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Restructuring the Australian Economy to Emit Less Carbon:

Main Report

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This report is accompanied by a publication: *Restructuring the Australian economy to emit less carbon: detailed analysis*. The accompanying publication provides supporting analysis and can be downloaded from the Grattan Institute website

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Overview

Like much of the world, Australia has debated putting a price on carbon emissions (a "carbon price") with an emissions trading scheme or tax. These aim to induce structural change in the economy that will reduce greenhouse gas emissions.

The Australian debate has been dominated by concerns that Australia might lose industry and jobs offshore if it has a carbon price when competitor countries do not. If Australian production moves to countries with *higher* emissions (carbon leakage), this would defeat the purpose of carbon pricing. To protect industry from such an event, government plans to provide some industries with free carbon permits.

We find that **much of the protection proposed for the major emissions-intensive industries is unnecessary or poorly targeted**. It would delay the structural adjustment required to move to a lower carbon economy.

- Several industries, such as **alumina refining, LNG production and most coal mining**, will be less profitable, but still internationally competitive. Shielding these industries imposes large costs on the rest of the community and can discourage the economy from efficiently adjusting to produce less carbon. "Compensating" these producers is contrary to general principles that industry is not compensated for changes to environmental or health and safety regulation.

- Free permits or other assistance would be justified for **steel and cement**. A carbon price could force these industries offshore to locations that would not have substantially lower greenhouse emissions. Intervention to prevent such perverse outcomes is appropriate. However, there should be ongoing monitoring of the type and level of assistance required by an independent body such as the Productivity Commission.

- Australia should provide targeted assistance to the individual workers and communities reliant on industries such as **aluminium, and oil refining.** These industries may well be forced offshore by carbon pricing, but they are likely to move to locations where they will emit substantially less greenhouse gases. The very purpose of carbon pricing is to promote this result. Assistance should be provided to the workers and communities affected to enable them to adjust successfully to an economy with carbon emission constraints.

For the **bulk** of the economy a carbon price would have only **minor impacts on costs and competitiveness** - smaller than other factors such as exchange rates, labour market costs, and fuel prices. Compared to other economic reforms, such as reduction in tariff protection over the 1980s and 1990s, a carbon price requires relatively little structural adjustment.

Consequently, we find that concerns about industry competitiveness are misplaced, and **no reason to delay introducing a carbon price**. The adjustments for emissions-intensive industries are manageable and inevitable if we are ultimately to constrain carbon emissions. Australia would be better to start restructuring its economy for the inevitable rather than persisting with an economy not structured for a carbon-constrained future.

1. Carbon pricing and structural economic change

1.1 Purpose of carbon pricing

There is substantial scientific and international concern that greenhouse gas emissions are changing the world's climate.[1] This is a significant challenge for Australia. Our greenhouse gas emissions are amongst the highest in the developed world, both per person and per unit of GDP.[2] This reflects our advanced economy and our electricity generation mostly fuelled by coal.

The previous Commonwealth Government's Shergold Report on Emissions Trading,[3] and the current Government's Carbon Pollution Reduction Scheme White Paper[4] make a compelling case that, from a risk management perspective, it is prudent for Australia to begin restructuring its economy now to take into account the cost of carbon emissions. This should prepare Australia to be more competitive in the likely future when carbon emissions are even more constrained.[5]

A carbon pricing regime would encourage investors and business managers to make decisions that take into account the effects on Australia's greenhouse emissions. Sometimes decisions have obvious carbon emission consequences, such as which type of power station to build. But often decisions dispersed across many firms can add up to substantial consequences for greenhouse emissions, such as whether to use timber or cement in constructing a building, how much metal to use in a product, and whether to use gas or coal for a steam boiler. A carbon pricing scheme enables these myriad decisions to take into account their consequences for carbon emissions which are all implicitly incorporated within the costs of goods and services. A carbon pricing regime should therefore result in resources being allocated so that goods and services are produced with greater efficiency in carbon emissions, resulting in an economy well-placed to compete internationally in the longer run.

1.2 Carbon pricing relative to historic economic reforms

The purpose of a carbon price is to restructure the Australian economy to emit less greenhouse gases. Any restructure results in some people changing jobs and some businesses being replaced by others. However, this change is no reason to resist carbon pricing.

Major economic reforms are rarely, if ever, painless. They usually involve the removal of subsidies and protections for particular sub-sections of Australian industry and workers. These typically require those engaged in these sub-sectors to adjust at some cost. Some businesses will close down and some workers will need to find new employment. Nevertheless, the reform process is ultimately worthwhile because it reduces the larger costs borne

[1] National Academies of Science of the United States, France, Brazil, Canada, China, Germany, India, Italy, Japan, Russia, United Kingdom (2005)
[2] World Resources Institute (2009)
[3] Australian Government Prime Ministerial Task Group on Emissions Trading (2007)
[4] Australian Government (2008)
[5] Garnaut (2008b)

by the community as a whole. On average we are ultimately better off.

However, some communities may be particularly affected, and there is usually a strong case that governments should assist the individuals and families in these communities to adjust, through support for retraining, facilitating the set-up of alternative viable employment, welfare, and relocation assistance.

Australia has undertaken significant reforms over the last 30 years that have resulted in higher productivity growth, higher living standards and more flexibility in coping with the unexpected. However, all of these reforms involved difficult adjustments for some sections of the community. The introduction of a price on carbon is an important reform but it does not appear to pose adjustment challenges greater than those Australia has successfully navigated in the past.

In terms of managing employment dislocation, the impact of a carbon price is likely to be small compared to the removal of tariff protections for the manufacturing sector over the 1970s and 80s; and competition reforms in the electricity sector over the 1990s.

In the industrial facilities this report analyses, which constitute a substantial proportion of the industries thought to be at risk from carbon leakage, total existing employment is about 70,000 people.[6] Of these, our analysis suggests the majority work within facilities which will continue to be viable under a carbon pricing regime, even without industry assistance measures.

By comparison, as a result of structural adjustment principally due to tariff reductions, employment in automotive manufacturing dropped from 100,000 in 1973 to 45,000 in 1995.[7] In textiles, clothing and footwear, manufacturing employment fell from 113,000 in 1985 to 49,000 in 2005.[8] Other manufacturing sectors also experienced significant employment losses as a result of tariff reductions.

While the electricity sector will also experience substantial structural change as a result of carbon pricing, the employment impacts are likely to be manageable compared to the privatisation and competition reforms of the 1990s. These reforms led to substantial improvements in electricity sector productivity, reducing the cost of providing electricity, and the number of people employed. Employment fell from 330,000 in 1985 to 154,000 in 2000.[9] In comparison, about 9,000 people are employed today in Australia within the electricity generation sector, the only sector of the electricity industry whose employment will be substantially affected by carbon pricing.[10]

In terms of an administrative compliance burden and change in the cost of living for households, a carbon pricing scheme will have lesser effects than the introduction of the Goods and

[6] This is a Grattan Institute estimate based largely on companies' published data of the number of people employed in the *facilities* considered at risk, rather than the entire *industries*. This facility-based estimate is more precise because often employment attributed to industry categories includes parts of the supply chain which are not exposed to international competition and which will not contract due to a carbon price.

[7] Australian Government Productivity Commission (1997b)

[8] Australian Bureau of Statistics, "6291.0.55.003 Labour Force, Australia, Detailed, Quarterly", www.ausstats.abs.gov.au

[9] Ibid

[10] Total employment in electricity and natural gas sector 2008-09: 52,000 (Source: Energy Supply Association of Australia (2009). Proportion employed in electricity generation: 15.9% (Source: Energy Supply Association of Australia (2007))

Services Tax (GST). According to the Government, there will be around 1000 companies with an obligation to acquire and acquit carbon permits under the CPRS.[11] Almost all of these companies are substantial corporations. By comparison the GST imposed compliance obligations on every single business in Australia, no matter how small, which applied to every sales transaction in the economy. For most of these businesses other tax administration burdens did not reduce. The government estimated the implementation cost (to business and government) was $4.5 billion.[12]

In terms of the effect on households' cost of living. the GST induced a once-off spike in CPI of 2.8%[13] and a temporary disruption to national consumption patterns.[14] By comparison the Australian Treasury estimates the CPRS will lead to, *"a once-off rise in the price level of around 1-1.5%, with minimal implications for ongoing inflation"*.[15]

1.3 Scope

This report focuses on the impact of carbon pricing on Australian industry and households, understanding how carbon pricing will affect their costs and competitiveness. It does this through adopting a carbon price reflective of what is likely to occur over the next 10 years according to Australian Treasury modelling - $35 per tonne of CO_2.[16] This carbon price is based on Australia reducing emissions by 5% below 2000 levels by 2020, which is the policy of both the Labor Government and Liberal-National Opposition. Under current policy, Australia would only adopt more stringent targets if Australia's trade competitors also constrained carbon emissions – in which case carbon leakage will be less of a concern. While there will be substantial impacts beyond 2020, it is relatively speculative to predict the impact of technological and social changes beyond this period, and we have not attempted to do so.

The report examines in detail several industries that are emissions-intensive and trade-exposed (EITE). These industries, which produce around a fifth of Australia's greenhouse gas emissions, include alumina refining, LNG production, coal mining,[17], steel, cement clinker, aluminium smelting, and oil refining. These represent around 70% of EITE industry emissions and also include sectors expected to experience substantial growth (LNG and coal).[18] A collection of other relatively small EITE industries have not been examined in detail because they contribute relatively little to Australia's emissions, or because a carbon price will not significantly alter their costs.

This report looks at the static impact of a carbon price on the costs and competitiveness of Australian industry and households. This form of analysis is intuitively easier to understand than dynamic models that are more sophisticated in capturing the

[11] Australian Government Department of Climate Change (2008)
[12] Binh Tran-Man (2000)
[13] Valadkhani and Layton (2004)
[14] Parliament of Australia, "Regulation Impact Statement for the Introduction of a Goods and Services Tax," www.aph.gov.au
[15] Australian Government Treasury (2008)
[16] Ibid

[17] Coal mining is not formally categorised by the government as an EITE industry but we have considered it within this broad categorisation because it is trade exposed and under the draft CPRS it will receive substantial free permits.
[18] Grattan Institute analysis utilising: Australian Government Department of Climate Change (2010); Australian Government Department of Climate Change (2009a); and Australian Government Department of Climate Change (2008)

interactions between sectors, but require more complex workings and assumptions. Both static and dynamic analyses are ultimately valuable in understanding the impact of carbon pricing.

The report does not investigate:

- The merits of pricing carbon through a tax rather than a cap and trade scheme;
- Dynamic interactions when carbon pricing causes an industry to reduce production, potentially reducing carbon prices for other industries;
- The impacts of carbon pricing on capital costs;
- Support for the electricity industry aimed at ensuring continuous supply.

These are all important issues, but beyond our core focus.

The report assumes a carbon price of $\$35/tCO_2$ and an exchange rate of US$0.85/A$1. Further details about the scope and assumptions of this report are in the detailed analysis.

2. Impact on emissions-intensive industries

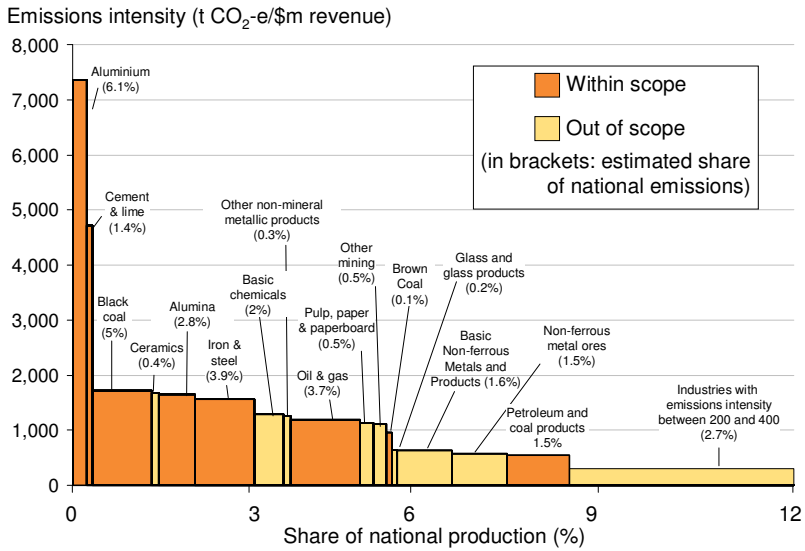
2.1 Industries affected

A carbon price would have a significant effect on only a few industries that constitute less than 8% of Australian GDP, but emit 30% of Australia's greenhouse gases either directly or through their consumption of electricity. As shown in Figure 2.1, a carbon price of $35/tCO$_2$ would increase the costs of about 8% of Australia's industry by more than 1.4% of revenue. Many of these emissions-intensive industries compete against overseas producers. Consequently, they will be constrained in passing on carbon costs to their customers.

This analysis excludes agricultural industries which are beyond the scope of this report. Their direct emissions are currently excluded from proposed Australian carbon pricing legislation. Their indirect emissions through using electricity and petrol are unlikely to substantially increase their costs on average.[19]

A few industries that emit substantial greenhouse gases are not trade exposed, particularly water supply and electricity production. Because they are not trade-exposed, it is likely that these industries will be able to pass on most of the carbon costs imposed upon them to their customers. The relative competitiveness of individual plants may change due to carbon pricing, but the point of carbon pricing is precisely to give a competitive advantage to producers that emit less carbon.

Figure 2.1 Australian trade-exposed industries with highest emissions intensity as a proportion of national production



Note: Preliminary analysis based on 2001-02 ABS data. Emissions intensity likely to have changed since this time.
Source: Australian Government Department of Climate Change (2008)

[19] See Tulloh *et al.* increased (2009). It is possible that agricultural costs could be significantly increased by a carbon price's effect on the cost of fertilizer, but only if Australian fertilizer producers were able to pass on these costs in spite of international competition. At present government policy is to provide free permits to fertilizer manufacturers because they are considered trade exposed and assumed to be unable to pass on cost increases. Further study is required to be definitive about who bears the impact of carbon costs on fertilizer.

2.2 Principles for government support to affected industries

Government support for affected industries might be advocated on a number of bases, including:

- Coherence (avoiding higher emissions due to perverse policy)
- Welfare (looking after individuals and communities adversely affected)
- Stability (ensuring continuity of essential services)
- Transition management (preventing deadweight loss as companies adapt to the new regime)
- Fairness (preventing the burdens falling disproportionately on one part of society)
- Sovereign risk (preserving future government credibility)
- Fulfilling expectations created by specific government actions or programs

The first of these arguments, **coherence**, is investigated in detail by this report**.** Welfare is a legitimate concern but assistance should be targeted to the workers and communities affected. The continuity of essential services is a complex issue beyond the scope of this report. The other arguments do not apply to the introduction of carbon pricing in Australia.

If Australia imposes a carbon price, and other countries do not, there is a risk that industry will move from Australia to locations where it will emit even more greenhouse gases. This would be a perverse result, defeating the purpose of carbon pricing.

This perverse result, sometimes described as "**carbon leakage**" would only occur if:

- Carbon pricing makes an Australian industry internationally uncompetitive;
- In its new overseas location, the industry emits more greenhouse gases per unit of production;
- There are no offsetting government policies to support the Australian industry.

This is the most important argument for government support, investigated in detail by the remainder of this report.

Carbon pricing may affect the **welfare** of some communities, particularly those that are based around an industry that is uncompetitive in a carbon-constrained world. Government support should not slow the pace of economic change to soften the blow on the affected industries. Instead, government support should be targeted towards assisting the affected individuals and communities to adjust, and thus minimise the human and economic costs of unemployment. The social safety net aims to do this; in addition localised programs for worker retraining, relocation, and education may help to minimise the human costs.

There is an argument that government may need to support the electricity industry to ensure **continuity of supply**, although the facts would require careful investigation and are beyond the scope of this report.

It might be suggested that intervention is required to assist companies to manage the **transition** to carbon pricing. However, this would require evidence that there will be deadweight losses (such as closing plants that in the long-run would have been viable). The proposed assistance is not particularly "transitional" – at the current rate of change in assistance, the transitional arrangements would only conclude in 2105.[20]

It might be argued that it is **unfair** that the burden of carbon pricing falls more heavily on some industries and that government support should soften the blow. However, industries are not entitled to pollute more in the future just because they polluted more in the past. Compensation in these circumstances perversely encourages investment in activities that investors know or suspect will cause harm. Compensation would protect investors from the risk of paying for harm they cause to others.

If governments intervene to compensate for the impact of general environmental or health regulation, this reduces the impact of the regulation on those who most need to change their behaviour. Intervention also delays industries restructuring to become more efficient in the new environment. Legal doctrines about acquisition of property support this approach: while governments must compensate for property that they take and use for a different purpose, they are not obliged to compensate for the impact of general regulations.

Consequently, there are numerous examples of government regulation without compensation to control or ban a product in widespread use after scientific investigation shows that the product causes harm. Examples include tobacco, asbestos, mercury, air-pollutants that cause respiratory illnesses and lead in petrol.

It might be argued that requiring producers to pay for 100% of emissions and using the revenue to compensate households is effectively a redistribution from producers to households. Assistance for trade exposed industries might be seen as a mitigation of this redistribution. However, the Australian government has not sought to justify assistance on this basis.

Another suggestion is the assistance is required to create a "level international playing field". However, a level playing field is not an end in itself. Its purpose is to ensure that international trade results in the most efficient location for production. Carbon pricing has a different aim: encouraging production to move to the lowest cost location taking into account carbon costs. Free permits, although formally consistent, would delay desirable relocation to low cost low emissions locations.

Nor is compensation needed to avoid a perception that Australia poses a **sovereign risk**. Australia would be pricing carbon later than many other countries, flagged the possibility of carbon pricing over a decade in advance,[21] and the government itself is not benefiting from any acquired asset. Although some other countries had adopted schemes in which producers only paid for

[20] Australian Government (2009a)

[21] In the lead up to the negotiations around the Kyoto Protocol in 1997, the Australian Government was a prominent advocate of the importance of market-based pricing mechanisms for controlling greenhouse gas emissions (for example see: Downer (1998)). Also in 1999 the Australian Government released a series of discussion papers proposing the establishment of a carbon trading scheme.

a percentage of their emissions, it was an open possibility that Australia would adopt a scheme that required producers to pay for *all* emissions.

A final argument is that compensation should be paid to companies that have acted on the basis of **specific expectations** created by governments. However, governments have not created specific expectations that there would be no carbon pricing – indeed it has been a public and significant agenda item for Australian governments for several years.

Nor is there a strong basis for specific expectations that there would be compensation for a carbon price. Assistance for the impacts of a carbon price were only adopted as government policy in July 2007,[22] yet the vast proportion of industrial capacity for which compensation is being claimed was established well before this time. In addition any expectation of government assistance was diluted within a few months by the Garnaut Review.

2.3 Current proposals

Current government proposals use a blanket approach that protects the profitability of any industry that emits a substantial quantity of carbon and is trade-exposed. They go much further than is necessary to prevent perverse outcomes due to carbon leakage. In many cases the proposed levels of free permits or other exemptions would simply minimise the reduction in profit margins of the Australian industry.

While protecting the profitability of Australian industry might seem like a good thing, it creates many problems. It mutes the incentives for these industries to reduce emissions. It creates perverse incentives which encourage investment in activities that benefit at the expense of others. It damages the environment because industries are not encouraged to move to lower emission locations. It inhibits efficient restructuring of the economy. And it imposes very substantial costs on the rest of the community.

The free permits envisaged by the Australian government's draft CPRS from December 2008 went substantially further than was necessary to prevent perverse outcomes due to carbon leakage in *all* the Australian industries that we have studied. Substantially more free permits were proposed in subsequent legislative drafts in May 2009 and December 2009 as shown in the box.

Our analysis suggests that at this level of free permits, ***no*** facility, let alone industry, would move from Australia, even though some industries would produce less carbon if they moved offshore.

[22] Australian Government (2007)

Free permits under the draft CPRS

The Australian government's draft CPRS from December 2008 proposed free permits to industries producing more than 1000 tCO_2/$1m revenue. At $35/$tCO_2$, a carbon price without free permits would increase their costs by at least 3.5%. Free permits were allocated according to the historic Australian industry average for emissions per tonne of product, rather than the individual emissions of each plant. These emissions included indirect emissions from electricity usage, with the simplifying rule of thumb that 1MWh of electricity results in 1tCO_2 emissions.

Proposed free permits for emissions-intensive industries

	1000tCO_2/$1m revenue or 3000$tCO_2$/$1m value-add		2000tCO_2/$1m revenue or 6000$tCO_2$/$1m value-add	
Fin yr begins	**White Paper Dec 2008**	**Draft legislation Dec 2009**	**White Paper Dec 2008**	**Draft legislation Dec 2009**
2011	60.0%	66.0%	90.0%	94.5%
2012	59.2%	65.1%	88.8%	93.3%
2013	58.5%	64.3%	87.7%	92.1%
2014	57.7%	63.5%	86.5%	90.9%
2015	56.9%	62.6%	85.4%	89.7%
2016	56.2%	61.8%	84.3%	88.5%
2017	55.5%	61.0%	83.2%	87.4%
2018	54.8%	60.2%	82.1%	86.2%
2019	54.0%	59.4%	81.1%	85.1%
2020	53.3%	58.7%	80.0%	84.0%

Free permits would cover a percentage of this cost increase, as shown in the table above. For example, a producer of 1000tCO_2/$1m revenue would get 66% free permits in 2011, so their costs would effectively only increase by 1.2% ((1-66%) x 3.5%) at a carbon price of $35.

Under the proposed free permits system, relatively efficient plants gain at the expense of inefficient plants. With 94.5% free permits, a plant that was 6% more efficient than average could make *more* profit under the CPRS scheme than at present, except for a no windfall gain provision.

Free permits mute the incentives for industries to reduce their carbon emissions. The free permitting regime maintains some incentives to reduce carbon emissions because they are allocated in proportion to production, based on the industry's historic emissions. A producer can increase profit by reducing emissions and the number of permits they need to buy. However, the incentives are weaker than they would be without free permits:

- The current CPRS design contains a "no windfall gains" provision so that facilities do not receive more free permits than their actual emissions.[23] As a result, there is no incentive for firms to reduce emissions below the level of free permits prescribed by the draft legislation. Although the number of free permits declines by around 1% per year, many industries would be capable of reducing emissions much faster than this.
- Competition occurs between industries when their products are partial substitutes. Free permits provided to one industry may protect them from competition from lower emission substitutes that do not receive free permits.
- In LNG, coal and steel,[24] higher polluting facilities can qualify for more permits per unit of production than lower polluting facilities, blunting the incentives for production to move to lower emission facilities.[25]

[23] Australian Government (2009a)
[24] In the case of steel this is because blast furnaces have a greater entitlement to free permits than electric arc furnaces, yet in the case of OneSteel these different types of furnaces produce the same product – steel billet.
[25] Australian Government (2009a)

- Behavioural economics literature suggests that managers and people more generally tend to satisfice rather than optimise, and to weight losses more than gains. Free permits represent an opportunity to gain rather than a serious competitive threat which forces a response. This suggests that while in theory firms work hard to contain costs in all environments, in reality they tend to work harder when profit is reducing - and especially hard when there is a "burning platform" of threatened losses.[26]

- The free permits are issued irrespective of the emissions intensity of overseas producers and will discourage industries from moving offshore when this would reduce global carbon emissions.

As a result, free permits slow the restructuring of the economy, reducing its efficiency in a carbon-constrained world.

"Free" permits aren't free. The rest of the community effectively pays for them. One way to think about this is that recipients of free permits pollute for free. In the long run other people will have to change their behaviour to avoid emitting an equivalent amount of carbon. In theory, the cost of this avoidance is the price of a carbon permit. Another way to think about "free" permits is that they are an exemption from a tax which is paid by all the other members of the community in order to achieve an emissions reduction target.

[26]Simon (1978); Thaler and Sunstein (2008) pg 36; DeCanio and Watkins (1998); Conner (1998) pg 117

The cost of the "free" permits proposed under the draft CPRS is very substantial. The "free" permits for the industries we have studied would cost over $22bn in the next decade, with an annual cost of $2.0bn in 2012-13 rising to an annual cost of $2.7bn by the end of the decade, as shown in Table 2.1.

Even in terms of protecting Australian employment these are very expensive jobs, far exceeding the cost of other employment schemes. On average, free permits cost over $65,000/employee, with jobs in the aluminium industry costing $160,000/employee.

Table 2.1 Value of "free" permits under proposed CPRS legislation

	Value of free permits ($m)			Value/employee – per annum ($)
	2012-13	2020–21	2011-2021	
Oil	119	166	1,356	23,379
Aluminium	756	990	8,111	161,101
Cement	137	190	1,551	83,857
Alumina	214	297	2,426	33,797
Steel: Electric Arc	26	37	300	8,570
Steel: Blast Furnace	328	455	3,717	53,877
Coal	222	n/a	1,082	52,576
LNG	181	525	3,585	103,344
Total	**1,983**	**2,660**	**22,128**	**Average:** 65,063

Source: Grattan Institute analysis using Treasury (2008) forecasts of carbon prices for each year of scheme and $10 for 2011-12. Assumes production is held constant at current levels except for LNG where production grows to 53Mtpa. Coal free permit assistance ends after 5 years of the scheme.

2.4 Targeting structural adjustment

A more sophisticated approach would facilitate efficient structural reform, target protection to prevent truly perverse outcomes, and provide assistance directly to the communities that will be affected by industry moving where they emit less greenhouse gases.

With this approach, an industry would only be supported in Australia (through free permits, or other measures such as cash transfers or border tax adjustments) if it would otherwise be unprofitable and would relocate to countries where it would emit more carbon.

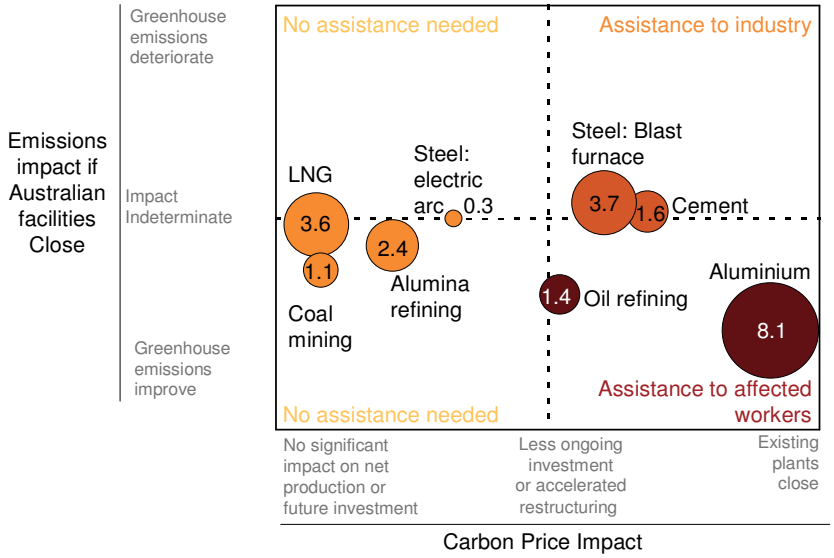
This more targeted approach requires analysis of individual plant profitability and world competitiveness. It would understand which Australian industries would truly become uncompetitive, rather than merely less profitable because of an Australian carbon price. It would also analyse where uncompetitive industries would go and how much carbon they would emit in their new location. This report analyses a number of industries in this way.

However, for assistance to continue to be targeted in the future, and to enable resolution of a number of issues on which data was not available to us, ongoing research is required. A permanent group should be established within the Productivity Commission to conduct similar analysis to this report to monitor the effect of a carbon price on the competitiveness of each industry receiving free permits or exemptions. The group would aim to identify the situations in which domestic carbon pricing would produce genuinely perverse outcomes such as carbon leakage and the level of permits required to prevent these outcomes.

2.5 Australian competitiveness with a carbon price

On this analysis, as summarised in Figure 2.2, several of the Australian industries most affected by carbon pricing will not in fact require substantial support while some others *will* require shielding from the impacts of a carbon price. Some industries may well not be competitive in the long run with worldwide carbon pricing, and moving offshore will reduce the world's net carbon emissions, so assistance to the relevant workers and communities is required.

Figure 2.2 Carbon price impacts on high emissions industries (bubble size proportional to value of free permits 2011-2020 in $b)



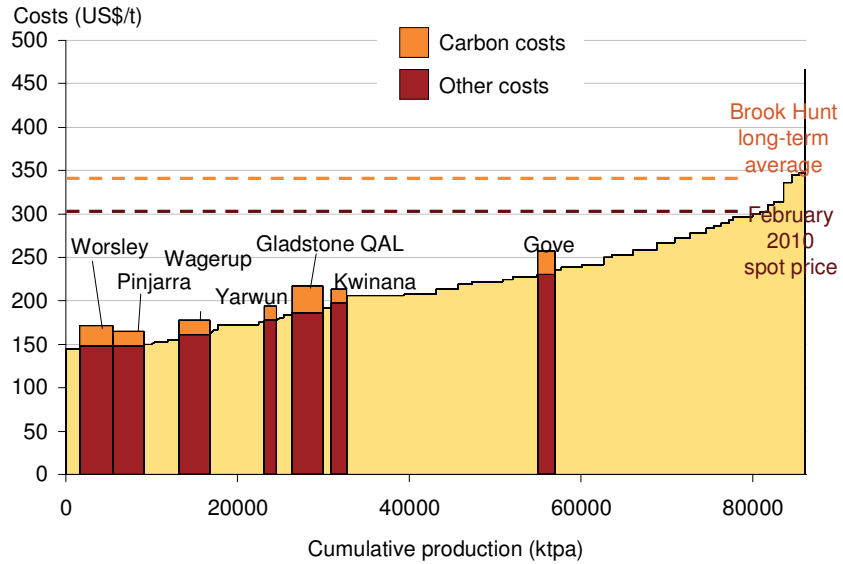
3. High emission industries that remain internationally competitive

Australian alumina refining, LNG production and coal mining will remain internationally competitive, even with a carbon price. Based on published industry data, they are currently low cost producers relative to the rest of the world and would remain so even with a carbon price.

3.1 Alumina

Figure 3.1 illustrates the impact of a carbon price on Australian alumina refining plants. Even with a carbon price, Australian alumina plants would remain relatively low cost producers. Their proximity to large bauxite deposits[27] and low fuel costs continue to provide them with a competitive advantage in spite of a carbon price. Free permits or other exemptions are not required to prevent producers and jobs moving offshore.

Figure 3.1 International cost curve for alumina and impact of carbon pricing (per tonne of alumina)



Sources: Alumina Limited (2009); Rio Tinto (2008g); Adelaide Brighton Ltd. (2009)

[27] Australian Aluminium Council (2000)

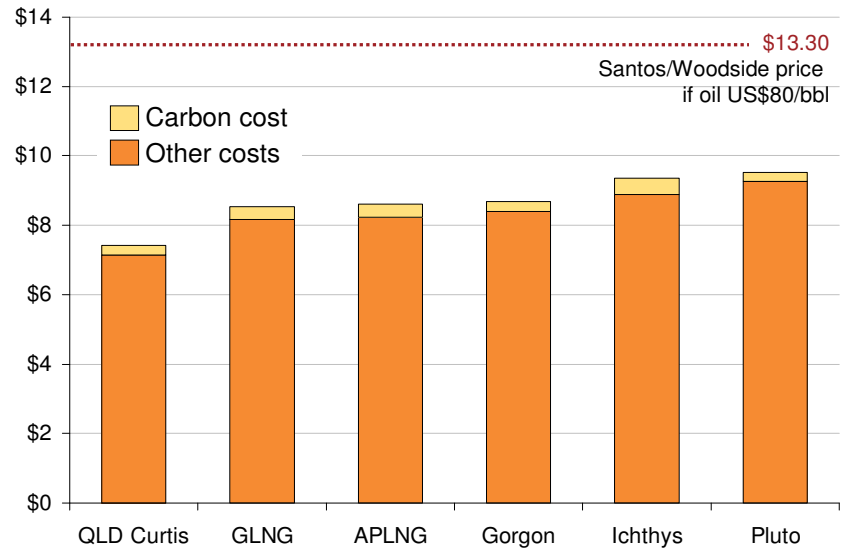
3.2 LNG

The key business decision for Liquefied Natural Gas (LNG) producers in Australia is whether to proceed with substantial investment in new projects. If projects currently under investigation proceed, Australia could become the world's largest LNG producer.[28]

A carbon price is very unlikely to materially affect these decisions. The carbon price would only be a small percentage of the projects' lifetime costs (including capital investment), as shown in Figure 3.2.[29] Production costs (including a carbon price) are less than gas prices outlined by major Australian project developers.[30] At these prices, Australian projects would provide significant return on capital invested. Nor does a carbon price substantially increase the uncertainty of LNG investment, which is subject to far greater uncertainties from other variables.[31] And finally, even if Australian costs were higher than those of other countries, investment would probably proceed in Australia because it has lower risk for both developers and customers.

Consequently, it is not necessary to provide any free permits to LNG producers to avoid carbon leakage.

Figure 3.2 LNG price required for 12% return on projects (AUD$ price per mmBTU)



Free on Board basis. Incorporates offsetting revenue from oil condensate. Assumes $A:$US is 0.85; APLNG assumed to have same emissions intensity as GLNG given similar size and location; 12% WACC.
Note: Pluto cost is inflated by pre-investment for future increases in capacity and will be lower once new LNG trains are brought on-line.
Source: Hirjee et al. (2009a) with Grattan Institute estimates of carbon cost impact.

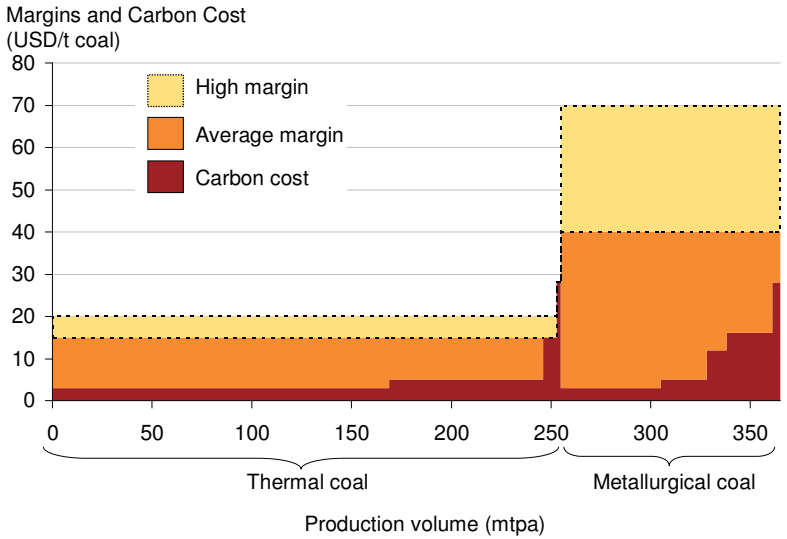
[28] ABARE (2009a); Hirjee *et al.* (2009b); Ramsay and Hardie (2009)
[29] Greenwood *et al.* (2009); ABARE (2009c)
[30] Santos (2009); Woodside (2009b); Energy Information Administration (2009); International Energy Agency (2009)
[31] McLennan Megasanik & Associates and KPMG-Econotech (2009)

3.3 Coal

A carbon price would have only a minor impact on the competitiveness of 90% of Australia's black coal mines. For the remaining 10% the impact on profitability is significant due to substantial emissions of methane, a potent greenhouse gas.

However, while their profitability might be significantly reduced, these emissions intensive mines are unlikely to close. Most of them primarily produce metallurgical coal that sells at a premium, at margins greater than $30 per tonne of coal, as shown in Figure 3.3.

Figure 3.3 Australian coal cash margins and carbon costs



Also, even if they did reduce production, it is likely that production would shift from these high emissions mines to lower emissions mines in Australia. A carbon price will have a minor impact on the profitability of other mines, but it is unlikely to noticeably change their international competitiveness.

It may be possible for some high emissions coal mines to reduce their emissions, and this may be economically viable,[32] although we have not obtained data on the precise costs and benefits.

For the coal industry, free permits, such as those provided under the draft CPRS are not justified. Rather than acting to prevent perverse carbon leakage or support a transition towards more carbon efficient processes, they primarily serve to protect profits of emissions-intensive mines and delay the movement of production from high emissions mines to low emissions mines in Australia, which is the very purpose of imposing a carbon price. Rather than providing free permits, it would be better to let these mines restructure and, in the rare cases where closure might occur, target assistance to the affected communities and the individuals who lose employment and income.

[32] Climate Works Australia (2010)

4. High emission industries that should be supported

Australian cement and steel production may become marginal with a carbon price, and production may move offshore to higher emission locations. Australian cement and steel are primarily produced for domestic use. If their production costs become too high they would be vulnerable to imports from countries with higher emissions.

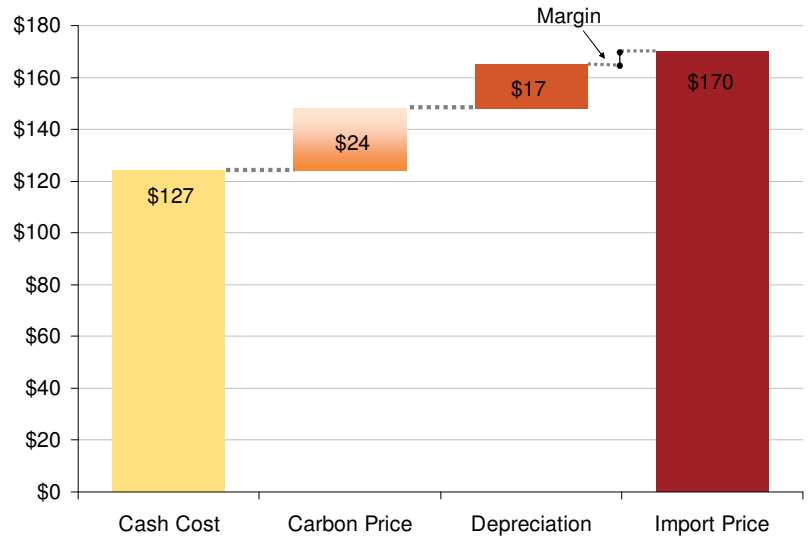
4.1 Cement

Carbon pricing might cause Australia to use cement clinker produced offshore rather than in Australia. While relocation might reduce greenhouse emissions, the improvements appear too marginal to justify the change. However, relatively few free permits are required to prevent declines in Australian clinker production.

The question regarding carbon leakage in the cement industry is unusual: here the relevant question is whether imports would substitute for local production. This contrasts with many other industries considered in this report, where the question is whether Australian exports would remain internationally competitive.

There is a real possibility that Australia would substitute cement clinker produced offshore for locally produced cement clinker as a result of carbon pricing. Figure 4.1 illustrates that the additional costs of carbon pricing would make domestic production marginal relative to imported cement clinker, despite the additional costs of freight for overseas production that usually make its international trade uneconomic.[33]

Figure 4.1 Cement prices and carbon price impacts



Offshore supply usually comes from South-East Asia and Japan.[34] These producers tend to be more energy efficient than smaller, older Australian plants and are likely to emit fewer greenhouse gases even after incorporating the extra emissions from

[33] Climate Strategies (2008)
[34] Australian Government Department of Industry, Tourism and Resources (2006); Grant-Taylor (2007); Kakoschke (2009); McNee and Hannam (2010)

shipping.[35] However the reduction in emissions of only 2-3% is too marginal to justify a shift in production.

Although the available data do not prove exactly how many free permits or exemptions are required to maintain local production, the CPRS scheme proposes more free permits than are required to prevent imports substituting for local Australian production. Current industry margins are healthy, and the three producers have a history of passing on significant price increases.[36] The costs of transport provide a substantial barrier to import competition.[37] Existing imports indicate that there is not critical mass for additional plant, but do not indicate that imports can undercut local production prices.

Nonetheless there is a better way to control for carbon leakage in the cement clinker sector than through providing free permits. It would be more efficient for Australian clinker producers to pay for permits but also require importers of clinker and cement to pay a carbon emissions import charge for each tonne they import. According to analysis published by the UK Government's Carbon Trust, the import carbon charge, commonly called a "border tax adjustment", can be structured such that it *"..complies with all relevant World Trade Organisation provisions"*.[38] In many respects this would operate in a similar manner to how the GST operates now – GST is payable on domestically consumed products whether made here or imported, but not on exports. Such a regime would encourage more efficient production and use of clinker and cement in the Australian economy while avoiding a situation where domestic producers might be excessively shielded from carbon costs at the expense of the rest of the Australian community.

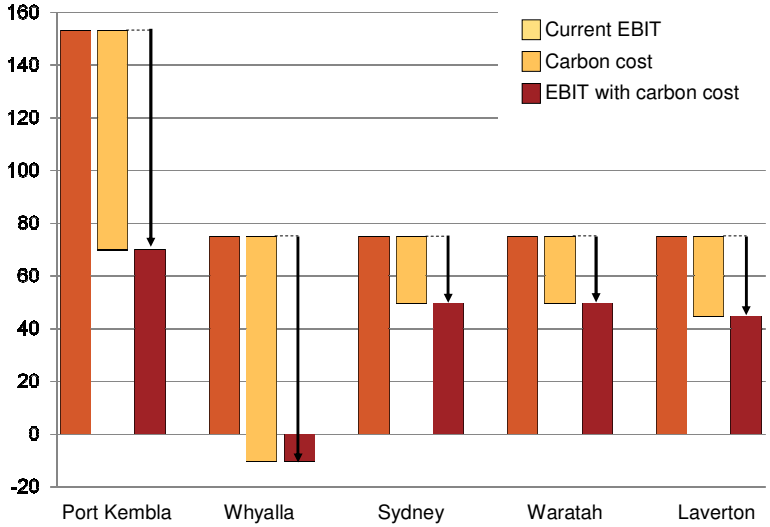
4.2 Steel

Australian steel production is in a similar category to cement clinker.

Available data indicate that Australia's steel mills have cash operating margins between $100 to $200 per tonne of steel. Without free permits a $35/t$CO_2$ carbon price would increase their costs by $85 per tonne of steel for blast furnaces and $28 for electric arc furnaces. While all mills would continue to be cash positive without free permits, they would struggle to earn sufficient returns on capital (see Figure 4.2). This would ultimately lead to blast furnaces closing, although probably only in the longer term. Electric arc furnaces would be less likely to close but may operate less frequently.

[35] Austrailan Government Department of Industry, Tourism and Resources (2006); Ecofys and Oko-Institut e.V. (2008); Boston Consulting Group (2008)
[36] Boral (2008); Adelaide Brighton (2009)
[37] Reinaud (2005); Boston Consulting Group (2008)
[38] The Carbon Trust (2010)

Figure 4.2 Impact of a carbon price on EBIT margins



It is unlikely that emissions would become noticeably worse if Australian blast furnace steel mills were to close. However substantial improvements in emissions are equally unlikely. If Australian electric arc mills closed, then emissions would substantially improve if their output was replaced by OECD countries' electric arc mills (such as Korea, Japan or Taiwan), but emissions would substantially deteriorate if their output was replaced by blast furnaces (electric arc furnaces that recycle steel use substantially less energy).

Considering the slight or indeterminate effect on global emissions, some level of assistance may be desirable to prevent perverse closures. However the current method for provision of free permits is not ideal, with potential for perverse outcomes in the Australian market where most Australian steel production is consumed. The draft CPRS scheme provides more free permits per unit of production to the emissions intensive blast furnaces than the less polluting electric arc furnaces, even though a substantial proportion of the Whyalla blast furnace's production is steel billet – the same product produced by the electric arc mills.[39] Also in some uses steel competes against less emissions-intensive substitutes such as plastic and wood. This substitution would be slowed if steel producers received free permits.

It would be better to rebate emissions permit payments if production is exported, and to impose a carbon charge on imports. The quantity of rebated permits or import charge should be set equivalent to the level of average global emissions intensity. Australian producers would still have ample incentives to improve their carbon efficiency given that most production is sold domestically. The import carbon change or border tax adjustment would be consistent with WTO rules provided that it treats imports on an equal basis to domestically produced steel.[40] This regime would distort the economy less, and reduce costs to the Australian community.

[39] OneSteel (2009) OneSteel Limited Operational Site Tour, 22 September 2009
[40] Droge (2009)

5. High emission industries that should not be assisted

5.1 Aluminium

Full carbon pricing would probably result in most Australian aluminium production moving offshore. In the medium term this would probably *reduce* global carbon emissions.

A carbon price without free permits or exemptions, in conjunction with the expected expiry of subsidised state-government electricity contracts, would make most Australian aluminium plants marginal to unviable, as shown in Table 5.1. This illustrates that Australian aluminium producers would move to high cost (4th quartile), uncompetitive positions on the international aluminium production cost curve.

Based on the available evidence, as legacy electricity subsidies for the industry unwind, Bell Bay and Kurri Kurri will become very high cost producers, and Point Henry will be vulnerable to swings in Aluminium demand. This loss of competitiveness is independent of a carbon price.

Table 5.1 Impact of carbon pricing and unwinding of electricity subsidies on Australian aluminium production costs

Smelter		Change in Al production cost (per tonne)		International cost curve position (Quartile)			
		Market electricity prices (tAl)	Carbon price	Current	Market electricity price	Carbon price	Market electricity AND carbon price
Portland		$307	$623	1st	low 3rd	low 4th	High 4th
Point Henry		$330	$623	up 1st -low 2nd	mid 3rd	mid 4th	High 4th
Boyne/ Glad-stone	L1&2	$210	$488	mid 2nd	low 3rd	mid 4th	High 4th
	L3			1st	hi 2nd	mid 3rd	High 4th
Bell Bay		$576	$110	mid 3rd	hi 4th	high 3rd	High 4th
Tomago		$266	$448	low 1st	low 3rd	low 3rd	4th
Kurri Kurri		$293	$522	mid 3rd	4th	high 4th	High 4th

Source: See section 7 of the Detailed Sector Analyses Report

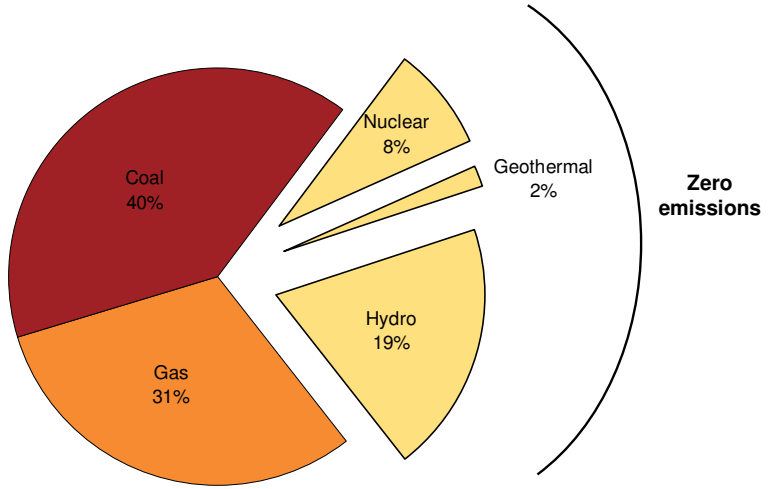
In the very short run, Australian capacity may be replaced by higher emission Chinese production. In the medium term, aluminium smelters that close in Australia (with the exception of Bell Bay) are likely to be replaced by smelters overseas that on average have lower greenhouse emissions.[41] Australian smelters emit more greenhouse gases than the current International Aluminium Institute global average and new global capacity is also likely to have lower emissions, as shown in Figure 5.1.

In the long run it is unlikely that Australia will have lower-emissions lower cost electricity which will be essential to sustain competitive advantage in aluminium smelting. Instead, aluminium production is likely to move to "stranded" low-emissions electricity sources such as the Middle-East, Canada and Iceland, that are relatively cheap because there are few alternative uses for the electricity fuel source in these locations.

Protecting the Australian aluminium industry with carbon pricing concessions will impose significant costs on the Australian community and impedes the almost inevitable restructuring that will enable Australia to *increase* productivity and living standards. In addition to the already considerable electricity subsidies, the cost of "free" permits proposed under the December 2009 CPRS provisions would average around $811m per year.[42] These costs amount to an annual subsidy of about $161,000 per person currently directly employed in the aluminium industry.

The most viable smelters if they are pay market electricity prices are at Portland, Boyne-Gladstone and Tomago. Keeping them in production with free permits would effectively cost other Australians $582m per year on average over the next decade, or $183,000 per person directly employed by these plants.

Figure 5.1 Proportion of proposed new aluminium smelter capacity to 2020 by electricity fuel supply



Source: Brook Hunt and Grattan Institute Analysis.

[41] International Aluminium Institute (2007)
[42] See Section 2.3 of the main report for a discussion of the cost of "free" permits.

5.2 Oil refining

The current economics of Australia's oil refineries are precarious. Although they generate cash from their operations, they do not make substantial returns on capital. New plants are not being built because these investments are unlikely to generate adequate returns.

Australian oil refineries are not internationally competitive on costs, and in the long run, with or without a carbon price, many are likely to close. More modern plants in Asia are substantially larger, more efficient, and better located. Australia's refineries only compete today against imports because their freight costs are lower, many competitor Asian refineries do not yet comply with higher Australian fuel quality standards, and Asian demand has tended to exceed supply in recent times.[43] These barriers are likely to erode so that we are likely to see:

- New overseas plants costs decrease further;
- Asian fuel standards lift to be closer to Australian standards;
- Asian supplies increase;
- Opportunities for Australian plants to reduce costs remain limited.

Carbon pricing would not result in immediate plant closures, but it is likely to bring them forward. Carbon pricing accelerates arrival at the point where Australian cash costs are higher than import prices.

Should Australian refineries close, global carbon emissions are likely to *reduce*. Overseas plants that are taking market share are substantially more efficient than Australian plants.[44]

Free permits under the draft CPRS will delay industry restructuring that is inevitable even without a carbon price and will increase global emissions.

If it were believed that Australia needed some domestic oil refining capacity to remain operational for energy security or defence purposes, this would be best managed through a direct and transparent subsidy for such purposes, not indirectly via free permits or other exemptions from a carbon price.

[43] ACCC (2007b)

[44] http://solomonline.com; Pers. Comms. (2010d)

6. Other industries and households

A carbon price of $35 per tonne of $CO_{2\text{-}e}$ would have mild impacts on the remaining sectors of the Australian economy. They provide no basis for delay in introducing a carbon price, even if other countries only act later. This finding should not be surprising. In total, the Australia economy emits 57kg CO_2 for every $100 in GDP.[45] At a carbon price of $35 per tonne of CO_2 this equates to an additional cost of $2 for every $100 in GDP. This impact will be ameliorated as the revenue from any scheme is reinvested in the economy or deducted from other taxes.

6.1 Industries that emit relatively little carbon

A carbon price would have limited impact on most Australian industry, and this is no reason to delay introducing a carbon price. Industries that produce 60% of Australian GDP emit few greenhouse gases (either directly or by consuming energy) relative to their total expenditure. Their costs would rise by less than 0.7% of revenue with a carbon price of $35/tonne $CO_{2\text{-}e}$. These industries all emit less than 200 tonnes $CO_{2\text{-}e}$ per $1m revenue.[46]

Industries representing a further 30% of Australia's GDP would not be affected much. Many are not exposed to international competition (for example water supply or government services), and hence will not lose production or employment to overseas competitors. They are likely to be able to raise prices commensurate with any increase in costs. The remainder would see their costs rise by less than 1.4% of revenue as these industries emit less than 400 tonnes $CO_{2\text{-}e}$ per $1m of revenue.[47] Carbon pricing would have a smaller effect on these industries than many other shifts in the economy. Across these industries a cost rise of 1.4% of revenue is the same as real wages rising 3.5% or the real exchange rising 9.2%. Australian businesses have already absorbed increases in these costs of over 40% since 2000.[48]

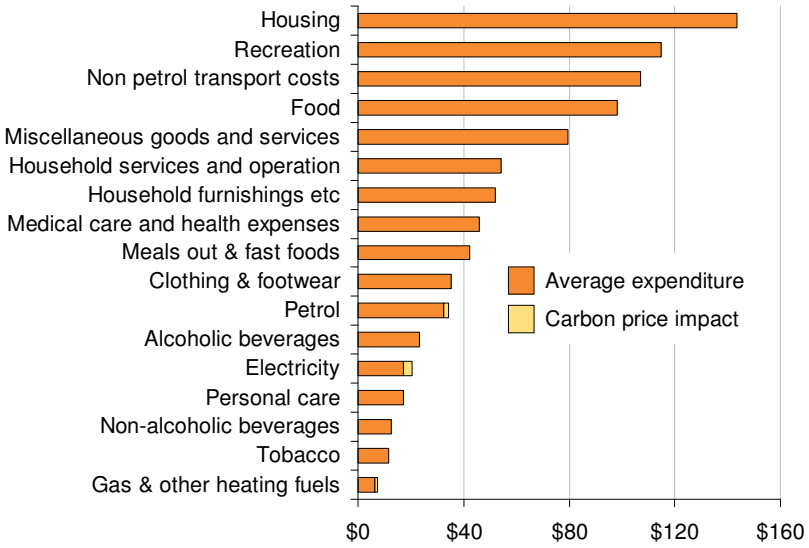
6.2 Households

A carbon price would have a small impact on household budgets relative to other changes in the cost of living and could be affordably offset by government through reductions in other taxes or cash transfers.

A carbon price would have most impact on the cost of energy goods – electricity, gas, and petrol, and relatively little impact on other household expenditures[49]. However, as Figure 6.1 illustrates, the impacts on energy costs would be small relative to total household expenditures. Although low income earners would be proportionately more affected, the percentage increase in household expenditure would still be relatively small.

[45] Australian Government Department of Climate Change (2009a)
[46] Australian Government Department of Climate Change (2008); and ABS (2010).
[47] Australian Government Department of Climate Change (2008); and ABS (2010)
[48] Grattan Institute analysis based on ABS6345, ABS5209.0.55.001 table 2 and 17. RBA table F15, real import weighted exchange rate index.
[49] Australian Government Treasury (2008)

Figure 6.1 Carbon price impact on Australian average household weekly expenditure (AUD)



Source: Australian Bureau of Statistics (2006). Carbon price impact based on Grattan Institute analysis

To put these cost increases from a $35 carbon price into historical context:

- petrol price rises experienced from 1999 to 2008 are nine times greater[50] than the increase in petrol prices induced by a $35 carbon price (8c/litre) – which will be offset by government reductions in excise taxes over the first 3 years of the scheme;
- A carbon price of $35 could be expected to increase residential electricity prices on average by around 20% from current levels. This percentage increase is smaller than that experienced by all Australian capital cities over the prior decade, when prices increased in real terms by between 31% and 69% depending on the capital city.[51]

[50] Grattan Institute analysis of Australian Automobile Association (2009) Fueltrac data
[51] ABS (2009); Government of Western Australia Office of Energy (2009)

Box 6.1: Restructuring then and now

Industry concerns at legislative change are not new. In *Hard Times*, first published in 1853, Charles Dickens wrote about the owners of the mills in the fictional Coketown of 19th Century England:

> *Surely there never was such fragile china-ware as that of which the millers of Coketown were made… They were ruined, when they were required to send labouring children to school; they were ruined, when inspectors were appointed to look into their works; they were ruined, when such inspectors considered it doubtful whether they were quite justified in chopping people up with their machinery; they were utterly undone, when it was hinted that perhaps they need not always make quite so much smoke."…*
>
> *Whenever a Coketowner felt he was ill-used - that is to say, whenever he was not left entirely alone, and it was proposed to hold him accountable for the consequences of any of his acts - he was sure to come out with the awful menace, that he would 'sooner pitch his property into the Atlantic.' This had terrified the Home Secretary within an inch of his life, on several occasions. However, the Coketowners were so patriotic after all, that they never had pitched their property into the Atlantic yet, but, on the contrary, had been kind enough to take mighty good care of it.*

As *Hard Times* illustrates, what is thought to be difficult for industry when it is introduced, often becomes orthodox business practice with the passage of time. Few, if any, people engaged in greenhouse emissions intensive businesses could have known when their industries and facilities were established that the greenhouse gases they emitted would be likely to cause harm. When problems are uncovered it may be difficult for businesses to imagine how they could do things differently. Nonetheless businesses (although not necessarily the same businesses that were in place in the past) have repeatedly shown a capacity to innovate in response to environmental, health and safety regulations in order to produce the goods that the market demands, while reducing the harm caused to others.

7. Glossary

ABARE	Australian Bureau of Agricultural and Resource Economics
ABS	Australian Bureau of Statistics
ACCC	Australian Competition and Consumer Commission
Al	Aluminium
Alumina	Aluminium oxide, the raw material produced from bauxite and used to produce aluminium
AUD	Australian dollars
Bauxite	The principal ore of Aluminium metal
Billet	A long, rectangular or cylindrical unfinished bar of iron or steel
Black coal	A lower water-content form of coal
BPD	Barrels per day
Brown coal	A higher water-content form of coal
BTU	British Thermal Units
Carbon leakage	The effect when a firm facing increased costs in one country due to an emissions price chooses to reduce, close or relocate production to a country with less stringent climate change policies
Carbon price	The cost of emitting carbon into the atmosphere. It can be a tax imposed by government, the outcome of an emissions trading market, or a hybrid of taxes and permit prices
CIF	In relation to cement: Cement Industry Foundation
CIF	In relation to a price of a commodity: Price including cost, insurance and freight – i.e. the price at the port where goods are imported – compare to FOB
Clinker	The precursor to cement, made by heating a mixture of limestone, sand and clay
CO_2	Carbon dioxide
CO_2 equivalent	A measure used to compare the emissions from greenhouse gases based upon their global warming potential
CO_2-e	See CO_2 equivalent
Coking coal	See 'metallurgical coal'
CPI	Consumer Price Index
CPRS	Carbon Pollution Reduction Scheme – the label the government has applied to its emissions cap-and-trade scheme
EAF	Electric Arc Furnace
EBIT	Earnings Before Interest and Taxes – profit taking into account the amortised cost of capital equipment, although positive EBIT may not provide sufficient return on capital to justify investment
EBITDA	Earnings Before Interest, Taxes, Depreciation and Amortisation – pure cash profit of a business without regard to the cost of capital equipment
EIA	Energy Information Administration
EITE	Emissions Intensive Trade Exposed
Electric Arc Furnace	Furnace for producing steel by recycling scrap iron and steel by melting it with an electric arc
Emissions intensity	The amount of greenhouse gas produced per unit of production

FOB	Price for goods free on board – i.e. the price at the port where goods are exported from, and excluding the costs of international insurance and freight – compare to CIF
Free permit	A certificate created under an emissions trading scheme that the holder does not pay for, and which entitles the holder to emit a specified amount of greenhouse gases
Garnaut Report	An independent study conducted by economist Professor Ross Garnaut, commissioned by Australia's Commonwealth, State and Territory governments in 2007
GDP	Gross Domestic Product
GFC	Global Financial Crisis
GJ	GigaJoule
Greenhouse gas	The atmospheric gases responsible for causing global warming and climate change
GST	Goods and Services Tax
IAI	International Aluminium Institute
IBF	Integrated Blast Furnace
IEA	International Energy Agency
Integrated Blast Furnace	Furnace for producing steel by converting iron ore and metallurgical coal into pig iron and then steel using a heat-intensive furnace
Kyoto Protocol	an international agreement linked to the United Nations Framework Convention on Climate Change, adopted in Kyoto, Japan on 11 December, 1997
LNG	Liquified Natural Gas
Metallurgical coal	Coal used in steel making
Methane	A greenhouse gas, estimated to have a global warming effect twenty-one times that of the same weight of carbon-dioxide
Mtpa	Million tonnes per annum
MWh	Megawatt hour
OECD	Organisation for Economic Co-operation and Development
Sequestration	The removal of atmospheric carbon dioxide, either through biological processes (eg. photosynthesis in plants and trees) or geological processes (eg. storage in underground reservoirs)
t	tonne
Thermal coal	Coal used in power generation
USD	United States Dollars
Windfall gain	A benefit accruing to a company without any effort on their part as a result of government regulation
WTO	World Trade Organisation

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