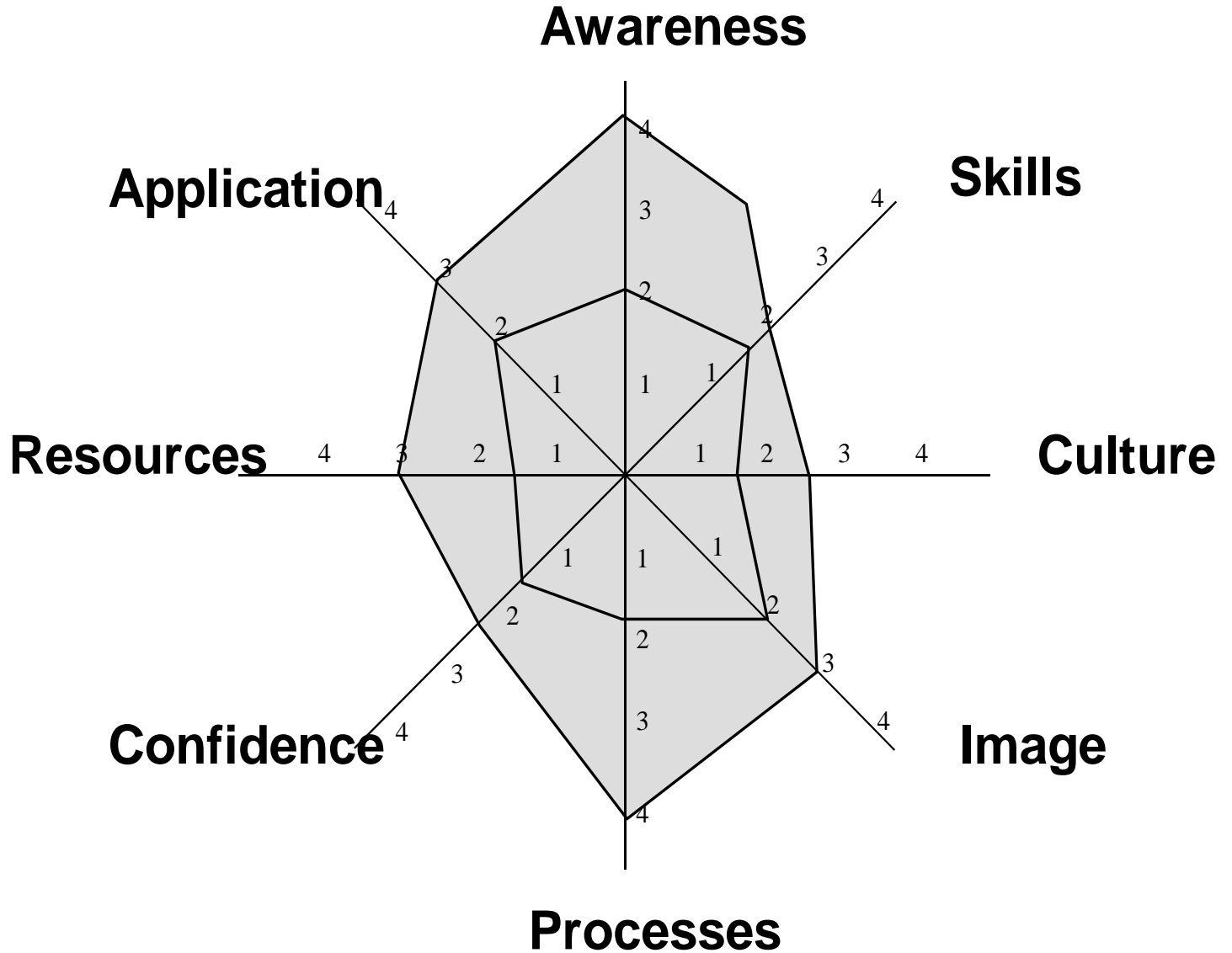
CCS Project Lead

Storage

1.	Otway	CO2CRC	2008
2.	Callide	CS Energy	2010
3.	Moomba	Santos	2010?
4.	Fairview	GE/Santos/Ergon	2011?
5.	Gorgon	Chevron/Shell/Esso	2012?
6.	ZeroGen	QLD Gov/Shell	2012?
7.	Kwinana	BP / Rio Tinto	2015?
8.	Monash	Anglo / Shell	2015?

But ? – dependent on ETS and carbon price

Risk Management Maturity Analysis



Thank you

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