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Mining and Energy

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Submission to the

Senate Select Committee on Scrutiny of New Taxes

Re Carbon Pricing

October 2010

1. Introduction

1.1. The Construction, Forestry, Mining & Energy Union (CFMEU) welcomes this opportunity for input to the Senate Select Committee on Scrutiny of New Taxes inquiry into carbon pricing.

1.2. The CFMEU is a major union in the industries of its title, with around 120,000 members. It is the principal union in the black and brown coal mining industries, with around 20,000 members. It also has membership in metal ore mining, power stations, oil refining and chemical manufacturing.

1.3. The CFMEU has been active on climate change issues as far back as 1990 when it was a major participant in the Australian Government's Ecologically Sustainable Development Working Groups process and in the formulation of the first National Greenhouse Response Strategy.

1.4. This submission endorses the submission made by the Australian Council of Trade Unions (ACTU), to which the CFMEU is affiliated. Matters raised in this submission are therefore generally of a supplementary character.

2. The fundamental rationale for carbon pricing

2.1. This submission takes as a starting point that the risk to humanity and ecosystems from climate change is major and must be mitigated. The scale of the challenge is extremely large, as it requires a transformation of the way all peoples and industries work, live and interact.

2.2. There is no single measure that will effectively achieve the transformation required. A vast suite of measures is required. Among these, a price on emissions to the atmosphere that are causing climate change is a fundamental building block.

2.3. Carbon pricing is not a sufficient measure to address the problem, and its aggressive deployment could also cause major economic and social dislocation. Conversely, the staged introduction of carbon pricing will help stimulate a wave of innovation and new industry. We know that carbon pricing will benefit certain industries and activities and create vast number of new jobs, as the joint research by the ACTU and Australian Conservation Foundation (ACF) has demonstrated.

2.4. However, it is also the case that the innovation unleashed by carbon pricing will produce new and novel ways of reducing emissions that are not well understood but which are likely to reduce costs and stimulate new jobs. One recent example is the introduction of algae farming using power station exhaust gases that may reduce the volumes of CO_2 going to geosequestration.

2.5. It is the CFMEU's experience that the need for carbon pricing is well-recognised by most professional people in carbon-intensive industries. It is recognised that new technologies to reduce emissions have no commercial rationale if greenhouse gas emissions to the atmosphere remain free. It is only the pursuit of short term benefits for shareholders that has restrained the official policy position of most major emitters.

2.6. Direct action measures to reduce emissions are also a necessary part of the suite of measures to mitigate global warming. They are complementary to a price mechanism and not a stand alone alternative. It is well-recognised that direct action measures alone are likely to result in higher overall costs as the variety and efficiency of measures stimulated by a carbon price will be muted.

2.7. For these reasons the CFMEU has been a supporter of carbon pricing since the 1990s. The union sees this as not only beneficial for the Australian and global community, but for protecting the jobs of its members by transforming their industries into low emission industries. There is more on this below.

3. Emissions trading vs carbon taxes

3.1. The CFMEU views that emissions trading is superior to a carbon tax in achieving emissions reduction.

3.2. While emissions trading is technically better able to achieve emissions reduction targets, carbon taxing is administratively simpler. However, the CFMEU rejects the view that carbon taxing is any less prone to gaming, lobbying and rent seeking by parties with vested interests. There is no easy way to introduce a carbon price.

3.3. It is possible, perhaps probable, for a carbon pricing scheme to have elements of both emissions trading and taxing. Proposals to set caps on emissions charges, or to fix emissions charges, in the early years of an emissions trading scheme make an ETS more similar to a carbon tax.

3.4. The CFMEU takes the pragmatic view that it is the introduction of a carbon price, rather than its specific form, that is essential to shifting both the economics and mindset of communities and business towards emission reduction. This view is predicated on the introduction of a carbon price being staged and from a relatively low starting point in the early years in order to minimise economic and social dislocation and restructuring costs. However, the signal should clearly be given that carbon prices will increase substantially over time.

3.5. The CPRS was a broad-based scheme that had considerable merit, though the CFMEU views that the final form included extensive compromise with heavy industry that was unwarranted. The union nevertheless supported the final form of the CPRS as simply a means of getting started on carbon pricing.

3.6. In the aftermath of the failure of the CPRS to become legislation, the CFMEU is of the view that an alternative scheme should be more restricted in scope in order to minimise the complexity of implementation and to reduce the potential for hysteria to be generated about its impacts.

3.7. Regardless of any simplification, it will be critical for government to communicate its proposals effectively and to win broad support. A key failing with the CPRS was the poor effort to seek and win public support. The government pursued the CPRS as a set of technical negotiations between major stakeholders (notably, with big business) that made the proposals more subject to mischaracterisation and hysterical attack.

4. The importance of a carbon price for stimulating CCS investment

4.1. The coal mining industry and the electricity supply industry support, in theory, the need for major action to mitigate climate change and the introduction of carbon pricing. In practice they have opposed the imposition of carbon pricing on their operations or have sought extensive exemptions and compensation – to the point where carbon pricing would either have barely have altered "business as usual" or where the public would have been required to shoulder most of the cost of restructuring.

4.2. Critical to the long term future of coal mining (and oil and gas extraction) and to fossil fuel based power generation is the need to reduce, capture and store greenhouse gas emissions. This is generally known as Carbon Capture and Storage (CCS).

4.3. There is undoubtedly very strong demand for Australian coal and gas from rapidly industrialising nations, and therefore the business case for the expansion of these industries is sound. However, the ethical or socially responsible case for these industries is not strong in an era of emissions reduction unless those industries specifically seek major emissions reduction from their operations and from the use of their product.

4.4. The coal mining and electricity supply industries in Australia officially support CCS and do provide funding towards it and are running some CCS demonstration projects. However, the funds allocated are small relative to the revenues of these industries, and relative to their profitability.

4.5. An obvious example is the case of BHP Billiton, Australia's largest company. It is a major emitter of greenhouse gases in its own right, and a heavy indirect emitter through its power use. It is major coal, oil and gas producer. Its direct contribution to energy efficiency and CCS is a US$300 million program over 5 years. Its most recent profit was US$12.7 billion in a single year. Its US$300m program is a tiny proportion of its profits and a virtually immaterial component of its revenues of US$52.7 billion. The contribution is woefully inadequate.

4.6. Similarly, there is little interest from institutional investors in CCS. The result is that the pace of progress is correspondingly slow. There are calls for most of the risk, and cost, to be borne by the public.

4.7. It is the absence of a carbon price that is causing this problem. There is no commercial or business rationale whatsoever for pursuing CCS technologies – that will inevitably significantly increase the cost and complexity of coal mining, power generation and other industrial processes – if there is no price on carbon.

4.8. Referring again to BHP Billiton, the statement by CEO Marius Kloppers supporting a carbon price is a welcome but well overdue recognition that the absence of a carbon price is hampering efforts to reduce emissions from heavy industry including the resource industries.

4.9. We have the classic problem of short termism vs long run imperatives and benefits. It is hard to see that BHP Billiton and other resources companies will have their fossil fuel businesses in 20 years time if the world moves steadily and ultimately more aggressively to reduce emissions. Standard risk management would indicate that action to reduce emissions from these industries would better support their long term future.

4.10. But clearly there will be additional costs sooner under carbon pricing. The problem is that most management is only around for 5 years, and their remuneration is generally only linked to medium term share price performance at best. This does not create the incentives to position businesses for growth over a 10 and 20 year period.

4.11. In direct contrast, most union members in resource industries and power generation have committed to a career in their industry. They have located their housing and families to suit the long term. They have lesser capacity to adjust those plans than more highly remunerated top management.

4.12. The CFMEU membership therefore seeks that their industry *not* be a laggard in responding to climate change. They seek that their industries begin the transformation to low emissions technologies and processes sooner rather than later so that the risks to their future are minimised.

4.13. For these reasons the CFMEU membership has strongly supported the introduction of emissions trading and therefore the introduction of carbon pricing. This policy has been affirmed by overwhelming direct votes of the membership.

4.14. The employers of our members will not direct substantial funds to CCS and other mitigation measures until there is both a price on carbon and a clear signal that carbon costs will increase.

4.15. The introduction of carbon pricing is a necessary challenge to the coal, oil, gas and fossil fuel power generation industries. Increasingly it will be understood to be a challenge for most industry. The sooner that industry starts dealing with this challenge rather than avoiding it, the sooner will both those industries and their workers secure their future.

5. The impact of carbon pricing on coal mining employment and on particular mines

5.1. There are no concrete proposals before parliament for a carbon price at the moment, so precise commentary on this issue is not possible at this time.

5.2. In the debate around the CPRS, there was considerable campaigning by the coal industry around the theme that the CPRS would cause major job losses in the coal mining industry, and that a significant number of coal mines – generally deeper underground mines with high methane emissions, would be forced to shut down.

5.3. The CFMEU response at the time separated these two issues, and remains pertinent to any consideration of carbon pricing.

5.4. In response to the allegations of major job losses across the coal mining industry, the CFMEU commissioned consultants McLennan Magasanik Associates (MMA) to examine the modelling reports used by the industry that purported to show job losses. That report is attached to this submission.

5.5. The key result – in the Executive Summary – shows that all three reports used by the industry actually showed significant *increases* in employment under a carbon price. A carbon price did cause slower growth in the coal mining industry, but this was not enough to offset the huge growth in jobs arising from surging demand for coal exports. The three reports for industry opposing the CPRS showed that employment in coal mining would increase by between 10,000 and 16,000 by 2020, on top of the 35,000 jobs existing in 2008.

5.6. The CFMEU's view is that somewhat slower growth in coal mining and exports due to a CPRS is an acceptable and necessary price to pay as part of shifting Australia to a low carbon future in the effort to mitigate global warming.

5.7. With respect to the issue of "gassy mines" the CFMEU view was, and is, that early closure of gassy mines in response to a carbon price would cause major social and economic dislocation in certain regions and was not acceptable in terms of winning and retaining widespread community support for emissions reduction.

5.8. The needed approach was roughly what the Australian Government proposed – that there be funds ($750m per year over 5 years) allocated to assist gassy mines to reduce their emissions more rapidly than would otherwise be economically feasible, and/or mitigate the impact of the emission permit costs. The amount may have needed to be increased, but there was no case for a general exemption for the coal industry, which is generally highly profitable, experiencing strong growth, and well able to afford carbon pricing in most cases.

5.9. An alternative, not explored in the CPRS but worthy of consideration in any revised carbon price scheme, is to revisit the breadth of coverage and possibly exclude fugitive methane emissions from the scheme and seek to mitigate them through regulation or other measures. It is noted that the European union emissions trading scheme does not cover fugitive methane emissions, and neither did he proposed US scheme.

5.10. While a broad emissions trading scheme is the desirable long term goal, it should be recognised that some sectors are less amenable to adaptation through a simple price mechanism. The case of "gassy mines" may be one where the issue is best addressed in the early stages of carbon pricing through other measures.

Attachment

Report to

The Construction, Forestry, Mining and Energy Union

The CPRS and Employment in the Australian Black Coal Industry

November 2009

McLennan Magasanik Associates

Ref: J1816 Part 1 Report

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EXECUTIVE SUMMARY

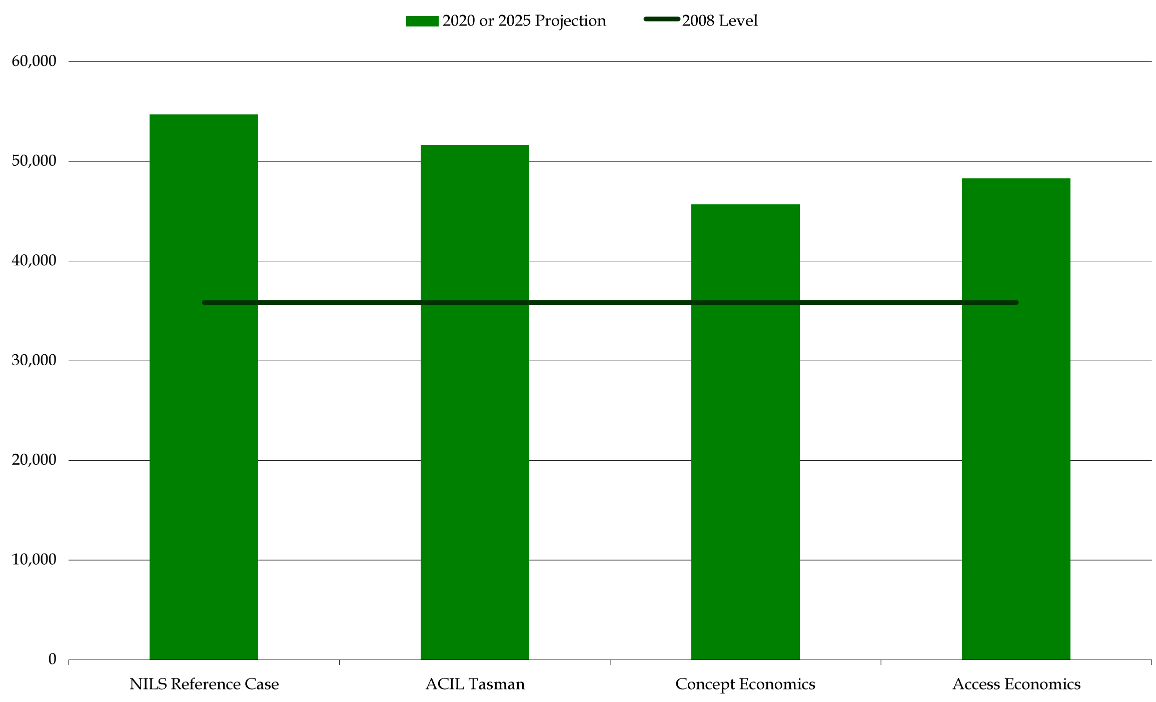
The Australian black coal industry has experienced strong growth over the last decade. This study was commissioned by the CFMEU to assess the potential for job prospects over the next two decades given the prospect for the implementation of the Carbon Pollution Reduction Scheme (CPRS). The analysis in this study is based on a review of findings of other studies conducted recently.

The key outcome from the review is that although production and jobs in the coal mining sector will not grow as strongly under a CPRS, they are still likely to continue to grow relative to 2008 levels, at least in the period through to 2020.

Beyond 2020 the prospects for production and job growth are less certain, and depend more on the extent to which the world, and especially developing nations, commit to greenhouse gas emission reductions, and the extent to which carbon capture and storage (CCS) technologies become commercially available.

Recent projections of coal industry employment, including those that show jobs losses due to a CPRS, show significant employment growth from current levels. Three recent studies project employment growth through to 2020 varying from around 10,000 to 16,000 new jobs in addition to the 35,000 coal industry jobs in 2008.

Exec Figure 1: Projections of jobs in coal mining



Note: MMA analysis. The projections were derived by taking estimates of the job impacts relative to reference case projections from the NILS reference case projection for 2020 (in the case of ACIL Tasman and Concept Economics) or 2025 (Access Economics). These estimates should be treated with caution as they were derived from relative estimates of job impacts.

The fundamental reason for this growth is that, while the CPRS may have significant impacts on the domestic electricity supply industry, the vast majority of Australian coal production is for international markets which will be affected by United Nations climate negotiations rather than the CPRS. Demand for coal on world markets is projected to continue to grow over the next decade even with international action to curb emissions. Australian coal exports enjoy a significant comparative advantage in international markets, especially in metallurgical coal for steel-making, which will not be directly affected by changes in power generation technologies.

Reflecting the projections, current coal industry investment plans infer significant growth in production and employment.

1 INTRODUCTION

The coal industry is a major contributor to the Australian economy. In 2005/06, the sector contributed around 2% of total economic output and 25% of total mining output, being one of the largest activities in the economy[1]. The sector employed around 33,000 people in mining activities at the end of 2007[2]. Exports of coal were valued at $24 billion or around 10% of the value of total exports from Australia[3].

Demand for Australian coal has expanded rapidly in recent years. However, the industry may face reduced growth and in the view of some may even contract with the introduction of the Carbon Pollution Reduction Scheme. In this report, the future of the industry is examined and an assessment made of the prospects for employment in the industry.

No new modelling is undertaken for this study. Rather, the analysis is based on other studies conducted recently. The analysis covers:

- National and state-based production trends for the black coal sector for 2020 and 2030.
- Associated employment trends.
- Underlying domestic and international drivers of black coal sector employment.

In addition, a review of other forecasts provided in recent studies is undertaken. The findings in the studies are examined and compared. A view on employment trends under a range of policy scenarios and global developments is then formulated.

1 ABS (2008), Australian Yearbook 2008. Canberra.

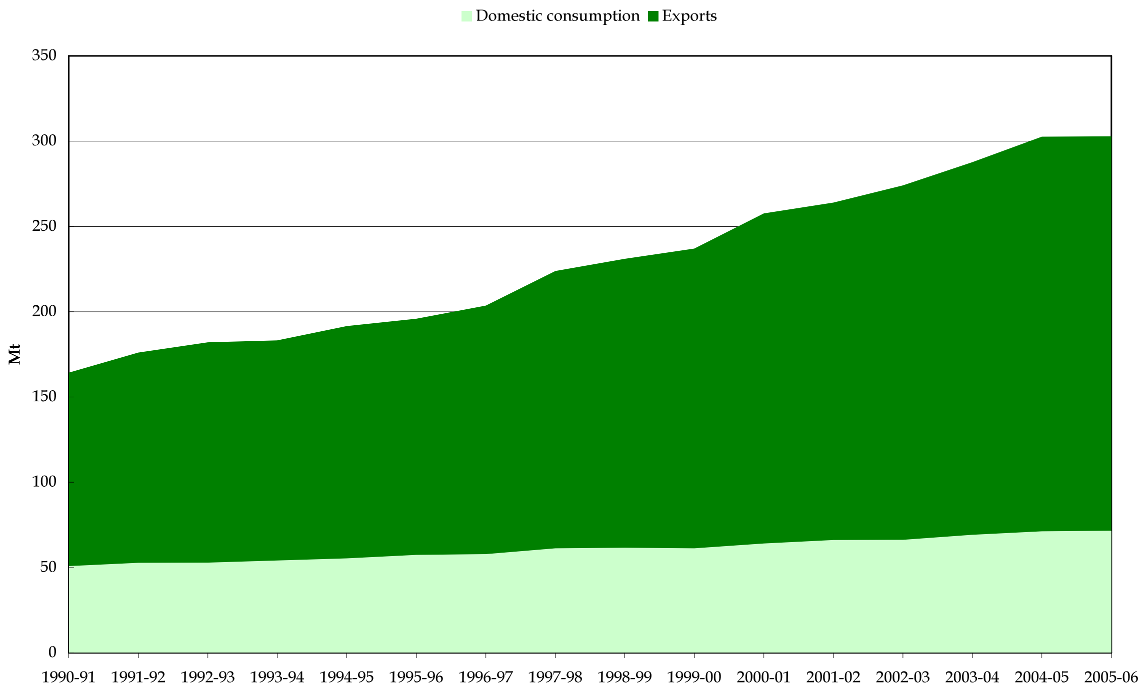
2 NSW Department of Primary Industries (2009), New South Wales Coal Industry Profile: 2008, Sydney; Queensland Department of Mines and Energy; annual reports and websites of Wesfarmers and Griffin Coal.

3 ABARE (2008), Australian Commodity Statistics: 2008, Canberra

2 PROJECTIONS OF COAL DEMAND

Australia coal is sold on domestic and export markets. Domestic markets comprise a minor proportion of coal sales (around 24%), with the bulk of black coal used as a fuel for power generation. Australia is the world's largest exporter of coal, with exports largely going to Asian and European markets.

Figure 2-1: Australia's domestic and export demand



Source: ABARE (2008)

2.1 Export markets

The outlook for global coal markets remains buoyant despite the recent economic slowdown due to the global financial crises. Economic growth and the price of alternative fuels will continue to impact on the long term prospects for coal, but the long term outlook will depend on two key additional factors: global action to curb greenhouse gas emissions and development of technologies to minimize or capture the emissions of carbon dioxide from coal combustion

The International Energy Agency (IEA) predicts[4] that world coal demand will increase by around 2% per annum in the period to 2030, assuming no major policies to constrain carbon emissions (see Table 2-1). As a result, coal production is projected to rise by 60%, with coal production expected to double in China and India over this period and increase by 75% in Russia.

4 International Energy Agency (2008), *World Energy Outlook: 2008*, Paris

Table 2-1: World coal demand, selected regions, IEA reference scenario

Country/region	Demand (Mt), 2006	Demand (Mt), 2030	% pa increase
United States	787	905	0.6
Other Nth America	52	54	0.6
Europe	472	418	-0.5
East Europe/Russia	307	386	1.3
Australia/Pacific	155	173	0.3
China	1,734	3,487	3.0
India	318	827	4.1
Japan	161	153	-0.2
Africa	147	175	0.8
Latin America	31	77	3.8
Other	199	356	2.9
World	**4,362**	**7,011**	**2.0**

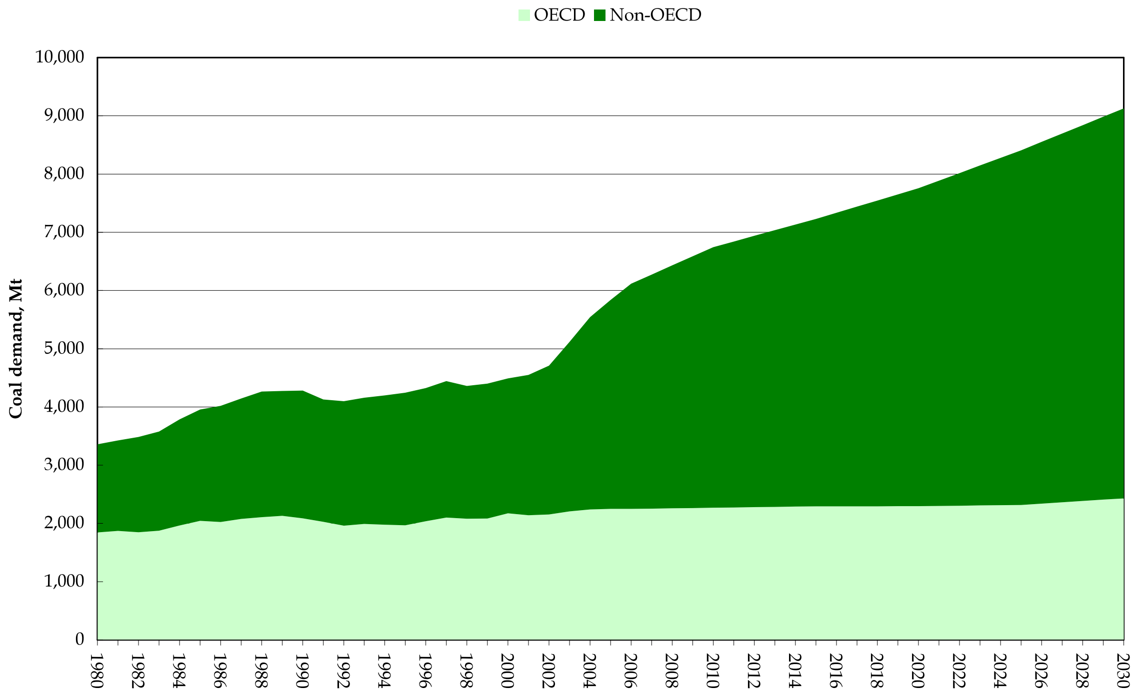
Source: IEA (2008) *World Energy Outlook: 2008*, Paris

The long term outlook for world coal demand will be influenced by the outcome of a global climate pact, either from Copenhagen in 2009 or some later date. There is range of plausible scenarios for a global climate deal. The upper and lower end of this range can be described as:

1. No strong climate deal, leading to only modest reductions in greenhouse gas emissions.
2. Global agreement to stabilise human greenhouse gas (GHG) levels in the atmosphere at no more than 550 parts per million (ppm).
3. Global agreement to stabilise GHG levels at no more than 450 ppm.

If no strong global climate deal is forthcoming, it is likely that Australia will continue with its target of a unilateral 5% reduction in emissions by 2020. Europe and Japan are likely to have modest targets (as already proposed) and continue with technology deployment policies. Other countries are likely to adopt a range of technology support measures to help reduce the costs of abatement. The outlook for this scenario is captured in the reference scenario modelled by the US Energy Information Administration, which shows coal demand continuing to grow but at a less rapid rate than in the recent past. The decline in the rate of growth is also due to the impacts of the recent global financial crises.

Figure 2-2: World coal demand with announced abatement policies



Source: US EIA (2009), International Energy Outlook 2009, Washington D.C., May

The World Energy Outlook reference scenario only includes government policy and measures enacted or adapted by mid-2008, therefore Obama Administration policies are not included. The reference case assumes weaker policies than anticipated even in the absence of a strong global deal. The forecast of coal demand in the reference scenario is annual growth of 0.6% in OECD countries and 2.5% for non-OECD countries between 2006 and 2030.

A strong global climate deal is likely to aim for a 450 ppm target. This deal would involve large cuts up to 25% to 40% by 2020 for OECD nations.

In the climate policy cases, both the 450 ppm and 550 ppm result in large reductions in OECD demand for coal by 2030 relative to the reference case. However, coal demand in developing countries that are significant markets for Australian coal continues to grow, at least through to 2020. The 550 ppm scenario involves an increase in demand of up to 370 Mt by 2020, but demand then stabilises in the period to 2030. The stabilisation occurs after action in non OECD countries begin to stabilise emissions. Tough global climate policies, such as a 450 ppm deal, will lead to higher carbon prices. Coal demand grows by up to nearly 300 Mt oil equivalents to 2020, which is 17% less than would have occurred under the reference scenario (no global action to curb carbon), but still 19% more than in 2006.

Table 2-2: World coal demand, Mt

	2007	2008	2015	2020	2030
WEO 2009 - Reference	4,548	4,946	5,468	6,010	6,981
WEO 2008 - 550 ppm	4,548	4,946		5,319	5,148
WEO 2009 - 450 ppm	4,548	4,946		5,009	3,734

Source: IEA World Energy Outlook 2009 and IEA World Energy Outlook 2008 for the 550 ppm scenario projections (which was not undertaken in the IEA World Energy Outlook 2009). Oil equivalent data converted to coal equivalents by multiplying by 1.43. 2008 data from EIA (2009).

A number of factors are not considered in the analysis that may see coal demand between 2020 and 2030 reduce less than projected:

- Advances in carbon capture technologies.
- New technologies to capture coal mine methane.
- Gas and oil prices rising faster than anticipated.

Even without those factors, having action to constrain carbon may impact less on Australian coal exports than from other countries if the intensity of fugitive emissions from coal mining is less in Australia than for other importing and exporting countries or if the cost of taking action to curb emissions is lower. Further research is required in this area.

ABARE in its most recent medium term forecasts predicts a large rate of growth in demand for Australian coal. Exports of thermal coal are predicted to increase from 115 Mt in 2007/08 to 164 Mt in 2013/14, an annual growth rate of 6.1%. Metallurgical coal exports (for steel-making) are predicted to grow from 137 Mt in 2007/08 to 159 Mt in 2013/14, a growth rate of 2.5%. Most of the growth comes from steadily rising imports by Asian countries to supply large capacity additions in coal fired generation and for steel-making.

Table 2-3: Planned addition of coal fired generation capacity in Asia

Country	Capacity, MW	Period
India	77,770	2008-17
Pakistan	19,710	2006-30
Sri Lanka	4,100	2007-16
Bangladesh	2,400	2008-16
Thailand	4,000	2008-14
Laos	1,800	2008-20
Cambodia	4,510	2008-20
Vietnam	116,000	2007-25
Malaysia	2,670	2007-14
Indonesia	50,000	2007-26
Philippines	4,360	2008-26
China	280,500	2009-20
Korea, Rep of	8,450	2005-20
Japan	2,940	2006-16

Source: ABARE (2009), *Australian Commodities*, Vol 16 (1), Canberra

2.2 Domestic markets

The three major uses for black coal in Australia are electricity generation, iron and steel and cement making. Domestic markets account for only 25% of coal production; the rest is exported. Over 85% of domestic coal consumption is in electricity generation and this proportion is growing. Consumption is also growing in the cement sector. For other sectors, consumption is either steady or declining.

The outlook for coal consumption is dependent on a number of factors especially trends in price for alternative fuels such as natural gas and government policies to develop low emission technologies and curb emissions of greenhouse gases.

Over the long term, the introduction of the carbon pollution reduction scheme could reduce demand for coal in Australia. Based on projections in the Australian Low Pollution Future Study by the Australian Government Treasury, black coal fired generation would have increased from around 135 TWh in 2008 to reach 195 TWh in 2030 under reference case assumptions (with no carbon pollution reduction scheme). Under the CPRS -5 scenario (where emissions are reduced by 5%), generation from black coal falls slightly from 135 TWh in 2008 to be around 120 TWh in 2030.

Table 2-4: Consumption of black coal in Australia

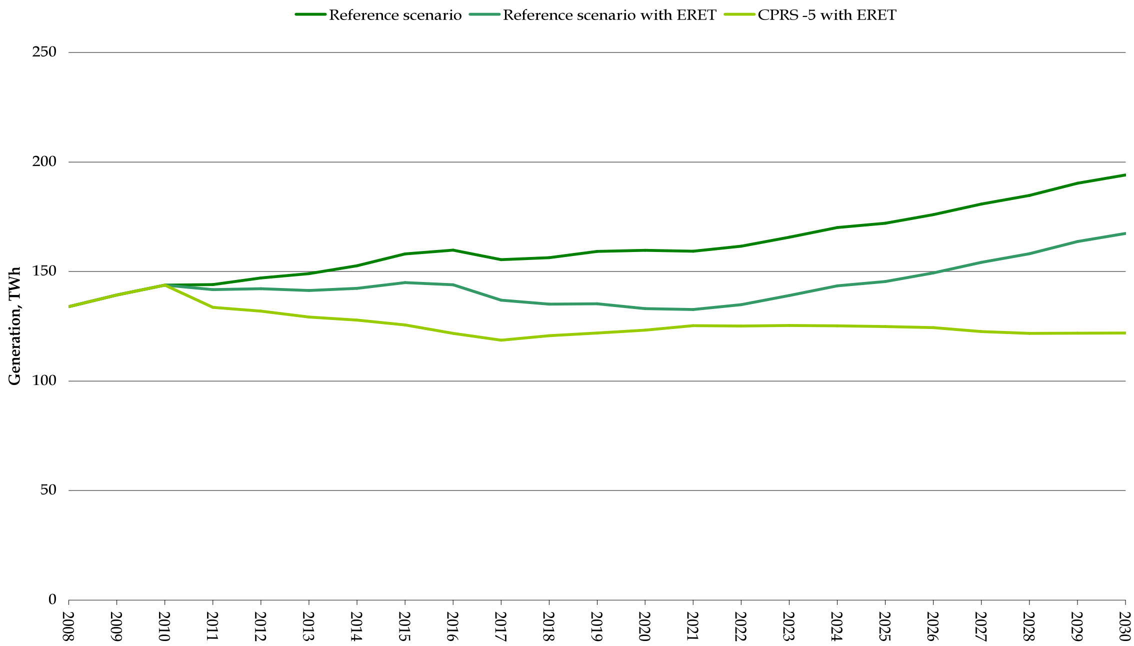
	Electricity generation	Iron & steel	Cement Industry	Other	Total
Consumption, Mt					
2000-01	53.54	5.20	0.74	4.66	64.13
2001-02	55.46	5.46	0.78	4.46	66.16
2002-03	55.55	5.41	0.85	4.52	66.34
2003-04	58.51	5.28	0.90	4.55	69.24
2004-05	60.43	4.99	0.90	4.97	71.29
2005-06	61.48	4.26	0.94	4.90	71.58
Proportion of total, %					
2000-01	83%	8%	1%	7%	100%
2001-02	84%	8%	1%	7%	100%
2002-03	84%	8%	1%	7%	100%
2003-04	85%	8%	1%	7%	100%
2004-05	85%	7%	1%	7%	100%
2005-06	86%	6%	1%	7%	100%

Source: ABARE (2008)

Estimates of the resulting fall in coal use are shown in Table 2-5. The analysis indicates that under the CPRS -5 scenario:

- Black coal use falls by 17 Mt in 2020, a fall of around 23% from projected reference case levels. This fall in production represent about 5% relative to the level of production of coal in 2008.
- However, not all of this is due to the CPRS. Part of the fall is due to the expanded Renewable Energy Target (ERET) Scheme. The relative impacts of the CPRS -5 scenario and the ERET are shown in Figure 2.3. The projection is for no substantial reduction in coal use for power generation through to 2020.
- After 2020 the Treasury modelling shows a greater reduction in coal use. But this rests on the assumption that there will be negligible deployment of CCS due to the only incentive being the CPRS emission permit costs. If there are stronger measures to bring forward CCS deployment from 2020, then the reduction in coal use after 2020 could be mitigated.

Figure 2-3: Black coal fired generation in Australia



Source: MMA (2008), *Detailed Results of the Modelling of the Impacts of Emissions Trading on the Electricity Markets*, report to the Australian Treasury, December. Projections for reference scenario with ERET derived by assuming 75% of the increase in the renewable energy target under ERET displaced black coal generation.

Table 2-5: Impact of CPRS on black coal generation in Australia, Mt

	2008	2010	2020	2030
Generation, TWh				
Reference scenario	134	144	160	194
Reference scenario with ERET	134	144	133	167
CPRS -5 with ERET	134	144	123	122
Coal use, MT				
Reference scenario	61	65	73	88
Reference scenario with ERET	61	65	60	76
CPRS -5 with ERET	61	65	56	55

Source: MMA analysis based on data in MMA (2008), *Detailed Results of the Modelling of the Impacts of Emissions Trading on the Electricity Markets*, report to the Australian Treasury, December. Coal use derived by assuming average fuel efficiency of 10 GJ/MWh and energy content of coal of 22 GJ/t.

Modelling of coal use in the electricity sector alone does not take into account the more significant export market for coal for both power generation and steel-making. Further, it does not consider other developments in coal use. In Western Australia, for example, there could be an emergence of exports markets for coal which is now mostly confined to domestic power generation. Industrial use of black coal could also increase as new industrial applications (fertiliser manufacturing) are progressed and as some existing customers switch to coal on the back of high gas prices. In recent times, Griffin Energy have been awarded contracts to construct 2 x 50 MW fluidised bed boilers to power the proposed expansion of the Worsley alumina refinery. The units are designed to burn up to 30% of biomass, which will enable the units to reduce greenhouse gas emissions and earn additional revenue under the expanded RET scheme. They are also planning to build two additional units at the Bluewaters Power Station.

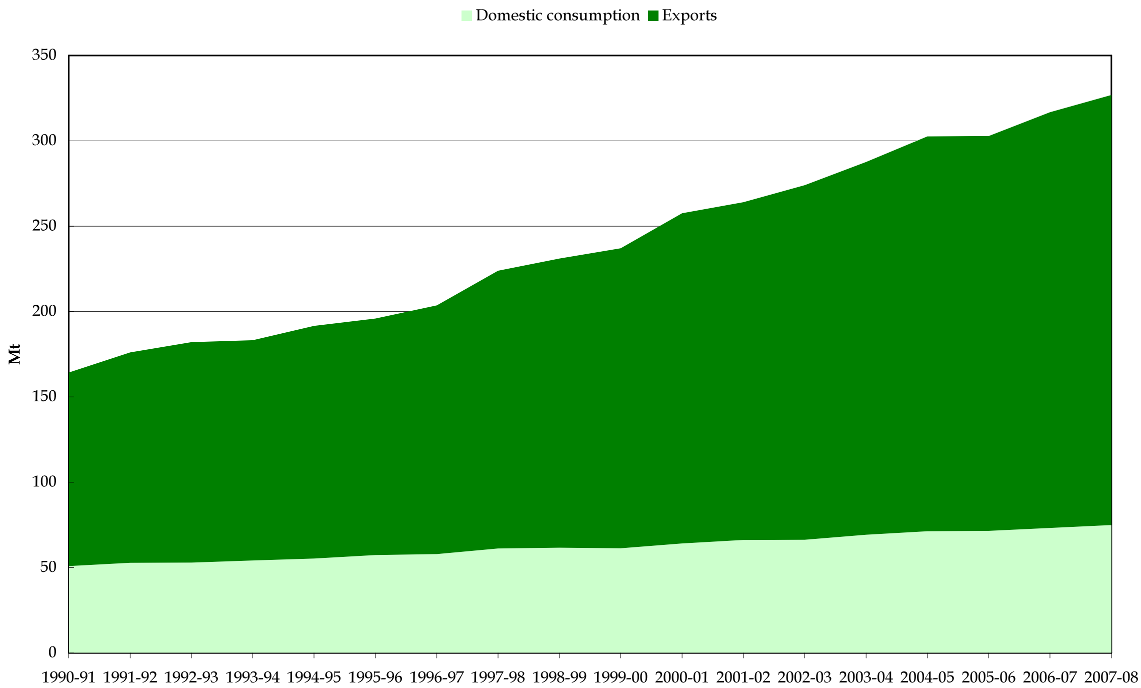
3 EMPLOYMENT IMPACTS

Fugitive methane emissions from coal mining are in the order of 23 million tonnes of CO_2e a year, which comprise about 4-5% of Australia's total emissions. Emissions from underground coal mines are of the order of 13 million tonnes.

3.1 Structure of domestic black coal industry

Coal production in Australia has grown rapidly in the last decade. However, most of the growth in recent years has been open-cut mines. Whilst total coal production in Queensland and NSW has increased by 60% since 1997, production from underground mines has remained relatively constant, with a large increase in 2006/07 leading to an overall increase since 1997 of 25%.

Figure 3-1: Saleable coal production in NSW and Queensland by mine type



Source: ABARE (2008), Australian Commodity Statistics: 2008, Canberra (Table 244). Domestic consumption data for 2006-07 and 2007-08 estimated by using historical growth rates.

3.2 Developments in production

3.2.1 Projections

There are three published forecasts of coal production in Australia:

- The IEA, in its World Energy Outlook, predicts production in 2030 to be 45% above 2006 levels[5], at around 481 Mt, under business as usual assumptions.
- Barlow Jonker in a report for the Department of Climate Change[6] predict Australian coal production to grow at a slower rate compared to historical levels to reach 520 Mt (in raw coal production terms or about 403 Mt in saleable coal terms) in 2020. However, they also predict that most of the growth will be in open cut mining, with production at underground mines remaining steady. The study assumed the impact of a range of Government measures but not the CPRS.
- The Australian Treasury predicted coal output for a world without an emissions trading scheme and a world with emission abatement policies to achieve a 550 ppm concentration of CO_2e in the atmosphere (the Garnaut -10 Scenario)[7]. These predictions were lower than other published forecasts with implied production expected to reach 370 Mt in 2020 without emission trading and 325 Mt with modest abatement targets, compared to actual production of black coal of 336 Mt in 2008. Beyond 2020, coal production grows as long as carbon capture and storage technologies are developed and utilised.

Other analysis has also been undertaken but the predictions of coal usage are not easy to gauge from the analysis. One source indicates that coal production in Queensland would have increased from 190 Mt in 2011 to around 235 Mt in 2020 and around 300 Mt in 2030[8]. The source cites two other studies as follows:

- According to this source, a study undertaken for the Confederation of Australian Governments by Access Economics had coal production in Queensland under a CPRS -5 scenario falling from 190 Mt to around 180 Mt in 2020, before increasing to reaching 210 Mt in 2030.
- A study undertaken by Concept Economics had Queensland coal production remaining steady at 190 Mt in 2020 and then increasing to just over 230 Mt in 2030.

Trends in production by method are more difficult to discern. On the one hand, because underground coal mines tend to be more capital and labour intensive[9] compared with open cut, it would be expected that steady coal production would be reflected in a shift towards open cut mining away from underground mining in the medium term. On the other hand, there are new underground mines being built due to open cut mines becoming too capital intensive due to high overburden ratios. In some case mines go from being open cut to underground as they "follow the seam" down. And if VAM can be captured,

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5 World Energy Outlook, 2008, IEA

6 Barlow Jonker Pty Ltd, *Australian Coal Forecast & Resource Estimation*, unpublished report prepared for the Australian Government Department of Environment and Heritage, May 2006. Cited in Department of Climate Change (2008), *Fugitive Sector Greenhouse Gas Emissions Projections: 2007*, Canberra

7 This was the only scenario in the report for which there was data on coal production

8 Morris, P (2009), "Session 1: ETS A View from Industry", paper presented at the Australian Economic Forum 2009, available at http://www.australianeconomicforum.com.au/LinkClick.aspx?fileticket=imo1ig40ZYQ%3D&tabid=56

9 NSW Department of Primary Industries (2008), *NSW Coal Industry Profile: 2008*, Sydney.

there might be an economic reason to favour underground mining, as it is impossible to capture methane from open cuts except some via pre-mining drainage.

3.2.2 Cost competitiveness of coal mines under a CPRS

Australia is the largest exporter of coal, with this dominance mainly due to a high share of the world metallurgical coal market (ie coal used for steel-making rather than power generation). Australian exports of metallurgical accounts for 61% of world trade. Canada, United States and the Russian Federation are other major traders, all of whom are developed economies and are likely to face cuts in emissions under a global agreement – this structure suggests that metallurgical coal exports may not be so threatened in the short term under a CPRS. For thermal coal, Australia is the second largest exporter, accounting 16% of world trade. Indonesia is the largest exporter of thermal coal, with Columbia and the Russian Federation also major exporters. China and South Africa are major exporters but the level of exports from these countries have stabilised this decade. In fact, China over the last two years has shifted to being a significant importer, including of coking coal. This shift has helped to boost world markets even though there has been a decline in Japanese import demand.

Under a CPRS, the international competitiveness of Australian coal will depend on a number of factors including:

- Level of reserves, depletion rates, accessibility of reserves and export infrastructure. Australia has one of the highest levels of reserves, and both accessibility and export infrastructure is good relative to competitors.
- Institutional and regulatory arrangements. Australia has relatively transparent and efficient regulation of minerals extraction, and relatively low sovereign risk.
- Quality of coal. Although Australia coal mines could face higher costs under a CPRS, the coal from Australia may still have advantages in a world with global action to curb emissions due to better quality of Australia's coal relative to other exporters, in particular thermal coal.
- Coverage and extent of action in other countries to curb greenhouse gas emissions. Other exporting countries such as the United States, the Russian Federation and Canada could implement action to curb domestic emissions, although the proposals (Waxman-Markey) have to date exempted fugitive emissions from coal mining.

Table 3-1: World trade in coal

	2000	2001	2002	2003	2004	2005	2006	2007	Share, 2007
Metallurgical coal									
Australia	101	106	104	112	117	125	124	138	61%
Canada	28	27	23	24	24	27	25	27	12%
China	7	11	13	13	6	5	4	3	1%
Poland	5	4	4	3	3	3	4	2	1%
Russian Federation	7	14	9	10	12	10	10	15	7%
United States	30	23	20	20	24	26	25	29	13%
Other	8	4	13	9	14	10	18	13	6%
World	186	189	186	190	200	206	210	227	
Thermal coal									
Australia	86	87	99	103	107	108	112	112	16%
Canada	4	3	2	1	2	1	3	4	1%
China	49	79	71	81	81	66	59	51	7%
Colombia	36	39	36	46	51	54	62	67	10%
Indonesia	57	65	74	85	96	128	170	191	27%
Poland	18	19	19	17	17	16	13	10	1%
Russian Federation	29	27	34	45	57	76	81	85	12%
South Africa	70	68	69	71	67	71	69	66	9%
United States	23	21	16	19	19	19	20	24	3%
Other	60	70	74	67	87	71	84	87	12%
World	431	478	493	535	583	610	673	697	
Total									
Australia	186	193	203	215	224	233	236	250	27%
Canada	33	30	25	25	26	28	28	31	3%
China	55	90	84	94	87	72	63	54	6%
Colombia	36	39	36	46	51	54	62	67	7%
Indonesia	57	65	74	85	96	128	170	191	21%
Poland	23	23	23	20	20	19	17	12	1%
Russian Federation	37	42	44	55	69	86	91	100	11%
South Africa	70	68	69	71	67	71	69	66	7%
United States	53	44	36	39	43	45	45	53	6%
Other	67	74	87	76	101	81	102	100	11%
World	617	668	679	725	783	816	882	924	100%

Source: ABARE (2008), Commodity Statistics:2008, Canberra

3.2.3 Feasibility of reducing fugitive methane emissions

A major factor affecting competitiveness of Australian coal is the potential development of technologies to reduce the emission profile of coal mining. Around 66% of direct and indirect emissions from the supply of coal (from mine to ship) come from fugitive emissions, with only 21% from energy use in mines[10]. Reducing or mitigating mine methane emissions at low cost could reduce the impact on competitiveness from the CPRS. The issue of technological development to reduce mine emissions appears to have been ignored in studies on the impact of the CPRS on coal mines.

There has been little development of technologies to reduce methane emissions from open cut mining, apart from extracting the methane ahead of coal mining to supply coal seam gas. However, there has been active development of new technologies to reduce emissions from underground mining.

There are two sources of emissions from underground coal mines: pre-mine drainage methane and ventilation air methane. In Australia, fugitive emissions amounted to around 35 Mt CO_2e in 2006 (around 6% of net emissions in Australia), with emissions associated with the mining, handling and decommissioned mines contributing around 67% of total fugitive emissions[11]. Over half of the methane released from coal mines is in low concentrations in the expelled air stream (ventilation air). Special technologies are required to mitigate this methane release.

Over 50% of methane released from mining is through ventilation air methane, and the combination of high flow volumes and low concentrations of methane poses significant challenges to capturing the methane[12]. At present, it seems that there is no clear-cut choice of technology for mitigating coal mine ventilation air methane (VAM). There are a number of alternative technologies under investigation. Only one technology is actively being demonstrated.

There are a wide range of technologies (gas engines and micro turbines) available to combust coal mine methane but these technologies typically need at least 25% methane concentration to function. Even simple flaring requires concentration of methane in excess of 1%. The discussion below focuses on technologies that can mitigate methane in air stream where its concentration is less than 1%.

Several technologies that can mitigate or economically use the captured methane contained in ventilation air includes:

- Flow reversal reactors.
- Lean burn combustion turbines.

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10 Morris, P (2009), Session 1: ETS A View from Industry, Slide 12

11 Source: Department of Climate Change (2008), *National Greenhouse Gas Inventory 2006 – Accounting for the Kyoto Target*, Canberra, June

12 J.M. Sommer and H. Schultz, "Thermal oxidation of coal mine ventilation air methane", paper presented at the *12th U.S./North American Mine Ventilation Symposium*.

- Coal and VAM hybrid systems.
- Methane concentration[13].

VAM mitigation technologies are still at an early stage of development. Reliable data on operating and capital costs are not available. The states of development of these technologies are in the following table.

Table 3-2: Methane mitigation technologies

Project	Value of support	Details
West Cliff - MEGTEC	Up to $6M from GGAP[14]	6 MW generation and methane abatement project. MEGTEC has also managed to secure support for two CDM projects in China involving up to 10 of their units.
VAMOX	Not available	Demonstration project in British Columbia, funded by Sustainable Development Technology Canada
MEGTEC	$0.7M US EPA $1.6M US DOE	Demonstration project at Windsor mine portal, West Virginia
VAMCAT	$1M, Australian government	Development and demonstration of a 25kWe demonstration unit

While the cost estimations for these technologies are scant, it is clear that there will be a major incentive to their further development. The technology will not only be required in Australia but across the world.

3.3 Employment trends

3.3.1 Recent studies on employment impacts

Several studies have estimated the impacts on the coal mining sector and on employment from the CPRS. These studies include:

- The Australian Low Pollution Future Study undertaken by the Australian Treasury. There is little detail of the direct employment effects in this study. However, according to this study "the future of coal depends heavily on the development of carbon capture and storage technologies. Without such technologies, Australia's coal production could fall to 4% below current (2008) levels by 2030 and 18% below by 2050". Across the four scenarios (-5%, -10%, 15% and -25% cuts in emissions), all of which assume

[13] F.P. Carothers, H.L. Schultz and C.C Talkington (2004), *Mitigation of methane emissions from coal mine ventilation air: an update*.

[14] Source: http://www.environment.gov.au/settlements/industry/ggap/bhp.html

carbon capture and storage is available post 2025, they found "that Australia's coal output falls relative to the reference scenario but grows relative to current levels". Under the CPRS -5 scenario and with the successful development of CCS, output increases 66% from current levels, although this is around 26% less than growth in output that would occur under reference case assumptions[15]. Based on these findings it is likely that with the development of CCS, employment will remain stable over the next decade and then grow slightly. Without the development of CCS, employment could fall slightly (less than 5%) relative to current levels under a CPRS over the next decade, but be around 20% lower by 2050. It is worth noting that the Treasury modelling assumes no special measures to bring on early deployment of CCS; there is only the CPRS permit price signal. If the Australian Government follows through on its commitment to bring forward commercialisation of CCS, there could be greater coal production and employment.

- A study undertaken by Concept Economics for the Minerals Council of Australia. This study estimated the impacts on aggregate and regional employment from the CPRS -5 scheme proposed by the Australian Government. The study assumed the same global assumptions (in regards to action to curb emissions) as were used in the Treasury study but updated some of the economic assumptions to account for the impact of the global financial crises. Their results indicated that under a CPRS -5 scenario, employment would be 9,040 fewer in 2020 in coal mining in NSW and Queensland compared to what would have occurred under a reference scenario. Little detail is provided to explain the sources of loss relative to the reference scenario but presumably it is due to the reduction in coal use in domestic markets, a reduction in coal use on world markets and a loss of competitiveness on world markets. Crucially, there is no detail of the employment that would have occurred in the reference scenario, so it is difficult to readily determine whether employment levels under its scenario represent an absolute increase or decrease relative to current levels.

- A study undertaken by ACiL Tasman for the Australian Coal Association. ACiL Tasman undertook a partial equilibrium analysis using data on costs and production levels obtained from a survey of mines. The analysis determined job impacts by taking current mines and determining how their costs and profitability would change under a CPRS. The analysis indicated that for a CPRS -15 scenario, jobs were reduced by 3,075 in 2021 due to the premature closure of mines (with 2,037 in NSW and 1,035 in Queensland). Because of lower permit prices, presumably the job impacts would have been less with the CPRS -5 scenario. Because this analysis was partial no data was provided on impacts at as yet to be developed mines. It is possible that over time the some mines could close and be replaced by additional output from other existing mines and from new less gassy mines. It is also possible that the $750 million of assistance being offered under the Coal Industry Adjustment Assistance could assist underground mines to adopt technologies to mitigate emissions – it is unclear whether

[15] Access Economics (2009), *Impacts on Disadvantaged Regions*, Report 2 to the Council for the Australian Federation Secretariat, May

this assistance was considered in the analysis. In addition, it appears that no consideration was given to increasing costs in other exporting countries, which would affect the competiveness of coal mining in those countries. This should be reflected in the reference case prices used (which were a weighting of forecasts from ABARE (50% weighting) and 8 institutional investors (50% weighting)), but as no detail was provided on the basis for the forecasts it is difficult to assess whether the reference prices were impacted by assumptions on international action to curb emissions.

- A study undertaken by Access Economics for Council for the Australian Federation Secretariat. This study found that there would be 6,470 jobs lost in coal mining in NSW and Queensland in 2025 under a CPRS -5 scenario allowing for international trading. The study found that relative to 2008 levels, output in 2025 would be 5% higher for coking coal but that thermal coal output would be about 30% lower.

The Federal Government has only set a unilateral target of 5% reduction below 2000 levels by 2020. It has not determined targets beyond 2020 and this will only be determined on the basis of the level of international action. All the modelling presumes international action to keep concentrations below 550ppm beyond 2020. This would only occur if global action is taken.

The study for the Australian Coal Association is based on the 15% target by 2020, which is only likely to proceed if there is international action to reduce emissions. Hence, when undertaking partial analysis of this nature it is important to consider the impact not only on Australian mines but also on the costs at major international competitors. In particular, a large proportion of coal from gassy mines is metallurgical coal[16], the international trade in which Australia dominates by a large margin, and which commands a premium price relative to thermal coal. The major competitors in this market are other developed countries, which could also face imposts under an international agreement.

Technological developments could reduce mine emissions. As discussed above, some promising technologies could be available to reduce emissions from ventilation air. Moreover, techniques are already available and used to reduce emissions via pre-mine drainage at underground mines. These technologies could be deployed to reduce the impact on cost competitiveness of the mines. It is difficult to determine whether mitigation technologies were considered by any of the studies.

3.3.2 Jobs growth relative to 2008

The studies discuss reductions in employment relative to what would have occurred without the CPRS. In a separate study undertaken for the Minerals Council of Australia in 2008 it was projected that direct jobs in the coal industry would increase from 35,837 in 2008 to 54,732 in 2020. That is, very strong growth of almost 19,000 jobs or over 50% in 12 years. Presumably this did not take into account the impacts of the CPRS as this was not

16 All the deep gassy mines on the NSW south coast are coking coal mines. The NSW central coast mines are gassy but are thermal coal tied to local power stations. The smaller number of Queensland gassy mines produce both coking and thermal coals

known at the time of the study. Deducting for the estimated job losses in the above studies, it would appear that there would still be substantial net gains in employment in the coal industry.

Table 3-3: Estimated employment levels in the coal industry

	2008	2020	Net Gain
NILS Reference case[17]	35,837	54,732	18,895
Deduct for job losses[18]			
Concept Economics		9,040	
ACiL Tasman		3,075	
CAF[19]		6,470	
Employment under a CPRS			
Concept Economics	35,837	45,692	9855
ACiL Tasman	35,837	51,657	15,820
CAF[20]	35,837	48,262	12,425

Note: Data for NSW and Queensland coal sectors.

The result here indicate that the three recent studies showing losses in coal jobs from reference scenarios also show that coal industry employment will increase strongly from current levels – by between 10,000 and 16,000 jobs by 2020.

3.3.3 Other investment and growth factors affecting employment

The studies done to date have estimated impacts on output and employment using simulation models of the Australian economy. Whilst highly useful for policy analysis, other developments are occurring which may not have been captured in the modelling process.

First, world demand for coal is continuing to grow. As shown in Table 2-3, an estimated 580 GW[21] of new coal capacity is planned to be installed in Asia during the period to 2026, with around one-half in China alone. Excluding China, Indonesia and India, which have their own indigenous coal resources, around 170 GW of new capacity is planned that could require additional imports of coal. If this capacity operated at 80% capacity factor, then this would represent an additional 555 Mt of coal being required per annum, a good share of which could be supplied with Australian resources. Although the impact on Australian jobs is hard to determine (because estimates of the share met by Australian

[17] S. Molloy and Y. Tan (2008), *The Labour Force Outlook in the Australian Minerals Sector: 2008 to 2020*, report prepared by the National Institute for Labour Studies for the Minerals Council of Australia, Canberra, June

[18] These data are estimates provided in the noted reports of job losses relative to reference case (without CPRS) used in each study.

[19] Access Economics (2009), *Report 2: Impact on Disadvantaged Regions*, report to the Council for the Australian Federation Secretariet, Canberra, May. See Table 7.1. We have interpreted the data in this table as change relative to the reference scenario.

[20] The CAF estimate should be treated with caution as this study was the only study of those quoted to state that there is a loss of output relative to 2008 levels. The gain in jobs using the CAF estimate is probably due to the higher estimates of job increases under the NILS reference case.

[21] This compares with around 50 GW of installed capacity in Australia.

exports would have to be made), only 10% of this additional requirement would be needed to replace the estimated loss in growth in production under the CPRS.

Second, the nature of the export market could change. Many of the countries that have been major exporters are in the processing of expanding domestic use of coal due to the high price of alternative fuels and renewable energy. China and Indonesia are planning to increase coal usage. Indonesia has instigated a program that could cap exports of coal to ensure that sufficient coal is available for domestic users[22]. If this cap holds then this would open up opportunities for further coal exports from other countries exporting thermal coal including Australia.

Third, despite the potential and imminent implementation of the CPRS, investment in the coal industry is continuing:

- According to ABARE's survey of major projects, about 9 new mines are currently under construction or financially committed. An additional 41 projects are being actively considered, although not all these projects may proceed. From available data, around $6 billion is being spent on new mines and at least $16 billion of expenditure is under consideration. Some of these projects will replace closed operations. Additional employment at mines (not including that from replacement mines) is estimated to be 1,460 full time equivalents for projects under construction and 5,000 full time equivalents for planned projects.

Table 3-4: Estimates of capital expenditure and operating employment for new mines

	Capital expenditure $M	Operating employment
NSW - committed	1,965	720
NSW - under investigation	3,894	1,899
Queensland - committed	3,917	740
Queensland - under investigation	12,403	3,254

Source: ABARE 2009

- New industrial projects could underpin the future of the black coal industry in Western Australia and South Australia. A coal to liquids project is planned for South Australia (start date unknown). Perdaman Chemical and Fertilisers plans to develop a coal-to-urea plant at the Shotts Industrial Park, near Collie, for planned start up in 2013. The plant will use proven coal gasification and fertiliser production technologies. Around 2.7 Mt per annum of coal will be used as a feedstock and as a source of energy to produce approximately 2 Mt per annum of urea, primarily for export to India. The expansion of the Worsley Alumina refinery currently under construction will be powered by a 100 MW fluidised bed generators utilising coal or a coal/biomass mixture.

22 I. B. Setiawan (2009), "Indonesia's Coal Policy", paper presented at the *Indonesia – Japan Coal Seminar*, Tokyo, March.