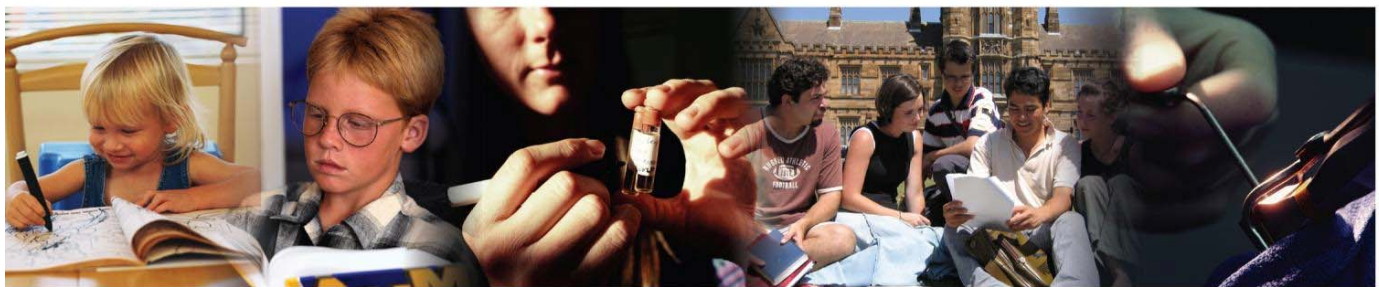


# New Directions For Australia's Coal Industry

## The National Clean Coal Initiative



March 2007



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# New Directions For Australia's Coal Industry

## The National Clean Coal Initiative



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Shadow Minister for Resources and Energy

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**March 2007**

# Executive Summary

Australia's coal industry is an integral part of our economy, and is the lifeblood of many regional communities in Queensland, NSW and Victoria. In 2006 there were over 30,000 people employed in coal mining, Australia's coal exports were worth over \$23 billion - making Australia the world's largest coal exporter, and around half of Australia's energy was produced by coal-fired power stations.

Because burning coal for energy results in the emission of large amounts of greenhouse gases, which in turn contributes to harmful climate change, a comprehensive strategy to tackle climate change must include reducing the greenhouse gas emissions from burning coal.

To reduce greenhouse gas emissions while placing Australian coal exports and jobs on a sure international footing, Federal Labor is launching a **National Clean Coal Initiative**. Labor's plan includes:

- Setting up a national objective for clean coal technologies that significantly reduce emissions to enter the national electricity grid by 2020, for near-zero emission CCS technologies to enter the grid by 2030, and monitoring policy effectiveness against this goal;
- Establishing a National Clean Coal Fund (NCCF) worth \$500m (over the period to 2015) to provide Commonwealth support for the development and demonstration of clean coal technologies and generate at least \$1.5 billion in new investment while working in partnership with the private sector; and
- Increasing Commonwealth funding for the CSIRO by \$25m over four years so that it can drive the National Clean Coal Initiative.

Achieving our target for electricity generated from clean coal to enter the grid by 2020 will be difficult and require substantial effort and funding from all of the coal industry's stakeholders. However, to do anything less would be to sell Australian coal jobs, Australia's export competitiveness, and hence Australia's future, short.

Federal Labor's National Clean Coal Fund is in addition to the \$175m allocated to clean-coal projects through the Commonwealth's Low Emission Technology Demonstration Fund since 2004.

Key elements of what are considered clean coal technologies include:

- **Coal gasification**, whereby power plants gasify the coal with the resultant synthesis gas used to run a turbine that produces electricity;
- **Carbon Capture and Storage (CCS)**, whereby the CO<sub>2</sub> from the synthesis gas is separated, and then redirected and stored;
- **Oxy firing**, whereby pulverised coal is combusted in a mixture of oxygen and recirculated flue gas in order to reduce the net volume of flue gases from the process; and
- **Post Combustion Capture (PCC)**, whereby CO<sub>2</sub> is removed from the flue gas from conventional coal fired power stations and then stored.

Labor's National Clean Coal Initiative is an important element in Labor's comprehensive approach to dealing with the threats and opportunities of climate change which include:

- Immediately Ratifying the Kyoto Protocol;
- Cutting Australia's greenhouse gas emissions by 60 per cent by 2050;

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- Setting up a national emission trading scheme;
- Substantially increasing the mandatory renewable energy target; and
- Convening a National Climate Change Summit in Canberra in late March or early April.

Federal Labor will be making further announcements on renewable energy and other energy sources in the coming months.

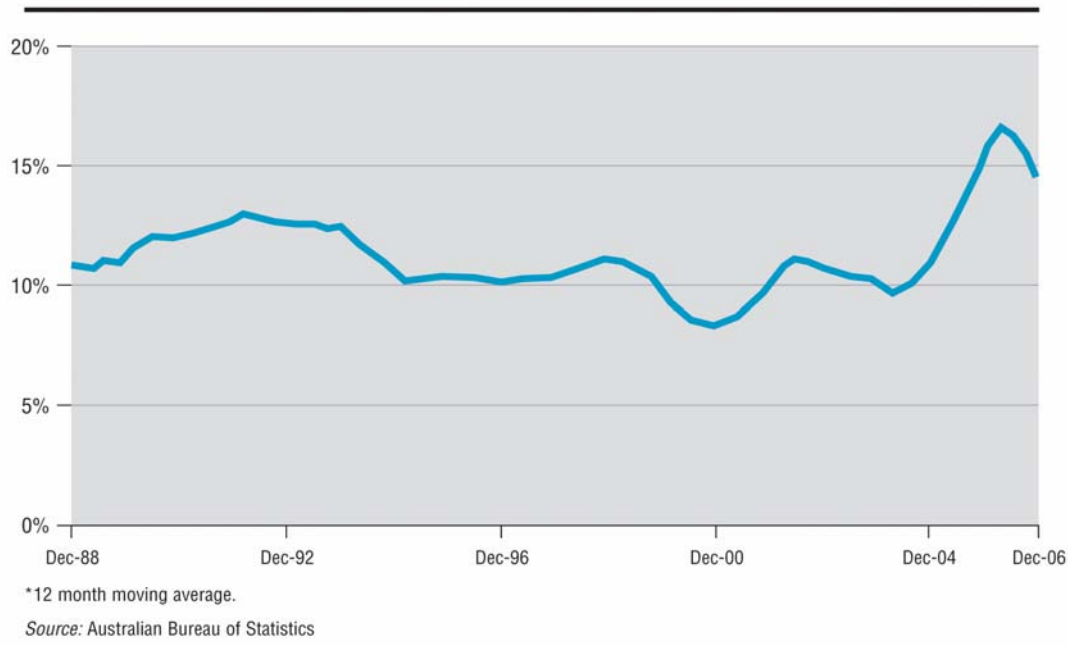
# Introduction

Some stylised facts about Australia's coal industry

Australia's coal industry is an integral component of the Australian economy. In 2005-06, Australian firms produced just under 400Mt of raw black coal and just over 70Mt of brown coal, and there were around 30,000 people employed in black coal mining alone.<sup>1</sup> Coal is also the lifeblood of communities in regions such as the Bowen Basin in Queensland, the Hunter Valley in NSW and the Latrobe Valley in Victoria.

In recent years Australia's coal industry has benefited enormously from the global resources boom; since 2003 the value of Australian exports has increased from \$10.9 billion to \$23.3 billion, an increase of 114 per cent.<sup>2</sup> Coal now represents around 14 per cent of merchandise exports (Chart 1) and Australia is by far the world's largest exporter of coal, accounting for around a third of total world coal trade in 2005-06.<sup>3</sup>

**Chart 1: Australia's Coal Exports**  
Share of total merchandise exports\*



The abundance and efficiency of coal production in Australia makes it a key input into our energy production and means that our electricity prices are amongst the lowest in the world. Around half of Australia's energy is produced in coal-fired power stations and cheap energy also gives Australian exporters of energy intensive goods such as aluminium an enormous competitive advantage in international markets.<sup>4</sup>

<sup>1</sup> ABARE (2006), *Australian Commodity Statistics*; Australian Coal Association (2006), *Australian Coal Industry – Selected Summary Statistics*

<sup>2</sup> ABS (2007), *5368.0 International Trade in Goods and Services*

<sup>3</sup> ABS (2007), *5368.0 International Trade in Goods and Services*; ABARE (2006), *Australian Commodity Statistics*

<sup>4</sup> ABARE (2006), *Energy Update*

The opportunities and risks for Australia's coal industry from climate change

Despite its recent successes, Australia's coal industry faces an enormous challenge – climate change.

A by-product of burning fossil fuels such as coal for energy and other industrial processes is that large quantities of greenhouse gases such as carbon dioxide are released into the atmosphere. According to the Australian Greenhouse Office (2006), around a third of Australia's annual greenhouse gas emissions results from burning coal for energy and emissions from this source are expected to grow significantly over the coming decades.<sup>5</sup>

According to scientists, the large build up of greenhouse gases in the atmosphere since the Industrial Revolution has caused the planet to warm significantly and increased the severity of extreme weather events such as cyclones and droughts.<sup>6</sup> Moreover, if substantial action to curb future greenhouse gas emissions is not taken, climate change is likely to accelerate in the 21<sup>st</sup> century, which would have disastrous consequences for the environment and the economy.

To mitigate the consequences of climate change, Federal Labor is committed to reducing Australia's greenhouse gas emissions by 60 per cent by 2050, and leading international efforts to reduce global emissions.

Federal Labor also understands that achieving emission reductions of this magnitude will require a significant fall in the emissions from coal-fired power stations.

Nevertheless, Labor also believes that climate change represents an enormous opportunity for Australia's coal industry.

If carbon capture and storage (CCS) technologies that nearly eliminate the emissions from coal-fired power stations are developed in Australia and become commercially viable, not only will Australia's coal industry grow and prosper in a carbon constrained world, but the industry could export this technology to the world.

Federal Labor's support for the future of Australia's coal industry

Some steps to promote clean coal technologies in Australia have been taken in recent years. For example, Australia's coal producers have joined to establish the \$300m COAL21 Fund to support the research, development and demonstration of clean coal technologies. Commonwealth and State governments have also made funds available for clean coal projects. However, much more needs to be done.

To ensure that the coal industry continues to prosper while making a vital contribution to reducing Australia's greenhouse gas emissions, Federal Labor has launched a **National Clean Coal Initiative**. This will raise the Australian research effort into clean coal technologies and boost government and private sector funding for the demonstration of clean coal projects.

This paper sets out Federal Labor's plan for increasing Commonwealth funding for the development and demonstration of clean-coal technologies in partnership with the coal industry and State governments. Our target is nothing less than for technologies that reduce the carbon dioxide emissions from burning coal to be commercially viable and feeding in to our electricity grid by 2020, and for near zero emission technologies to be feeding into the grid by 2030.

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<sup>5</sup> Australian Greenhouse Office (2006), *Australia's National Greenhouse Accounts*

<sup>6</sup> IPCC (2007), *Climate Change 2007: The Physical Science Basis – Summary for Policymakers*

Achieving this target will be difficult and require substantial effort and funding from all of the coal industry's stakeholders.

However, to do anything less would be to sell Australian jobs, Australia's export competitiveness, and hence Australia's future, short.

# Clean Coal Technologies

Clean coal is an umbrella term given to a range of technologies that have the capacity to significantly reduce the greenhouse gas emissions from converting coal into energy.

A recent report written by the OECD and the International Energy Agency (2005) commented that:<sup>7</sup>

“Coal-based technology has the potential to make significant CO<sub>2</sub> emissions reductions which are compatible with a low emissions future.....Collaborative action by governments and industry is also required to encourage worldwide coordinated research, development and demonstration of clean coal technologies such as carbon capture and storage, which will in the longer term deliver near zero CO<sub>2</sub> emissions from the use of coal.”

What follows is a brief description of key clean coal technologies.

## Integrated Gasification Combined Cycle (IGCC)

IGCC plants gasify coal, allowing the pre-combustion capture of CO<sub>2</sub>. The synthesis gas produced is then used to run a gas turbine to produce electricity.

The term ‘combined cycle’ refers to a gas fired power plant that combines a gas fired generator with a steam powered generator running off the heat from the resultant flue gas.

Because the IGCC power plant separates out the CO<sub>2</sub> before combustion it can be captured more effectively and efficiently when compared to a traditional coal fired power plant. Up to 100% of CO<sub>2</sub> could be captured from an IGCC power plant.

The capital costs of IGCC plants are significantly greater than traditional coal-fired power. Consequently there are only four international IGCC plants currently delivering electricity into a grid, and none employ carbon capture and storage.<sup>8</sup>

## Carbon capture and storage (CCS)

While an IGCC plant will allow the capture of CO<sub>2</sub> as a product of the chemical process, the CO<sub>2</sub> still needs to be compressed and then transported to a suitable storage site.

Geosequestration involves the pumping of CO<sub>2</sub>, in a compressed liquid form, into suitable geological formations deep underground. The most likely sites for carbon storage are depleted oil or gas fields, deep saline aquifers and deep coal seams.

The technology for pumping liquid CO<sub>2</sub> into oil or gas fields is well known and proven. The first commercial-scale project dedicated to CO<sub>2</sub> storage in a geological reservoir has been in operation at the Sleipner West Field in Norway since 1996.<sup>9</sup>

Current research is aimed at very closely monitoring and modelling the movement of CO<sub>2</sub> underground and identifying areas where it will be trapped under impermeable rock.

Internationally there are a number of joint IGCC and CCS demonstration projects being planned, including the \$1 billion FutureGen project in the USA.<sup>10</sup>

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<sup>7</sup> OECD/IEA (2005), *Reducing Greenhouse Gas Emissions: The Potential of Coal*

<sup>8</sup> Clean-Energy.US (2006), *About IGCC Power – Integrated Gasification Combined Cycle (IGCC)*

<sup>9</sup> World Energy Council (2006), *Carbon Capture and Storage: A WEC Interim Balance*

Although there are no IGCC plants combining CCS operating in Australia, a demonstration project called ZeroGen is planned for construction adjacent to the Stanwell Power Station near Rockhampton in Queensland. The compressed CO<sub>2</sub> from the plant will be injected into a saline aquifer in the Denison Trough.

There are also there are some research projects underway in Australia to gain greater understanding of our local geological structures and identify suitable sites for geosequestration.

In the Otway Basin, Victoria, there is a project to separate CO<sub>2</sub> from methane, pipe it 2 to 3 kilometres and pump it 2 kilometres underground into a depleted gas field. Approximately 100,000 tonnes of CO<sub>2</sub> will be sequestered over two years.<sup>11</sup>

The Fairview Zero Carbon Project (ZCP) in Roma (Qld) will extract methane from deep coal seams (non-minable), which will be then burnt in a 100 mega watt gas fired power station.<sup>12</sup> The emissions from the power station will then be captured and injected back into the coal seam.

#### Post combustion capture (PCC)

Post combustion capture of carbon involves the removal of CO<sub>2</sub> from flue gas from conventional coal fired power stations allowing it to be transported to a storage site.

The benefit of PCC technology is that can be applied to existing power plants. Given the life expectancy of coal fired power stations, existing plants are expected to continue contributing carbon emissions for the next 30 to 50 years. Consequently, any attempt to cut emissions in this period will have to capture and store emissions from existing plants.

The CSIRO has developed a small portable trial PCC facility that will be used to research the technology and is actively involved in research into reducing the cost of the technology.

#### Oxy firing (or Oxy- fuel) coal fired plants

Oxy-firing involves the combustion of pulverised coal in a mixture of oxygen and recirculated flue gas in order to reduce the net volume of flue gases from the process and to substantially increase the concentration of CO<sub>2</sub> in the flue gases (up to 95%). In conventional coal combustion, using air, CO<sub>2</sub> concentrations in flue gas are approximately 15%.

The advantages of oxy-fuel technology are that it is potentially a lower cost and lower technology risk option for cutting emissions and that it can potentially be retrofitted to existing plants from coal-based electricity generation.

There are no full-scale oxy-fuel plants currently operating either in Australia or overseas. A current problem with the technology is the cost of generating the pure oxygen needed to inject into the recycled flue gas.

There is, however, a project to retrofit a 30MW oxy-fuel plant into Power Station A at the Callide facility near Biloela for demonstration purposes.<sup>13</sup>

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<sup>10</sup> IEA (2006), *Focus on Clean Coal*

<sup>11</sup> Cooperative Research Centre for Greenhouse Gas Technologies (2006), *Research Project Update*

<sup>12</sup> Cooperative Research Centre for Greenhouse Gas Technologies (2007), *CO2 Futures Newsletter*

<sup>13</sup> Cooperative Research Centre for Greenhouse Gas Technologies (2007), *CO2 Futures Newsletter*

# The National Clean Coal Initiative

To reduce greenhouse gas emissions while placing Australian coal exports and jobs on a sure international footing, Federal Labor has launched a National Clean Coal Initiative. Labor's plan includes:

- Setting a national objective for clean coal technologies that significantly reduce emissions to enter the national electricity grid by 2020, for near-zero emission CCS technologies to enter the grid by 2030, and monitoring policy effectiveness against this goal;
- Establishing a National Clean Coal Fund worth \$500m (over the period to 2015) to provide Commonwealth support for the development and demonstration of clean coal technologies and generate at least \$1.5 billion in new investment while working in partnership with the private sector; and
- Increasing Commonwealth funding for the CSIRO by \$25m over four years so that it can drive the National Clean Coal Initiative.

Meeting Labor's target dates for the commercial viability of clean coal

Achieving Labor's target for clean coal technologies that significantly reduce carbon emissions to enter the national electricity grid from 2020 is a big challenge for our nation.

It will require both an increased funding commitment from the Commonwealth, an upgrade to the nation's existing research effort, and over time, the price signal generated by a national emissions trading scheme.

For example, the CSIRO's current estimates are that the use of CCS technologies would roughly double the cost of producing electricity to around that of the cost of producing electricity with wind and nuclear energy (chart 2).<sup>14</sup>

However, the CSIRO believes that with further research the cost of capturing and storing carbon could fall significantly over the next fifteen to twenty years, a forecast supported by the Energy Suppliers Association of Australia.<sup>15</sup>

In addition the International Energy Agency stated in 2006 that "after 2020, coal fired generation technologies featuring efficiencies of some 50% can be available", and CRA International in a report prepared for the National Generators Forum has estimated that electricity generation from coal-fired power stations employing CCS technologies could contribute over 20 per cent of Australia's total electricity generation by 2030.<sup>16</sup>

There is no doubt that Labor's targets for clean coal are ambitious, but to do anything less would be to sell Australian coal jobs, Australia's export competitiveness, and hence Australia's future, short.

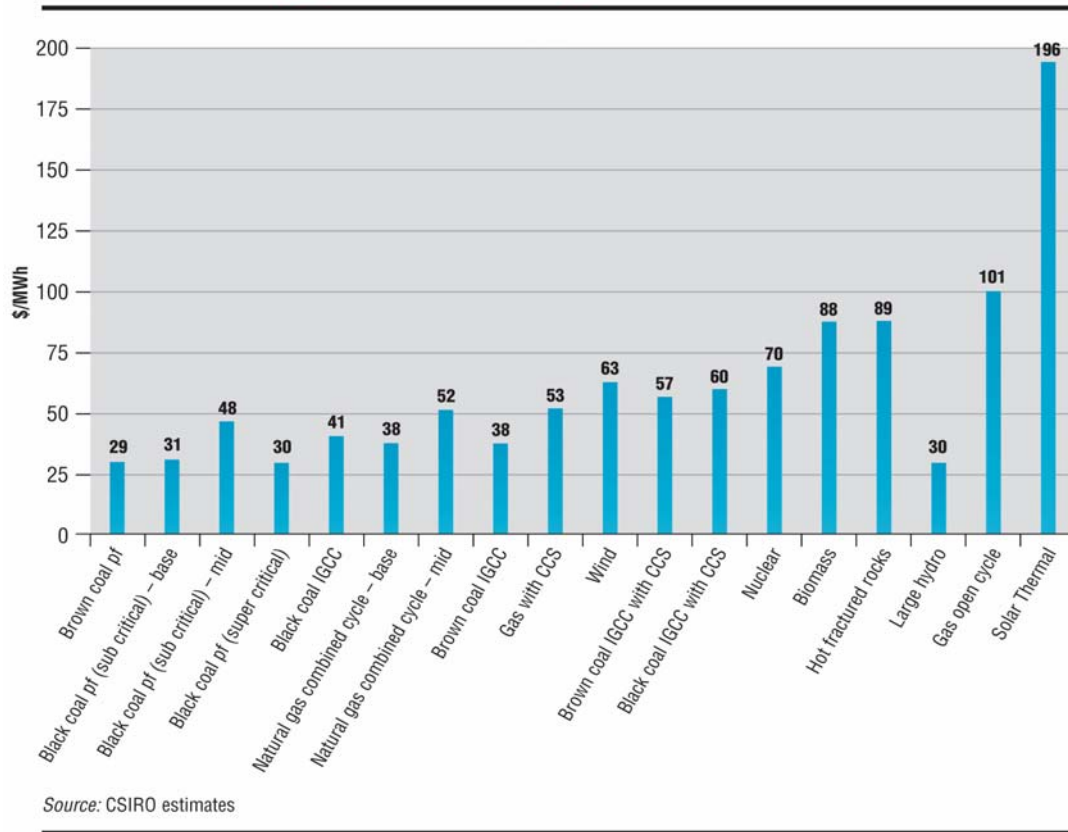
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<sup>14</sup> CSIRO (2006), *The Heat is On: The Future of Energy in Australia*

<sup>15</sup> Energy Suppliers Association of Australia (2006), *Emissions Targets and Least Cost Generation Options*

<sup>16</sup> OECD/IEA (2005), *Reducing Greenhouse Gas Emissions: The Potential of Coal*; CRA International (2006), *Analysis of Greenhouse Gas Policies for the Australian Electricity Sector*

**Chart 2: Estimated electricity generation costs of selected centralised electricity generation technologies**



### The National Clean Coal Fund

To ensure that electricity from clean coal plants enters the grid from 2020, the Commonwealth's support for clean coal demonstration projects and research must be stepped up significantly.

That is why an integral element of the NCCI is to increase funding for large scale clean coal demonstration projects through a \$500 million National Clean Coal Fund that will support projects with private sector funding of at least twice the Commonwealth contribution over the period to 2015. This means that total funding for clean coal demonstration projects will increase by at least \$1.5b.

Current Commonwealth funding for large scale clean coal projects occurs through the \$500 million Low Emission Technology Demonstration Fund (LETDF), and requires clean coal projects to compete for funding with other low-emission technologies.

Despite establishing the LETDF in 2004, the Howard Government has agreed to fund only five projects and three clean-coal projects worth \$175m. \$190m from the fund remains uncommitted.<sup>17</sup>

Federal Labor's NCCF will almost treble the current level of Commonwealth funding for demonstration projects and ensure that projects that are vital to the national interest and long term health of Australia's coal industry get off the ground.

<sup>17</sup> <http://www.greenhouse.gov.au/demonstrationfund/#roundone>

## A strengthened leadership role for the CSIRO

The achievement of Labor's target for electricity from clean coal power stations to enter the electricity grid from 2020 requires more than just an increase in Commonwealth funding for clean coal demonstration projects. It also requires a dramatic upgrade to national research and development of clean coal technologies.

Labor believes that the CSIRO is perfectly positioned to spearhead the National Clean Coal Initiative and will increase its funding by \$25 million over four years so that it is resourced to succeed in this mission.

For example, the CSIRO's stated purpose is: 'By igniting the creative spirit of our people we deliver great science and innovative solutions for industry, society and the environment'.

This mission statement goes to the heart of the challenge that climate change poses to Australia's coal industry. If technological solutions that reduce the carbon emissions from coal-fired power stations can be delivered within the next decade and a half, not only will the coal industry win, but so will the Australian economy and the environment.