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Transitional assistance or windfall profits? The financial impact of the carbon price and compensation payments on Victoria's brown coal generators

A report for Environment Victoria

February 2013

This report has been written by Bruce Mountain, Director, CME.

CME
Level 43,
80 Collins Street
Melbourne
3000
Telephone 03 9664 0680
www.carbonmarkets.com.au

This report to be cited as: Mountain, B. February 2013. "*Transitional assistance or windfall profits? The financial impact of the carbon price and compensation payments on Victoria's brown coal generators*". A report for Environment Victoria.

EXECUTIVE SUMMARY

This report presents analysis of the impact of the carbon price package legislated in Australia's Clean Energy Act 2011 on the profitability of Victoria's brown coal generators.

This analysis takes account of actual carbon market and electricity market outcomes since the commencement of the carbon price on 1 July 2012 until 31 December 2012.

The context to this report is our client's interest in obtaining a deeper understanding of the extent to which carbon price 'compensation' payments through the Energy Security Fund may deliver "windfall" profits to the Victorian generators that are eligible to receive payments from this fund.

The Clean Energy Act 2011 legislated a package of carbon pricing reforms negotiated by the Multi-Party Committee on Climate Change (MPCCC) in 2011. The package adopted by the Government included significant assistance for industry to adapt to a price on carbon including, controversially, a fund to assist the most emissions-intensive generators adapt to a price on carbon, as well as to pay for the closure of 2,000 MW of Australia's most emissions intensive power stations via a process named Contracts for Closure. The fund established for these two purposes was called the Energy Security Fund.

Energy Security Fund assistance for the most "strongly affected generators" was estimated at $5.5 billion, with most of this accruing to the high emission brown coal generators in Victoria. The Government's decision to make these payments reflected advice from the Australian Energy Market Commission that without these payments energy security would be at risk. Professor Garnaut disputed this advice. He suggested that the security risks were quite small, and hence that transitional assistance payments were unnecessary. Likewise the Australian Energy Regulator was skeptical that the emission reduction scheme presented a risk to energy security.

We have analysed the change in operating profit to Victoria's brown coal generators attributable to the carbon price, using half-hourly data on actual outcomes in the "spot" National Electricity Market (NEM) for the first two quarters since the implementation of the carbon price package.

We have calculated that Victoria's brown coal generators have been able to pass through an estimated 111% of the cost of the carbon price in the spot market, or a little over 100% after accounting for the cost of emission permits that need to be surrendered for electricity used in the process of generating electricity at the power stations.

This is a higher level of pass-through than was expected. Modelling studies conducted in anticipation of the carbon price had predicted different levels of pass-through, although the expectation in most studies (and by the Government) was that generators in the NEM would not, on average, be able to fully recover the costs. In Victoria, the higher emission-intensity generation was expected to be able to pass through around 80% of the emission cost.

Our analysis of actual outcomes in Victoria finds higher pass-through rates than the previous expectations. The outcomes across the market as a whole also seem to have been higher than expected as well.

For example, the Australian Energy Market Operator suggested that spot electricity prices after the implementation of emission prices had increased by around $21/MWh. Based on their calculation of NEM-wide average emission intensity of 0.85 tonnes CO2-e per MWh, this translates into a NEM-wide average pass-through of 107%. This is far above the market and Government's expectations of average pass-through, before the emission trading scheme started.[1]

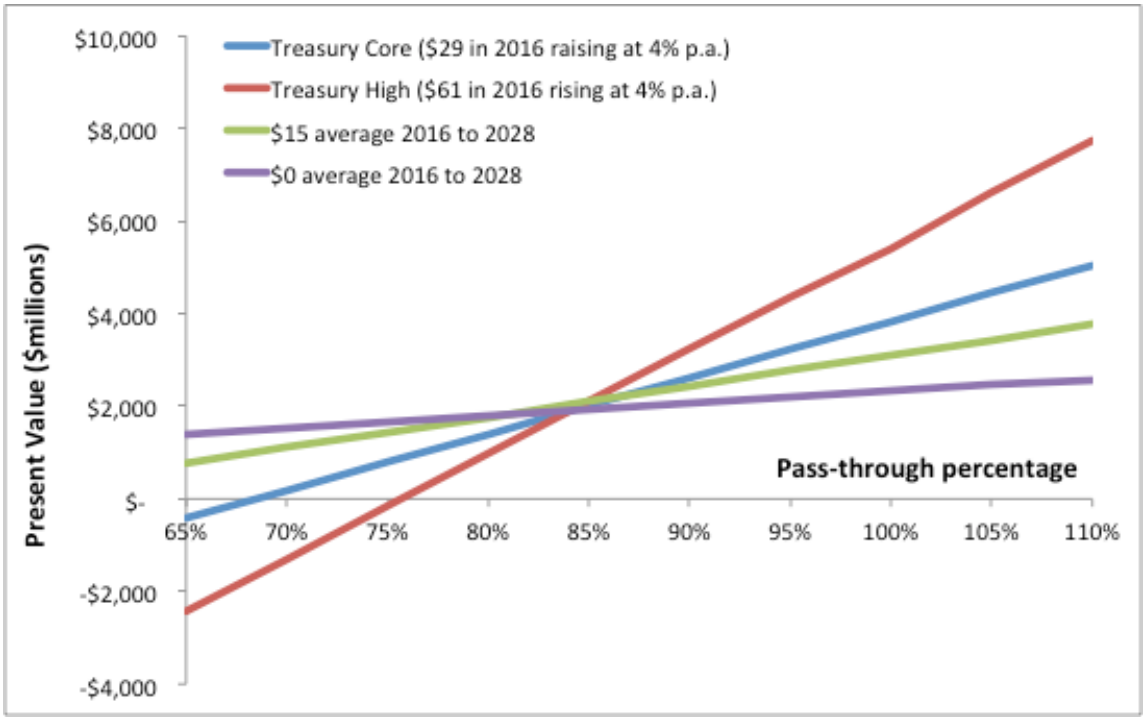
It is impossible to be certain about the precise pass-through percentage since it depends on assumptions of the extent to which spot prices change for reasons other than the carbon price. Our calculation assumes that the carbon price was the only reason why relevant NEM prices in the first two quarters of 2012/13 were higher than the comparable quarters in 2011/12. Others may attribute the difference to other factors, in part. In this case, a lower (or higher) pass-through percentage could be calculated.

We have considered reasons, other than the carbon price, that might explain why the relevant NEM prices in 2012/13 might be different to those in 2011/12. But none of these reasons provide a basis to conclude that prices in 2012/13 should necessarily have been higher than they were in 2011/12. To the contrary, declining average demand in 2012/13 would, we expect, have lead to lower, not higher prices.

We also considered changes in carbon markets, and specifically the Government's decision to link the Australian emission trading scheme to the emission trading scheme covering the member states of the European Union (EU). This decision, combined with the low price of emission permits in the EU, suggests that future emission permit prices in Australia can be expected to be somewhat lower than when the Government legislated its carbon pricing package.

The results of our analysis of the Present Value of operating profit/(loss) for Victorian brown coal generators attributable to the Clean Energy Agreement, for various emission price assumptions is summarised in the chart below.

[1] AEMO qualified their study, as discussed within this report.



Our analysis leads to the following conclusions:

1. In the first six months since the introduction of the emission price, generators in Victoria seem to have been able to pass on all of the cost of the emission permits, through higher electricity prices in the spot market. While spot market outcomes may not actually match the actual prices that the generators have received so far, the spot market outcomes are significant since they set the reference price for future financial contracts.

2. As a result of the Energy Security Fund payments and assuming a continuation of the observed pass-through percentage, the Victorian brown coal generators can expect to accrue additional operating profits somewhere in the range of $2.3bn to $5.4bn (Present Value) depending on emission prices in future. The lower end of this range corresponds to lower expected emission prices in future.

3. Even if pass-through percentages fall significantly, Victoria's brown coal generators would still be likely to improve their net profits as a result of the Energy Security Fund payments.

Finally, evidence of the observed pass-through percentages and the price that AGL paid to acquire the remaining equity in Loy Yang A from its GEAC partners, suggests that Professor Garnaut's advice that security of supply risks attributable to the carbon package was small, was sound advice. As such, on the available evidence, the payments made to Victoria's brown coal generators under the Energy Security Fund are perhaps best characterised as windfall profits rather than transitional assistance.

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1 Introduction

This report presents analysis of the impact of the carbon price package legislated in Australia's Clean Energy Act 2011 on the profitability of Victoria's brown coal generators.

This analysis takes account of actual carbon market and electricity market outcomes since the commencement of the carbon price on 1 July 2012 until 31 December 2012.

The context to this report is Environment Victoria's interest in obtaining a deeper understanding of the extent to which carbon price 'compensation' payments through the Energy Security Fund may deliver "windfall" profits to the Victorian generators that are eligible to receive payments from this fund.

Victorian brown coal generators are set to receive over 90 per cent of all Energy Security Fund payments and free permits issued to 2016-17. The Energy Security Fund compensation package was valued at $5.5 billion when the Clean Energy Act was legislated. Given the large sums of public money earmarked for compensation payments for generators, Environment Victoria seeks to better understand the impact that these payments are having on the behaviour, profitability and value of the brown coal generators.

This report is intended to address the following issues:

1. Explain the context of Energy Security Fund payments as a component of the Clean Energy Act 2011.
2. Discuss the rationale behind the Government's decision to establish Energy Security Fund payments for generators
3. Outline how Energy Security Fund payments to generators operate
4. Summarise changes to the price on carbon and non-carbon price changes to electricity markets since the MPCCC Clean Energy Agreement and passage of the Clean Energy Act 2011.
5. Build a model to assess the impact of Energy Security Fund payments on individual Victorian generators asset values and profitability based on different carbon price scenarios and taking account of the spot prices of electricity since the introduction of carbon price.
6. Use the model to test the possibility of windfall gains to generators and quantify the value of any gains.
7. Discuss the results and draw conclusions about the impacts of Energy Security Fund payments on generator profitability and market behaviour, and whether the level of generator compensation is appropriate if you accept the Government's rationale for compensation.

Section 2 of the report addresses the first 4 issues, Section 3 outlines the methodology of the model, Section 4 presents the results of the modelling, Section 5 discusses the results and draws conclusions.

2 Background

The Clean Energy Act 2011 legislated a package of carbon pricing reforms negotiated by the Multi-Party Committee on Climate Change (MPCCC) in 2011. The package, adopted by the Government and outlined in "*Securing a clean energy future: The Australian Government's Climate Change Plan*" included significant assistance for industry to adapt to a price on carbon including, controversially, a fund to assist the most emissions-intensive generators adapt to a price on carbon, as well as to pay for the closure of 2,000 MW of Australia's most emissions intensive power stations via a process named Contracts for Closure. The fund established for these two purposes was called the Energy Security Fund.

"*Securing a clean energy future*" says that Energy Security Fund assistance for the most "strongly affected generators" was estimated at $5.5 billion[2], while an unknown sum was earmarked to secure contracts for closure. Strongly affected generators were later defined in the Clean Energy Act as those with emissions over 1.0 tonnes of CO_2/MWh, which includes all of the Victorian brown coal generators, the Port Augusta brown coal generators in South Australia and 2 black coal power stations (Collinsville in Queensland and Redbank in NSW).

2.1 Rationale for payments to 'strongly affected generators'

The MPCCC Clean Energy Agreement explains that the Government was advised that free permit allocations and cash was needed to address "significant risks to energy security". This advice was principally from the Australian Energy Market Commission (AEMC) who advised[3], without equivocation, that:

"*Without an appropriate level of transitional assistance for highly emitting generators we believe there is significant risk to energy security because of the impacts of a number of the generators not having a net equity position that would allow them to operate and maintain their plant, operate effectively in the contract market, and have the willingness and capacity to invest in new plant. We would emphasise that these concerns regarding the financial position of existing market participants does not relate to a concern about their financial position per se, but rather its impacts on the efficient functioning of the overall market and its consequences for energy security.*"

The Australian Energy Market Operator (AEMO) made no reference to risks of effective contracting in contract markets, but did concur, conditionally, on the potential loss of

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[2] Commonwealth of Australia, 2011, Securing a clean energy future: The Australian Government's Climate Change Plan p.75

[3] Correspondence from Mr J. Pierce, Chairman AEMC, 21 June 2011, cited in Multi Party Climate Change Committee, Clean Energy Agreement, 2011.

market confidence and hence risks to future investment, and possibly also to premature market exit. Specifically, AEMO said:

The potential premature departure of high emissions plant and/or delay in new investment could lead to the market not being able to meet its reliability and security standards. Those risks are higher if:

- *existing generation participants are under severe financial distress and exit the market early; or*
- *participants and potential participants lose confidence in the market and energy industry investment is stalled.*

While the AEMC's main rationale for "transitional assistance" (as the AEMC called it) was that it was needed to address risks to energy security arising from the imposition of a price on emissions, the Investment Reference Group Report (IRG) to the Commonwealth Minister for Resources and Energy[4] did not make the same argument. Instead the IRG suggested that compensation was needed to ensure that investments to reduce emissions would be made:

"Although the transition to an environment conducive to efficient investment may be quite long, any impairment to the value of existing generators assets will occur when the policy is legislated. This could have important implications for the investment challenge being met. Any impairment of asset values immediately reduces the value of equity, which in turn increases the gearing ratio of the generator. The generator may then need to address its financial structure to maintain ratios to meet credit rating and debt covenant requirements, which reduces the generators financing flexibility.

While it may be possible to attract some new investment into the Australian energy sector, it is likely that existing participants will need to play a major role in future investments. The recent New South Wales electricity privatisation process shows the difficulty of attracting new investors and market participants to the Australian domestic energy sector. This was seen in heavily discounted asset values, substantially attributable to the expectation of a carbon price being imposed. The assets saw a 30- 40% discount compared to book value, even though investors appear to have been factoring in only a relatively low carbon price expectation. The reduction in asset value will be directly felt by equity investors.

Existing participants and new entrants are dependent on the same pool of funds from lenders and equity capital markets. The impact of carbon policy on the balance sheets of existing market participants will determine their lenders' and equity investors' appetite for future investments in the sector."

The Investment Reference Group's report was not publicly debated and, to the extent that their report is not officially endorsed (or even mentioned) in the Clean Energy Agreement, we surmise that while the Government may not have disagreed with the

[4] Investment Reference Group Report, A report to the Commonwealth Minister for Resources and Energy, April 2011.

IRG report's argument, the Government's principle rationale for compensation was to address the energy security risks that the AEMC had advised were material.

2.2 Past criticisms of compensation to affected generators

Professor Garnaut, in the original 2008 Garnaut Climate Change Review and the subsequent "Update 2011" was a strident critic of compensation to generators that were expected to be affected by emission policy. His unequivocal view, in his initial 2008 Review was that there was no reason to compensate generators for the loss of economic value that the emission reduction policy might deliver to some high emission generators.

In his Update Papers in 2011 he suggested that energy security concerns lacked clarity and their materiality had not been thoroughly analysed. His conclusion, from his own analysis, was that there was a concern about "contract market contagion", which he described thus:

If the firm operating a large and emission intensive generator were unable to meet financial obligations as they were due, it may be unable to reach a mutually acceptable agreement in the timeframes available. As a result, the generator would be unable to honour existing hedge contracts to retailers at a time of high spot prices. This unlikely event could trigger a financial contagion precipitating instability within the industry.[5]

However, he suggested that the risk was "*quite small*" and that the strengthening of the regulatory framework represented by the formation of the Energy Security Council would be a sufficient response to the risk. He suggested however that the proposed Energy Security Council "*will leave some anxieties*" which he proposed should be addressed through a temporary Energy Security Loan Guarantee through which the Government would be a lender of last resort to distressed generators, if needed.

In the development of the emission trading scheme, the Australian Energy Regulator was also sceptical that the scheme would jeopardise energy security.[6]

It is helpful to summarise the similarities and differences in the advice of the Investment Reference Group, AEMC, AEMO and Professor Garnaut on the need for generator compensation:

- The Investment Reference Group suggested "transition mechanisms" were needed to compensate for impairment to the value of existing generators assets, and the consequential implication of this impairment on investment needed to secure the transition to low carbon electricity generation. Unlike the AEMC, the

[5] Garnaut Climate Change Review, Updated Paper 8: Transforming the Electricity Sector.

[6] Commonwealth of Australia, 2008. "*Carbon pollution reduction scheme, Australia's low pollution future, White Paper, Volume 2*".Pages 13-46.

IRG report did not claim that compensation was needed to address financing risks.

- The AEMC said that "transitional assistance" was needed to address the "significant risk" to energy security. It defined this risk as a weaker equity position for some generators that would detrimentally affect the operation and maintenance of their plant; their "effective" contracting in the contract market; and their willingness and capacity to invest in new plant.
- AEMO said that the "potential" premature departure of some generators and/or investment delays "could" mean reliability standards may not be met. It said the risks of reliability standards not being met would be higher if there was premature exit or loss of investor confidence. AEMO did not advise in favour or against transitional assistance.
- Professor Garnaut was more equivocal on whether there would be asset impairment for the highest emission generators. Even if there was, he suggested transitional assistance was not needed to compensate for asset impairment. Unlike the AEMC he was not convinced by the arguments that such impairment would deterimentally affect asset operation or investment in low emission generation, although he had a more open mind about possible impacts on long term asset maintenance. Also unlike the AEMC, he suggested that the contract market risks of asset impairment were "quite small" and that a proportionate response was an Energy Security Council. He also somewhat reluctantly advised on a role for government acting as a lender of last resort through the temporary provision of loan guarantees to distressed generators, if needed.
- The Australian Energy Regulator was sceptical that the scheme would jeopardise energy security, and by implication that transitional assistance was needed.

The records show that the MPCCC (and hence the Government) accepted the AEMC's advice and rejected Professor Garnaut's and the Australian Energy Regulator's advice.

2.3 The operation of Energy Security Fund payments

Energy Security Fund payments are made to generators whose emission intensity (greenhouse gas emissions per unit of energy produced) is above a specified level. The allocation of these payments amongst these generators depends on their emission intensity, with the greatest compensation going to the most emission-intensive generators (subject to an emission intensity ceiling).

The compensation is made annually for five years and consists of one year of cash payment (already made) and further four years of permit allocation. For the first two of these four years, a fixed permit price applies.

The total value of the compensation provided under this scheme depends on the value of the emission permits. These are known to a high degree of certainty for the first three years of the Clean Energy Agreement, but are not known from 1 July 2015 when the price of emission permits will be determined in the market.

The compensation that was paid under this scheme for the 2012/13 financial year is shown in Table 1.

Table 1: Energy Security Fund cash payments to coal generators 2012-13[7]

Generation complex name	$ Cash payment amount
Alcoa Anglesea Power Station	$14,901,959.75
Augusta Power Stations	$59,482,064.73
Collinsville Power Station	$8,719,952.91
Energy Brix Australia Corporation Pty Ltd	$27,721,819.72
Hazelwood Power Station	$265,887,649.47
Loy Yang A Power Station	$240,116,761.67
Loy Yang B Power Station	$59,621,264.21 $57,283,175.42 $116,904,439.63
Redbank Power Station	$8,766,418.74
Yallourn W Power Station	$257,498,933.37

2.4 Expectations of the price on carbon since the implementation of the Clean Energy Agreement

There have been two significant changes to the Clean Energy Agreement that impact on the operation of the carbon price and have implications for the Energy Security Fund. Firstly the Australian carbon price has been linked to the European Union (EU) Emissions Trading Scheme, and secondly the Australian Government abandoned the Contracts for Closure program.

Linkage with the EU Emission Trading Scheme

On 28th August 2012 the Australian Government announced an agreement between Australia and the EU to fully link their emissions trading schemes by no later than 1 July 2018 and allow Australian businesses to use EU Allowances to help meet liabilities under the Australian emissions trading scheme from 1 July 2015.[8]

By far the most significant international market for emission reduction certifications is the market for EU Emission Allowances (EUA's) traded under the European Union's Emission Trading Scheme. At the time of the Clean Energy Agreement, EUA's traded for around AUD22. At the time of writing this report, EUA's are trading for around AUD5, about one quarter as high. Since the price of emission permits in Australia is fixed until 30 June 2015, the price of emission permits in international markets is not relevant until then.

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[7] http://www.climatechange.gov.au/government/initiatives/energy-security-fund-cash-payments/eligible.aspx

[8] Minister Greg Combet, Media Release, 28th August 2012

From 1 July 2015 the Government's intention is that the price of Australian emission permits will converge with those of the EU ETS. Through these changes the Government has restricted the quantity of eligible Kyoto units that liable entities can use to 12.5 per cent of their carbon pricing liabilities. The amendments also remove the requirement for a surrender charge on eligible international emissions units. These changes will ensure the convergence of Australian and EU carbon prices.

Linkage with the EU ETS means that the supply and demand for emission permits in Australia will be much less consequential than the far higher supply and demand for emission permits in Europe. The price of emission permits in Australia can therefore be expected to converge with those in Europe.

It is notable that there has been a significant reduction in the current (and expected) price of emission permits in mandatory emission reductions schemes. In its modelling[9], released at the time of the Clean Energy Agreement, the Federal Treasury's permit price in its "Core" scenario was $29 in 2016 rising at 4% per annum. Its "High" scenario had prices starting at $61 in 2016.

On the basis of the currently observed price of EUA's it would seem that the expectation in carbon markets is for substantially lower international emission prices than the Treasury had expected in its updated modelling. By virtue of the linkage with the EU scheme, this therefore implies consequently lower emission prices in Australia.

Abandonment of Contracts for Closure process

The contracts for closure program sought to secure the closure of 2,000 MW of emission intensive coal generation by 2020. The existence of this program reflected the Government's view that, in the absence of contractual payments to encourage closure, high emission generators were unlikely to close as a result of the carbon price alone.

The Government sought expressions of interest from generators with emissions greater than 1.2 tonnes CO2/MWh unit closure. Five power station owners submitted expressions of interest and proceeded to negotiations with Government. However on September 5 2012, Minister Ferguson announced that the Federal Government would not be proceeding with contracts for closure and that negotiations with generators had ceased as the amounts sought by generators did not represent value for money[10].

[9] Australian Government Treasury, July 2011. Strong Growth, Low Pollution, Modelling a carbon price.

[10] Minister Martin Ferguson, Media Release, September 5 2012

2.4 Changes in the electricity market since the implementation of the Clean Energy Agreement

Expectations of continued demand growth have changed considerably. While some market participants and commentators had suggested that demand growth was slowing and would even turn negative, until recently this has not been the common view.

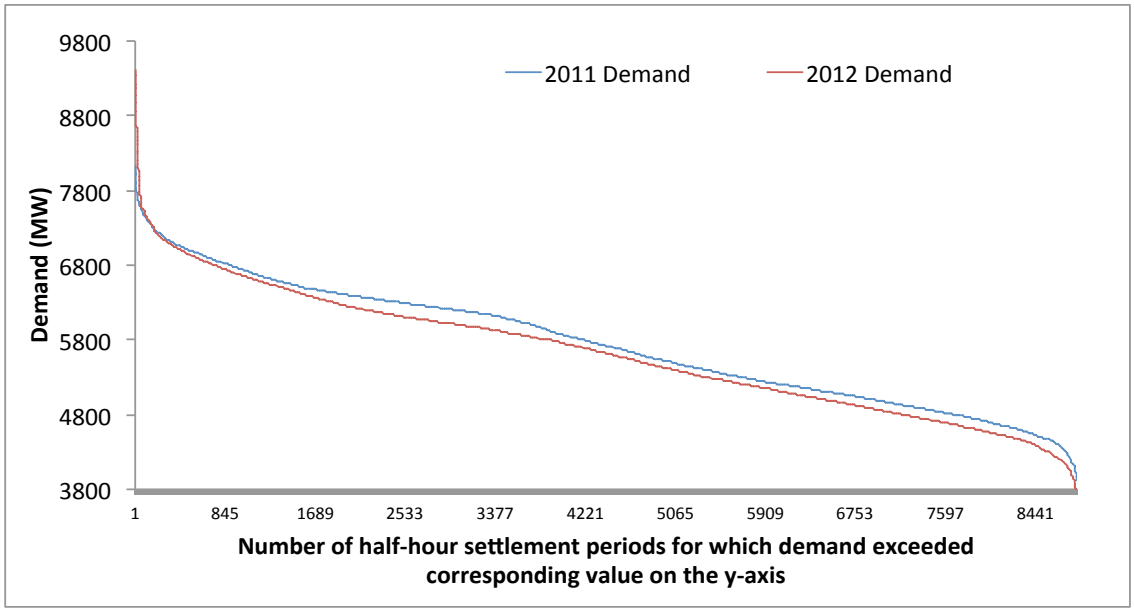
The change in market expectation is most clearly seen in the AEMO's 2012 "National Electricity Forecasting Report". This report suggested very large reductions in the expectations of future demand growth – both peak and average - compared to AEMO's previous projections.

A number of reasons have been cited for the reduction in demand including more benign summers, higher efficiency consumption technologies, contraction in manufacturing output, higher embedded generation including from photovoltaics, greater use of gas and renewables for water heating and consumer response to higher electricity prices.

Between the introduction of the emission price on 1 July 2012, and 31 December 2012, the total electrical demand in Victoria in the NEM has been 24,852 GWh. This is a 2% reduction on the demand in the comparable period in 2011.

However peak demand in Victoria over this period – 9,410 MW – has been much higher than peak demand over the same period in 2011 – 8,134 MW. This difference in the peak demands is attributed to very high temperatures on the 29th November and 13th December 2012. The load duration curves shown in Figure 1 however show that, with the exception of the few hours of very high demand in 2012 (on 29 November and 13 December) demand was consistently lower in 2012 than in 2011.

Figure 1. Load duration curves for last two quarters of 2011 and 2012



The relative decrease in average demand in 2012 compared to 2011 is significant in this analysis. The lower average demand will have reduced demand for the higher cost Yallourn and Hazelwood power stations, which are the last units to be dispatched in Victoria for much of the year. This reduction in demand is likely to have been the most significant variable explaining lower overall production, although there may have been some possible substitution of production from the most emission intensive Victorian generators with imports from other regions of the NEM as a result of the carbon price.

In particular, total production from Victoria's brown coal generators for the first two calendar quarters of 2012 was 21,446 GWh, a little under 7% less than production for the comparable period in 2011. The (sent out) production from the main brown coal generators in 2011 and 2012 is shown in Figure 2.

Figure 2. Production from Victorian brown coal generators in the first two quarters of 2012 compared to the first two quarters of 2011

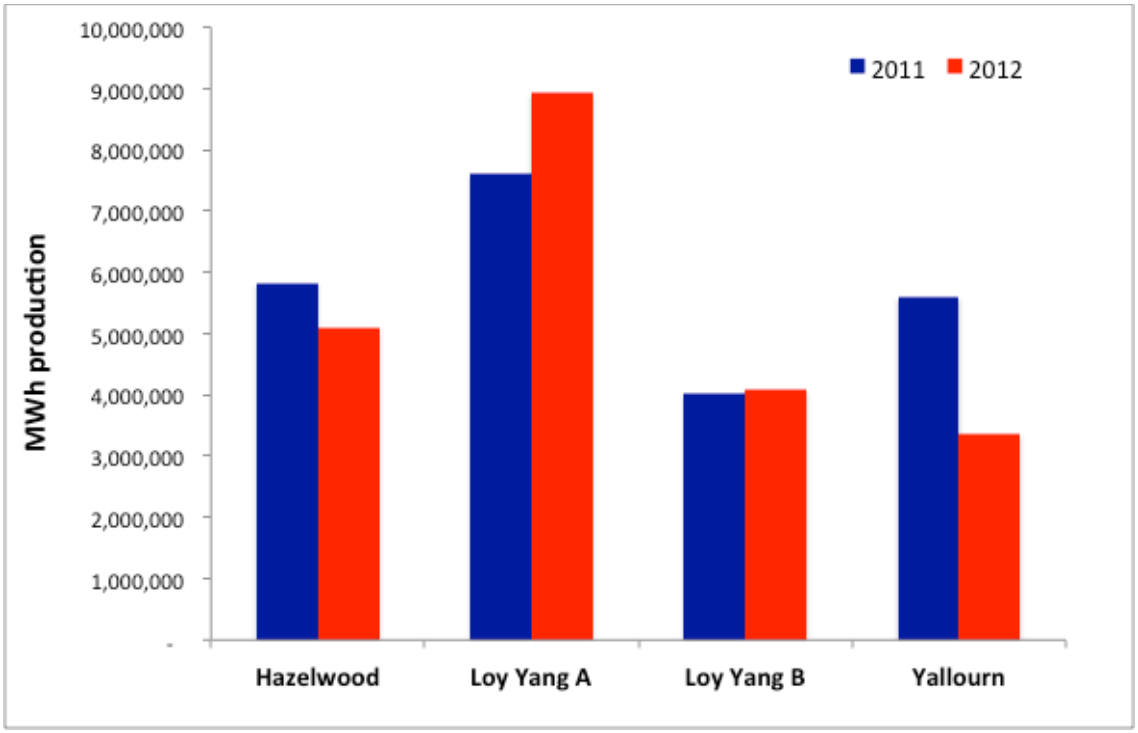


Figure 2 shows that Loy Yang A substantially increased production in the first two quarters of 2012 compared to the first two quarters of 2011, while there was almost no change for Loy Yang B. Hazelwood decreased production somewhat while Yallourn decreased production significantly partly due to mine-site problems early in the 2012 financial year. Flooding in June 2012, had a significant, although short-lived, impact on Yallourn production. However Yallourn typically produced around 360 MW – 720 MW less in 2012, than in 2011. This corresponds to the outage of one to two generating units (each generating unit is rated to produce 360 MW). In October 2012, EnergyAustralia

(owners of Yallourn power station) announced that "it will only operate three of the four units … at this time",[11] though these units have since been returned to operation.

The relative difference in the dispatch of Loy Yang A compared to Hazelwood may reflect the effect of the change in the relative competitiveness of these plants following the imposition of the emission price with the relatively lower emission intensity Loy Yang A gaining an advantage over the higher emission intensity Hazelwood power station. While Yallourn was affected by the flooding early in the 2012 financial year, the extent to which their lower production throughout the period 1 July 2012 to 31 December 2012 was attributable to the impact of this flooding, to maintenance decisions or to what they considered the most commercially advantageous operating regime, is less clear.

[11] EnergyAustralia Press Release, 17 October 2012 "Changes to Renewable Energy Target required for a sustainable electricity market"

3 Methodology

3.1 Model definitions and parameters

We have built a model to test whether the Energy Security Fund payments could lead to windfall profits to individual Victorian generators based on different carbon price scenarios and current Energy Security Fund compensation payments. The model uses spot price data in NEM for the first two complete quarters of the 2013 financial year, since the emission price has been implemented. Average spot prices in 8831 half hours in 2012/13 have been compared to the same period in the 2011/12 financial year

Windfall profits have been defined as:

"*Huge profits that occur unexpectedly due to fortuitous circumstances. Such profits are generally well above historical norms and may occur due to several factors - such as a price spike or supply shortage - that are either temporary in nature or may be longer lasting. Windfall profits are generally reaped by an entire industry sector, but can also be reaped by an individual company.* "[12]

With this definition in mind we have built a model in Excel that calculates the change in operating profit (earnings before interest tax depreciation or amortisation) attributable to the changes that were implemented pursuant to the Clean Energy Agreement (i.e. the changes attributable to the price on carbon and the commencement of Energy Security Fund payments).

If the results of the model suggest a significant increase in the present value of future operating profits, this would suggest the existence of windfall profits.

The calculation is done for Victoria's four main brown coal generators. The reason for focusing on Victoria's brown coal generators is that these high emissions intensity power stations are set to receive over 90% of all Energy Security Fund payments as can be seen in Table 1 earlier.

The Clean Energy Act's main effect on the operating profits of these generators is:

1. Compensation payments under the Energy Security Fund worth a little over $3bn for the three years from 2012 to 2014, and an uncertain amount (because it depends on unknown future emission prices) reflected in the free allocation of a pre-determined number of emission permits in 2015 and 2016.
2. Gains (or losses) from the sale of electricity depending on the extent to which the prices that generators receive are more (or less) than the costs they bear through the mandatory acquittal of emission permits (Australian Emission Units).

[12] http://www.investopedia.com/terms/w/windfall-profits.asp#axzz2JDNQS0wv

3.2 Model Assumptions

In our model we calculate the change in operating profits over the period to 2027[13] that is attributable to these two factors. We discount the profit calculated in this way back to 2012, assuming a discount rate of 8%[14]. The resulting Present Value can be considered to be the pre-tax profit (or loss) to the generators, attributable to the carbon price and compensation arrangements enacted in the Clean Energy Act.

The model allows for different assumptions of the two main valuation variables:

- The pass-through rate of the carbon price (the extent to which the price of electricity sold, rises more or less than the price paid for emission permits). The rate reflects the ability of generators to pass on the cost of the carbon price to retailers (and subsequently consumers);
- The price of emission permits from 1 July 2015, at which point prices will be determined in carbon markets.

There are a few important assumptions underlying this model that readers should be aware of in properly understanding its results. In particular, we have assumed that the implementation of the Clean Energy Act does not affect the:

1. non-permit operating costs (the cost of fuel or the cost of maintenance); or
2. demand for the generator's output; and
3. the cost of finance.

These assumptions affect the conclusion of the existence of windfall profits – if the assumptions are not valid, our conclusions would not necessary follow.

Taking each of these three assumptions in turn, the Agreement is unlikely to affect the non-permit operating costs (such as the cost of fuel or operations and maintenance). This is because they do not affect the supply or demand in the markets that determine the price of fuel (brown coal) or the other operating costs (operations, maintenance and so on).

On the second assumption, we submit that there is a scope for a little doubt that the Agreement has no effect on the demand for electricity. This doubt exists because the Agreement raises electricity prices and this may reduce demand. However we suggest that with existing emission prices the effect is likely to be small, since the impact on the emission price on final electricity prices – around 10%-15% - is relatively small, certainly by comparison to the other factors that have led to much larger increases in the electricity price.

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[13] This is sixteen years after the start of the Australian emission trading scheme, and towards the end of the likely operating life of all Victoria's brown coal generators.

[14] Our estimate of the expected of the pre-tax opportunity cost of capital to investors in Victoria's brown coal generators

On the third assumption, we submit that there is scope for debate on whether the Clean Energy Agreement has affected (i.e. increased) the cost of finance. As discussed in some detail in the previous section, the Government's main justification for the Energy Security Fund is to compensate for the risks presented by the Agreement. This risk, assuming the Government's concerns were valid, would have raised the cost of finance. As such, the calculation of the profits (or losses) attributable to the Agreement should also take account of the consequently higher financing costs. This would be expressed in our model in a higher discount rate. Our calculation has not done this. This is because the available evidence – the market valuation of Loy Yang A, and the evidence of pass-through rates suggests that the Agreement has not presented significant risks to the brown coal generators, that would have resulted in more expensive financing.

We deal with pass-through rates below, but first we will explain the market valuation of Loy Yang A. AGL acquired the remaining 67.5% stake in GEAC, the owner of Loy Yang A two days before the emission price was imposed. AGL's acquisition reflected an enterprise value for Loy Yang A of $3.1bn, about $600m less than what GEAC paid for Loy Yang A eight years earlier. Loy Yang was well-known to be highly geared, and the possible impairment of GEAC's equity in Loy Yang would have been a focus for the AEMC's concern about asset impairment and consequential risks to security of supply. But, if asset impairment was really as significant as imagined, why did AGL have to pay so much to acquire the interest of its GEAC partners in the power station?

The compensation promised to Loy Yang A under the Energy Security Fund accounts for some part of the value of Loy Yang A, but it is not enough to explain the apparently handsome valuation of this power station. The transacted price seems to suggest that both AGL and the sellers attributed significant value to Loy Yang A, in spite of its coming emission permit obligations.

On the pass-through rate, we have analysed spot market prices received by the Victorian brown coal generators over the first two (financial year) quarters of 2012/13 and compared them to the first two (financial year) quarters of 2011/12.

The average prices received by the generators in these two comparative periods might be different for several reasons other than the imposition of the carbon price, amongst them changes in fuel costs, operating costs, the level of demand, prices in a few extreme settlement periods and so on. Of these non-carbon reasons, its difficult to see why any factor would mean prices should be significantly higher. For example operating costs and fuel costs are unlikely to have changed to any meaningful extent.

There were a few occasions of extremely high prices in 2012, that did not occur in 2011 mainly corresponding to the extreme demand on 29 November 2012. The extreme prices on this day raised the average prices received by the brown coal generators in 2012, by about 4% from what they otherwise would have been.

On the other hand, demand in 2012 was lower than 2011, and this is likely to have depressed prices in 2012, from what they otherwise would have been.

On the basis of the assumption that all of the increase in prices in the first two quarters of 2012 (relative to the same period in 2011) was attributable to the imposition of emission prices in 2012, it is possible to calculate the percentage of the increase in cost attributable to the emission price, that has been passed through in the prices achieved in the spot market. The results of this analysis are shown in Table 2 below. Its shows that the pass-through percentage of the Victorian brown coal generators has ranged between 105% for Hazelwood (the most emission intensive generator) and 117% for Loy Yang A (the least emission intensive). The analysis uses the average emission intensity data available from NEM Review™ and emission prices as specified by the Clean Energy Act.

Table 2. Pass through percentages for Victorian brown coal generators

	Pass-through percentage
Loy Yang B	114%
Hazelwood	105%
Loy Yang A	117%
Yallourn	107%
AVERAGE	**111%**

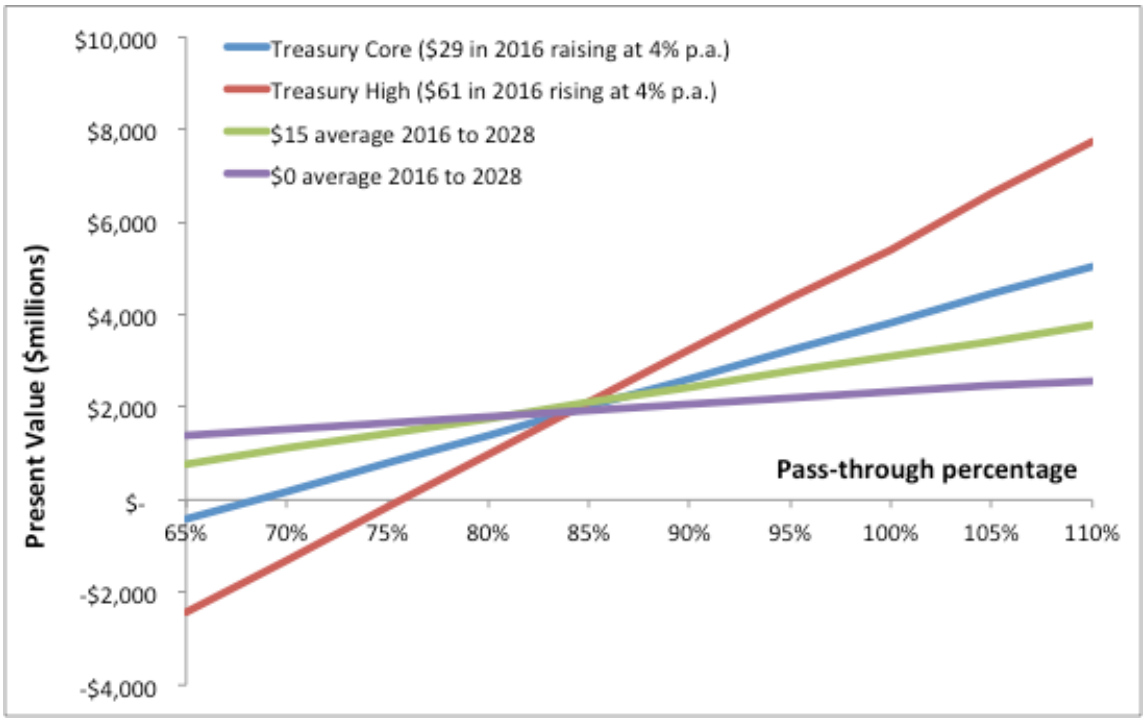
This calculation of the pass-through percentage has not taken account of the emission permits that need to be surrendered for the difference between the electricity that is actually generated, and the electricity that reaches the electricity grid (the difference is the energy used in operating the power station). These electrical losses typically range between 7% and 9% of the electricity sent out. So the pass-through percentage that should be used in an assessment of the full cost, should deduct this amount. In round numbers, and taking account of some uncertainty on the actual greenhouse gas emissions from each of these power stations, a pass-through percentage of a little over 100% would seem reasonable.

It might be argued that a pass-through calculation based on prices only, does not account for any losses in revenue that some of the brown coal generators might have suffered as a result of lower production volumes since the scheme has been introduced. Specifically we noted that in the first two quarters of 2012, in aggregate the Victorian brown coal generators produced a little under 7% less than they did in 2011, while aggregate demand over the comparable periods was around 2% lower (though Loy Yang A produced much more than before, Loy Yang B much the same and Yallourn and Hazelwood less). The difference in the aggregate production will be accounted for through increased imports (and to a lesser extent higher distributed generation). So, would it not be correct to adjust the pass-through calculation for the loss of profits associated with this lower aggregate production from brown coal generators? We don't think this would be correct: the prices that all the brown coal generators achieved in 2012 far exceeded their production costs (including their carbon liability), and so it would have been a rational response for them to maximise production. For this reason it is hard to see why the emission price can be held to account for their lower production in 2012/13 compared to 2011/12.

4 Results

The main results of our analysis are presented in Figure 3 below.

Figure 3. Present Value of operating profit/(loss) for Victorian brown coal generators attributable to Clean Energy Agreement



This chart shows the Present Value of the operating profits (or losses) attributable to the carbon price and compensation payment arrangements enacted by the Clean Energy Act. This can be interpreted as the profit (or loss) associated with the introduction of the Clean Energy Act.

The methodology for the calculation of this was explained in the previous section. In Figure 3, the X-axis is the pass-through percentage (the extent to which the prices that generators receive compensate for the higher carbon costs they face). The Y-axis is the Present Value of the operating profit attributable to the changes brought about by the Agreement (ie windfall profits or losses). The four lines presented in the chart reflect different assumptions on the price of emission permits from 1 July 2016. These four lines are:

1. The Treasury's "Core" scenario in its updated modelling (discussed earlier) of the emission scheme. This assumed that emission prices in Australia would start at $29 in 2016, and rise at 4% (real) per annum after that;
2. The Treasury's "High" scenario in its updated modelling of the emission scheme. This assumed that emission prices in Australia would start at $61 in 2016, and rise at 4% (real) per annum after that;

3. A scenario where emission prices are assumed to average $15 per tonne CO2-e from 2016 to 2028;
4. A scenario that assumes that Victoria's generators will not be required to surrender emission permits from 2016 due to repeal of the Clean Energy Act (or if they are required to surrender permits, that those permits will have no value).

The chart shows that the rate at which the present value of profits varies as a function of the pass-through percentage is proportional to the emission prices. It shows that unless permit prices exceed Treasury's "High" assumptions ($61) in 2016, rising at 4% p.a. thereafter) and pass-through percentages fall below 75%, the Victorian generators will increase their operating profits in present value terms (i.e. the present value of operating profits is greater than zero) as a result of the Clean Energy Act .

Assuming the average pass-through rates as observed in the spot market (100% - see previous discussion) and the four assumptions of future emission prices from the figure above, our model delivers the estimates of the present value of operating profit changes as shown in Table 3 below.

Table 3. Present value of change in profit for various emission price scenarios assuming continuation of observed pass-through rate

Emission price scenario	**Present value of change in operating profit ($'million)**
Treasury High ($61 in 2016 rising at 4% p.a.)	$3,826
Treasury Core ($29 in 2016 rising at 4% p.a.)	$5,419
$15 average 2016 to 2028	$3,098
$0 average 2016 to 2028	$2,317

5 Discussion

This final section responds to the request that we discuss the impacts of Energy Security Fund payments on generator profitability and market behaviour, and whether the level of generator compensation is appropriate if you accept the Government's rationale for compensation.

Are compensation payments providing an incentive to generators to not close plant permanently?

Eligible generators will not receive compensation if they close their plant permanently, but will continue to receive compensation if the plant remains available to produce, even if it does not produce. This compensation averages between $120m per year for Loy Yang B to $275m per year (for Hazelwood) during the fixed price period. It seems very unlikely that the generators will close permanently and sacrifice receipt of these payments during the fixed price period.

In the flexible price period, the level of compensation would be much lower if emission prices were lower. If emission prices from 2016 are at current EU levels (around $5 per permit), it is hard to see that compensation or the lack of it will be a significant factor affecting closure decisions.

It is likely, though not the subject of this analysis, that the significant Energy Security Fund payments to Victorian brown coal generators contributed to the failure of the contracts for closure process. Having the right to the Energy Security Fund payments would have increased the amount the Government would have needed to pay to secure closure.

Has EU linkage increased the likelihood of windfall profits?

The emission price and the pass-through percentage are, in the short term at least, somewhat independent of each other. In the longer term, if emission prices are high and if these prices are substantially passed through to consumers through higher spot and hence high contract prices, this can be expected to stimulate investment in low emission generation. This new lower emission generation would be more competitive than the high emission generation thus forcing the high emission generation to reduce prices in order to sustain production, or to exit the market. This competitive impact will result in lower pass-through rates in the long term.

EU linkage (and the consequential elimination of the floor price in Australia) has reduced expectations of future emission prices in Australia. The logic in the previous paragraph leads to the conclusion that a higher pass through percentage can be sustained for a longer period. A higher pass-through percentage translates into higher operating profits (or smaller operating losses), although the extent of the gain/loss is mitigated by lower emission prices. In summary therefore we think that EU linkage means that the generators are more likely to gain from the Agreement, although not necessarily more than they would, had the linkage not occurred.

What is the likely change in operating profits that the generators will receive as a result of the Agreement?

In Table 2 we showed that, assuming the pass-through percentages that have been achieved so far continue in future, the present value of the additional profit arising under the emission scheme ranges between $2.3bn and $5.4bn.

It was widely expected by market participants (and the Government) that the higher emission intensity generators in Victoria would achieve pass-through rates substantially below that of the average rates in the market. And it was also widely held that the average rate of pass-through in the market would be less than 100%.

For example, Nelson, Orton and Kelly (2010)[15] noted that the average pass-through rate in the NEM in various published studies was 93.4%, although the expected pass-through rate in different studies varied significantly from this. An analysis by economists at the University of Queensland[16], which was released one month before the emission price took effect, predicted that the pass-through rate in Victoria (which they said depended on the emission permit price) would typically be around 80%.

It was expected by market participants (and the Government) that the higher emission intensity generators in Victoria would achieve pass-through rates substantially below that of the average rates in the market. However, in the debate leading up to the implementation of the emission trading scheme, the Government was evidently concerned about the possibility that pass-through rates would be higher than expected and hence that windfall profits might arise. For example in the White Paper for the Carbon Pollution Reduction Scheme, the Government said

"*… to ensure that assistance does not lead to windfall gains, a review will be held in 2013 to determine whether generators in receipt of ESAS assistance are likely to earn windfall profits, taking into account actual and forecast net revenues, compared to those predicted when assistance was originally estimated*".[17]

In the only published study (that we are aware of) that has purported to examine actual outcomes since emission prices have been implemented, the Australian Energy Market Operator (AEMO) concluded that the average increase in NEM spot prices attributed to the emission permit obligation was around $21/MWh.[18]

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[15] AGL Applied Economic & Policy Research Working Paper No.23

[16] Wild, P, Bell, P, Foster, J. April 2012 "*The Impact of Carbon Pricing on Wholesale Electricity Prices, Carbon Pass-Through Rates and Retail Electricity Tariffs in Australia*".

[17] Commonwealth of Australia, 2008. "*Carbon Pollution Reduction Scheme: Australia's low pollution future*". White Paper. Page XXXiX

[18] AEMO, November 2012 "*Carbon price - Market Review*"

Based on their calculation of NEM-wide average emission intensity of 0.85 tonnes CO2-e per MWh, this translates into a pass-through rate of 107%, far above the average expectations in the market before the emission scheme took effect.

AEMO did not calculate the pass-through for Victorian generators (as distinct from the market as a whole). There are other differences between AEMO's analysis and ours, the most significant of which is the point of comparison. Their analysis used price data from 1 July 2012 to 18 October 2012 and compared it to average prices in June 2012. Ours compared average prices from 1 July 2012 to 31 December 2012 and compared them with average prices from 1 July 2011 to 31 December 2011.

AEMO commented on their analysis that:

"*Caution should be used when extrapolating these outcomes. The period covered is short for markets in which seasonal influences across quarters have a major impact. Additionally, there were other major factors occurring just ahead of and during the introduction of carbon pricing that makes interpretation of the outcomes less straightforward.*"

AEMO's caution is well-directed, and it is because of these seasonal price differences that we have chosen comparable seasons to deliver a like-for-like comparison.

The evidence of the pass-through percentage for the Victorian generators of around 100% is therefore, against prior expectations, remarkable. Is this outcome a short-term aberration, will the pass-through percentage decrease in future over the period of our study? It may, but in the absence of substantial new entry by much lower emission generation, we have no basis - other than that numerous modelling studies had not expected them - to conclude that the outcomes so far are an aberration.

At the time of writing there is no certainty that there will be substantial new entry of low emission generation in Victoria over the period of our calculation. While there may possibly be new entry of low emission renewable generation, it is difficult to see that this will have a significant impact on the market share of the Victorian brown coal generators. For example, modeling by the Climate Change Authority shows little change in the production from Victoria's brown coal generators even if sufficient renewable generation is installed to meet the Renewable Energy Target. This seems particularly plausible if emission prices remain lower than has been expected in the Treasury (and Climate Change Authority's modelling). Therefore we have no basis to suggest that the observed pass-through percentages are not indicative of the pass-through percentage that is likely to be achieved in the longer term.

It should be recognized however that the Victorian generators may not have actually received the spot price for their production, and therefore it might be suggested that the pass-through percentages calculated in the spot market may not be appropriate.

To varying degrees, generators hedge the prices they receive in the spot market by entering into various forms of financial contracts with each other, with retailers and financial intermediaries and with some large energy users. These contracts are

confidential and so we can not be certain what average sales price the generators actually received.

For those generators that were substantially contracted in 2012, it might be the case that the price they received was below the weighted average spot market price. For example the volume-weighted average strike price of the quarterly base-load futures contract (this is a commonly traded contract) for the third and fourth quarters of 2012 was $48/MWh and $45/MWh respectively, compared to the production-weighted average spot prices (that the generators received) for these quarters, which were typically a little over $60/MWh.

Generators have an incentive to get the best price they can in the contracts they enter into. Base load quarterly contracts for the first quarter of 2013 are currently priced at around $65/MWh. It would seem that generators have noted the spot prices that have occurred since the implementation of the emission price and have adjusted upwards, their expectation of prices in contract markets. The point from this is that highly contracted generators may have received a lower average price in 2012 than if they were uncontracted, but this does not mean that this will continue in future.

The second issue that needs to be considered in developing expectations of the change in operating profits attributable to the Agreement is the likely future emission price. As we noted earlier Treasury's "Core" scenario had prices at $29 per permit in 2016 increasing at 4% p.a. However current emission prices in the EU ETS are around $5 per permit and the Government has amended the legislation arising from the Clean Energy Agreement to ensure that emission permit prices in Australia will converge with those in the EU from 2015/6. The Federal Opposition has said that if it wins Government it will abolish the emission reduction scheme and hence permit prices will be zero. On balance, therefore, the best estimates at this point therefore suggests that the Treasury's "Core" scenario assumption seems to indicate higher emission prices than the market is currently expecting.

With pass-through rates exceeding 100%, the change in operating profits is reduced if emission prices are lower rather than higher. Based on the current evidence and expectations of emission prices, the change in operating profits attributable to the agreement are therefore more likely to be towards the lower end of the $2.3bn to $5.4bn range.

Summary of the main conclusions

1. In the first six months since the introduction of the emission price, generators in Victoria seem to have been able to pass on all of the cost of the emission permits, through higher electricity prices in the spot market. While spot market outcomes may not actually match the actual prices that the generators have received so far, the spot market outcomes are significant since they set the reference price for future financial contracts.
2. As a result of the Energy Security Fund payments and assuming a continuation of the observed pass-through percentage, the Victorian brown coal generators can expect to accrue operating profits (or windfall profits)

somewhere in the range of $2.3bn to $5.4bn (Present Value) depending on emission prices in future. The lower end of this range corresponds to lower expected emission prices in future.

3. Even if pass-through percentages fall significantly, Victoria's brown coal generators would still be likely to improve their net profits as a result of the Energy Security Fund payments.