Options for the design of emissions trading schemes in Australia

A SUBMISSION TO THE GARNAUT CLIMATE CHANGE REVIEW

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Executive summary

The implementation of an emissions trading scheme involves addressing a number of public policy concerns and issues. These include, most obviously, the need to meet environmental policy objectives. They also include issues of carbon leakage, external competitiveness, adjustment effects, and public finance and governance concerns.

The Discussion Paper on the design of emissions trading prepared by the Garnaut Review proposes a mechanism by which these various objectives, and any trade-offs between them, could be managed. The proposal is based on a Cap and Trade mechanism with full auctioning of permits, and the recycling of permit revenue to fund various government transfers to meet objectives besides the environmental goal of abatement. The merits of this proposal would be better established if it were compared to possible alternatives, and if this comparison were undertaken on a systematic basis.

This submission seeks to extend the analysis presented in the Discussion Paper by comparing the performance of three scheme options against the key policy objectives mentioned above. These three options are:

- A Cap and Trade scheme with full auctioning;
- A Cap and Trade scheme based on output based allocation; and
- A Baseline and Credit scheme.

The choice of these schemes is motivated in part by the different price and distributional effects they have, which in turn have a bearing on the policy objectives set out above. We attempt to assess these differences by focusing on one specific price effect: the impact of these schemes on the electricity wholesale price. The focus on electricity is motivated by its importance to overall emissions, but also because the price of electricity is a key mechanism through which the price of emissions can be propagated across the economy. We estimate these price effects using a suite of proprietary simulation models of the National Electricity Market.

The modelling points to significant differences in price effects across these schemes. When modelled to achieve the same greenhouse gas target (i.e. NETS Target 2):

- A *Cap and Trade scheme* would result in wholesale prices on average about $25 dollars per MWh higher per year in NSW, compared to an *output based allocation*, over the period 2010 to 2019. The differences for Queensland, South Australia and Victoria are, respectively, approximately $26, $27, and $27.
- A *Cap and Trade scheme* would result in wholesale prices on average about 32 dollars per MWh higher per year in NSW, compared to a *Baseline and Credit scheme*, over the period 2010 to 2019. The differences for Queensland, South Australia and Victoria are, respectively, approximately $36, $40, and $39.

These are considerable differences by any measure. They suggest significant adverse impacts of the Cap and Trade scheme on carbon leakage, competitiveness and adjustment relative to the other two schemes.

One way in which these impacts could be addressed under a Cap and Trade scheme would be to use transfers funded out of permit revenue. While this option has been considered at length in the Discussion Paper, it appears that the pitfalls surrounding such an approach have not been given due consideration. These pitfalls involve the informational capacity required to administer such transfers in an efficient manner, and the ability to safeguard the process from rent seeking and capture.

The proposed process for addressing carbon leakage and external competitiveness is illustrative of these issues. It rests on computing a number of inherently unobservable counterfactual parameters, thus increasing the scope for subjective judgement and thus the possibility of capture by vested interests. Moreover, it is likely to be unworkable under current international trade rules.

The problems of informational capacity and susceptibility to rent seeking that arise under any system predicated on transfers against significant amounts of government revenue must be set against the advantages the other schemes have of obviating (or attenuating) the need for most of these transfers by virtue of their price effects.

This is not to understate the implementation challenges raised by these other schemes. These include issues of administrative complexity, and the possibility that lower price effects may impact on demand side abatement, and therefore require other measures such as demand-side management rules.

The basic conclusion of the submission is that choice of a particular scheme option must be informed by an understanding, and where possible, quantification, of the costs and benefits of scheme alternatives in relation to key policy objectives. It is not a choice that can be made on the grounds of *a priori* judgements. Our contention is that, for all its merit, the Review's Discussion Paper concludes in favour of one particular form of emissions trading scheme, without carrying the systematic analysis of alternatives that is required. Policy debate would be considerably enriched if this shortcoming were to be addressed.

1 Introduction

1.1 ABOUT THIS SUBMISSION

Frontier Economics appreciates the opportunity afforded by Professor Garnaut's Review process (henceforth, the Review) to make a contribution to the public debate on issues relating to the design of emissions trading. Frontier Economics is an economic consulting firm providing advisory services to government and private clients on a range of public policy issues. Frontier Economics has a specific interest and expertise in the area of emissions trading, having advised the New South Wales government on the design and implementation of its Greenhouse Gas Abatement Scheme (GGAS) and working extensively on the European Emissions Trading Scheme. We make this contribution on our own behalf and expense in the spirit of fostering an informed, balanced debate on matters raised by the Review.

1.2 OBJECTIVE AND STRUCTURE OF THIS SUBMISSION

The central purpose of this paper is to assess different options for emissions trading scheme design, in relation to the key policy objectives and concerns that of relevance in the implementation of climate change policy. We note that the discussion paper on emissions trading produced in March 2008 (hereafter, the Discussions Paper) focused to a very large extent on the implementation of a Cap and Trade scheme, and the use of government transfers funded from permit auction revenue. While such an approach has its merits, we submit that these should be evaluated more systematically in comparison to other scheme design options. These other options include:

- Cap and Trade schemes with a different allocation methodology (notably output based allocations); and
- A Baseline and Credit scheme.

One reason for focusing on these alternatives is that they have been examined in theoretical and empirical research on emissions trading. Another is that these are both intensity-based approaches (i.e. predicated on the computation of emissions intensity baselines), which is the type of approach with which Australian policy makers have had the most practical experience. For example, the NSW GGAS scheme is an example of a Baseline and Credit scheme. Tradable emissions efficiency schemes such as the MRET and VRET schemes are also variants of the Baseline and Credit scheme concept. It is somewhat paradoxical that, given the extent of experience with these approaches in Australia, these alternative price setting mechanisms should receive fairly limited and uneven treatment in the Review process to date.

We hope to extend and balance the analysis presented by the Review's Discussion Paper by examining the properties of these schemes, and by focusing on their relative strengths and weaknesses relative the particular Cap and Trade approach considered in the Review's discussion paper. Noting that the latter contained very little in terms of quantitative analysis of scheme effects, we draw on some simulation modelling of outcomes in the electricity market to better understand some of the comparative impacts of these schemes. The modelling draws on Frontier's proprietary models, (the details of which are confidential but can be made available to the Review on a confidential basis on request),

Our submission is therefore structured in the following manner:

- Section 2 sets out the main policy issues that emerge in relation to scheme design and implementation, and then presents the main properties of the different schemes; and
- Section 3 models the impact of these schemes on electricity wholesale prices, and uses the results as a basis for evaluating the different options against the main policy objectives.

2 Policy issues and scheme options

2.1 KEY POLICY ISSUES AND CONCERNS

The Review's Discussions Paper sets out the main policy issues that arise in relation to the implementation of emissions trading, and consequently we limit ourselves to a brief overview. Our main immediate observation is that the range of issues is a reflection of the specific context in which emissions trading is implemented, namely that of a small open economy, with a steep abatement cost curve owing to Australia's past reliance on its relative abundance of fossil fuel endowments.

2.1.1 Environmental objectives

As noted by the Review, the overarching aim of emissions trading is to correct a market failure, namely that production and consumption decisions do not take full account of the cost imposed by these decisions, since the true cost of carbon consumed as a result of these decisions is not taken into account. The purpose of emissions trading is to establish a price signal through which the relative scarcity of carbon emissions is captured in decisions. The relative scarcity is set by the overall carbon emissions budget established for Australia as part of a wider international effort to maintain emissions levels within a range that does not induce damaging and irreversible climatic impacts. Pricing emissions correctly should affect relative prices and rates of return between carbon intensive and less carbon intensive activities, directing investment and consumption decisions towards the latter.

Certainty in abatement and investment certainty

In conditions of certainty, different emissions trading scheme designs should be equivalent in terms of their ability to reach a certain abatement target (abatement efficiency) and the costs of reaching this target measured in terms of the inter-temporal volatility in the cost of carbon. In practice, there will be uncertainty regarding, *inter alia*:

- demand for future emissions, and by implication the abatement task; and
- the costs of new technologies to reduce emissions.

This will result in some volatility of carbon prices over time, creating some level of uncertainty to investors, including investors seeking to commit resources to abatement activities. In practice, the presence of uncertainty is liable to create some trade off between abatement certainty on one hand, and investment certainty on the other. A Cap and Trade approach with a firm cap can maintain the former, but at the expense of the latter by introducing a high degree of carbon cost volatility. Intensity based approaches can smooth volatility in carbon prices by allowing emissions to grow faster than planned when demand is higher (and conversely, by restricting emissions to a lower rate if demand is lower than planned). This helps preserve some investment certainty, but can lead to a loss of abatement certainty over the period when demand deviates from projected levels.

The balance of overall cost and benefits from preserving one type of certainty over another is an empirical question. Countries exposed to a relatively high degree of demand volatility, such as developing countries, stand to gain from managing investment certainty by attenuating the volatility of carbon costs.

2.1.2 Carbon leakage

As noted in the Review's Discussion Paper, the threat of carbon leakage emanates from incomplete international participation in abatement commitments, and the consequent relocation of carbon intensive activities from carbon constrained to non-constrained regions. The key issue here has to do with the impact of abatement commitments on rates of return in carbon intensive sectors. This impact will be particularly strong in the tradables sectors, which are likely to face higher input costs and fixed world prices (an issue we will also take up in the section below on competitiveness effects).

The first best option for managing carbon leakage is to support trading partners, notably developing countries, in their efforts to undertake and implement binding abatement commitments. In the absence of this, the next best policy response would be to address the effect on rates of return of emissions trading. The Review's Discussion Paper in effect suggests granting a subsidy through recycled auction revenue, which is intended to offset the cost impact of the emissions trading scheme. An alternative is to choose an emissions trading scheme design with effects that have a lower impact on input costs, while preserving environmental objectives. We will show how the Output Based Allocation and Baseline and Credit approaches offer such an alternative in section 3.3 below.

2.1.3 Competitiveness effects

Competitiveness effects stem from the combination of asymmetric international abatement commitments, and the small open economy assumption under which increased input costs in tradables cannot be passed on given exogenous world prices. In this sense, competitiveness concerns are related to issues of leakage, though they are not necessarily the same. This is because carbon leakage is a policy problem on account that it leaves global emissions unchanged (or higher) in the absence of commitments in trading partners. However, a loss of competitiveness in domestic tradables may occur even when trading partners make commitments consistent within a globally efficient abatement framework, if there is asymmetry in these commitments.

This is not necessarily a problem from a domestic efficiency point of view. It may however, be a problem from a political economy point of view insofar as losses to the sectors concerned may create pressure for offsetting action. More specifically, these competitiveness effects create incentives to capture policy processes – such as the granting of transfers for the purposes of managing carbon leakage – which may have an efficiency objective. They may also create pressure for policy measures that are likely to be welfare reducing, such as the use of trade policy measures, or the creation of exemptions to scheme coverage.

2.1.4 Adjustment effects

Competitiveness effects are a subset of wider adjustment effects that emanate from the introduction of emissions trading and the pricing of consumption. As noted in the Discussion Paper, these effects will impact on households and producers, with the effect on the latter being a function of the extent to which they can pass higher costs. These adjustment effects are distributional in nature and will create claims for the use of state funded transfers primarily on equity grounds.

Whether or not adjustment effects are a matter of policy concern is likely to depend on equity considerations, or whether adjustment issues have wider economic impact. The latter might be a consideration in relation to sectors such as electricity. Here certain standards of delivery (reliability and security, for instance), need to be met on a continuous basis. If one assumes that investment is "lumpy", and is liable to be undertaken by firms whose asset value might be significantly affected by the introduction of a price on emissions, then managing the financial impact of the adjustment to emissions trading becomes an important issue given the wider economic consequences of unreliable or un-secure power supplies.

2.1.5 Public finance and governance effects

The prospect of raising revenue through an externality tax is of interest from a public finance perspective, given that it is a method of raising finance that does not have the costs associated with general taxes on investment and labour (indeed, an it has inherent efficiencies). Consequently, revenue raised from such a tax can be used to:

- Offset distortions created by other taxes; and/or
- Finance transfers that are required to meet some of the other objectives listed above (leakage, competitiveness and adjustment).

Access to such a pool of revenue to meet these objectives is usually touted as one of the attractive features of a Cap and Trade scheme with full auctioning. Indeed, the approach taken by the Review's Discussions Paper relies heavily on transfers from this pool of revenue to meet the various policy concerns that arise in the context of emissions trading.

While theoretically appealing, this approach should be treated with great caution insofar as the appeal of this approach is crucially dependent on the institutions and processes that manage the disbursement of transfers. The key requirements are:

- Informational capacity – in the sense that the state needs to be able to identify to whom transfers should be made, and to what order of magnitude, in a manner that does not create further distortions.
- Insulation from rent seeking behaviour – this reflects the concerns that where significant pools of funds are created, pressures inevitably arise to disburse these funds in a manner that promotes particular interests.

The broad requirements of informational capacity and insulation from rent seeking behaviour can obviously be applied to any emissions trading scheme, whether they raise revenue for the government or not. Indeed the Review's Discussion Paper uses these criteria to critique alternatives to its preferred approach, without systematically considering these approaches, nor considering how its preferred approach fares in relation to these criteria. The main requirement is to apply these criteria systematically across alls schemes: we do this in greater detail in Section 3.3.5 below, having first described in greater detail options for scheme design.

2.2 SCHEME DESIGN OPTIONS

2.2.1 Introduction

As already mentioned, the three scheme design options we consider are:

- A Cap and Trade scheme, with full auctioning (a classic Cap and Trade scheme)[1]
- A Cap and Trade schemes with an output based allocation; and
- A Baseline and Credit scheme

Our reason for choosing to review the first of these approaches is because it is the approach set out by the Review's Discussion Paper. As already mentioned, the second and third approaches are based on the use of emissions intensity baselines, an area in which Australia has considerable policy experience.

Notwithstanding the extensive discussion of the classic Cap and Trade scheme option in the Review's Discussion Paper, we will begin by setting out its main properties. This is primarily with a view to put the scheme within a presentational and analytical framework that will facilitate a systematic comparison with the alternatives we have mentioned.

In our approach we will focus specifically on the impact of these schemes on the electricity sector. There are several reasons for this, beginning with the importance of the sector in terms of emissions. Moreover, the price of electricity is a key price in the economy as a whole; indeed, it provides a mechanism through which the introduction of a price on emissions can be propagated across sectors, even those that are not explicitly subject to key coverage. In subsequent Section 3.2 we model the response of electricity prices to various scheme design options.

This section provides a simple example of the electricity market, for the purpose of comparing the effects of different scheme designs. We will use this example to consider the mechanics of the three types of scheme under consideration. In this highly stylised example of the market for electricity generation, the supply curve

1 As noted subsequently in this submission, a Cap and Trade with a free allocation of permits will have equivalent price effects to that of a Cap and Trade scheme with full auctioning of permits, though the distributional effects will be different.

can be represented by the "merit order": plant is ordered by short-run marginal cost from lowest to highest, and the intersection of demand and supply determines the market price. For the purpose of this example, four types of generating plant are considered, each with constant marginal costs over output:

Plant	Short Run Marginal Cost ($/MWh output)	Emissions intensity (tCO2/MWh)
Hydro	2	0
Brown Coal	6	1.2
Black Coal	12	0.9
Gas - CCGT	25	0.5

Table 1: Simple plant assumptions

The corresponding merit order for these plant is represented in Figure 1.

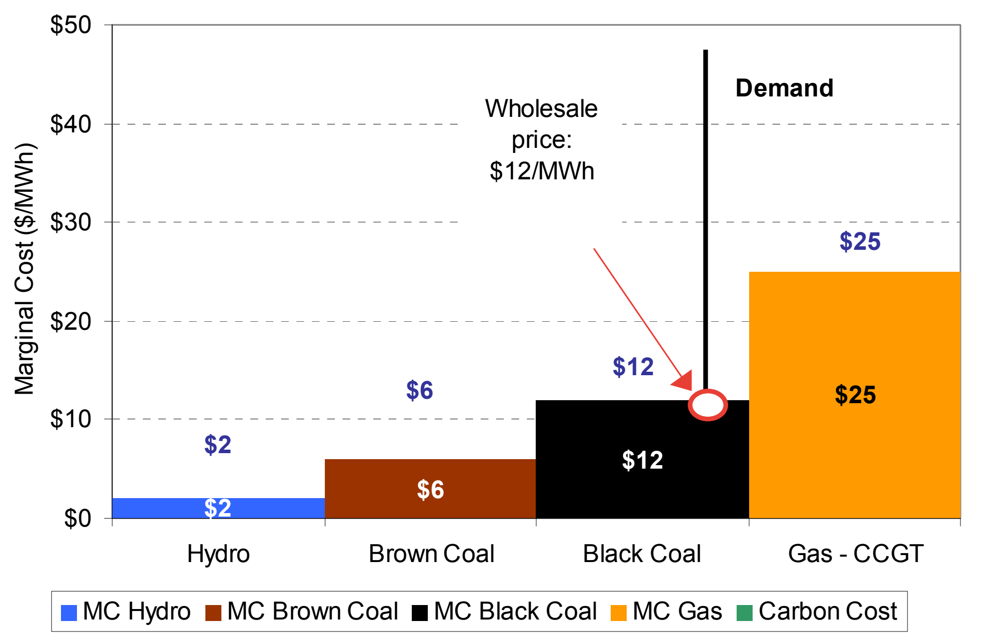

Figure 1: Merit order without a carbon cost

2.2.2 Cap and Trade scheme with full auctioning of permits

Outline of operation

The Government sets an absolute emissions cap and allocates permits (rights to emit) either by auction or by an administrative mechanism (grandfathering). Permits are tradeable and emitters must acquire permits equivalent to their total emissions.

Issuing a limited number of permits (the cap) creates scarcity, while the ability to trade reveals a permit price. This intenalises the cost of emissions and provides producers and consumers with incentive to pursue both demand-side and supply-side abatement measures. The effects of the permit price on the electricity price will be the same whether permits are auctioned or grandfathered. If generators have to purchase permits then they will be included in pricing decisions. Equally, if generators receive grandfathered permits then the price that could be received by selling them is the opportunity cost associated with their use.

The price of permits has to be high enough to constrain total emissions to the target (ie cap). In the electricity sector the most important abatement mechanism is a change in the merit order, such that low emitters supplant high emitters. The permit price will increase the marginal costs of all generators emitting CO2, which will cause the market supply curve to shift upwards. It will also increase the costs of high-emitting generators by more than the costs of low-emitting generators. This will flatten the market supply curve.

Example: price effects and substitution effects

In this example, we assume by way of example a carbon price of $35/per tonne of CO2. In these circumstances:

- a black coal generator emitting 0.9tCO2/MWh would experience an increase in marginal cost of $31.50/MWh
- a gas generator emitting 0.5tCO2/MWh would experience an increase in marginal cost of $17.50/MWh
- The net change in relative costs between the black coal and gas is $14/MWh

This is sufficient to change the merit order, and achieve the required abatement. In this example, black coal has become the marginal plant, and the wholesale price increases to $44/MWh. Gas plant supplants brown coal plant in the merit order. The merit order is changed: the market supply curve increases, and in this instance has also flattened, since lower cost generators tend to be more emissions intensive and experience a greater increase in costs.

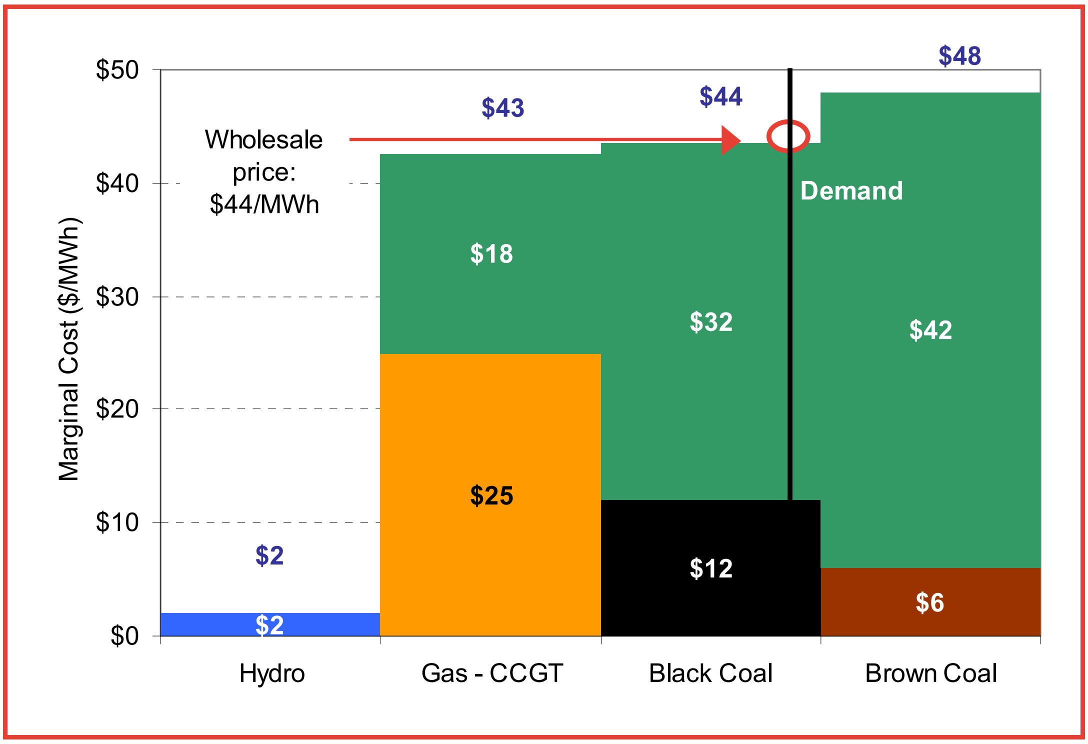

Figure 2 Example of Cap and Trade effect with permit price of $35/tCO2

Opportunity cost pricing

There is a large body of literature, beginning with Coase's Theorem, which shows that the price effects of a given carbon price will be equivalent whether permits are auctioned or freely allocated. Clearly, if generators have to purchase permits then they will be included in pricing decisions. Equally, if generators receive grandfathered permits then there is an opportunity cost associated with the use of those permits (as opposed to selling them). As a simple analogy: a house that is inherited has the same value as a house that is purchased, irrespective of how it was initially acquired. Consequently, the above results for the merit order and electricity prices also hold for a Cap and Trade scheme with free allocations. The main difference will lie in wealth distribution effects.

Distribution effects

In this example demand is inelastic, hence the cost of abatement is funded by consumers via higher energy prices. For reasons discussed above, this is expected whether permits are auctioned or grandfathered.

- If permits are auctioned:
  - the **Government** will receive auction revenue, which is likely to be larger than the value of price increases. In theory, this could be recycled to compensate consumers for the higher prices. It could also be used to offset distortions that occur elsewhere in the economy as a result of existing taxes.

- The impact on generator profits (and values) is influenced by a "price effect" and a "quantity effect":
  - the price effect reflects the difference between the increase in wholesale pool prices and the increase;
  - the quantity effect reflects changes in output for each generator, given that the intent of the scheme is to encourage increased output from low emissions generation to supplant output from high emissions generation;
- Generators will all receive the same increase in prices, but will experience differing increases in carbon cost to reflect their different emissions intensities.
  - **Existing low emitting Generators**: higher prices will be sufficient to compensate low emitters for their increased cost (or purchasing permits). They will likely see an increase in output, which should lead to an increase in value;
  - **Existing high emitting Generators:** the increase in prices will be insufficient to compensate for their increased costs. Many will also experience a decrease in output in the long-term (when carbon prices are high). They will see a decrease in value.

- If permits are grandfathered the price effects will be the same, hence consumers will still fund the abatement.
  - The **Government** will not receive auction revenues, and will have no funds to recycle;
  - Generators: prices will increase by the same amount as under auctioning, but the grandfathered permits will represent a transfer in value.

2.2.3 Cap and Trade with output-based allocation

The basis of this approach is that permits are allocated based on emissions intensity, as opposed to an absolute cap. An intensity target can be based on historical output or emissions (which may translate to an absolute cap), but in this example it is based on "updating"; i.e. actual output in the given period. The difference between this and a classic Cap and Trade approach is that under this approach producers (e.g. Generators) would freely receive permits equal to a baseline per unit of output (MWh).

All generators would receive the same number of permits for each MWh of output up to the baseline. Each generator would still have a differing carbon cost per MWh. The *relative* difference in costs between generators would be equivalent to cap and trade. An intensity target could be calculated to achieve an equivalent level of total emissions as cap and trade; in the electricity industry this could be 0.8tCO2/MWh (initially), and declining over time.

Consider the following example, with a target intensity of 0.8tCO_2 permits for each MWh of output.

- a black coal generator emitting 0.9tCO_2/MWh would have a net cost of 0.1tCO_2/MWh. This shortfall would need to be purchased from other generators. For a carbon price of $35/t$CO_2$, this reflects a net *increase* in marginal cost of $3.50/MWh
- a gas generator emitting 0.5tCO_2/MWh would *receive* a net excess of 0.3tCO_2/MWh. This excess could be sold to generators requiring additional permits. At a carbon price of $35/t$CO_2$, this would result in a net *reduction* in the marginal cost of gas plant by $10.50/MWh;
- Since the marginal cost of Black Coal increases by $3.50/MWh, and the marginal cost of CCGT Gas decreases by $10.50/MWh, the change in relative marginal cost between Gas and Coal is $14/MWh: exactly the same as under Cap and Trade;

The effects are summarised in Table 2.

Plant	SRMC ($/MWh output)	Emissions intensity (tCO2/MWh)	Permits sold (bought) per MWh[2]	Marginal revenue (cost) of carbon ($/MWh)	Net Marginal Cost ($/MWh)
Hydro	2	0	0.8	28.0	(26)
Brown Coal	6	1.2	(0.4)	(14.0)	20
Black Coal	12	0.9	(0.1)	(3.5)	15.5
Gas - CCGT	25	0.5	0.3	10.5	14.5

Table 2: Plant assumptions with $35/t$CO_2$ price, benchmark of 0.8tCO_2/MWh

In practice, the methodology set out here would be equivalent to auctioning all permits under Cap and Trade and recycling the revenue into a flat subsidy. In a demand and supply context, this is equivalent to a parallel downward shift of the merit order (compared with the Cap and Trade scenario); see Figure 3 for an illustrative example. That is, it shifts absolute costs downwards, but the relative costs of different parties in are exactly the same as a Cap and Trade scheme. As with any subsidy, the extent to which producers pass on the subsidy to consumers is determined by the elasticity of demand. Demand for electricity is

2 In this illustrative example, if it is assumed that the output from Hydro, Gas and Black Coal is equal then there will be an excess of permits created/sold with the benchmark of 0.8t/MWh – this would result in a fall in the carbon price or, to maintain the same abatement as Cap and Trade a tighter intensity target (eg 0.47t/MWh) would be set. The 0.8t/MWh baseline is more reflective of the required intensity target in the Australian market, given the current level of average emissions intensity.

typically inelastic, so we can expect that the majority (if not all) of the subsidy will be passed on in lower prices.

Note that the effective marginal cost for each generator is $28/MWh less than under the Cap and Trade example in Figure 2. If there is no demand response, then this means that wholesale pool prices will be $28/MWh lower than under a cap and trade.

These effects are depicted in Figure 3 below.

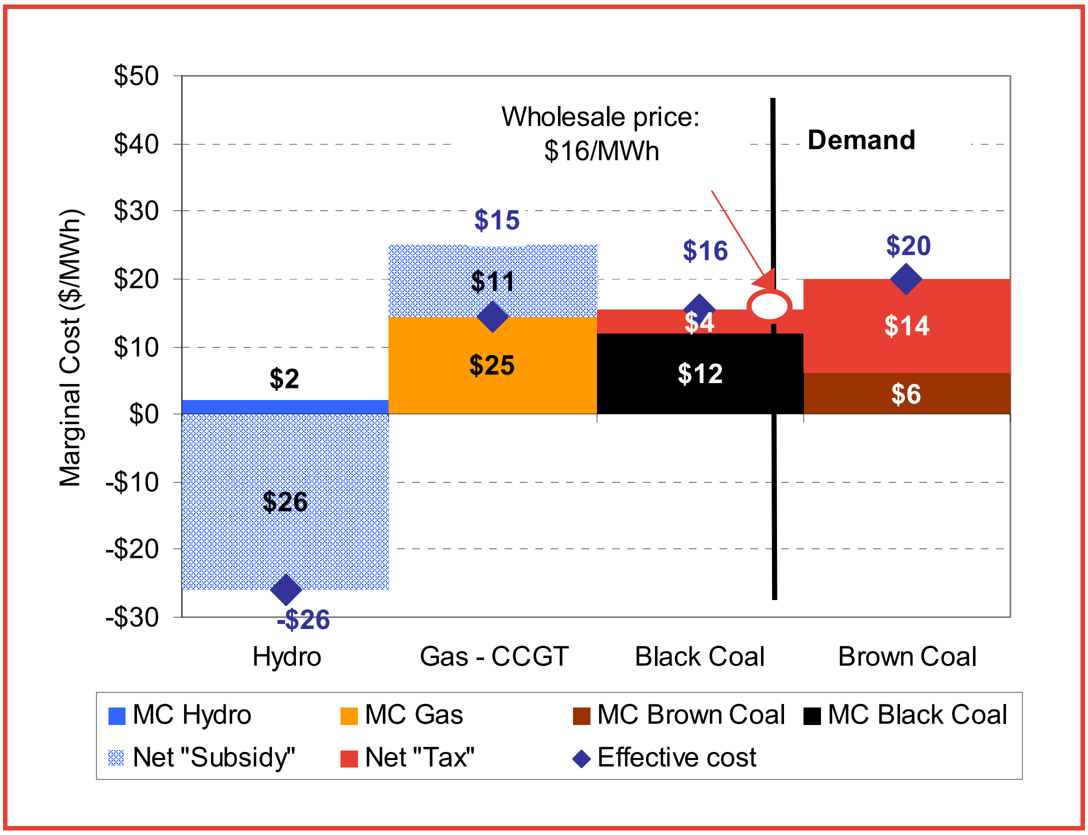

Figure 3: Example of Output Based Updating effect with permit price of $35/tCO2 (NB: the figures in this graph have been rounded to the nearest cent)

Distributional effects

The main difference vis-à-vis a classic Cap and Trade is in the transfers between government and consumers.

Consumers will pay a lower price than under cap and trade. As already explained, the Output Based Allocation functions in a manner identical to an auction with revenue recycled into a flat producer subsidy. The main difference is that the Output Based Allocation avoids the need for a large transfer of funds into government coffers and then back out to consumers.

For generators, the change in relative costs (due to carbon) is exactly the same as under the Cap and Trade scheme. If there is minimal demand response, or if complementary policies encourage the same level of demand –side abatement as under Cap and Trade, then individual generators will experience the same impact on profitability and value as under a Cap and Trade scheme with auctioning of permits. If there is some demand-side response, then not all of the effective subsidy will be passed through to consumers in the form of lower prices; generators will capture some of the value of the permits.

2.2.4 Baseline and credit

A Baseline and Credit design is the basis of the NSW GGAS scheme, and the CDM under Kyoto; essentially, permits or credits are created for reductions in emissions below a baseline. In a domestic scheme, such as the NSW GGAS, demand for credit comes from retailers (in the electricity industry), since they have the liability to acquit permits. Internationally, demand for permits under the CDM comes from other countries with Kyoto obligations. A simple example of the effect of a Baseline and Credit scheme is provided below.

Assuming a baseline of 1.1tCO2/MWh, gas plant with an emissions intensity of 0.5tCO2/MWh would be eligible to create 0.6 permits per MWh or output; black coal with emissions of 0.9tCO2/MWh would create 0.2 permits; and brown coal emitting 1.2tOC2/MWh would create none, since it is above the baseline. Existing Hydro plant, with zero emissions and low marginal cost, would not be eligible to create permits since it is not additional to the baseline: it would produce electricity regardless of whether it receives permits, so no additional abatement would be achieved.

Plant	SRMC ($/MWh output)	Emissions intensity (tCO2/MWh)	Permits created per MWh	Marginal revenue from permits ($/MWh)	Net Marginal Cost ($/MWh)
Hydro	2	0	-	-	2
Brown Coal	6	1.2	-	-	6
Black Coal	12	0.9	0.2	7	5
Gas - CCGT	25	0.5	0.6	21	4

Table 3: Plant assumptions with $35/tCO2 price (Baseline of 1.1tCO2/MWh)

At a carbon price of $35/tCO2, the net effect on the wholesale pool price is a reduction to $5/MWh, and gas would supplant brown coal in the merit order: see Figure 4. This carbon price would be set by the market, and is a function of the supply of permits (itself determined by output from low emissions generation and the level of the benchmark) and demand for permits (determined by the target set for retailers).

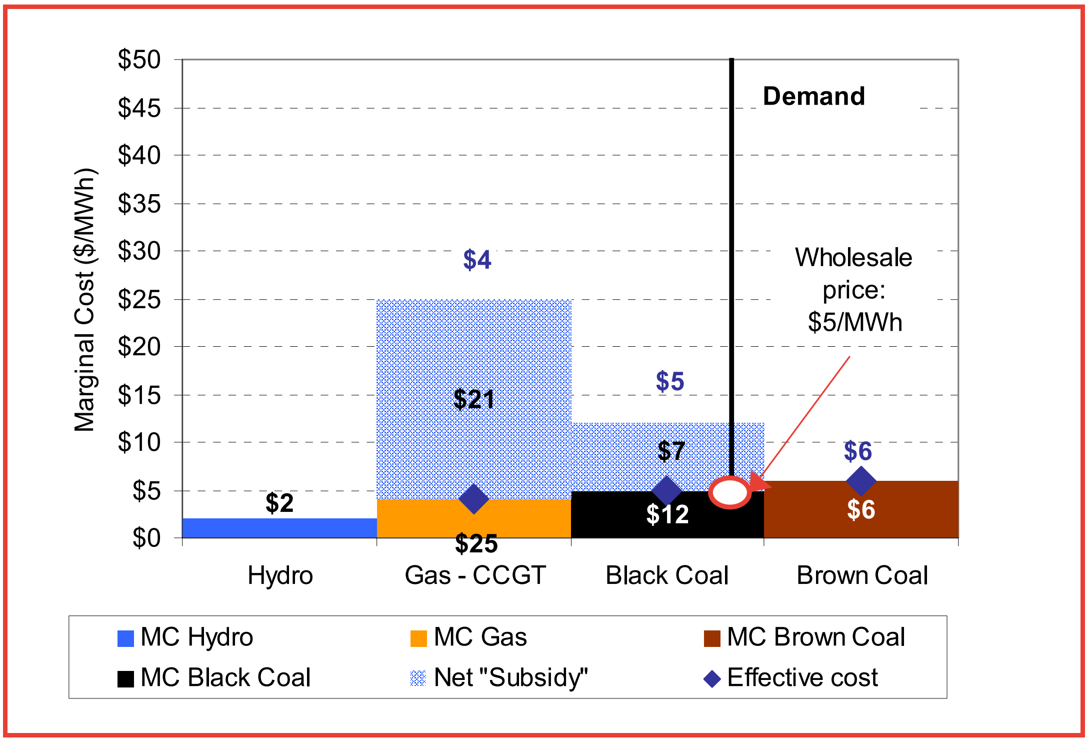

Figure 4: Example of Baseline and Credit effect with permit price of $35/tCO2 on wholesale price (Baseline of 1.1t/MWh)

The creation of permits provides an alternate source of revenue for low emissions generators, which results in the lower wholesale pool price. However, this also requires a retail levy to fund these certificates: given the assumed output of each plant in this simple example, this levy would equate to around $9/MWh, giving a retail equivalent energy price of $14/MWh.

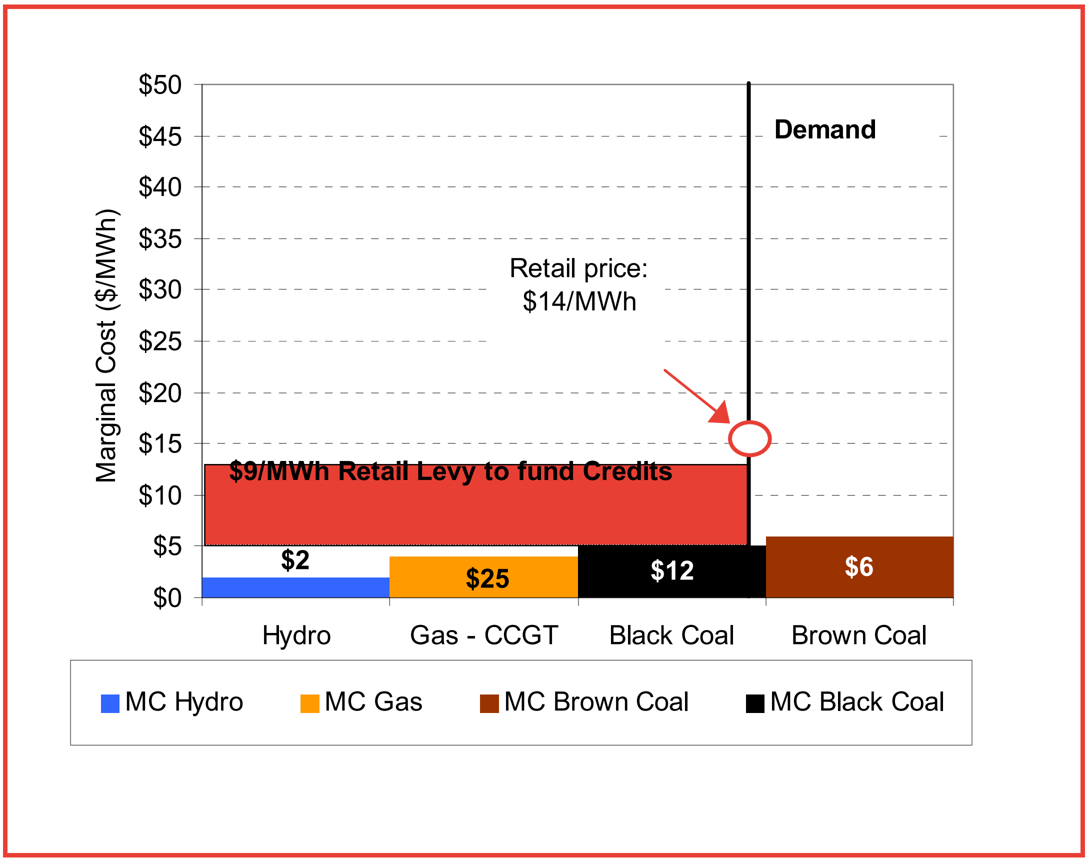

Figure 5: Example of a Baseline and Credit effect with permit price of $35/tCO2 in retail price

In effect, it is partly similar to the Output Base Updating in that it provides an effective subsidy for low emissions generation. However, it differs from Output Based Updating in two ways: (a) it does not effectively penalise options that are worse than the baseline (for example, brown coal); and (b) it does not reward options that are not additional to the baseline. Under the schemes described above, existing low emissions generation in the electricity sector will benefit from higher electricity prices, even though this does not encourage any additional abatement. However, the Baseline and Credit impact disadvantages such producers if the scheme results in lower pool prices (due to the subsidy effect) and does not allow existing producers to create permits.

2.2.5 Excursus: international scheme linkages and permit trade

The issue of international scheme linkages is raised at length in the Review's Discussion Paper, which outlines the different types of linkages and benefits. We do not intend to cover that same ground. Rather, given that purpose of this submission is to encourage consideration of alternative scheme options, it is appropriate to consider whether the choice of scheme poses any constraint to international linkages and permit trade.

In principle, there is no reason why such differences should be an obstacle.[3] Recall that all schemes start with an initial emission allowance. It is this allowance that determined the overall scarcity of permits in a particular country. In the case of output based allocations or baseline and credit, the baseline is predicated on this overall target. Under all approaches, the permit price is determined by this overall scarcity. The schemes may have different effects in terms of product prices – notably the price of wholesale electricity – but this is fundamentally a question of how the costs of emissions scarcity are distributed across the economy. The overall price associated with that scarcity should be the same, all else being equal, regardless of the chosen trading system architecture.

Assuming that there is a uniform permit price in each of the linked schemes trading will be able to take place even if the schemes differ at their methodologies. For example, under a Baseline and Credit scheme, firms below the baseline that create certificates would have the opportunity to trade them to firms on-country or outside the country. One proposal would involve developing registries or repositories where emissions could be deposited for acquisition through trading.[4]

The main issues that arise in interlinking schemes concern whether:

- The overall allowances of partner schemes are sufficiently stringent i.e. that permits are not over allocated. For instance, it has been suggested that there may be problems linking the proposed emissions trading scheme in Canada (a Baseline and Credit scheme) to the Cap and Trade scheme for the North Eastern states of the US (the RGGI) on the grounds that the cap in the latter is too loose.).[5]
- whether there are discrepancies in monitoring and accounting of emissions, scheme coverage; and
- whether policy interventions by government (e.g. allocating extra emissions rights) will cause instability across schemes.

These issues will arise whether or not the linked schemes considered are only of a Cap and Trade variety, only of a Baseline and Credit variety, or a combination of both.

3 See OECD/ IEA (2006) *op.cit*

4 see International Emissions Trading Association (2006), *Linking EU- Canada Emission Trading Systems, An Opinion Paper by IETA*

5 see E.Haites, *Canadian Climate Policies – Global Carbon Markets and EU ETS* (presentation made in June 2007), available at website http://ec.europa.eu/environment/climat/emission/pdf/4thmeeting/2b_haites.pdf

3 Modelling results and evaluation of alternatives

3.1 INTRODUCTION

In our previous sections, we discussed the main policy issues that arise in the context of emissions trading, and then examined the mechanics of three different scheme options. In this section, we assess the impact of implementing these schemes by modelling their impact on electricity wholesale prices on an equivalent emissions reduction basis.

For reasons already discussed, the price of electricity is a key price in the economy. While measuring the response of this price to scheme design alternatives is by no means a comprehensive guide to the effects if these alternatives, it does provide a starting point to understanding these effects. This is mainly due to the fact that all of the policy issues discussed above are related to the price impact of implementing emissions trading.

3.2 MODELLING APPROACH AND RESULTS

3.2.1 Overview of approach

Our approach draws on Frontier's proprietary suite of electricity market models that have been extensively used by policy makers, regulators and industry participants in Australia and across the world. Recently these models have been subjected to an external review by Professor Richard Green, on the occasion of their use to inform the rule making decisions of the Australian Energy Markets Commission, which is a level of public scrutiny that has not been applied to other models in use in Australia.[6]

We have followed a two-step approach to modelling the effects of emission scheme alternatives. The first is to establish the merit order that emerges as a result of these schemes, on the basis of a least cost dispatch model of the NEM. To this end we have used one of our proprietary software models - a mathematical optimisation model where the objective function in this case is to minimise the total cost of meeting system demand.

We have used demand projections contained in the NEMMCO's latest SOO-ANTS report to estimate projected demand. We also assume the implementation of a mandatory renewables energy target (MRET) of 20% by the year 2020. The implementation of MRET is considered to be part of "business-as usual".

The next step is to assume a target for emission reductions under a trading scheme. We have assumed that the emissions trading scheme aims to ensure that

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6 Available at Australian Energy Market Commission website http://www.aemc.gov.au/pdfs/reviews/Congestion%20Pricing%20and%20Negative%20Residue%20Management%20Arrangements%20for%20the%20Snowy%20Region/aemcdocs/013Professor%20Richard%20Green%20Due%20Diligence%20Report%20-%20August%202007.PDF

electricity generation emissions are capped at 150 Mt in 2030, which is approximately the level of electricity generation emissions in 1997. It represents a 43%, or 114 Mt, reduction on forecast business-as-usual emissions for this sector in 2030.[7] We then analyse the implementation of this scheme under the three design options already mentioned:

- A Cap and Trade with full auctioning;
- An Output Based Allocation methodology
- A Baseline and Credit scheme

The mathematic optimisation model used in this firsts stage assumes that generators bid at marginal cost. This is obviously not an accurate depiction of the National Electricity Market, where at least some generators are capable of bidding strategically by selecting the quantity of output they choose to dispatch in response to decisions made by other participants.

We therefore use the supply conditions derived from the first stage as an input into a game theoretic model of the NEM. This model allows for certain parties to bid strategically – that is to withdraw capacity in order to earn a higher price on the capacity that is despatched. The model calculates Nash Equilibrium bidding levels and the associated wholesale prices. The use of a model that systematically tests the behavioural response to such a profound change in market operations, such as follows the introduction of an emissions trading scheme, is crucial as it is not possible to use historic market participant reactions to these policy shocks as there is no history to rely upon. And the market is too complicated to rely on a guess, educated or otherwise, of participants' responses.

Typically, for any given round of competition (which in the NEM occurs on a half hourly basis), there will be a distribution of prices reflecting a range of equilibria. Consequently, in presenting price effects, we present average prices over a period of time.

3.2.2 Pricing effects

The forecast annual average prices are depicted in the figure below. They depict the ten-year period from 2010 to 2019. A ten year period is chosen because it is likely that this would be the duration of a first abatement period. Moreover, the further modelling results are extended into the future, the less stable they are on account of the various intervening factors that could affect outcomes.

There are four scenarios modelled:

- A business-as-usual case;
- A Cap and Trade with full auction (the price results would also hold for a free allocation);
- An Output Based Allocation; and

7 This is consistent with scenario 2 under the NETS

- A Baseline and Credit scenario. Note that in this instance, the wholesale price has been adjusted upwards by the cost of abatement certificates (which, as explained in Section 2.2.4 are borne by retailers) to provide a suitable basis for comparison.

The results are decomposed by four regions of the National Electricity Market: Queensland, New South Wales, South Australia and Victoria. These price results are presented in, respectively, Figure 6, Figure 7, Figure 8 and Figure 9.

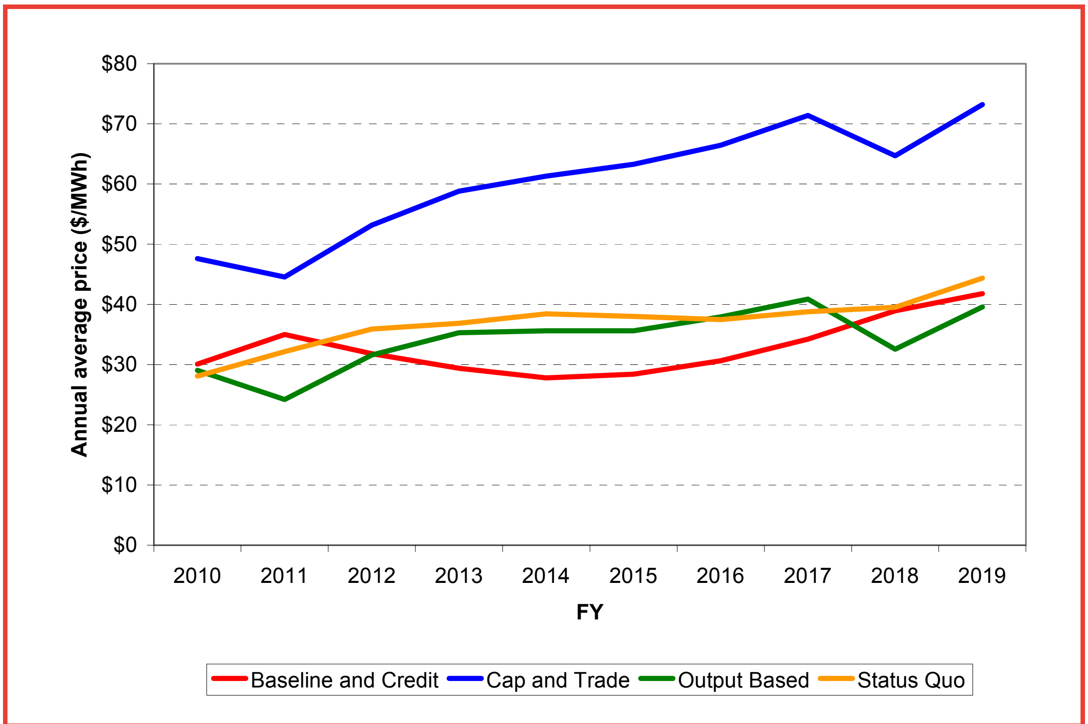

Figure 6: Annual average pool prices in Queensland, 2010 –2019, under status quo and alternative schemes

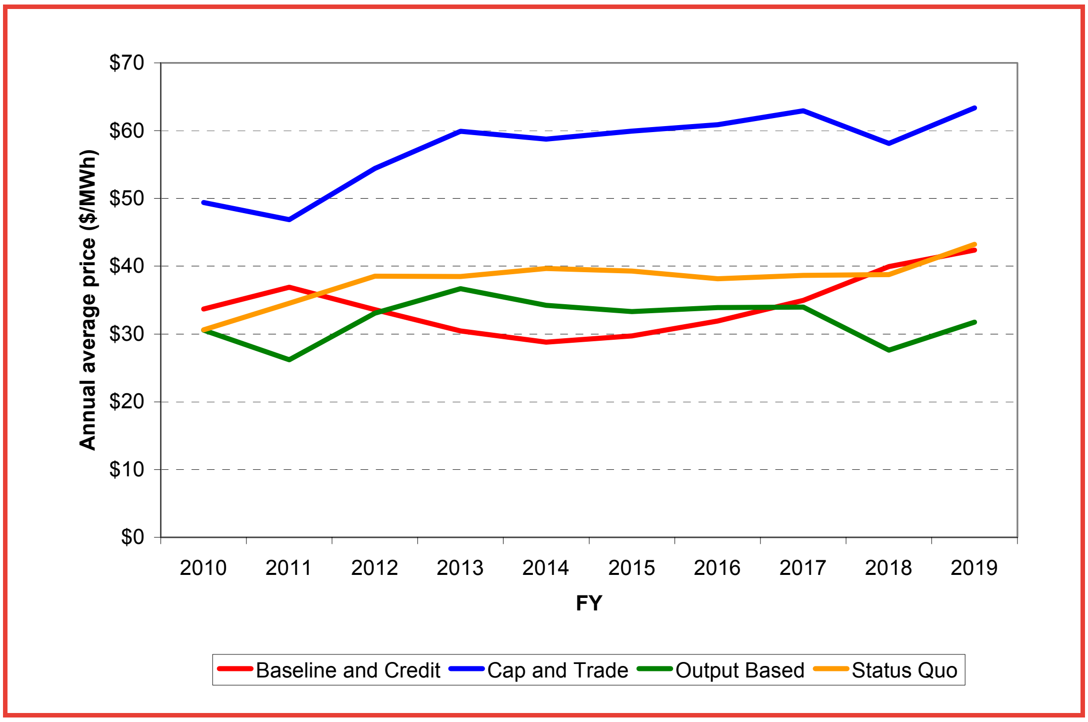

Figure 7: Annual average pool prices in New South Wales, 2010 –2019, under status quo and alternative schemes

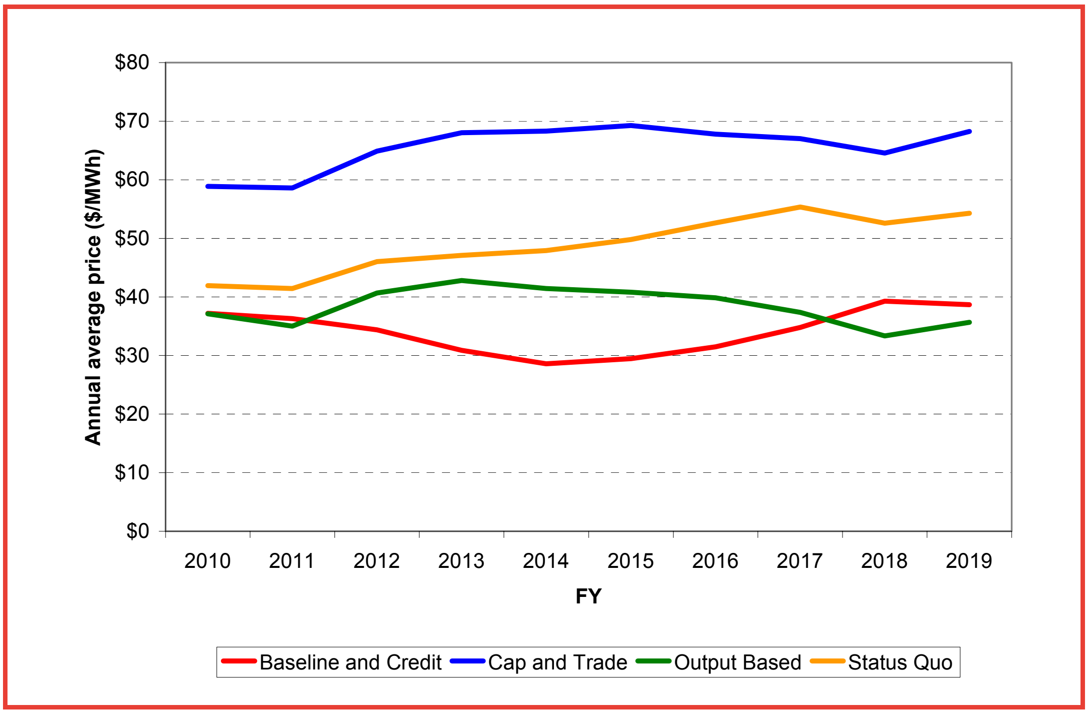

Figure 8: Annual average pool prices in South Australia, 2010 –2019, under status quo and alternative schemes

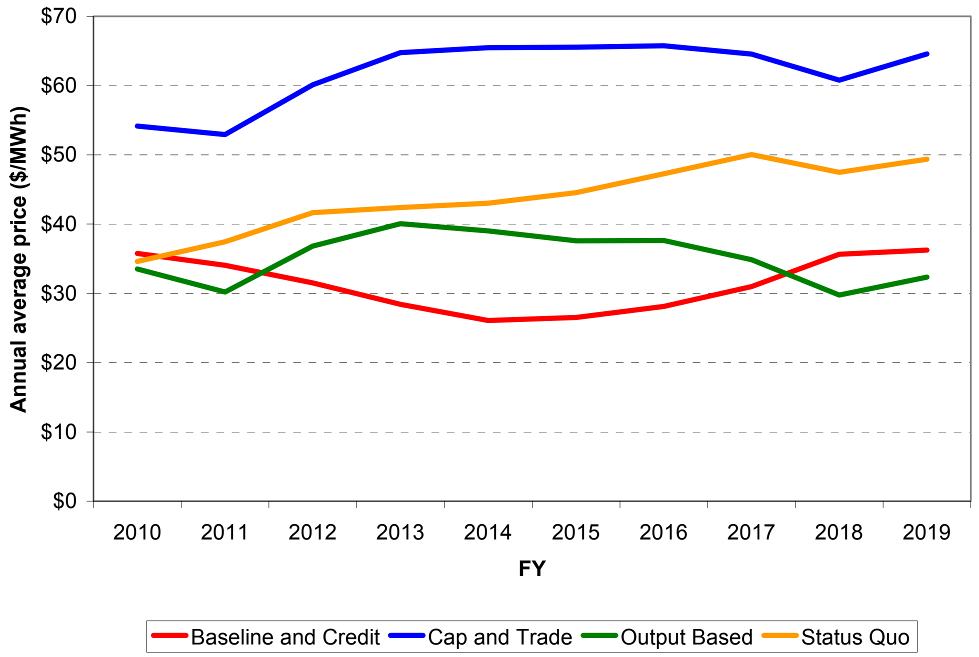

Figure 9: Annual average pool prices in Victoria, 2010 –2019, under status quo and alternative schemes

The results are in line with the theoretical discussion of these schemes set out in Section 2.2. In particular, we note that the Output Based Allocation price series is essentially a downward shift of the series for the Cap and Trade scheme with full auction. The latter has the strongest price effects on all the scenarios modelled. The Baseline and Credit scheme's impact on prices derives primarily from the subsidies it directs towards gas fired generation, and the fact that the cost of this subsidy is smeared across the retail side of the market, rather than other generation stock.

3.3 EVALUATION OF SCHEME ALTERNATIVES IN THE LIGHT OF MODELLING RESULTS

This section considers the policy issues raised in Section 2 in the light of the modelling results presented above, with a view to evaluating the different scheme options. The discussion does not present a definitive ranking of these options: rather, it used the modelling results on electricity prices to illustrate the relative advantages and drawbacks of these different schemes, and the issues these raise.

3.3.1 Environmental objectives

Abatement efficiency

Figure 10 depicts the emissions trajectory for each of these scheme alternatives. These are presented in the graphs below across the NEM as a whole.

The overall emissions under both Cap and Trade and output based allocations coincide for the period modelled, and are depicted by the orange line. The Baseline and Credit results show a lower level of emissions in the earlier years, before ending up at a slightly higher point than the other two schemes. The differences are accounted for primarily by differences in the investment pattern and plant mix under the various schemes. The Baseline and Credit scheme subsidises gas power plant from a very early stage. The Output Based Allocation and Cap and Trade have a lower subsidy effect on gas initially. Over time, their effect in taxing coal (particularly brown coal) generation displaces these in the merit order in favour of cleaner sources of generation.

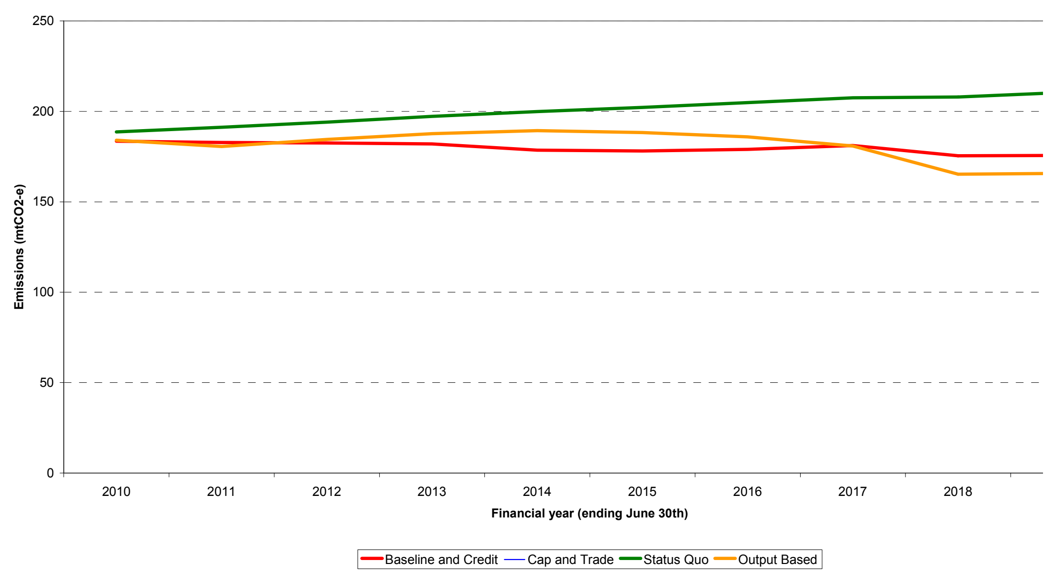

Figure 10: Total emissions measured in metric tonnes of CO2

One potential drawback attributed to both the Baseline and Credit scheme and the Output Based Allocation is that by muting the price signal to consumers, they reduce incentives to pursue demand-side abatement. If demand would respond to the higher prices under a Cap and Trade scheme, then the other two schemes would encourage higher domestic emissions than under a Cap and Trade scheme, if this is allowed. From our modelling results, we note that there is no loss of abatement efficiency under the Output Based Allocation relative to the Cap and Trade scheme, though there is a small loss when the Baseline and Credit scheme is compared to Cap and Trade.

Loss of abatement efficiency, whether under an Output Based Allocation or Baseline and Credit could be addressed in a number of ways, including:

- Encouraging demand-side abatement via complementary policies to encourage energy efficiency or within the scheme, similar to NSW GGAS. It is possible that this could be as effective, since price alone may not be sufficient to drive substantial cuts in demand. Estimates of the Marginal Cost of Abatement Curve (MACC) for Australia include significant quantities of energy efficiency savings at negative zero cost already. These abatement opportunities must be a result of other market failures, and will not necessarily be achieved from higher electricity prices;
- Setting a lower intensity target to offset the increase in demand: this would result in higher price for carbon to achieve the same level of abatement.
- Allowing for international trade in permits. It is highly likely that Australia will be a price taker in the carbon market: with unlimited ability to purchase permits elsewhere, this will mean that a small increase in domestic emissions would be offset by higher imports of carbon permits (or lower exports). This may be a preferable outcome if one of the consequences of higher prices under the Cap and Trade alternative is carbon leakage to more emissions intensive economies (see below).

3.3.2 Carbon leakage

A full assessment of carbon leakage effects would require a general equilibrium model of the economy and interaction with trade partners, an exercise that is beyond the scope of this submission. At the same time, the electricity price results give an indication of the impact of different scheme options on the prospects of leakage, by providing information on a key input price. All else being equal, in particular, absent any offsetting policy action, we can assume that a higher price of electricity will be more conducive to carbon leakage.

On this logic, it is evident that the two intensity based approaches – Output Based Allocation and Baseline and Credit schemes – have the lowest risk of carbon leakage. This is consistent with observations made in the context of wider studies incorporating explicit modelling of carbon leakage effects.[8] The lower price effects of these schemes thus contribute to increased abatement efficiency. This would be true even if there were some domestic demand response to lower electricity prices, provided the increase in emissions resulting from this is less than the level of leakage avoided.

Of course, the higher electricity price under a classic Cap and Trade scheme and the threat of leakage are likely to prompt policymakers to consider offsetting policy action. A priori, there are various options. One of these is the use of subsidies to trade exposed sectors funded by permit auction revenues. This is the method favoured by the Review's Discussion Paper. The use of these

8 An overview of these studies and their results can be found in NERA (2007), *Complexities of Allocation Choices in a Greenhouse Gas Emissions Trading Program*, Paper prepared for the International Emissions Trading Program.

instruments is also contemplated in the context of meeting the loss of competitiveness of trade exposed emissions intensive activities. We therefore reserve our comments on the use of these offsetting mechanisms for the discussion under the competitiveness rubric.

An alternative mechanism, not contemplated by the Review's Discussion paper, is the use of border measures on imported goods. The measure most often suggested is the use of border tax adjustments. These work rather like adjustments for differentials between countries in indirect taxes such as VAT. These adjustments are permissible under international trade rules in the context of taxes such as VAT. The difference here is that the tax is not implemented on products, but on product processes (namely the amount of carbon consumed and not taxed in the country of origin in the process of production). Even assuming that taxes on product processes are permissible under trade rules – a question not fully resolved - it is likely that any such tax measures would need to satisfy a number of onerous conditions to meet trade rules administered by the WTO.

In particular, they would need to be undertaken on a sliding scale that takes into account the level of development of the trading partner, the emissions limiting measures in place in that trading partner, and whether these are appropriate for the level of development of that partner.[9] This makes administration of such a scheme complex. Moreover, whereas an offset to VAT is relatively simple, with a fixed rate, it is much more complex to offset the level of exempted carbon embodied in a product. This is all the more so that the level of that tax at home, and the level of the tax that *would* have obtained abroad *had* trading partners adopted the scheme, is liable to vary with fluctuating permit prices. The question inevitably arises as to what baseline series of prices should be taken into account, and this inevitably creates the scope both for inefficient levels of border taxes, and international disputes. Moreover, the scope for subjective judgements in this methodology inevitably opens the scope for policy capture by vested interest. This runs the risk of imposing further costs on the economy at a time when it is already undergoing significant adjustment.

3.3.3 Competitiveness effects

In light of the modelling results presented above, adjustment effects faced by users of electricity are likely to be greater under a pure Cap and Trade scheme (or one with auctions) than under either of the intensity based approaches (Baseline and Credit and Output Based Allocations). This is particularly true of trade exposed sectors. Again this assumes that there are no offsetting policy actions.

The Review's Discussion Paper suggests that these competitiveness effects, along with the risk of carbon leakage, stemming from the price effects of a Cap and Trade scheme can be addressed through a system of subsidies. It suggests a methodology that could be adopted to calculate the level of transfers to this

9 See for example Pauwelyn, J, (2007), *US Federal Climate Policy and Competitiveness Concerns: The Limits and Options of International Trade Law*, Nicholas Institute for Environmental Policy Solutions, Duke University, Durham, North Carolina.

sector. This essentially involves establishing the materiality to the trade exposed firms of the higher emission price in Australia; computing the counterfactual price levels in partner countries had they implemented the scheme; and factoring in an efficiency factor to take into account improvements in efficiency in the sector over time.

This approach raises a number of questions. First, while conceptually simple, it would be in practice difficult to implement.[10] This applies in particular to the notion of the counterfactual price which would have obtained in competitor countries, which requires that a view be formed on these countries overall emissions allocations, and also the scheme architecture implemented. Suppose for example, that a developing country adopted an intensity-based approach that had lower price effects than a Cap and Trade scheme. That differential itself may have implications for the extent of competitiveness effects and adjustment costs incurred by Australia – but it is not clear that could or should be legitimately taken into account. Moreover, establishing the extent of materiality to a firm will be a matter of judgement, as would be the rate of efficiency improvement. These issues impede the extent to which any lump sum transfer could be done in a way that is consistent with public policy objectives. Moreover, as discussed elsewhere in this paper, these measurement difficulties open the scope for policy capture.

A second difficulty is that proposed transfers are very likely to fall foul of international trade rules on export subsidies, which are governed by the WTO agreement on subsidies and countervailing measures[11]. Even assuming the subsidies do not fall foul of provisions relating to de jure prohibited subsidies, they run a strong risk of being considered subsidies that:

- Are actionable in that they cause "adverse effects" to a trading partner, and which then may be object of dispute settlement proceedings if some negotiated solution is not found between the parties;[12] and
- Can be the subject of countervailing measures in response to submissions by its domestic firms claiming injury as a result of the subsidy.[13]

The prospect of litigation or countervailing measures is generally more likely when methodologies underpinning the award of subsidies are seen to offer significant scope for discretionary or questionable determinations. The methodology set out by in the Discussion Paper seems to exhibit just such scope.

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10 A point Professor Garnaut himself conceded when questioned about the methodology, at the public presentation of his discussion paper on 26 March 2008.

11 Under WTO rules, a subsidy involves transfers through actual expenditures (e.g.a lump sum transfer) or revenue foregone (e.g. permits allocated without auctioning). To be subject to WTO disciplines on subsidies and countervailing measures, the subsidy must be "an enterprise or industry or group of enterprises or industries" within the jurisdiction granting the subsidy. (See WTO, *Agreement on Subsidies and Countervailing Measures*, Article 2.)

12 See WTO, *Agreement on Subsidies and Countervailing Measures*, Article 5. Adverse effects are defined to cover: "injury" to the domestic industry of another member; nullification or impairment of benefits accruing directly or indirectly to other members as a result of the trade liberalisation commitments that have already been made; or serious prejudice to another member.

13 See WTO, *Agreement on Subsidies and Countervailing Measures*, Article 11.

As mentioned above, it turns on the judgements about essentially unobservable variable. It is unclear that trading partners – particularly developing countries for whom exports represent a vital pathway to development – will remain passive as judgement calls are made about the level of emissions pricing they should have adopted, and trade policy instruments are imposed as a consequence that affect their exports.

In the event that these subsidies are actionable, they would be difficult to implement on a sustained basis. If countervailing action were to be taken by trading partners, the overall adjustment package awarded to the tradable sector will not achieve its effects either in terms of adjustment or in terms of carbon leakage. Moreover, the international setting for policy cooperation between countries on matters of both trade and environmental policy will be strained by the use of these policy instruments. That does not seem to be a good basis for progress on global common policy objectives.

One response to these arguments is that it might be possible to negotiate amendments to existing disciplines. At a multilateral level, this does not seem to be a realistic prospect in the short to medium term (i.e. over the period when adjustment effects would be most severe). Amendments require consensus amongst 150 or so member countries; and this in a context when the current round of trade negotiations is making little headway as it is.

3.3.4 Adjustment effects

The results suggest that household adjustment effects are greater following the introduction of the classic Cap and Trade, compared to the other two variants we have modelled. The stronger price effects could be offset through transfers administered through the tax system and financed through permit revenue. The question then amounts to whether its is preferable to have a scheme that has weaker price effects, or one that has strong price effects which are then offset through transfers. This in turn depends on:

- The extent of consumer demand responsiveness to prices, which determines whether there is a loss of abatement certainty as a result of the lower prices under the Output Based Allocation or the Baseline and Credit scheme;
- The extent to which transfers under a Cap and Trade regime could be administered in a way that efficiently compensates for adjustment costs. Efficiency here means:
  - The ability to deliver the appropriate level of compensation to different classes of household; and
  - The ability to deliver it in such a manner that does not generate a demand response i.e in a manner that does not produce similar effects to what a scheme with lower price effects may have generated anyway.

We have dealt with adjustment to firms in the tradables sector in the section on competitiveness. Adjustment effects on the non-tradables sector is a function of a number of factors, including the carbon intensity of assets, the extent of pass-through, and whether they are directly covered by the scheme or not.

In the case of power producers, it is unclear whether the profitability effects will be the same or different under all schemes, and this is worthy or more consideration (unless, as explained in Section 2.2.3, there is some demand responsiveness under and output based allocation, in which generators capture some of the flat subsidy from government to consumers).

3.3.5 Public finance effects and governance

As already mentioned, a key advantage of the Cap and Trade methodology is that it provides the government with a pool of revenue that is relatively costless to raise (since it is raised by means of taxing an externality). This affords the government the possibility of both offsetting tax distortions elsewhere, and of meeting the different policy concerns set out in this paper. The Output Based Allocation methodology and the Baseline and Credit scheme do not provide this revenue source; however they also do not generate the price effects that require the use of government transfers in the first place.

This observation suggests that the relative merits of the different schemes need to be assessed in terms of their implications for governance. As already observed, two related considerations are relevant in this case: the burden placed on informational capacity, and the risk of facilitating rent-seeking behaviour.

Intensity based approaches, such as the Output Based Allocation methodology and the Baseline and Credit scheme, are open to the charge that they are administratively complex. The complexity stems from the need to determine appropriate baselines, and from the challenge of measuring and accounting for the performance of activities relative to this baseline. The extent of these costs needs to be quantified, and need to be set against the advantages of these schemes and the costs that are associated with alternatives.

A criticism frequently levelled at Output Based Allocation is the difficulties in determining the appropriate baselines and in monitoring output can complicate the allocation process, opening the scope for gaming by generators and over allocation of permits. The problem is a reflection of the underlying information asymmetry of information between government and firms, but it needs to be emphasised that this problem is by no means unique to any particular type of scheme.

Indeed, issues of informational capacity and exposure to rent seeking behaviour are very relevant to the administration of the Cap and Trade approach as outlined by the Review's Discussion Paper, in particular in relation to the proposals for the use of permit revenue to meet various public policy objectives. The proposed methodology to meet competitiveness and carbon leakage concerns is a case in point. As already observed, this involves the use of counterfactuals based on inherently unobservable factors. It thus opens the scope for pressure from putative beneficiaries to skew the process for determining the magnitude of transfers in their favour. This is all the more likely since the approach outlined in the Discussion Paper proposed a consultative process between the government and the affected parties.

An analogy can be drawn here with the use of anti-dumping duties. These too are predicated on the use of parameters that are difficult to observe and therefore require some degree of judgement. They are also based on industry submissions. Because of these features, anti-dumping processes have a reputation as one of the areas of economic policy most captured by vested interests, to the detriment of the social welfare. Guarding against such capture in the case of permit revenue allocation would require a very onerous administrative process that verifies and adjudicates between competing claims. It will need to take into account the submissions of foreign parties as well, if it is to have any chance of avoiding international litigation.

While we have dwelt on problems regarding the use of transfers to deal with competitiveness and carbon leakage issues, it is likely that similar problems would emerge in relation to any transfer designed to meet the public policy concerns set out here. This is not to say that these transfers cannot achieve their goals; rather to underscore the administrative complexity involved in ensuring that the transfers are conducted efficiently. It seems that the Review's Discussion Paper has largely assumed these and their associated costs away. This makes a proper evaluation of the relative merits of schemes difficult. The true question for policy makers lies in understanding how the costs of managing a complex system of transfers under Cap and Trade compare with the administrative complexities associated with the other schemes. This is not one that has been raised, let alone addressed, in the policy debate thus far.

3.3.6 Conclusions

This submission has set out the various policy issues and concerns arising in the context of the implementation of emissions trading. It has considered the impact of three alternative scheme options, primarily by looking at the consequences of these schemes on a key price, that of wholesale electricity. The electricity price impacts of these schemes are lower under Output Based Allocation and Baseline and Credit scheme than they are under a Cap and Trade scheme with full auctioning (or alternatively with free permit allocation). This suggests that the Output Based Allocation and Baseline and Credit schemes are likely to outperform the Cap and Trade scheme in regards to carbon leakage, competitiveness and adjustment concerns. The Output Based Allocation and Baseline and Credit scheme could produce some loss in abatement efficiency, though the extent of this may well be limited and can be offset through demand side management rules.

At the same time, a Cap and Trade scheme can potentially offer greater abatement certainty, and permit revenue could in theory be used to meet concerns about carbon leakage, competitiveness and adjustment. This submission has pointed to the need to critically evaluate the feasibility of managing such transfers in an efficient manner, given problems created by informational constraints and the scope for rent seeking. It also noted that these two problems can also be evoked in relation to Output Based Allocation and Baseline and Credit schemes.

Ultimately, the choice between these relative schemes must be based on weighing:

- The advantages of meeting carbon leakage, competitiveness and adjustment objectives through the price effects of output based allocations or Baseline and Credit schemes; versus rhe costs of meeting these objectives via a complex system of transfers funded by permit revenue under the Cap and Trade scheme;
- The relative administrative complexities of the three schemes; and
- The possibility that Cap and Trade confers greater abatement certainty, versus the effectiveness of a demand-side rule under Output Based Allocation and Baseline and Credit scheme.

This is ultimately an empirical issue, and one that cannot be done on *a priori* basis. This submission does not attempt to carry out such an exercise here. We do however emphasize that the main shortcoming of the Review's Discussion Paper is that its main proposals seem to rest on just such an *a priori* basis. The policy discussion surrounding the design of emissions trading would be enriched by a more systematic and through assessment of policy options than has been the case to date.

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