# The role of compensation and adjustment assistance in the introduction of an emissions trading scheme for Australia: response to the Green Paper

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**2. Free allocations of emissions permits should not play a major role in policy aimed at assisting adjustment to an emissions trading scheme.**

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**6. For the electricity sector as a whole, assuming competitive pricing, most costs of an emissions trading scheme will be borne by consumers. Retail price caps, if retained, should be adjusted to ensure that consumers receive an appropriate price signal.**

**7. Adverse effects on producers will be confined to the brown coal generation sectors. Any effective scheme to reduce emissions is likely to require the closure of some brown coal generators.**

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# The role of compensation and adjustment assistance in the introduction of an emissions trading scheme for Australia: response to the Green Paper

The introduction of an emissions trading scheme, such as the proposed Carbon Pollution Reduction Scheme will involve significant costs to households, employees and businesses, while yielding long term net benefits to Australia and the world. In this respect, the Scheme is similar to previous policy reforms.

The distributional consequences of previous reforms have been dealt with following two main principles. First, where reforms such as the GST have generated additional revenue, this revenue has been redistributed to households in a way designed to ensure that most households, and particularly those on low incomes, are no worse off on balance.

Second, where reforms involve structural adjustment, workers, firms and communities have been given assistance to find new sources of employment and offset the costs of adjustment. However, owners of capital have not, in general, been compensated for the loss of future profits arising from policy changes.

While adopting principles that are generally consistent with past practice, the Green Paper has suggested that compensation to investors in industries such as brown coal generation will play an important role in the design of the proposed scheme. This submission is an analysis of the costs and benefits of such a departure from established practice.

## I. General principles

In considering whether the emissions trading scheme should constitute an exception to established principles regarding adjustment to changes in public policy, it is important to consider whether reasonable investors should have

anticipated the introduction of an emissions trading scheme, or similar measures aimed at reducing emissions of greenhouse gases

The physics of the greenhouse effect have been understood since the work of Arrhenius around the turn of the 20th century. The possibility of human-caused global warming was discussed by the US National Academy of Sciences in the 1970s, but it was unclear at this time whether warming would be outweighed by natural or anthropogenic cooling associated with such factors as the emission of aerosols from industrial processes.

By 1988, concern about human-caused climate change had become sufficient to justify the establishment of the Intergovernmental Panel on Climate Change. From this point onwards, standard business practice requires that reasonable investors should have taken account of the possible implications of global warming and measures to mitigate it.

The IPCC issued its first assessment report in 1990, a supplementary report in 1992, and a second assessment report in 1995. The second found that climate had changed over the past century and while many uncertainties remained, 'the balance of evidence suggests a discernible human impact on climate'.

The first international policy response was the United Nations Framework Convention on Climate Change signed by Australia in 1992, which, despite carefully flexible language was generally understood as embodying a commitment to reduce greenhouse gas emissions.

In negotiations leading up to the drafting of the Kyoto protocol to the UNFCCC in 1997, a clear preference became evident for market-based approaches such as emissions trading schemes, as opposed to direct regulatory controls on production processes (the 'command and control' approach). The Australian delegation played a central role in this process.

This history indicates that investors have had 20 years warning of the possibility that action would probably be taken to mitigate global warming and 10 years since

the Australian government indicated its willingness to meet specific targets for reductions in emissions, with a preference for market-based policies such as emissions trading schemes. Few policy changes in Australian history have come with such lengthy advance notice.

To assess the adequacy of information for investors, it is useful to examine the history of investment in the industry. Electricity generation assets in Victoria and South Australia, the two states most reliant on brown coal were privatised in the 1990s. Most of the Victorian assets were later resold by the initial buyers. Hazelwood power station, among the most likely to close as a result of the introduction of an emissions trading scheme, was expected to close in the 1990s, but was extensively refurbished following its privatisation.

Assuming due diligence, the existing owners of brown coal power stations acquired these assets in full knowledge that they might be subject to restrictions on $CO_2$ emissions.

It might be argued, however, that the sale value of assets was reduced when the possibility of climate change mitigation policies became evident (say, in 1988), and that the owners of the assets at that time (namely, state governments) deserve compensation. On standard assumptions about commercial discount rates and depreciation however, the proportion of asset value accounted for by earnings over 20 years in the future is modest (assuming, say, a real discount rate of 8 per cent and depreciation of 5 per cent, the residual value of an asset 20 years in the future is about 6 per cent of its current value). Such losses are small in relation to those associated with normal commercial risks.

Furthermore, one needs to consider the effects of compensation on dynamic efficiency. More specifically, a decision to compensate investors who chose the 'wrong bet' might treat unfairly those investors who understanding the risks involved decided not to invest in brown coal generation. It is well-known that

moral hazard might emerge when investors do not face the full cost of their decisions.

*The case of tariff policy: a comparison*

The most important process of industry adjustment in Australia has been the reform of tariff policy. In 1972, the policy of tariff protection had been a central element of Australian industry policy for more than 60 years. Although some academic debate on the topic had emerged in the late 1960s, the policy was barely debated in public.

In 1973, the Whitlam government cut tariffs by 25 cent and initiated a process of tariff reform, converting the Tariff Board into the Industries Assistance Commission, the predecessor of the Productivity Commission. The process was stalled under the Fraser government, but by the early 1990s, the policy of tariff protection had been effectively abolished.

In the course of this process, the share of import-competing manufacturing in the Australian economy declined dramatically. Large numbers of firms closed down or relocated production overseas. Governments undertook a wide range of adjustment policies to assist firms, workers and communities in the transition to other economic activities. Yet the idea of compensating owners of capital for foregone profits was not even raised, let alone implemented.

*Conclusion and recommendation*

**1. Adjustment assistance policies associated with the introduction of an emissions trading scheme should be based on the established policy framework developed in previous processes of microeconomic reform. Suggestions that investors in assets affected by the scheme require special treatment to maintain confidence are without merit.**

## II. Free emissions permits and grandfathering

The terms 'grandfather clause' and 'grandfathering' are used to describe element of a policy program in which existing participants in an activity are protected from the impact of regulations, restrictions or charges applied to new entrants. Grandfathering has been particularly common in the development of policies to control pollution.

Two main forms of grandfathering have been used, depending in part on the form of regulation applied to pollution. Where point sources of pollution are required to adopt particular control technologies, or to limit the volume of emissions, existing sources may be exempted from the requirement, or subject to some less stringent restriction than new sources. Where an aggregate limit is applied to pollution or some other environmentally damaging activity, existing sources may be granted permits, while new entrants are required to buy permits, or undertaking offsetting activity.

*International experience*

The first emissions trading schemes were mandated by the 1990 amendments to the US Clean Air Act and covered the emission of sulphur dioxide ($SO_2$).[1] Title IV of the Clean Air Act set a goal of reducing annual $SO_2$ emissions by 10 million tons below 1980 levels. To achieve these reductions, the law required a two-phase tightening of the restrictions placed on fossil fuel-fired power plants.

Phase I began in 1995 and affected 263 units at 110 mostly coal-burning electric utility plants located in 21 eastern and Midwestern states. An additional 182 units joined Phase I of the program as substitution or compensating units, bringing the total of Phase I affected units to 445. Emissions data indicate that, under Phase I, $SO_2$ emissions at these units nationwide were reduced by almost 40 percent below their required level. Phase II started in 2000 by tightening the annual emissions

[1] See information available at http://www.epa.gov/airmarkets/trading/factsheet-auction.html.

limits imposed on these large, higher emitting plants and also set restrictions on smaller, cleaner plants fired by coal, oil, and gas, encompassing over 2,000 units in all. The program covers new generating units and existing units with an output capacity of greater than 25 megawatts.

The US $SO_2$ emissions trading system evolved from more limited forms of offsets, which in turn evolved from a fixed regulation. The starting point implied 100 per cent grandfathering, since companies did not have to pay anything to emit their regulated quantity. To start an auction market EPA withdrew around 3 per cent, and sold these at auction. Initially, this would have taken place in a cost-based regulatory system, so electricity prices would have been adjusted in line with costs. However, with deregulation, the value of electricity companies was increased by the fact that they had been given emissions permits. However, given the history, there doesn't seem to have been much controversy about this.

The European Experience with emissions trading, however, provides perhaps more directly useful insights for Australia. In the first trading period, from 2005 to 2007, it covered $CO_2$ emissions from large emitters in the power and heat generation industry and in selected energy-intensive industrial sector such as combustion plants, oil refineries, coke ovens, iron and steel plants and factories making cement, glass, lime, bricks, ceramics, pulp and and paper. In the second period, from 2008 to 2012, emissions of nitrous oxide are included. National states develop National Allocation Plans by sector and installation. In the first trading period, there were no national targets and opt-out provisions. Caps on emissions in the second period were governed by Kyoto targets. Similarly to the US $SO_2$ emissions trading system, in the first phase of the European ETS, generators were allocated free permits. This has been the subject of intense controversy. Most notably, analysts argue that Phase I revealed that the electricity sector profits from the combination of free allowances and passing through of increased costs to final consumers.

Finally, the Regional Greenhouse Gas Initiative (RGGI) is a co-operative effort to reduce $CO_2$ emissions from power plants by ten North-eastern and Mid-Atlantic states in the US. Under this scheme, which starts in 2009 with the first auction for 2009 permits to be held in September 2008, there will be no free allocation of permits to electricity generators.

In summary, international experience with grandfathering pollution permits cautions against a generous free allocation, which can lead to an increase in profits in the electricity industry given the ability of generators to pass-through the increased costs to consumers.

*Current policy discussions*

In recent discussions of the design of an emissions trading scheme for Australia, grandfathering has been a central issue. Different forms of grandfathering have been proposed in different cases.

Exemptions from participation in the scheme have been proposed for some sectors, both on grounds of practicality (such as the difficulty of assessing and monitoring emissions from agriculture) and on the grounds that trade-exposed, energy intensive industries should not be required to reduce emissions in the absence of a more comprehensive international agreement. It has also been suggested that the impact of the scheme on motor transport will be offset by reductions in fuel taxes.

The Garnaut Climate Change Review (2008) argues that current emitters should not receive free permits. Garnaut offers a number of supporting arguments.

First, that the costs of emissions permits, like other costs of production, will ultimately be passed on to consumers, so that there is no need to compensate producers through the allocation of free permits. Transitional effects of the introduction of an ETS on profitability are inherently difficult to measure, and hence any appropriate level of compensation would be difficult to determine.

Second, Australian governments have not historically, as a matter of course, compensated asset owners for losses associated with economic reforms or resulting from the internalisation of externalities. In general, it has been assumed that such losses are similar to character to those arising from adverse changes in demand patterns or from the entry of new competitors, and that firms and investors should use their own judgement.

Third, structural adjustment measures would be more appropriate than compensation. Such assistance could include incentives for investment in technology and to move to lower emissions technologies like the drying of brown coal, more efficient use of transport/logistics, and carbon capture and storage. In Garnaut's view, these alternative structural adjustment assistance measures are likely to more positively benefit the broader economy.

*Analysis*

Where pollution control takes the form of specific technological requirements, or plant-level restrictions on emissions, grandfathering may be technologically efficient, at least in the 'static' case where the policy is implemented, and firm responses determined in a one-shot game. This is because the cost of complying with new requirements will generally be greater for old plants than for newer ones (a point that may be made formally in terms of putty-clay technology).

In the case of tradeable emissions permits, a static analysis suggests that the consequences of grandfathering, in the form of free allocation of permits, are purely distributional. Trade should ensure that the final allocation of permits is consistent with efficiency in reducing emissions to the aggregate target level.

In a dynamic analysis however, it is necessary to take account of the incentive effects on investment choices that arise if grandfathering is anticipated as a feature of future policy changes. In the presence of fully anticipated grandfathering, firms will not invest in emissions-reducing technology even if they expect policy changes that will increase the cost of emissions.

It follows that grandfathering should be considered as a last resort. In general, owners of capital should not be compensated for policy changes that might reasonably be anticipated. Any form of compensation to owners of capital distorts investment decisions.

**Conclusion and recommendation**

**2. Free allocations of emissions permits should not play a major role in policy aimed at assisting adjustment to an emissions trading scheme.**

**III. Treatment of emissions-intensive tradeable goods**

In the absence of a global agreement on reducing emissions of greenhouse gases, adoption of measures to reduce emissions in individual countries can have perverse effects.

Currently the international framework governing the emission of greenhouse gases is the United Nations Framework Convention on Climate Change, operationalised in the Kyoto Protocol to the Convention, which was adopted in 1997 and came into force in 2005. All major emitters, with the exception of the United States have ratified the Kyoto protocol. However, following a change of government in 2006, Canada indicated that it would not fulfil its obligations under the protocol. Thus, until the first commitment period under the Protocol ends in 2012, the only significant competition from non-compliant firms is that from the US and Canada. Australian policy should seek to encourage these countries to return to the commitments made in Kyoto.

The discussion leading up to the drafting of the Kyoto protocol in 1997 envisaged an initial phase in which developed countries would reduce their emissions, followed by a global agreement encompassing emissions from both developed and developing countries. Subsequent discussion has produced widespread acceptance of a 'contract and converge' model in which all countries would agree to move, over the period between the present and 2050, a common level of per capita emissions

consistent with stabilisation of global atmospheric concentrations of greenhouse gases at levels leading to warming of 2 degrees C relative to pre-industrial levels.

Adoption of this, or any other comprehensive agreement, will require agreement on the part of developing countries, most importantly China and India, to limit growth in emissions of greenhouse gases and (if the agreed final level is below current emissions) ultimately to reduce emissions levels.

At this stage it is unclear whether major emitters such as China and India will agree to accept quantitative emissions targets. Even assuming successful negotiation of an agreement with these countries, it is necessary to consider the possibility that other countries will remain outside a new agreement, or will fail to comply with their obligations.

A global agreement to reduce emissions will be undermined if emissions-intensive industrial activities relocate to countries that decline to participate in such an agreement. Hence, it is desirable that Australian industries should not be disadvantaged in competition with firms located in non-compliant countries. However, this should not be regarded as the basis for an open-ended commitment to assist emissions-intensive industries, and should not reward the adoption of emissions-intensive technologies.

The Green Paper correctly recommends that any assistance to a sector should be allocated on the basis of the share of a firm's output in total sector output and not on firm-level emissions. However, the Green Paper is less satisfactory on the question of how such assistance should be allocated in response to differential adoption of mitigation policies in other countries.

Assistance to emissions-intensive industry should be treated as a precautionary response to the possibility that no satisfactory successor to the Kyoto protocol will emerge. It should be made clear in international negotiations that, in markets where all major participants are compliant, Australian firms will be required to participate in the emissions trading scheme and will not receive any special

assistance. In particular, this policy should be applied even where (as in Kyoto) an international agreement allows differentiated targets based on the circumstances of particular countries.

Second, any measure to assist export-oriented industries should be matched by assistance to import-competing industries in competition with competitors locate in non-compliant industries, preferably in the form of taxes or quotas on imports from non-compliant countries. Since failure to comply with a global agreement is an unfair subsidy, such measures are consistent with the spirit of the agreements establishing the World Trade Organisation. In the event that any technical difficulties arise in relation to the WTO, Australia should support renegotiation of the WTO agreement to make explicit the right of compliant countries to respond to unfair practices in non-compliant countries.

*Conclusion and recommendation**s***

**3. As proposed in the Green Paper any assistance to a sector should be allocated on the basis of the share of a firm's output in total sector output and not on firm-level emissions**

**4. Assistance should only be provided to the extent that Australian firms face competition from non-compliant countries**

**5. Exporting and input-competing emissions intensive industries should receive comparable assistance. Assistance to input-competing emissions intensive industries should rely on countervailing duties applied to imports from non-compliant countries**

**IV. Assistance measures for electricity generators**

The Green Paper indicates that assistance should be provided to generators of coal-fired electricity, but does not nominate a preferred delivery mechanism. While the Green Paper summary initially refers specifically to the needs of the owners of long-lived assets, that is, coal-fired power stations (p29), the subsequent

description of the Electricity Sector Adjustment Scheme (ESAS) refers to 'strongly affected industries and workers and communities.'

The latter perspective is consistent with long-standing practice in adjustment assistance policy. Governments have long provided assistance to enable firms to reorient production activities and avoid or reduce redundancies, and to assist workers and communities in the adjustment to changing patterns of employment. By contrast, as noted above, the suggestion that owners of capital assets should be compensated for changes in government policy that reduce the expected flow of income from those assets represents a radical innovation.

It may be argued, however, that as coverage will initially be partial, an appropriate compensation mechanism would mean that there would be no incentive for particular groups of emitters, to seek to delay their inclusion in an emissions trading scheme. Thus, it is of interest to estimate that amount of free permits to be allocated to existing emitters in the electricity industry who implement efficient reductions in emissions and are not no worse off as a result.

*Conceptual model*

This section provides a conceptual framework to determine the level of compensation, in terms of free permits that would make a representative firm indifferent between participating or not in an emissions trading scheme. In this simple framework we consider a representative firm that is subject to perfect competition in the output market.

We assume that the supply of electricity is given by $S(p,p_e)$, where $p$ and $p_e$ denote, respectively, output and emission permit prices and demand for electricity is given by $D(p)$. We abstract from distribution and transmission charges and consider a vertically integrated generator/retailer who faces perfect competition downstream.

In this setting, if target quantity of emissions is $q^*_e$ the equilibrium output price $p^*$, equilibrium output quantity $q^*$ and equilibrium price of emissions $p^*_e$ satisfy the following:

$$q_e(p,p_e) = q^*_e$$

$$S(p^*,p^*_e) = D(p^*) = q^*$$

where $q_e(p,p_e)$ is input demand for emissions. Let

$$s_e = (p_e q_e)/pq$$

be the cost share of emissions (assuming competitive pricing so that $pq$ is equal to the total cost of producing $q$ units of output.

Letting $p_o$ be the equilibrium price when $p_e$ =0, we have, for small changes in emissions around $p_o$

$$(p^*- p_o)/ s_e p_o = \rho /(\rho + \varepsilon) = \gamma$$

where $\rho$ is the (price) elasticity of supply and $\varepsilon$ is the (price) elasticity of demand.

In the case where emissions intensity cannot be adjusted, therefore, a representative firm will have profit unchanged if $g$ = ( 1-$\gamma$) $q^*_e$ permits are issued.

It is generally assumed that the elasticity of supply greatly exceeds the elasticity of demand, both in the short run and in the long run.

In the short run, the elasticity of supply in the electricity market is determined by the bidding behaviour of market participants. Observations on the bid curve suggest that the short-run elasticity of supply is likely to be in the range 0.5 to 1. The short-run elasticity of demand for electricity is close to zero, perhaps 0.1. In the long run, estimates of the elasticity of demand are close to 1, while under standard assumptions the elasticity of supply is very large (with constant returns

to scale at the industry level, the elasticity of supply is infinite). In both cases, supply is substantially more elastic than demand.

It follows that, in a homogenous industry, if the policy objective were to leave the welfare of industry participants unchanged, *g*, the optimal proportion of permits to be allocated freely would be small, since most cost increases will be passed on to consumers. With a short-run elasticity of supply equal to 0.5 and elasticity of demand equal to 0.2 (assumptions that are respectively conservative and optimistic), the optimal proportion of freely allocated permits would be below 30 per cent. More plausible parameter values would suggest that free permits should be no more than 15 per cent of the total.

*A simulation of the effects of ETS on electricity generators' profits*

Given that the industry is not homogenous, it is necessary to consider the effects of an ETS on different groups of generators. In this submission, a simulation approach is used. We consider historic NEM wide demand and generation profiles for 2007 and focus on the determination of the NSW price. Table 1 shows the baseline conditions.

| | |
|---|---|
| Average Price | 67.07 |
| Peak Average Price | 97.95 |
| Off-Peak Average Price | 44.98 |

Table 1: Base Case Price Data (NSW Historical 2007).

The approach used to simulate an ETS involves a number of steps. First, a value for the price of a ton of CO2 is posited. In particular, a range of $20/ton to 50/ton of CO2 is considered. Then, it is assumed generators would pass-through one-hundred per cent of this additional cost through to their bids in the NEM. Two NEM-wide prices are considered: a single peak price and a single off-peak price.

By using a single pool price for peak and one for off-peak we make two important implicit assumptions. First, we assume that transmission inter-connector

constraints observed in the previous year reflect the probability of them binding into the future.[2] Second, this implies that transmission constraints do not have a significant impact on price. Additional simplifications include the removal of penalty/benefits of the current state based abatement and technology enhancement schemes from the short-run marginal cost of each of the generators.

In the next step, generators' short-run marginal costs and long-run marginal costs[3] are adjusted to reflect the carbon price; the price of carbon is multiplied by the emissions intensity factor to determine the increase in costs. This is done by fuel type. The marginal generators are identified at peak and off-peak. It is assumed that bids off-peak equal short-run marginal cost and at peak long-run marginal costs. The new market price then is determined by the new bid (i.e., the cost adjusted by the price of carbon) of the marginal generator.

The analysis therefore assumes that prices are not constrained by retail price caps. The introduction of an ETS requires that, if such price caps are retained, they should be adjusted to allow generators to pass on the cost of emissions permits.

In the empirical analysis below, we focus on the case of 100 per cent pass-through. That is, generators are assumed to increase their bid prices by an amount equal to the full cost of the carbon permits they are required to buy. The change in the market price will be determined by the demand response to this increase in prices.

We consider a range of carbon prices from $20/tonne to $50/tonne. The starting price of $20 is based on the suggestion by the Green paper that it this is the starting point for the analysis of the economic impact of the introduction of the ETS to be undertaken by Treasury.

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***[2] We use transmission constraints data from the Annual National Transmission Consultation 2007/2008 (NEMMCO) and raw data from NEMMCO's historical data set (Public Daily generation data set 2007).***

***[3] Short-run marginal costs are essentially fuel costs. Long-run marginal costs are obtained by adding a unitized value of fixed costs to the short-run costs.***

The crucial determinant of supply response is the 'merit order' associated with the bid stack, listing suppliers from lowest cost to highest. Initially, brown coal-fired baseload stations are the least-cost suppliers. However, at a carbon price of $26/ tonne, the costs of brown coal, black coal and gas-fired power are approximately equal. At higher prices, brown coal stations are displaced in the merit order by gas, and price determination changes accordingly.

At prices around $30/tonne, brown coal power stations, beginning with the least efficient, cease to cover their long-run variable costs of operation, and will therefore shut down. We model the case where a single power station with 1600MW of installed capacity (assumed for concreteness to be Hazelwood in Victoria) closes down first.

Next, we incorporate demand response. Assuming that the short-run elasticity of demand is equal to 0.2 for retail electricity, and that approximately half of all costs are associated with the distribution and retail sectors, we estimate the derived short-run elasticity of demand for electricity in the wholesale market to be 0.1.

Table 2 provides a summary of average prices for the various carbon price scenarios, after taking account of the interaction of supply and demand responses.

| Carbon Price | Average Price | % increase | Peak price | % increase | Off-Peak price | % increase |
|---|---|---|---|---|---|---|
| Base Case | $67.07 | n/a | $97.95 | n/a | $44.98 | n/a |
| 20/100% | $84.53 | 26% | $109.95 | 12% | $66.34 | 48% |
| 25/100% | $89.57 | 34% | $112.95 | 15% | 72.84 | 62% |
| 26/100% | $90.58 | 35% | $113.55 | 16% | $74.14 | 65% |
| 30/100% | $94.61 | 41% | $115.95 | 18% | $79.34 | 76% |
| 35/100% | $99.65 | 49% | $118.95 | 21% | $85.84 | 91% |
| 40/100% | $104.69 | 56% | $121.95 | 25% | $92.33 | 105% |
| 50/100% | $114.77 | 71% | $127.95 | 31% | $105.33 | 134% |

Table 2: Market outcomes with a range of carbon prices

The final stage consists of calculating the changes in profits from the introduction of carbon prices compared to the benchmark where carbon prices were set to zero. In this calculation we assume that generators only sell in the spot market and there is no hedging. Table 3 summarises the results of this calculation for the assumption of 100 per cent pass through. Negative values indicate that generators in this class are better off. As shown in Table 3, only brown coal generators are made worse off by the introduction of an ETS.

| Carbon price | Brown Coal | Black Coal | CCGT | OCGT |
|---|---|---|---|---|
| 20 | 31% | -2% | -53% | -66% |
| 25 | 29% | -3% | -57% | -72% |
| 26 | 29% | -3% | -58% | -73% |
| 30 | 28% | -4% | -60% | -76% |
| 35 | 27% | -5% | -63% | -79% |
| 40 | 27% | -5% | -64% | -81% |
| 50 | 26% | -6% | -67% | -84% |

Table 3: Fuel type percent compensation required

Additional modelling, not reported here, shows that this conclusion is quite robust. Even with 80 per cent pass through, which implies either restrictions on retail price increase or a substantial divergence from competitive behaviour, black coal generators suffer modest losses, but, again, the main loss falls on brown coal generators.

The analysis supports the conclusion of the Green Paper that policy attention should be focused on generators using brown coal. However, it does not support the view that the main concern should be on losses to the owners of such generators.

The primary implication of the analysis is that substantial reductions in emissions will be achieved only when existing brown coal generators shut down and are replaced by other sources of electricity or by electricity conservation. In the short run adjustment modeled here, this would be achieved by increasing the availability

and output of existing gas-fired plants, and by the demand effects of higher electricity prices.

In the longer term, adjustment will include the construction of new low-emissions electricity generating plant, and, if technological difficulties can be overcome, the adoption of carbon capture and sequestration technology. Cost-effective carbon capture would probably require the construction of new plants, although retrofitting remains a possibility.

The process of adjustment is usually a difficult and painful one for the workers and communities affected. The primary focus of government policy should be on assisting workers to find new jobs and assisting communities to expand alternative sources of employment. In the context of the La Trobe valley, this might include assistance with the adoption and implementation of carbon capture and sequestration technology.

In this context, resources diverted to compensating the owners of existing capital for reductions in the value of capital assets are unavailable to support the adjustment of workers and communities. Any payments made to owners of existing assets should be used to assist this adjustment process, for example by assisting owners of coal-fired plants to implement emission-reducing technologies such as coal-drying, or to develop methods for carbon capture and sequestration.

*Conclusion and recommendations*

**6. For the electricity sector as a whole, assuming competitive pricing, most costs of an emissions trading scheme will be borne by consumers. Retail price caps, if retained, should be adjusted to ensure that consumers receive an appropriate price signal.**

**7. Adverse effects on producers will be confined to the brown coal generation sectors. Any effective scheme to reduce emissions is likely to require the closure of some brown coal generators.**

**8. Adjustment assistance should be directed primarily towards enabling workers, firms and communities to deal with the consequences of plant closures rather than towards compensating investors.**