Australian Government
Productivity Commission

Emission Reduction Policies and Carbon Prices in Key Economies

Methodology Working Paper

March 2011

The Productivity Commission

The Productivity Commission is the Australian Government's independent research and advisory body on a range of economic, social and environmental issues affecting the welfare of Australians. Its role, expressed most simply, is to help governments make better policies, in the long term interest of the Australian community.

The Commission's independence is underpinned by an Act of Parliament. Its processes and outputs are open to public scrutiny and are driven by concern for the wellbeing of the community as a whole.

Further information on the Productivity Commission can be obtained from the Commission's website (www.pc.gov.au) or by contacting Media and Publications on (03) 9653 2244 or email: maps@pc.gov.au

Contents

This Working Paper outlines the Commission's approach to a range of methodological issues associated with the study of emissions-reduction policies in key economies. It builds on a paper originally circulated to facilitate discussion at a workshop in December 2010 with representatives from the business sector, government agencies, academics and other interested parties. It has further benefitted from feedback on an earlier draft. Further comment on the Working Paper is welcome.

1. What the Commission has been asked to do

The Australian Government has asked the Productivity Commission to undertake a study on the 'effective carbon prices' that result from emission and energy reduction policies in Australia and other key economies (the terms of reference are attached). As defined by the terms of reference, effective carbon prices include both explicit carbon prices, such as taxes or prices arising from emissions trading schemes, and implicit carbon 'prices' that result from the impacts of measures such as direct regulation of technologies, renewable energy targets, or subsidies for low emissions technology.

In summary, the Commission is asked to:

- examine and detail key emissions-reduction policies either in place or committed in Australia and other key economies, such as the UK, USA, Germany, New Zealand, China, India, Japan and South Korea
- estimate the effective carbon price per tonne of carbon-dioxide equivalent (CO_2-e) emissions faced by the electricity generation sectors in these economies, and selected industries drawn from manufacturing and transport sectors in these and other countries, where relevant and data permitting[1]
- report on the methodology, assumptions and data sources used, so as to inform further analysis in this area.

2 How emissions-reduction policies work

The terms of reference for this study essentially ask the Commission to capture the various emissions abatement policies being applied in a number of countries in a single metric — an 'effective' carbon price.

1 For convenience, this paper uses the term carbon to refer to greenhouse gas emissions. The term CO_2 is also used hereafter, rather than CO_2–e (which stands for carbon dioxide equivalents),.

This would be a relatively straightforward task if all countries applied economy-wide carbon taxes or quota schemes — in that case, the carbon 'price' would be observable and comparable. But none does, eschewing broadly-based explicit pricing for a myriad of less transparent, more narrowly-focused interventions designed to assist the production and consumption of selected, less carbon-intensive technologies or which penalise particular emissions-intensive products and processes (box 1). For example, the Commission has provisionally identified more than 230 policies operating in Australia, over 300 in the United States (excluding many state-based schemes) and more than 100 in the United Kingdom. Even those countries that have carbon pricing/quota schemes apply them only to a limited range of emitting activities. This fragmented approach not only increases the cost of achieving any given level of abatement, but makes comparable measurement problematic.

Box 1 **Some examples of emissions-reduction policies**

- Emission-trading schemes (ETSs) and carbon taxes — these schemes provide an explicit carbon 'price' but in practice often only cover a limited part of an economy
- Renewable energy targets — these schemes sometimes use tradeable permits (for example, electricity retailers might be required to purchase permits created by renewable energy generators)
- Feed-in tariffs — generators of renewable energy (such as solar) are offered a higher price for their electricity
- Subsidies for renewable energy capital costs or energy production
- Energy efficiency measures — designed to overcome barriers to adoption of more efficient technologies, these are often also justified on emission-abatement grounds
- Vehicle emission standards and fuel-content regulations
- R&D subsidies to encourage development of low emission technologies and products
- Education campaigns and information provision
- Policies that encourage passengers and freight to utilise less emission-intensive modes of transport

'Carrots and sticks'

Understanding how different policies operate is an important first step to measuring and aggregating their effects.

Despite the variety of policy instruments, all policies designed to promote lower carbon emissions essentially must somehow either provide incentives (carrots) to abate or disincentives (sticks) to emit carbon, or both. Broadly speaking, all policies can be classified as those that:

- encourage substitution of low-emission technologies and products (for example, renewable electricity and biofuels) for higher-emission technologies and products (such as coal-generated electricity and fossil fuels). These policies essentially focus on the production or supply side.
- discourage consumption of products that generate emissions, either through price increases of those products and/or non-price induced decreases in demand for emissions-intensive products. These policies work through the demand side.

But whichever side of the market or 'margin' policies target, they will have implications for the other. Policies that effectively tax one commodity implicitly subsidise others. Effective subsidisation of a commodity implicitly taxes others. Put another way, to achieve their objective, policies that seek to reduce greenhouse emissions must alter relative prices to favour production of low-emission products and those that enable users to reduce their demand for products that generate emissions, and to discourage products with the opposite characteristics.

Carbon taxes and quotas

The most direct and, consequently, most efficient way of implementing the 'relative price' change required to discourage consumption of high-emission products in favour of low-emission ones, is through a global, broadly-based carbon tax or quota scheme. Placing a 'price' on emissions through these mechanisms means that an additional cost must be taken into account in all decisions involving production and consumption of CO_2-emitting products.[2] Production of carbon-intensive products will decline as consumers reduce their purchases in response to higher prices, and as producers switch to comparatively cheaper, low-emission production technologies and intermediate inputs. Because these adjustments can be made entirely on the basis of consumer and producer assessments of relative costs and benefits to them, any given amount of abatement will be achieved at least cost.

Carbon permit or quota trading schemes limit the total quantity of emissions, but in effect work in a similar fashion to taxes, by directly raising energy prices to consumers and implicitly subsidising producers of 'clean' products. Therefore, any

2 A tax can be regarded as an administered or fixed price on carbon emissions (at least in those sectors to which the tax applies), while the traded price of emissions quotas or permits is analogous to a tax rate. Both can be described as 'market-mechanisms', but require intervention either to set the tax rate or to fix the quantity of emissions.

quota scheme has a 'tax equivalent' that would deliver precisely the same amount of abatement from the same sources for the same resource cost. The two approaches also would have identical distributional impacts, delivering the same revenues to government, if permits were auctioned.

However, as far as the Commission is aware, no country currently imposes an economy-wide tax on carbon emissions or has in place an economy-wide permit scheme. Of the countries under examination, the United Kingdom, Germany, some parts of the United States and New Zealand have emissions trading schemes operating — but these apply only to particular sectors, such as energy generation. These more limited emissions trading schemes or taxes work in the same way as broadly-based taxes and quotas, though the potential abatement options are obviously more limited. Such schemes increase the price of non-renewable energy and reduce energy consumption overall (assuming a non-zero price elasticity of demand).[3] At the same time, they implicitly subsidise lower emissions-intensity energy production because they raise the price that renewable energy producers can charge energy buyers (and still compete with other producers). Non-renewable energy production will thus be squeezed on two margins: by lower demand for energy overall, and by the increased competitiveness of renewable energy production.

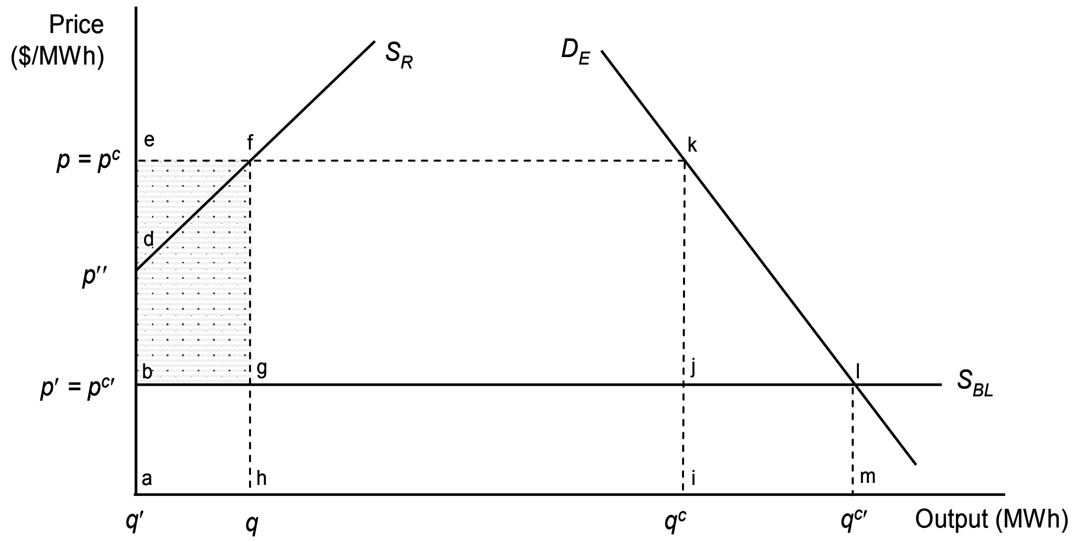
As shown in box 2, a carbon emissions tax in the energy sector effectively taxes consumption of *all* energy, with the revenue raised from taxation of high emissions intensity energy production accruing to government, and the revenue from higher prices for low emissions intensity energy production accruing to producers as an effective subsidy (with the rate of subsidy, or producer 'price uplift', for renewable production equal to the rate of tax on emissions intensive production). In other words, a carbon tax is conceptually akin to the consumer tax/domestic producer subsidy equivalent of an import tariff designed to assist local producers. The difference is that, in this case, the 'tariff' is imposed on local producers of high emissions products.

Subsidies, renewable targets or mandated production standards

As noted earlier, there is a myriad of policies that subsidise the production or consumption of particular 'clean' technologies, or that mandate targets for the use of these technologies by producers.

3 Reductions in energy consumption could be countered by compensation payments, particularly arrangements linked to energy use, such as rebates rather than lump-sum income supplements.

Box 2 **How emissions taxes and permits work**



This figure presents a stylised market for electricity generation. Before intervention, price p' is the price (and levelised cost per MWh) of energy generated from non-renewable sources. A carbon tax is then imposed, driving up the price of electricity from p' to p.

This higher price will have two effects: household and business demand for energy falls (from $q^{c'}$ to q^c) (they use less energy either through adopting more energy efficient processes or by curtailing activities and production that use energy). At the same time, provided the tax is high enough, energy generated from renewable or less emissions-intensive sources will come on line in response to the higher consumer price for energy from non-renewable sources (as drawn, supplying q). Amount $q^c - q$ is still supplied from non-renewable energy sources. Tax revenue collected from non-renewable energy production is represented by area *gfkj* (a quota or permit scheme that only allowed total emissions consistent with this output from non-renewable sources would have the same price and abatement effects as the tax, but who gets revenue represented by area gf*kj* will depend on whether permits or quota entitlements are given away or sold).

Shaded area *befg* represents the 'total subsidy equivalent' to renewable energy producers, paid by consumers of energy. The economic costs of the scheme are the additional cost of producing renewable energy (area *bdfg*) plus the consumption loss (represented by triangle *jkl*). Consumers, however, not only curtail their energy consumption, but pay more for what they continue to consume — in total, area *bekj*, which comprises tax payments to government (or payments for permits) and the 'subsidy' to producers of renewables.

Regulations or schemes that set quotas, standards or targets for renewable or clean energy, or which mandate prices for generating certain types of clean energy (such as solar feed-in tariffs), implicitly subsidise their production, with the subsidy rate equal to the producer price uplift required to induce the amount of renewable energy set by the target or quota (in other words, the excess of the marginal cost of producing the last unit of renewable energy over the cost of producing the unit of energy it replaces) (box 3). The 'total subsidy equivalent' of a policy will equal this subsidy rate times the quantity of renewable energy produced.

Except for explicit, taxpayer-funded subsidies, such schemes must also 'tax' consumers to pay for the higher cost of supplying energy from renewable technologies. Higher energy prices in turn will induce some reduction in overall energy use, leading to some additional emissions abatement (again, of course, to the extent that energy consumers were compensated for the additional energy cost, this additional source of emissions abatement could be diminished, depending on the nature of the compensation payment).

It is important to note, however, that even if the full costs of implicit production subsidies are passed on to energy consumers, the resultant increase in the price of energy will not have the same effect as imposing an equal tax (or 'price') on carbon emissions in the sector. An emissions tax that led to a similar uplift in energy prices would induce different, lower-cost abatement and, almost certainly, would generate different levels of abatement (higher or lower) than the renewable target.

To induce an identical switch to the particular abatement technologies achieved by a renewable target using a carbon tax instead, would require a tax equal to the implied subsidy rate (that is, at a rate high enough to allow a price equal to the marginal cost of the marginal renewable technology). But a carbon tax at this level would induce abatement from lower-cost abatement options as well, and thus achieve more abatement than the renewable target alone. In other words, there is no carbon emissions tax or price in practice that could bring about precisely the same level and type of abatement as a scheme that assists a narrow subset of abatement options.[4]

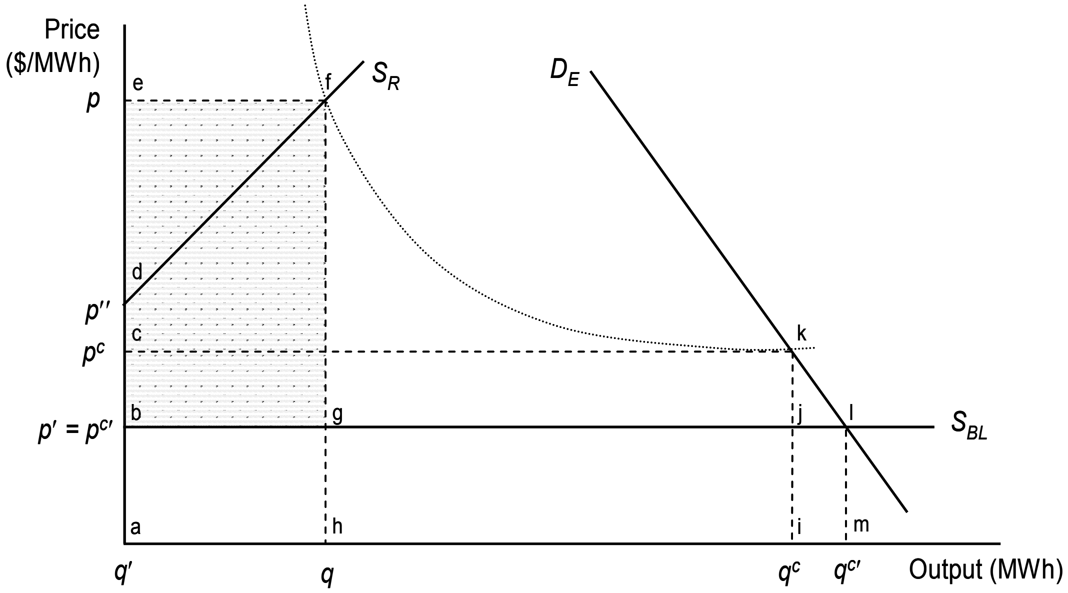
Persuasion and energy efficiency measures

In addition to policies that increase prices of energy products, there are many policies designed to compel or encourage consumers and firms to invest in more energy-efficient durable products such as fuel-efficient cars and energy-efficient

4 It is conceivable that an abatement *subsidy* could be made to be fully equivalent to a carbon emissions *tax*. The subsidy would need to be paid at the same rate as the tax on all abatement (from reduced consumption of emissions intensive production as well as from substitution of cleaner technologies for emissions intensive ones) that would have occurred under a carbon tax. Implementing such a subsidy would be problematic, however, as it would be virtually impossible to identify and measure all sources of abatement accurately.

appliances. The switch to such products is intended to reduce the demand for energy and, hence, emissions.

Box 3 **How subsidies and renewable energy targets work**



This figure again depicts a stylised electricity generation market, with non-renewable base load electricity being provided at a constant unit cost equal to price *p′*, pre-intervention. Total consumption is $q^{c\prime}$. A mandatory renewable-energy target is introduced that is assumed to induce supply from low-cost (for example, biomass), medium-cost (wind) to high-cost (solar) sources. The supply curve for these options is shown as S_R. If the renewables target is set at quantity *q*, the price required by marginal generators will be *p*.

- The implicit subsidy paid per MWh to renewable producers is *p* – *p′*, and the total subsidy equivalent (*TSE*) the shaded area, *befg*. Total abatement would be equal to the difference in emission intensities of the base load generator and the renewable generators, multiplied by the amount of renewable electricity *q*.
- Part of the *TSE*, area *def*, is producer surplus to renewable suppliers — the size of this depends on the excess of the price received over their costs of production. The remainder (area *bdfg*), is the additional cost of supplying *q* (that is, additional to the cost of the base load generation being replaced).

The renewables target will increase the average cost of generating electricity and lead to an increase in the electricity price from *p′* to p^c (as drawn, the full cost of the subsidy is passed on to consumers so area *befg* is the same as area *bckj*). This will induce a reduction in consumption of energy and some additional abatement. If the subsidy to renewable energy producers were paid by taxpayers instead, the consumer price of electricity would not change, but the average cost of producing energy would still rise.

However, the ultimate impact on emissions will be a function of the level of their use. Because the effective running costs are reduced, usage might simply increase, offsetting some of the initial savings. (This behavioural response, the so-called rebound effect, is observed empirically.) To the extent that overall demand falls, the effect on abatement will also depend on the emission intensity of energy or fuel production displaced — higher-cost renewable products could be displaced instead of cheaper but more emission-intensive products.

Measuring the cost of these schemes is also fraught because they would seem on the face of it to save investors money. But energy or fuel costs are only one element of the cost–benefit equation for purchases of these durables — people may rationally prefer to fully depreciate existing appliances and vehicles and they may value other characteristics of products more than energy efficiency (durability, design, fitness for purpose, performance, reliability etc).

If consumers and firms correctly assess the benefits of more energy-efficient durables, then tightening efficiency standards can leave them worse off (box 4). Only if efficiency standards can be shown to correct consumer myopia or miscalculations about the long-term savings from purchasing energy or fuel-efficient products, could they achieve abatement while generating a net benefit for consumers.

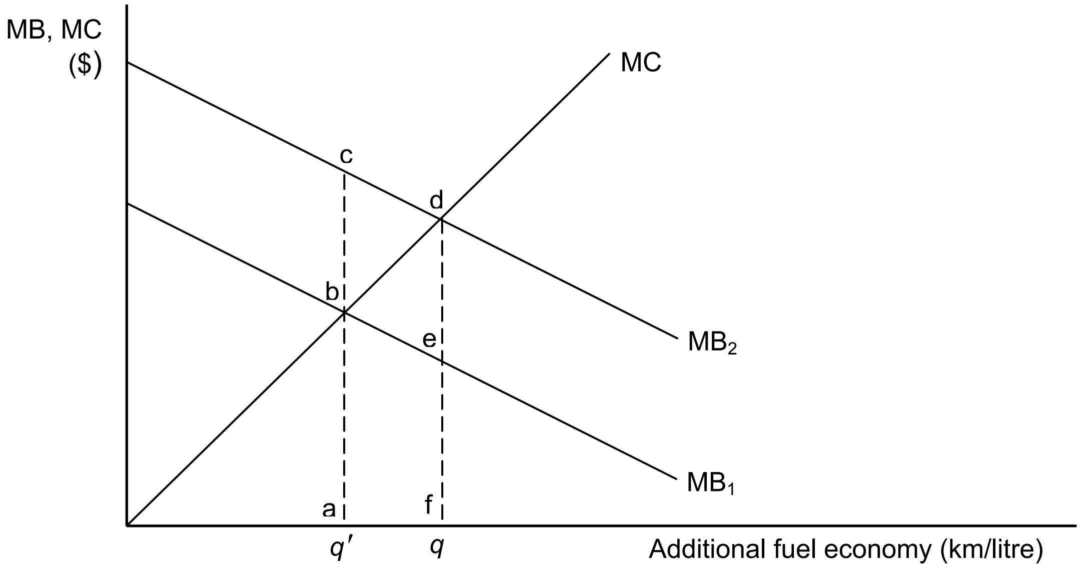
3. Which policies should be covered by this study?

It would not be feasible, in the time available and given the multitude of policies across countries, for the Commission to analyse and quantify them all in this study. Nonetheless, the coverage of the analysis could have important implications for the comparability and usefulness of any measures — hence, the importance of developing consistent selection criteria. Even then, data availability and quality will inevitably influence the robustness of the estimates.

As noted above, the terms of reference suggest that the study cover eight countries in addition to Australia. These are the UK, USA, Germany, New Zealand, China, India, Japan and South Korea. The Commission is attempting to cover relevant policies in all of the countries in this list, although accessing data is proving particularly challenging for some.

In addition to the electricity sector, the terms of reference suggest that effective carbon prices be estimated for selected industries drawn from the manufacturing and transport sectors, where relevant and data permitting. Emissions associated with electricity generation and transport account for around half of Australia's emissions (figure 1).

Box 4 **How energy efficiency standards work**



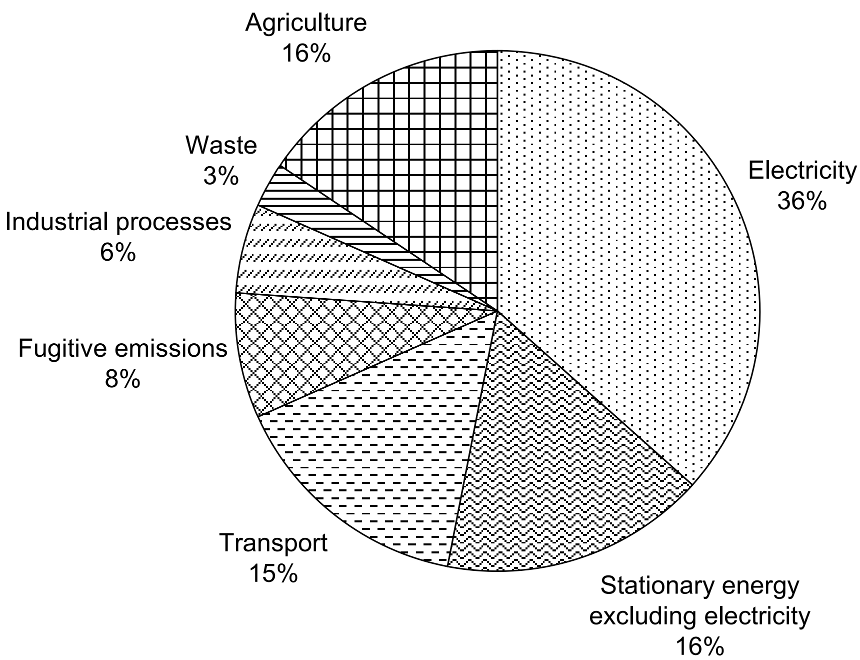
A large number of policies promote the production of and investment in energy-efficient durable products with the objective of reducing the demand for energy. The above figure is a stylised representation of the marginal benefits and costs of investing in a durable product (a car) that gives additional fuel economy. Marginal costs represent the resource costs used in producing the product, whereas the marginal benefit to investors depends on the value of expected future fuel savings discounted over the product lifespan (less any other transaction costs).

Expected fuel costs are the discounted value of the expected distance travelled in each future year, times the expected price of petrol divided by the fuel economy (km/litre). Marginal benefits are the change in fuel savings (that is, the negative of the change in expected fuel costs) from a change in fuel economy. With higher petrol prices, greater distance travelled and/or a lower discount rate, there are larger marginal benefits.

Many studies have shown that investors seemingly undervalue increased fuel economy. That is, marginal benefits are perceived to be MB_1 rather than the ‘true’ MB_2 and actual investment *q′* is less the desirable level *q*. This ‘energy paradox’ could result from imperfect information or excessive discounting. In this case, a mandatory fuel economy standard *q* is seen as achieving the desired production level and net benefits — the increase in production costs *abdf* is smaller than fuel savings *acdf*, leaving net benefits *bcd*.

However, if investors correctly evaluate fuel savings, then marginal benefits are represented by MB_1 and a mandated fuel economy standard *q* results in additional production costs *abdf* less fuel savings *abef*. In this case the fuel economy standard leads to over-investment in fuel economy with net costs *bde*. Thus, the costing of mandated energy efficiency standards such as fuel economy is particularly problematical and depends critically on the assumption about the extent to which investors may misperceive costs and benefits (to themselves).

Figure 1 **Australian greenhouse gas emissions by emission process, 2009-10[a]**



[a] Excludes land use, land use change, and forestry. Emissions are measured in terms of carbon-dioxide equivalents.

Source: DCCEE (2010a).

Manufacturing industries are both users of emissions-intensive products, particularly electricity, and generators of emissions themselves. In 2008, *direct* emissions from Australian manufacturing amounted to around 73 Mt (table 1), or about 13 per cent of total Australian emissions (DCCEE 2010e, 2010f). In addition, the manufacturing sector's *indirect* emissions from electricity use were 64 Mt, almost as large as its direct emissions (national greenhouse accounts data for indirect emissions by specific industry within manufacturing are not available). This suggests that by assessing policies targeting electricity generation, the study would also be covering a significant proportion of abatement policies relevant to manufacturing. This would particularly be the case for emission-intensive trade-exposed industries that have a high reliance on electricity, such as aluminium production.

Table 1 **Greenhouse gas emissions associated with Australian manufacturing, 2008[a]**

Economic sector[b]	*Emissions*
	Mt
Direct emissions[c]	
Food, beverages, tobacco	4.43
Textile, clothing, footwear and leather	0.44
Wood, paper and printing	2.40
Petroleum, coal and chemical	18.96
Non-metallic mineral products	11.74
Metal products	34.19
Machinery and equipment	0.48
Other manufacturing	0.02
Total manufacturing	**72.67**
Indirect emissions from purchased electricity[d]	**63.57**

a Emissions are measured in megatonnes (Mt) of carbon-dioxide equivalents. **b** Sector definitions are those used in the Australian and New Zealand Standard Industrial Classification (ANZSIC). **c** Direct emissions are produced from sources within the boundary of an organisation and as a result of that organisation‘s activities. **d** Purchased electricity is defined as electricity that is purchased or otherwise brought into the organisational boundary of the entity.

Sources: DCCEE (2010b, 2010e, 2010f, 2010g).

Proposed selection criteria

Many types of policy measure potentially reduce emissions and are thus within the scope of the study. They include policy measures that do not mention emission reduction as an explicit objective, but have a significant impact on emissions (for example, fuel excise taxes). Other policy measures may list emission reduction as one of many objectives, with little indication of the weight given to different (potentially competing) goals.

A further issue noted earlier is the large number of emissions-reduction policies in most countries.

Balancing the need to provide robust estimates for the countries selected against the data and time constraints, the Commission is proposing to estimate the impacts of policies that:

- are in place or committed (where committed means they have a high probability of being implemented — for example, they are in the process of being or have been enacted) in the electricity generation and road transport sectors

- penalise emissions or give an incentive for abatement (explicit or implicit taxes and subsidies, regulations but not voluntary schemes or R&D incentives (as the effects of the latter two are considered too prospective and therefore uncertain))
- have the effect, even if not necessarily the explicit intent, of reducing emissions (for example, excise taxes on fuels)
- have a material impact on a country's emissions in a sector and/or impose significant total costs.

Subject to the important filter of materiality, these criteria would cover policies such as explicit carbon prices, taxes on fossil fuels and electricity production or consumption, feed-in tariffs for renewable energy production and renewable energy mandates (with or without certificates/credits), and biofuel content standards for transport fuels.

The great majority of policies with material effects focus on energy generation and surface transportation, with few policies *directly* targeting stationary emissions from manufacturing processes (steel, cement), for example. Hence, this study will focus on energy generation and surface transportation.[5] But, in some cases, even though policies in these two sectors might meet the criteria in principle, in practice quantification may prove infeasible. For example, energy and fuel efficiency measures are widely employed and seen as CO_2 abatement measures, but for the reasons alluded to earlier, measuring their impacts is complex and uncertain. As a result, any estimates will likely be assumption driven, and potentially wide ranging. Even more problematic are policies such as public transport and rail freight infrastructure subsidies, which arguably have nebulous links to emissions reduction. Consequently, the study will focus on estimating policies directly aimed at reducing emissions from road freight and private vehicle use.

A threshold issue relating to policy coverage is whether the estimates should try to capture *net* incentives to reduce emissions. Gross estimates of measures to reduce emissions may materially overstate abatement effort to the extent they are offset by interventions pulling in the opposite direction. Realistically, this study will not be able to account for all such policies, but it will attempt to document and possibly quantify the impacts of those that could substantially counter emissions reduction policies (reducing the incentive to abate).

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5 Within transport, it is difficult to attribute emission abatement and costs associated with international aviation and shipping to particular countries. For this reason, and as a result of certain international agreements, emission abatement in these sectors is being pursued through international, rather than domestic, policy development processes. This study will not consider these policies.

4 Measurement issues

The crux of the challenge for this study is how disparate, limited policies of selective application can be measured and aggregated in a useful way. If all carbon emissions were 'priced' directly, comparing prices across countries would be meaningful, as globally efficient (least-cost) emissions abatement requires a uniform carbon price (whether achieved through a tax or an emissions trading scheme) across all activities in all countries (even so, any differences in carbon prices would not reveal whether some were too high or some too low — that would require an assessment of the desirable level of abatement globally).

In the absence of explicit carbon prices or taxes being imposed on all emissions in an economy, the total economic (welfare) costs of individual policies and their associated abatement effects ideally need to be estimated.[6] Measurement of total costs and abatement allows calculation of average costs per tonne of CO_2 abated *under the schemes analysed*. This in turn allows comparison of the cost-effectiveness of the various policies.

An inherent difficulty of these measurements is that they involve comparing an existing situation with an unobserved counterfactual. Calculating the effects of an existing or committed policy requires an assessment of what would have happened in the absence of the policy. This requires assumptions about or estimates of the supply and demand responses to the policy. Yet there is often considerable uncertainty about these responses, and the underlying models that are used to measure them can be quite different (and are sometimes only implicit). Some models are based on engineering estimates with little behavioural response, whereas others allow for behavioural supply and demand responses.

These considerations are especially important when attempting to construct comparable measures across diverse policies and countries. In some cases, there are sophisticated models allowing consistent measurement across policies in a single country,[7] but for most there are no available models and also significant data limitations. Costs of a policy derived from even a fully-specified model in one country will not be comparable to those calculated from more ad hoc methods in another.

6 Price and quantity adjustments induced in markets will also likely generate real adjustment costs involving capital write-offs and labour relocation. Implementation and ongoing administration and compliance costs should also be taken into account but are difficult to measure.

7 For the US, a comprehensive and consistent measurement of the economic cost effectiveness of a wide range of energy policies has been produced by Resources for the Future and National Energy Policy Institute using a version of the US Energy Information Administration's National Energy Modelling System (NEMS) (Krupnick et al. 2010).

For policies that assist producers of low-emission products, the value of the assistance ('subsidy equivalent') is more easily calculated than their resource costs and is more comparable across policies and countries. These production subsidy equivalents[8] are of interest in themselves, because they capture the often hidden transfers to producers. Also, they are indicative of the true (resource) costs, though they generally will overstate them.

Measuring economic costs and subsidy equivalents

The economic costs of carbon policies must be measured in those product markets where they have an impact. As noted above, this requires some simplifying assumptions — in other words, a model — of the way the market and the policy work.

A relatively simple case: measuring resource costs and subsidy equivalents of policies assisting low-emission products

The analysis is simplest in the case of policies that encourage production of low-emission products such as renewable electricity. Consistent with boxes 2 and 3, the notation p and q is used to designate respectively the price received by producers of the low-emission product and the quantity they produce *with* the policy, and p' and q' to designate price and quantity *without* the policy.

A policy that enables producers of the low-emissions product to sell at price p gives them a production subsidy equivalent of $s = (p - p')$ per unit of output.[9] The total subsidy equivalent (TSE) of the policy is given by:

$$TSE = s\ q = (p - p')\,q$$

which is a transfer to producers of the low-emission product from government or whoever is paying it (most likely consumers of the product). In turn, the total subsidy equivalent can be broken down into the additional resource costs of producing the low-emissions output[10] (ΔTC) and additional producer surplus (ΔPS), so that:

8 The OECD (2010) uses the terminology 'producer support estimates' for these measures.

9 This applies to policies that provide explicit or implicit output subsidies but it also applies to policies that subsidise inputs, in which case s is the input subsidy per unit of output. It also applies to the case of a carbon tax which raises the price of high-emission products and allows the price of low emissions products to increase by the same amount.

10 These resource costs of producing the low-emission product are the costs additional to the cost of producing the higher-emission equivalent.

$$\Delta TC = TSE - \Delta PS$$

Whereas quantifying *TSE* does not depend on the marginal cost of production, the breakdown into additional resource costs and producer surplus does.[11] Accordingly, estimates of the additional economic costs of output require more information than is required for calculating total subsidy equivalents.

For existing policies, q can be observed and, in cases such as a feed-in tariff, p also can be observed. What is not observed is the quantity q' and price p' in the absence of the policy.

But these calculations are simplified considerably where:

1. it is assumed that there would be no production of the low-emissions product without the assistance policy ($q' = 0$)
2. the price received by producers of the low-emission product as a result of the policy is known, so that p can be observed
3. it is assumed that consumers consider the low-emission product (for example, electricity generated from renewable sources) to be perfectly substitutable for a higher-emissions product (such as electricity generated from coal), the price of which is known and for which supply is perfectly elastic, so p' is equal to the price of that perfect substitute.

Assumption 1 means that an approximation of the additional resource costs of production is given by:[12]

$$\Delta TC = TSE - ½ \, (p - p'') \, q$$

where p'' is marginal cost at zero output, that is, the minimum price at which production would commence.[13] If it could be assumed that marginal costs are constant, then the total subsidy equivalent and total cost are equal ($p = p''$, $\Delta PS = 0$ and $\Delta TC = TSE$).

[11] This can be seen in boxes 2 and 3 where *TSE* is area *befg,* additional resource costs are area *bdfg* and producer surplus is area *def*.

[12] The approximation assumes that supply curves are linear over the relevant range. The costs of carbon policies in the US calculated by Krupnick et al. (2010) from the NEMS-RFF model use this approximation. As they pointed out, these are the well-known Harberger (1964) formulas often used in applied public finance (for example, Just et al. 2004).

[13] This can be seen in boxes 2 and 3. Note that $p''> p'$ or else $q'>0$, that is, production would be greater than zero in the no-policy situation.

More complicated cases

If assumption 1 is relaxed — that is, there would already be production of the low emission product absent any policy inducement — the link between the total subsidy equivalent and the total costs of the policy becomes more tenuous. This is because, depending on scheme design, higher prices may flow to existing production as well as incremental production, while the additional resource costs of the intervention come only from the incremental units (box 5).

Box 5 **Subsidies and costs in more complicated cases**

Existing production

If assumption 1 is relaxed, then an estimate of q' is required. This in turn requires knowing marginal costs or the supply elasticity. For a given supply elasticity (η^S) then:

$$q' = q - \eta^S (q/p)(p - p').$$

The calculation of *TSE* does not depend on the estimated q' but ΔTC does:

$$\Delta TC = TSE - ½ (p - p')\, q - (p - p')\, q'.$$

With q'>0 then *TSE* will overstate ΔTC by more than it does with q'=0 because *TSE* includes the additional producer surplus that accrues post-policy on pre-policy production ($(p-p')q'$). So while *TSE* is of interest in its own right — because it exposes the often hidden transfers involved in the various policies — it is in this case less indicative of ΔTC.

Imperfect substitution in production

If assumption 3 is relaxed, then we need to know both marginal costs *and* demand for the product *and* the shift in supply or demand that the policy induces so that we can calculate both p' *and* q'. In this case, it is necessary to solve for p' and q' simultaneously. For a given supply elasticity (η^S), demand elasticity (η^D) and percentage shift in demand x^D, then:

$$p' = p\,(1 - x^D) / (\eta^S - \eta^D)$$

and:

$$q' = q\,(1 - x^D)\, \eta^S / (\eta^S - \eta^D).$$

The obvious difficulty in this case is that the policy-induced shift in supply or demand requires much more information than is generally available.

Producer prices can be observed where there are explicit subsidies or feed-in tariffs or renewable energy certificates. However, with other less transparent assistance measures, such as mandatory quantities of renewable energy, *p* needs to be inferred. In these cases, it will usually need to be assumed that *p* is equal to average costs of production. In the case of electricity generation, estimates are usually made of levelised energy costs (for example, US EIA 2010). This is the break-even price at which electricity generation from a given source covers all costs including cost of capital, operations and maintenance. In this case too there is no producer surplus and thus $TSE = \Delta TC$.

More problematic is where high-emission and low-emission products are imperfect substitutes (assumption 3 does not hold). In this case, estimates of both p' and q' are required. This measurement is difficult because it is necessary to know the product's marginal costs, demand *and* the shift in supply or demand that the policy induces (box 5). Nonetheless, once estimates of p' and q' are available, then the calculations of *TSE* and ΔTC are straightforward. Again the estimate of *TSE* does not depend on q' although it does depend on p'.[14]

Measuring consumption costs

Any policy that raises product prices to consumers will reduce their consumption and impose costs on them. However, rather than considering the consumption costs of each individual supply-side policy in a sector it is best to calculate the price uplift for all policies combined and then calculate consumption costs.

The measurement of consumption costs requires estimates of the price paid by consumers and the quantity they consume *with* policy intervention (denoted by p^c and q^c) and the respective price and quantity *without* intervention (denoted by $p^{c\prime}$ and $q^{c\prime}$). Without intervention consumer and producer prices are the same, that is, $p^{c\prime} = p'$. Pre-intervention consumption $q^{c\prime}$ is not observed, and its estimation requires knowledge of the demand curve or the elasticity.

The consumer tax equivalent of the intervention is $t = (p^c - p^{c\prime})$ per unit of output. Measuring t is straightforward in the case of a carbon tax or emissions trading system. In the case of a number of different supply-side policies, then t depends on who pays the producer subsidy equivalents. Where these are all paid for by consumers, then t will equal the sum of the producer subsidy equivalents for the sector divided by post-policy consumption (box 3).

An approximation of the consumption cost is given by:

$$\Delta TC^c = \tfrac{1}{2}\, t\, (q^{c\prime} - q^c)$$

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14 As noted by Salerian, Davis and Jomini (1999), the production subsidy equivalent for a product that is imperfectly substitutable in demand for another product whose price changes is sensitive to the assumed degree of substitutability.

This measures consumer valuation of the forgone consumption, less the valuation of other goods that can be purchased with the diverted expenditure.[15] Unfortunately, unlike total subsidy equivalents, there is no proxy measure of consumption costs. The 'total tax equivalent' of measures that increase consumer prices is not helpful although, of course, the explicit or implicit tax rate measures the price 'wedge' that drives the consumer response.[16]

Measuring costs of energy efficiency policies

Policies that mandate efficiency standards affect the investment demand for energy-using durable products. The objective is to reduce the demand for energy by encouraging the production of, and investment in, more energy efficient durable products. Thus, with these policies, there are resource costs in producing the additional energy efficient durables, but there are also expected future savings in resource costs from using less energy (box 4).

Both the additional production costs and the expected future cost savings are difficult to measure.

- The difficulty in measuring production costs of additional energy efficiency is that, as noted, energy efficiency products generally do not exist on their own. Instead, energy efficiency attributes are embodied in durable products along with other attributes. A car, for example, in addition to its fuel economy attribute, has a large number of other attributes such as size, number of doors and so forth. Product prices reflect the bundle of attributes and disentangling the costs is problematical. In short, there are generally no identifiable product markets for pure efficiency products where prices and quantities can be observed and which reveal information about costs and benefits.
- Measuring the expected decrease in future energy costs is also difficult because it depends on whether investors underestimate the benefits of energy savings (box 4). The 'energy paradox' is that there appears to be a reluctance to invest in seemingly cost-effective energy efficient durables. Why this is so is contentious. The net result depends on whether the apparent reluctance reflects investor misperception, or whether it reflects some unobserved cost of additional energy

[15] In boxes 2 and 3, the consumer valuation of the foregone consumption is *iklm*, while *ijlm* will be diverted to the consumption of other goods and reflects the valuation of those other goods. This leaves the consumption cost, i.e. a net loss, of *jkl*.

[16] The total tax equivalent (= $t\ q^c$) plus consumption costs is equal to the loss in consumer surplus (in box 2 the total tax equivalent is area *bekj*, the consumption cost area is *jkl* and the loss in consumer surplus is *bekl*). The consumer welfare loss will be less than the loss in consumer surplus if some of the total tax equivalent is returned to consumers.

efficiency (such as search costs, high borrowing costs, or a preference for product attributes other than energy efficiency).

Therefore, the net costs of efficiency standards depend critically on assumptions regarding investor perceptions. For example, Parry et al. (2010) provided estimates suggesting that in the United States, the marginal costs of using auto standards to reduce economy-wide CO_2 by several percent can vary from roughly –\$100 to +\$100 per ton of CO_2.

Measuring abatement

In addition to measuring the economic costs and subsidy equivalents of individual policies, it is necessary to calculate the abatement brought about by each policy. The difficulty again is that this requires a counterfactual; namely, how much abatement would have happened in the absence of the policy?

Another issue is that policies aimed at supply-side abatement can also generate demand-side abatement if they raise product prices by reducing quantity demanded and emissions. However, it is more convenient to consider first the supply-side abatement of individual policies and to introduce later the effects of all the sectoral supply-side policies on the demand for the sector's product and emissions.

Supply-side abatement

A simple case is a policy that encourages production of a low-emissions product that replaces production of a higher-emissions product. In this case, abatement is the additional quantity of the low-emissions product multiplied by the difference in carbon intensities between the high-emissions and low-emissions products.

Nonetheless, identifying the counterfactual can be complicated where the marginal operator varies depending on the circumstances (for example, peak load electricity), and this can have a substantial impact on the amount of abatement that might reasonably be attributed to a policy. It is conceivable that at certain times some types of renewable energy production replace (relatively high cost) hydro or gas-fired power rather than (relatively cheap) coal-fired power, for example.

It is even more complicated when a number of piecemeal, seemingly independent, policies interact. Here, the unintended consequence can be that the combined abatement is not additive. One policy may increase the production of a no-emission product such as electricity from solar, but it may act to displace another no-emissions product such as electricity from wind generation.[17]

Furthermore, it is necessary to measure *net* abatement in cases such as biofuels which, by replacing fossil fuels, reduce emissions, but in their production use fossil fuels, which increases emissions.

Demand-side abatement

Demand-side abatement is important for policies that push up the price of products that contain emissions. These policies obviously include explicit carbon taxes and quota schemes and fuel taxes. In addition, to the extent that subsidies operating on the supply side to induce production of cleaner energy and other low-emissions products are paid for by users — and demand elasticities are not zero — then higher product prices will provide an additional source of abatement and, ideally, should be taken into account.

Abatement from energy efficiency policies

Policies mandating energy efficiency standards for energy-using durable goods are aimed at reducing the demand for energy — and thus also emissions — by non-price means. However, as noted above, at unchanged energy prices, usage might increase, thus increasing the demand for energy and the amount of emissions. This 'rebound effect' should be taken into account when measuring the abatement from these policies. And, as noted earlier, because there is no incentive to reduce production of emissions-intensive products ahead of low-emissions ones, such policies conceivably could have negligible effects on total emissions.

Other measurement issues

Time dimension

Ideally, emissions-reduction policies would be assessed over multiple years because:

- policies are often designed to induce capital investments, such as the building of renewable electricity generation, which can take years to complete and result in

[17] In these cases, as abatement from one policy goes to zero then abatement costs per tonne of CO_2 for that policy goes to infinity. Nonetheless, the combined abatement and costs from the two policies would be included in the sectoral averages.

abatement over many years

- it is common for policies to be phased in over a period of years, such as an increasingly stringent target for the share of electricity generated from renewable sources.

However, this can add considerable complexity, and so its advantages have to be weighed against the time constraint on the study. In measuring costs and subsidies and abatement of policies, the pragmatic approach adopted in this study will be partial equilibrium, comparative static. That is, we will compare in the latest year for which data are available, a snapshot of the post-policy situation to the counter-factual snapshot of no policy. This is not to say that longer term issues cannot be accommodated in the framework. For example, a capital subsidy that encourages investment in low-emission generation has a one–off upfront cost but may contribute to abatement over many years. To account for this divergence in costs and benefits the value of the subsidy can be amortised over the life of the project and expressed on an annualised basis. This can also be done for previous year's capital subsidies, as some of these previous up-front payments also contribute costs today when considered on an annualised basis. Similarly, the costs of policy measures that bring forward investment that might reasonably be assumed to have occurred in the future can be approximated in similar ways by use of appropriate discount rates.

'Additionality'

Some policies promote other, domestic objectives (such as revenue raising or reducing local pollution), while having the 'by-product' effect of achieving carbon abatement. (This issue is more likely to arise for policies that are not explicitly intended to target carbon emissions (such as fuel excise taxes).) Where such policies deliver domestic benefits and would have been undertaken regardless of their impact on carbon emissions, the marginal costs of any associated carbon abatement will be negligible. Given that policies can have multiple objectives and that it in most cases it is not possible to decompose abatement estimates (or for that matter costs), sensitivity analysis will be needed to capture the range of possible outcomes.

Sensitivity analysis

Given the measurement challenges outlined above, it is inevitable that there will be a degree of uncertainty associated with estimating abatement costs. The Commission anticipates that it will need to produce a range of estimates, rather than a single number, for different policies and for each sector in each country. This will involve a sensitivity analysis, with assumptions varied within plausible ranges to see how this affects the estimates.

5 Adding it up

In sum, given that most emission reduction policies do not impose a ‘price’ on carbon so much as they encourage particular types of abatement though explicit or implicit subsidies, the Commission will need to measure the *resource costs* of the various measures and the abatement they achieve.

Realistically though, the estimates will not be true measures of total costs, mainly because of the absence of information about marginal costs of producing low-emission products. This means that the measures often will rely on estimates of total subsidy equivalents, which can only be an upper bound estimate of total costs. In addition, losses resulting from reduced consumption of high emission products will be difficult to measure and any estimation may have to be illustrative only, absent knowledge of demand elasticities in many cases.

Notwithstanding the considerable measurement challenges, as far as possible, for each policy measure, a total subsidy equivalent (as a proxy measure of total costs) and subsidy (average cost) per tonne of CO_2 abated will be reported. However, as noted earlier, in some cases it will not be possible to isolate the abatement effects of particular measures.

The Commission will also aggregate the subsidy equivalent measures to produce an estimate of the total and average abatement subsidy for the electricity and road transport sectors in each country (this average abatement subsidy could be referred to very loosely as the ‘price’ of abatement achieved under the schemes analysed).

These measures will facilitate comparison of the *cost-effectiveness* of different measures within and across countries in these sectors. They will also be useful indicators of the resources that respective governments are prepared to commit the community to devote to encouraging abatement, either directly through explicit financial subsidies or indirectly through higher prices to consumers.

As far as possible, the Commission will also endeavour to estimate the overall product price ‘uplift’ that results from the various supply and demand side interventions in each sector for each country. But as noted above, in the absence of information about supply and demand elasticities, such estimates will depend on assumptions about these parameters.

It should be noted, however, that the estimated price uplift (per unit of output) is not a *carbon price* equivalent and cannot be converted to one. For example, some estimates have essentially divided the cost uplift for electricity per MWh by the carbon intensity of baseload generation. This converts the cost uplift expressed per MWh to a cost uplift expressed per tonne of CO_2. Put another way, this is abatement costs expressed per unit of emissions. But this ratio is *not* equivalent to a carbon price — a carbon price or tax set at the same rate would not generate the same level (or cost) of abatement.

As discussed below, conceptually there will be an economy-wide carbon price that would achieve the same amount of abatement as existing sectoral policies at a lower cost, but estimating this price would require a comprehensive economy-wide model for each country.

Comparing 'effort'

Effort implies some sort of sacrifice that a country is making to achieve a given level of abatement. But sacrifice is difficult to define. For example, does it mean that each country should reduce its emissions by the same proportion, or incur the same economic costs (for example, the same proportionate loss in national income)?

Even if all countries had identical carbon taxes, it could not be said that each was making the same *abatement* effort. This is because the impact of those 'prices' on economic aggregates such as GDP or consumption would differ according to the characteristics of each economy.[18]

A uniform global tax or global emissions trading scheme is efficient precisely because it would encourage abatement from the lowest-cost sources in whichever country they existed, not impose equal abatement across countries. This is not to say that countries not abating would avoid 'pain'. Global tax or quota schemes would also ensure that for those activities where the costs of abating exceeded the costs of paying the tax or buying permits, emissions would (efficiently) continue to be produced. For these activities, 'effort' would effectively be the payments made in lieu of actual abatement. Indeed, for this reason, such payments are recognised as part of a country's emission reduction effort under international agreements.

[18] In modelling of the Copenhagen Accord, McKibbin, Morris and Wilcoxen (2010) estimated that while Australia could have an efficient carbon price in 2020 that was less than one-third of that in Western Europe, the percentage reduction in Australia's GDP would be almost a third greater. They also found that Australia and Europe would have a similar percentage reduction in emissions in 2020 (relative to business-as-usual).

Nor will the Commission's (proxy) estimates of the costs of abatement under the many schemes allow meaningful comparisons of effort:

- a relatively high average abatement cost would not necessarily indicate that a country also experiences a greater proportionate impact on its economy, or emissions, than other countries
- a country that adopts more inefficient (and hence high cost) abatement opportunities may be inappropriately given greater credit than a country that achieves the same abatement at a lower cost.

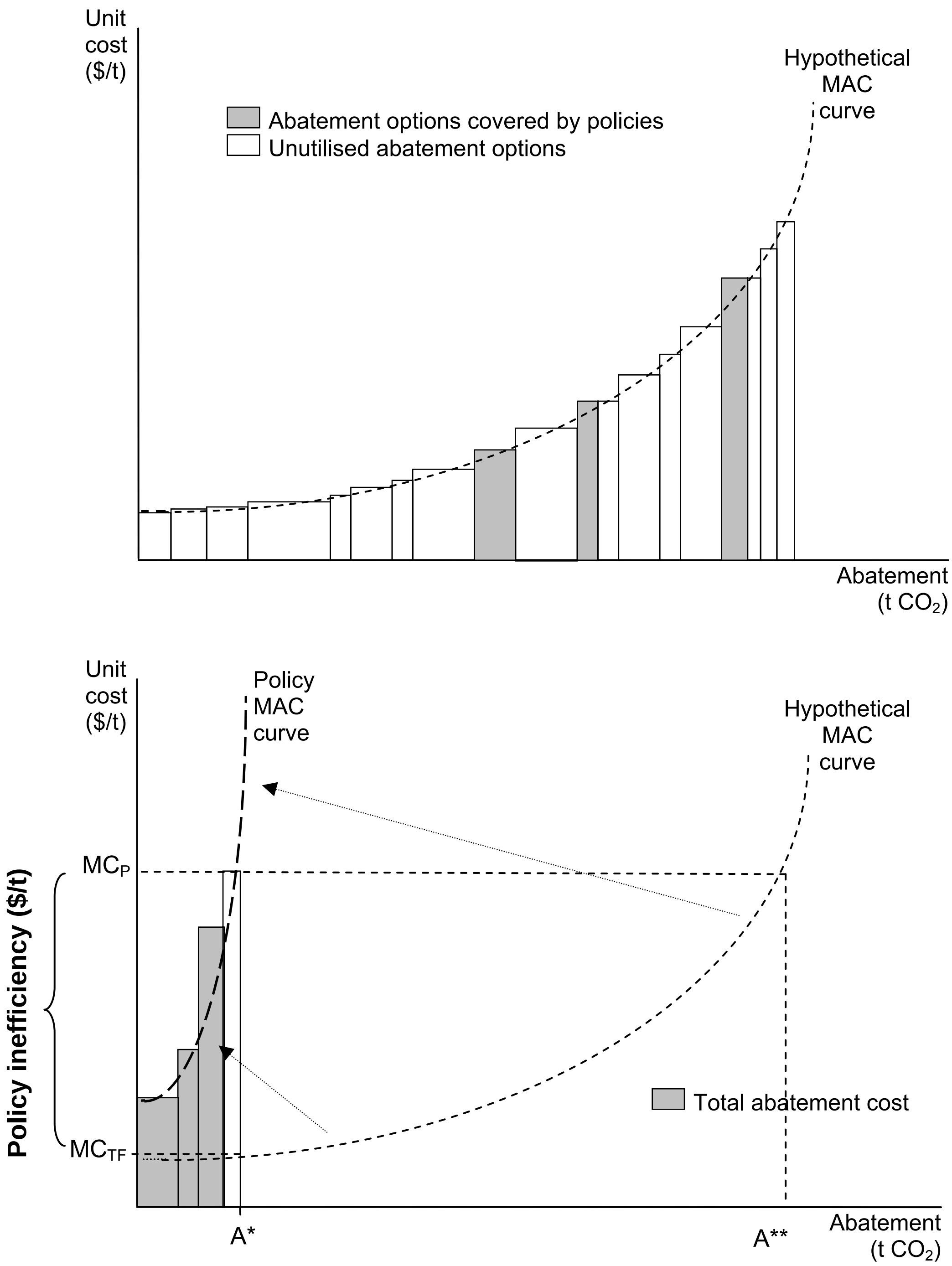
The missing yardstick for comparison is the abatement that would be required by each country in order to achieve efficient global abatement.

As the estimates the Commission can feasibly produce are not carbon-price equivalents, an appropriate carbon price for Australia cannot readily be inferred from them. However, the subsidy equivalent-cum-abatement 'cost' estimates the Commission is able to calculate will facilitate further analysis of whether the abatement being achieved under existing policy instruments could be achieved at a lower cost — for example, by replacing those schemes with an economy-wide emissions price.

This is illustrated in figure 2, which compares a (hypothetical) marginal abatement cost (MAC) curve that shows the cost of achieving a given amount of abatement (A*) from a few targeted (relatively high-cost) schemes (the Policy MAC Curve), with the (hypothetical) lower economy-wide MAC curve that would be possible if *all* feasible abatement options (including by reducing relatively low value consumption) were included. By broadening the coverage the same amount of abatement can be achieved at a lower cost (MC_{TF}), or conversely a much greater level of abatement can be achieved at the same unit cost (A**).

The Commission is exploring the scope for using a general equilibrium model to generate an illustrative, efficient carbon tax that could achieve the same level of abatement as policies currently in place in Australia at the lowest possible cost. Alternatively, such a model could be used to show how much abatement (such as A** in figure 2) could be achieved if a carbon price were applied at the same rate as the average subsidy equivalent (as drawn, MC_P). Importantly, of course, the ability of any model to produce a plausible substitute tax will depend on realistic specification of substitution possibilities in both production and consumption. Indeed, if it were possible to model such 'efficient' carbon tax equivalents for the abatement being achieved in each country, these would provide a more accurate indication of Australia's relative 'effort'.

Figure 2 **Marginal abatement cost curves (MACs) and policy efficiency: a hypothetical illustration**



Competitiveness impacts

Assessment of specific sector competiveness impacts requires an assessment of the effects of emission reduction policies on product prices. Estimates of abatement costs in the electricity sector, for example, could facilitate estimation of the consequential impacts on energy prices faced by firms and households.

To the extent it proves feasible to estimate the percentage increases in energy and transport prices across competing countries, this could begin to give some indication of potential competitiveness impacts for Australian producers who use these inputs. But more sophisticated modelling would be required to assess the flow-on impacts on production costs and likely changes (if any) in world prices resulting from policy interventions internationally. Moreover, assessing the ultimate impact on producers' costs in Australia and abroad would also require accounting for any policies serving to *counter* the cost impacts of emissions reduction policies.

Also of relevance to Australian business competitiveness is that, as discussed above, there may be more efficient (lower cost) ways of achieving the abatement being achieved domestically. Replacement of high-cost with lower-cost schemes has the potential to reduce impacts on the prices of business inputs and production processes, irrespective of the policy settings in competitor economies.

References

DCCEE (Department of Climate Change and Energy Efficiency) 2010a, *Australian National Greenhouse Accounts*: *Quarterly Update of Australia's National Greenhouse Gas Inventory: June Quarter 2010*, Canberra.

—— 2010b, Glossary, Australian Greenhouse Emissions Information System, Canberra, http://www.ageis.greenhouse.gov.au/Help/PublicTutorialGlossary.aspx (accessed 3 March 2011).

—— 2010c, Multi-Party Climate Change Committee, Canberra, http://www.climatechange.gov.au/government/initiatives/multi-party-committee.aspx (accessed 29 November 2010).

—— 2010d, Multi-Party Climate Change Committee: Terms of Reference, Canberra, http://www.climatechange.gov.au/en/government/initiatives/multi-party-committee/terms-of-reference.aspx (accessed 29 November 2010).

—— 2010e, *National Inventory by Economic Sector: 2008*, Australian National Greenhouse Accounts, Canberra.

—— 2010f, National Inventory by Economic Sector, Australian Greenhouse Emissions Information System, Canberra, http://www.ageis.greenhouse.gov.au/ANZSIC.aspx (accessed 3 March 2011).

—— 2010g, Scope 2 emissions – Indirect emissions from purchased electricity, Australian Greenhouse Emissions Information System, Canberra, http://www.ageis.greenhouse.gov.au/Electricity.aspx (accessed 3 March 2011).

Harberger, A. 1964, 'Principles of efficiency: the measurement of waste', *American Economic Review*, vol. 54, no. 3, pp. 58-76.

Just, R., Hueth, D. and Schmitz, A. 2004, *The Welfare Economics of Public Policy*, Edward Elgar Publishing, Cheltenham.

Krupnick, A., Parry, I., Walls, M., Knowles T. and Hayes, K. 2010, *Toward a New National Energy Policy: Assessing the Options*, Resources for the Future, Washington DC, http://www.rff.org/RFF/Documents/RFF-Rpt-NEPI%20Tech%20Manual_Final.pdf (accessed 21 March 2011).

McKibbin, W., Morris, A. and Wilcoxen, P. 2010, *Comparing Climate Commitments: A Model-Based Analysis of the Copenhagen Accord*, Paper prepared for the Harvard Project on International Climate Agreements, John Kennedy School of Government, Cambridge, Massachusetts.

OECD (Organisation for Economic Cooperation and Development) 2010, *OECD's Producer Support Estimate and Related Indicators of Agricultural Support:*

Concepts, Calculations, Interpretation and Use (The PSE Manual), Paris, September, http://www.oecd.org/dataoecd/52/5/46193164.pdf (accessed 21 March 2011)

Parry, I., Evans, D. and Oates W. 2010, *Are Energy Efficiency Standards Justified?*, Discussion Paper 10-59, Resources for the Future, Washington DC.

Salerian, J., Davis L., and Jomini P. 1999, 'The Consumer Tax Equivalent of a Tariff with Imperfect Substitutes', *Economic Record*, September

US EIA (United States Energy Information Administration) 2009, *Levelized Cost of New Electricity Generating Technologies,* Washington DC, http://www.instituteforenergyresearch.org/2009/05/12/levelized-cost-of-new-generating-technologies/ (accessed 21 March 2011).

Terms of Reference

STUDY INTO EMISSIONS REDUCTION POLICIES IN KEY ECONOMIES

Productivity Commission Act 1998

I, Bill Shorten, pursuant to Parts 2 and 4 of the *Productivity Commission Act 1998*, hereby request the Productivity Commission to undertake a research study on the effective carbon prices that result from emissions and energy reduction policies in place or committed in Australia and other key economies.

This work is intended to provide accurate and timely information on the extent of climate action in key economies and sectors.

Context

Reducing greenhouse gas emissions to mitigate the worst effects of climate change is a global challenge. Various mitigation policies are available, though not all impose explicit carbon prices on businesses and households. While some policies such as carbon taxes or emissions trading schemes will involve explicit carbon prices others, such as direct regulation of technologies, renewable energy targets, or subsidies for low emissions technology, impose less transparent carbon prices.

Given this, comparing the impact of different policies on a given sector across economies can be difficult as their scope can vary considerably and their impacts are not always clear. In this context it is important to develop a methodology for aggregating sectoral impacts across policies, and for making comparisons across key economies.

Against this background, the Commission is requested to provide advice on the effective carbon prices that result from emissions reduction and other relevant policies in key economies, where effective carbon prices include both explicit carbon prices, such as taxes or emissions trading schemes, and implicit carbon prices.

Scope of the Study

The Commission is requested to:

- examine and detail emissions reduction policies, either in place or committed in Australia and in other key economies such as the UK, the USA, Germany, New Zealand, China, India, Japan and South Korea;
- estimate the effective carbon price per tonne of CO_2-e faced by the electricity generation sectors in these economies, and selected industries drawn from manufacturing and transport sectors in these and other countries where relevant and data permitting;
- report on the methodology, assumptions and data sources used, so as to inform further analysis in this area.

Key Considerations

In conducting the study and making recommendations the Commission would:

- consult with the business sector, government agencies and other interested parties as appropriate in Australia and internationally;

- draw on credible evidence both nationally and internationally, including by utilising local research expertise in economies being examined.

The Commission is to report to the Government by the end of May 2011. The report will be published.

BILL SHORTEN