

Economic and Environmental Potential of Energy Efficiency Regulations

Submission to the Productivity Commission Inquiry
into Energy Efficiency

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Economic and Environmental Potential of Energy Efficiency

Summary

Australia's government measures to promote energy efficiency are ad hoc and ill-targeted. Most were originally responses to particular notions of market failure that have since been largely discredited. They include regulations to compensate for perceived consumer myopia to long term and short term trade-offs; this rationale remains, notwithstanding greater contemporary doubt about superior wisdom of governments. Historically, an additional goal for energy saving policies stemmed from fears - no longer widely held - of an imminent global shortage of energy.

A renewed plausibility for energy saving regulatory measures was provided by concern about CO₂ driven global warming. Whatever the merits of this concern, the piecemeal assembly of regulatory and tax expenditures to address it involves considerable waste. The table below summarizes the more readily identified costs.

Summary of Greenhouse Taxes and Expenditures

	Annual Costs M
Commonwealth, NSW and Queensland Abatement Requirements on Retailers	\$669 (2010)
Royalties	\$844
Commonwealth Government Disbursements	\$124 (2006/7)
State Government Disbursements	\$32
Total	~\$1669

In addition, there are costs stemming from energy saving requirements for houses and a range of consumer durable products.

The value of these different measures in terms of greenhouse emission abatement is highly variable. They clearly do not deliver the best outcome for each dollar of expenditure. For example, the Commonwealth Mandatory Renewable Energy Target (MRET) scheme involves costs in terms of dollars per tonne of CO₂ abated that are almost threefold those of the NSW scheme. Moreover, at least in the cases of the MRET and the Queensland "13 per cent gas" schemes, there is no incentive for existing sources to reduce their emission levels using improved technology.

There are considerable deficiencies in the process by which these policies have been selected. This reflects poor coordination both between different jurisdictions and within the Commonwealth. The issue has spawned new vistas for "winner picking" that has been long discredited in other areas of industry policy.

If measures are justified, the most efficient approach is likely to involve a simple carbon (and other greenhouse gas) pricing mechanism. This would offer the right incentives for those best placed to determine and act on the most cost-effective means of defraying the emissions. Rationalising the current measures into a single instrument should be the goal. An essential first step is to measure returns, in terms of dollar costs per unit of abatement, that each of the present measures entails.

Energy and Efficiency

The Inquiry's Terms of Reference

The Minister's reference to the Commission says, "Australia's historic (sic) energy efficiency performance has been weak in comparison with other OECD countries". This unsupported statement is accompanied by another that appears to contradict it - "low cost reliable energy is a source of competitive strength for Australia".

It may well be that Australia's energy performance has historically been comparatively weak but it is doubtful if such a case can be made with reference to the past decade.

It is certainly true that Australian energy intensity is high in per capita or per unit of GDP terms but this says nothing about energy efficiency. Rather, energy efficiency refers to the technical conversion of material into energy, the way consumers use that energy and the allocation of the energy between users. In none of these measures does Australia appear to be an inefficient energy user.

While the Terms of Reference identify the importance of market based measures to promote efficiency, they are overwhelmingly directed at increasing government intervention in consumer decisions. This is unfortunate since such governmental activism is more likely to bring reduced overall efficiency.

Most of the matters on which the Commission is asked to advise seek an examination of measures that promote increased efficiency of energy use or reduced use of energy *per se*. A focus on seeking to improve energy efficiency by reducing its intensity of use can call forth real inefficiencies by causing a substitution of other inputs for lower cost energy inputs. We could, for example, readily reduce energy use by banning cars, or coal fired power stations but this would leave us considerably worse off.

Measures to reduce energy use can even backfire and indirectly increase that use. For example, measures targeting high energy using aluminium might lead to its substitution by lower energy using steel but the latter's increased weight might entail greater energy inputs in transporting and using the products manufactured from the steel. For these sorts of reasons the efficiency of a particular factor of production is best examined in a general economic setting, in which prices emerge from demand and supply interactions.

Some of the matters raised in the Terms of Reference require firms to provide greater user information and forces them to undertake energy audits. Although not normally as costly as requiring firms to undertake product or activity modifications, even this element of regulation brings costs. It does so by diverting firms' resources from other pursuits which their management considers to be more fruitful, or by entailing the hiring of additional resources.

This submission does not set out to cover all the issues covered by the Scope of the Inquiry but focuses on some of the issues which we see as central to the matters before the Commission. It seeks to draw attention to some of the more egregious cost impositions that the current mix of poorly assembled policies entail.

Regulatory Measures to Promote Energy Efficiency

The original stimulus for regulatory measures to promote energy efficiency was the oil crises of 1974 and 1979. These developments led to a marked increase in the price of energy. They were accompanied by a worldwide concern, most notably expressed in publications of the Club of Rome¹, which incorrectly estimated that the world was running out of energy and other natural resources.

The 1970s lift in energy prices brought calls for increased information, particularly covering energy efficiency, to be offered to consumers so that they could be better apprised of this feature of the goods. In some cases they also brought calls for mandatory levels of energy efficiency for some goods.

Concerns about energy shortages have now abated, (Victoria, for example, has proven brown coal resources to supply electricity for 1000 years). However, those promoting regulatory measures to foster greater energy savings had no opportunity to acknowledge their mistaken analysis before a new justification for regulatory measures arose. This was the greenhouse issue which offered those promoting concern about energy reserves a seamless transition to a new agenda heading under which the previous policy approaches could be maintained.

Increased regulatory intrusion to require particular standards of behaviour with regard to energy use, or to deny access to certain goods is contrary to sound government policy. Good (economic) policy is best pursued by allowing individuals to decide how to use their own funds and not to constrict their spending decisions. Where there is competition between sellers seeking to profit from meeting consumers' needs, the best use of resources will be achieved in the absence of regulations. Competitive provision by profit maximising entities largely characterise the energy industry. Exceptions are in some areas of natural monopoly – especially electricity poles and wires - and, arguably, with regard to suppliers under government ownership².

The Terms of Reference however do not highlight a need for evidence and advice on these avenues to efficiency.

The case for greater regulation rests on three rationales:

- that consumers are not sufficiently informed or sufficiently capable of taking informed decisions about the purchase of goods that is in their best interests;
- that there is a principal/agency distortion as many goods are bought for the use of certain consumers by others who place too high a weighting on reducing initial rather than long term costs; and
- that the use of certain goods brings adverse externalities in the form of costs that are imposed on others and not captured in the prices paid.

All of these rationales for regulation are controversial.

¹ Meadows et al (1972) *Limits to Growth*, Universe books, New York.

²For evidence about the potency of private ownership in promoting efficiency see <http://ipa.org.au/pubs/Moranwebpapers/Energy28.pdf>

The notion of free markets is based on the fact that consumers generally make purchases in their best interests. Although there is information asymmetry between sellers and buyers, consumers buy highly complex goods like computers and motor cars incorporating many different components and exhibiting many different performance characteristics. The sellers have every incentive to draw the attention of buyers to those features that would persuade them to select their own offerings. Because of this, the outcomes of consumers' purchases are generally agreed to accord with their overall interests without the need for the governments to dictate certain requirements of the products' manufacturers beyond those that might impact on third parties (e.g. braking requirements for cars).

Regulations requiring the provision of information on products' features or their inputs are normally less intrusive and costly than regulations that specify such features.

The principal/agency distortion is equally fallacious. It might be said that landlords of property which includes an installed appliance are indifferent to its performance. This is however not true. People weigh up a great many features in the purchases of products and services. Suppliers, including those of rental properties, respond to meet the needs. In fact, there are strong reasons why homes built for owner-occupation would incorporate fewer energy saving features – the home buyer, at least the first home buyer, is likely to be borrowing constrained and will seek to defer unnecessary outlays.

The externality case is the one that can best justify regulatory intrusion. Externalities have long been associated with inadvertent pollution from productive facilities. However, there is no automatic application of a regulation resting on this case. Externalities are around us all the time: they could be used by the purchaser of an expensive motor vehicle to justify community subsidies on the basis that the superior braking and pollution characteristics confer unpaid benefits. Even in the case of pollution they may require no action if the polluter had traditional rights to discharge waste material. Moreover, in seeking to offset an externality, government action can easily lead to even greater loss. Externalities are therefore matters that do not automatically justify regulatory intrusion.

In determining whether the externality justifies regulatory action, matters to be considered include:

- the degree to which the externality is present,
- whether beneficiaries are able to compensate those harmed if the latter hold the rights to be free of the activity's effects,
- whether the regulation to overcome the externality is addressed to goods and services that provide the most cost effective means of overcoming it.

It is clear from the foregoing that for regulatory active government measures directed at energy that the Terms of Reference mainly address have very slender rationales aside from those based on the greenhouse issue. This in turn is centred on the Kyoto Agreement and its associated provisions.

Australian Energy Policy and the Kyoto Agreement

The Kyoto agreement in 1997 was designed as a first real step towards stabilising emissions of gases, dominated by carbon dioxide, that are considered to bring increased global warming. Having signed the agreement, Australia along with the US has declined to ratify it.

Only developed countries among the signatories were obliged to accept a discipline on their emission levels and hence fossil fuel outputs. Although keen to demonstrate support for reduced greenhouse gas emissions, the Australian government is conscious that Australia has a greater dependence than most other developed countries on fossil fuels. In Kyoto, this resulted in Australian negotiators requiring a relatively high level of emission targets (108 per cent of 1990 levels as the average for 2008-12, while most other countries agreed to reductions). At the time there were many within Australia who were critical of the government for requiring an emission level that was higher than the spirit of the Kyoto agreement.

Australia's relatively generous target was posited on a business-as-usual level of emissions at about 128 per cent of the Kyoto level by 2010. The stronger than anticipated level of economic growth that Australia has experienced since then would have boosted the business-as-usual level. However, this effect is more than offset by a redefinition of what constitutes abatement and some measures taken to reduce emissions. The net effects leave Australia's 2010 projected emission levels just a few percentage points above the target.

The Kyoto target is only for the initial period and is expected to be tightened considerably in the post 2012 period.

Energy policy in Australia that is directed at greenhouse issues has evolved into a complex regulatory and tax regime. The original measures in place, designed to counter consumer myopia and a supposed dwindling energy supply, have been built upon over many years in different program announcements. For the Commonwealth, the latest of these *Securing Australia's Energy Future* was issued by the Prime Minister in June 2004.

Measures include:

- Regulation based subsidies and customer taxes to encourage low carbon emitting energy.
- Regulatory requirements on energy efficiency.
- Government outlays designed to promote specific types of low carbon energy.

Regulatory Requirements for Low Carbon Emitting Energy

The Main Regulatory Schemes

There are three main schemes that tax electricity, ostensibly with a view to imposing penalties to encourage consumption of fuels that produce lower carbon dioxide emissions per unit of energy. These measures are:

- the Federal Government's Mandatory Renewable Energy Target (MRET),
- the Queensland's 13 per cent gas target, and
- the NSW's Greenhouse Gas Abatement Certificate (NGAC) scheme.

The MRET scheme's focus is on renewable energy and requires retailers to acquire and annually surrender a progressively increased number of Renewable Energy Certificates (RECs). The major beneficiary was hydro in 2003, with Snowy having some 490,000 RECs, worth some \$16 million to the business. Although accounting for only 10 per cent of the RECs created in 2003, wind is likely to increasingly account for the growth in new RECs.

The Queensland scheme seeks to substitute gas for coal based electricity inputs, while the NSW scheme seeks to introduce a penalty on CO₂ graduated in line with the emissions per unit of energy of each electricity generation source.

The default penalty costs of the three regulatory measures provide a cap on the costs they are likely to entail. These costs entail a premium over the costs of conventional electricity to retailers. By 2010, when the schemes are at full maturity, the fall back penalty rates for the Commonwealth, NSW and Queensland schemes respectively are \$40, \$14.3 and \$13.1 per MWh³. These rates provide the (maximum) subsidies to the non-carbon or low-carbon emitting fuels. In after-tax terms, costs to retailers of the three schemes' subsidies are \$57, \$20.4 and \$18.66 per MWh. respectively. These costs are over and above the basic wholesale (contract) price of electricity, which is likely to remain close to its present level of \$35 per MWh.

Economy Wide Costs of the Main Regulatory Schemes

The costs of the three schemes, based on the penalty costs (in pre-tax terms) for 2010, are estimated as follows:

³ Penalties under the NSW and Queensland schemes are subject to indexation; annual inflation of 3.5 per cent is assumed.

Table 1 2010 Costs of Abatement Reduction

Commonwealth ⁴	\$380M
NSW ⁵	\$221M
Queensland ⁶	\$68M

These costs are based on the Commonwealth MRET scheme applying to 9,500 GWhs; the NSW NGAC scheme delivering approximately 15,756 GWhs; the Queensland 13 per cent gas scheme delivering a little over 5,219 GWhs.

However, it is unlikely that the penalty rates for the Queensland scheme will normally be triggered because gas is not as uncompetitive as the set rate. Similar conclusions might be drawn with regard to the NSW scheme where reduced carbon fuels may be available at below the penalty rate costs.

It is improbable that this will be the case for the Commonwealth scheme, even though current REC prices for 2007 are quoted at under \$50 per MWh, significantly below the \$57 per MWh effective tax rate on companies under fulfilling their quotas. At present there is an excess supply of RECs as the requirement on retailers is small but increasing.

For future MRET prices, the MRET Review Panel accepted the estimates of consultants MMA which were that the MRET scheme would cost about \$32 per tonne of CO₂ in 2010⁷. This is equivalent to a cost of REC at about \$34 (per MWh). It is implausible that we shall see a price this low since the MRET renewable fuel must eventually be dominated by wind once incremental hydro and bagasse based sources are fully exploited. Wind generation costs are about \$80 per MWh, some \$45-50 more than conventional coal based electricity.

In practice, isolating future REC prices from reflecting the renewable energy costs they embody may be difficult. Although the REC instrument is in principle separate from the energy that it represents, a financier will need to be satisfied that a proposed wind generator has adequate forward sales. This means the REC and the wind are normally bundled together which makes it difficult to separate the two components.

⁴ Based on 9,500 GWh at a penalty cost of \$40 per GWh

⁵ Based on:

- benchmark of 7.27 tonnes CO₂ per capita totalling 52.054 million tonnes in 2010
- 2010 business-as-usual emission level estimated at 71.406 million tonnes
- Giving State gap of 19.352 million tonnes CO₂ less MRET credit estimated at 2.808 million tonnes
- Giving 16.544 million tonnes
- With penalty rate at \$13.36 per tonne CO₂ (\$10.5 escalated at 3.5 per cent per annum)
- Gives total cost at \$221 million

⁶ Equals

- 2010 "liable load" of 43.630 GWh (52.639 GWh less 9 GWh)
- Less 8 per cent line losses times 13 per cent gas requirement = 5.219 GWh
- 5.219 GWh times (\$11 increased annually by CPI of 3.5 per cent) = \$68 million

⁷ <http://www.mretreview.gov.au/report/pubs/mret-review.pdf>

Since wind is highly unreliable and requires back up of over 90 per cent of its capacity⁸, its value is less than that of conventional generators' supplies. The true value of wind energy is, because it requires considerable capacity back up, more accurately expressed as simply the value of the energy saved. The (marginal cost) energy component cost of coal based power stations is only \$6-12 per MWh and not the \$30 that might be the assumed pool price for a wind generator. This may lead to the bundled REC and wind energy price being lower than expected. A retailer might even take the view, once the wind component is sufficiently large, that the back up support required is fast start generation valued far in excess of the pool price.

In addition, the dispersed and intermittent nature of wind generation is likely to call for increased expenditure on transmission and distribution lines. As discussed later, in non-compliance with the National Electricity Code, Victoria proposes to smear these costs across all suppliers. Even without such blatant cross-subsidisation, some additional costs of wind generation are likely to fall on the supply industry as a whole.

The various means of mitigating the low value of wind, including weather derivatives and marrying wind to fast ramping generators simply mask the costs.

Other countries' renewable energy provisions require cost absorption in ways that are non-transparent. The Australian system's placement with the retailer of the responsibility for ensuring the appropriate take up of renewable energy means most of the costs of wind will be revealed as retailers seek out the least cost means of meeting their obligations.

Carbon Dioxide Abatement Efficiencies of the Three Main Regulatory Schemes

Because the three schemes target greenhouse gases in different ways, they have much different tax incidences when they are expressed as taxes per tonne of CO₂.

In after tax terms the three schemes' costs in terms of carbon dioxide abatement are as follows.

Table 2 Abatement costs (\$/tCO₂e)

	Pre-tax	Post-tax
MRET	38	54
NSW Benchmark	13.4	19
Queensland 13% Gas	32.7	46

Source: For the Commonwealth and Queensland estimated by relating the penalty rate to the abatement tonnage; NSW legislation specifies the rate in terms of \$/tonne CO₂.

As tax rates, these are high compared to many international studies into the likely level of greenhouse gas tax required to achieve the requisite abatement levels, at least in the early years. Thus, the McKibbin G-Cubed and the ABARE-GTEM models

⁸ See NEMMCO, Forecasting Intermittent Generation in the National Electricity Market, 11 February 2004; e.on., Wind Report 2004

both envisaged international prices of the order of \$7-15 per tonne of CO₂ in the period to 2017⁹. The NSW scheme, being carefully sculpted to the profile of electricity generators' emission levels, provides more greenhouse abating power per dollar of cost. The Queensland scheme is less effective because it requires the substitution of gas which provides only about 40 per cent less CO₂ per unit of energy than coal (although if low cost gas is available in sufficient quantities the penalty rate will not apply).

In terms of efficiency in reducing carbon dioxide emissions, it is the Commonwealth's MRET that is the least sensible of these taxes. The Review Panel on MRET reported in September 2003 recognised that "MRET is not a 'least cost' abatement measure". However, the Panel adopted a 1970s winner-picking approach to industry policy. It recommended the scheme's continuance with a future increase and time extension, arguing that it promoted a future technology and without such support Australia risks losing its place in this future area of activity.

This is unfortunate, since aside from providing energy at three to fourfold the costs of conventional electricity generation, the uncontrollable feature of major windmills threatens considerable disruption in terms of power system stability. They are also at the receiving end of considerable environmental displeasure because of their visual/noise intrusion.

For its part, the Government agreed to maintain the current scheme (including its 2020 sunset) but not to its expansion or extension beyond 2020.

In spite of the regulatory advantages that wind power has been given, the industry has been clamouring for even greater assistance. Following the release of the Howard government's policy, according to a report in *The Age* 24 June 2004¹⁰,

Shocked wind power advocates say only aggressive lobbying, or the election of a Labor government, will save the market that was poised to reap billions of dollars in potential investment and dramatically reduce Australia's level of greenhouse gas emissions.

As a result of the Government not committing to even more generous subsidies, Andrew Richards, Pacific Hydro's manager of marketing and external affairs, was quoted as saying that his company will withdraw plans for \$1.5 billion in wind farm investments over the next five years. He was also reported as adding that the Government's announcement has chased away a further \$5.5 billion of investment from Australia. *The Age* also reported that Danish company Vestas, the world's leading manufacturer of wind turbines, is to reconsider "plans to build a multimillion dollar turbine blade manufacturing plant at Wynyard in Tasmania's northwest".

⁹ See www.greenhouse.gov.au/international/kyoto/index.html

¹⁰ Gone with the wind 23 June 2004
<http://www.theage.com.au/articles/2004/06/22/1087844936119.html>

The renewables industry argues that only 2 per cent of 2010 electricity will be derived from these exotic subsidised energy sources by 2010. A paper produced by WWF on behalf of a group of sponsors, including the wind industry and the Australian Gas Association, actually claims that less than one per cent of electricity will be so derived¹¹. In fact the correct amount is 4.5 per cent¹², considerably above the “2 per cent additional energy” that the Prime Minister announced in 1997¹³.

Supporting Regulatory Measures

Perhaps in response to the industry’s pressures and its well established publicity machine, some State Governments are preparing to offer a further free kick to wind generation. This is even at the expense of the much trumpeted apparent unity they expressed in support for national energy regulatory uniformity.

Victoria has been first off the block. A bill is before State Parliament¹⁴ that permits the Minister to require the costs of an expansion of the distribution system to cater for new wind generation to be smeared across all users.

The measure is contrary to the provisions that all governments, state and federal, have agreed to in the National Electricity Code. This states at 5.5:

- (f) The *Network Service Provider* and the *Generator* shall negotiate in good faith to reach agreement as appropriate on the:
 - (1) *connection service* charge to be paid by the *Generator* in relation to *connection assets* to be provided by the *Network Service Provider*;
 - (2) *use of system services* charge to be paid by the *Generator* in relation to any *augmentations* or *extensions* required to be undertaken in respect of all affected *transmission networks* and *distribution networks*;

Connection charges were to be paid for by the new generator on the basis of the costs entailed. Capital costs under the new proposal are to be paid for by the consumer. This is a further subsidy to an infant industry that will forever require a handicap.

The fact that the decision to smear a wind generator’s costs is at the Minister’s discretion is an additional shortcoming of the proposal since it is an invitation to political corruption.

¹¹ See “Towards Victoria’s Clean Energy Future” by Dr Mark Diesendorf, WWF, 2004.

¹² 9,600 GWh as share of total 2010 load of 213108 (estimated from 2002 load of 176279 and ABARE growth rate of 2.4 per cent per annum)

¹³ http://parlinfoweb.aph.gov.au/PIWeb/view_document.aspx?id=541758&table=HANSARDR
The Prime Minister said, “The government will work with the states and territories to set a mandatory target for electricity retailers to source an **additional two per cent** of their electricity from renewable **energy** sources by 2010.”

¹⁴ Electricity Industry (Wind Energy Development) Act 2004

Taxes on Energy Inputs

In addition to the three major greenhouse gas abatement regulatory measures, there are various other taxes on energy inputs. Chief among these is the royalties minerals must pay. These ancient levies were originally in place to provide sovereigns with income as recompense for extracting minerals (originally only gold and silver) within their realms. As a tax on inputs, their only rational justification in a modern economy is to pay for specific services mining activity requires. Chief among these is the Mining Warden but the costs associated with this are massively over collected.

According to estimates undertaken by APPEA, taxes are levied as royalties on basic minerals at a rate of three cents per gigajoule for brown coal, six cents for black coal and 25 cents for gas. Gas royalties are reduced by tax holidays for coal seam methane gas in NSW and increased up to an estimated \$1 per gigajoule for offshore gas which attracts resource rent taxation¹⁵.

In terms of revenue measures these are as follows

Table 3 Royalty Collections on Coal and Gas

Production for Domestic Market	pj	Royalties paid (\$M)
black coal	1400	84
brown coal	670	20.1
onshore gas	340	85
offshore gas	655	655

The tax rates imposed by royalties when expressed as a CO₂ tax are as follows:

Table 4 Carbon Taxes on Different Fuels

	\$/tonne CO ₂
Brown coal	0.32
Black coal NSW	0.61
Black coal Qld	0.64
on-shore gas	3.91
Coal seam methane (NSW)	0.94
off-shore PRRT	15.63

Thus, Queensland has a tax on gas at the rate of just under \$4 per tonne and a tax on coal of 64 cents per tonne. But, as shown in Table 2, the Queensland “13 per cent gas” requirement for electricity generation can place a tax on fuels other than gas at the rate of \$33 per tonne of CO₂.

Royalties as taxes therefore add further confusion to the policy on carbon abatement. One option would be to increase the royalty tax so that it is levied at comparable rates

¹⁵ The PRRT being levied on profits would attract much lower taxes than the \$1 per GJ for more marginal fields like those being developed in the Otways.

on all energy sources – either at the same rate per energy unit, or at the same rate per carbon dioxide unit. While such an approach would doubtless please those long on the energy sources that are currently more heavily taxed, it is not consistent with the rationale for royalties. These should have a neutral effect on production and should be levied so that only the purpose-specific costs are recouped.

Regulatory Requirements for Energy Efficiency

Generator efficiency and other facilities' standards

Standards have been set and measurements are required for fossil fuel electricity generators. These seek to increase the output per unit of input. Announcing the measures in June 2000, the Minister, Senator Hill said he expected the new standards for fossil fuel generators will lead to a cut of about four million tonnes of carbon emissions each year.

The specific provisions involve detailed reporting on a six monthly basis specifying the amount and source of greenhouse emissions.

There is no published report reviewing the effectiveness of the program. Perhaps representing a triumph of hope over experience the Prime Minister's energy statement of June 2004, *Securing Australia's Energy Future*, extends a similar reporting requirement (though only every five years) on all of Australia's largest energy users.

It is doubtful that such measures will have any effect on firms' energy usages, though their paperburden does of course use resources.

Minimum Energy Performance Standards (MEPS) for appliances

Having been pioneered as measures to encourage consumers to conserve energy, like many other energy saving measures, minimum energy performance standards now have as their main purpose the reduced production of greenhouse gases. Regulations to achieve this include standards for refrigerators, freezers, electric storage water heaters, and small electric motors.

The regulations were addressed by the Prime Ministerial statement, *Safeguarding the Future: Australia's Response to Climate Change* (20 November 1997), following the Kyoto Convention. In that statement the PM said, the Australian governments were to work "to develop energy efficiency codes and standards for housing and commercial buildings, appliances and equipment". Some \$4.4 million was allocated for a range of matters including "minimum energy performance standards for new appliances and equipment regulating or developing codes of practice to ensure their adoption and, where appropriate, labelling or rating appliances and equipment to help consumers with their selection."

Labelling to inform consumers of energy efficiency for these products is common worldwide, although such requirements were only introduced in the European Union in the past few years.

It is maintained that without the regulations consumers would place inadequate priority on purchasing goods that used less energy and would be attracted instead to appliances that offered a low initial price or some other features that the promoters of the regulations consider to be less valuable.

Now that the regulations are now primarily targeted at greenhouse gas emission reductions their proponents maintain that the “externality” effect of global warming caused by greenhouse gas emissions is not factored into consumer purchases of these appliances. Accordingly, they would argue that the incentives of savings in energy costs are insufficient to bring about an adequate response without regulatory intervention. The consequent artificially low prices of fossil fuel energy encourage consumers to use more electricity than they would if they had to pay for the full costs of their energy usage.

A number of reports by George Wilkenfeld and Associates¹⁶ and Energy Efficient Strategies attempted to calculate the increased carbon dioxide emissions that would result from an absence of labelling requirements and the additional benefits that would follow from mandatory performance standards. Among their conclusions were the following somewhat speculative estimates:

- total energy efficiency of refrigerators and freezers is trending downwards by 2-3% per annum, a trend which is taken to be directly caused by energy labelling
- abandonment of energy labelling would increase consumption of electricity for appliances by about 890 GWh or \$1690 million over 15 years, an average of 56 GWh per annum; of this 647 GWh over 15 years (43 GWh per annum) is from refrigerators and freezers
- abandonment of energy labelling would increase CO₂ emissions by 0.8 million tonnes per annum (total Australian emissions was expected to be 654 million tonnes in the year 2000 comprising 1.4% of world emissions); energy labelling measures therefore claim to reduce emissions by about 0.12%)
- the introduction of MEPS is estimated to reduce electricity use by an additional 99 GWh per annum on water heaters and by 59 GWh on refrigerators and freezers; this equates to reductions in CO₂ emissions of 1.2 and 0.8 million tonnes respectively¹⁷.

The proposed regulations are a highly selective, non-neutral method of achieving the goal. MEPS targets products that account for only 2% of Australia’s total greenhouse

¹⁶ GWA (1991) *Residential Appliances in Australia*, prepared for SECV 1991; GWA et al (1991) *Review of Residential Appliance Labelling* prepared for SEVC; GWA et al (1993) *Benefits and Costs of Implementing Minimum Energy Performance Standards for Household Electrical Appliances in Australia*, prepared for the SECV; GWA et al, (1993) *Evaluation of the National Energy Management Program* prepared for DPIE; GWA Analysis of ABARE’s MENSA/MARKEL model prepared for ABARE; GWA (1996) *Study on Energy Efficiency Standards for Traded Products*, prepared for DPIE; GWA (1996) *Calculation of Fuel Cycle CO₂ Coefficients for Natural Gas and Electricity 1993-94*, Prepared for the Greenhouse Challenge; Energy Efficient Strategies (1995) *Analysis of GfK Refrigerator and Freezer Sales Data*, prepared for DPIE and NSW Dept of Energy; GWA (1996) *Electric Appliance Energy Labelling: Estimated Costs and Benefits of Continuation, Abandonment and Enhancement*, Prepared for DPIE.

¹⁷ Because of timing changes on the introduction of MEPS, the upper limit figure for refrigerators and freezers considerably overstates the maximum benefits as manufacturers have already made major energy efficiency improvements in the period since 1993 when the estimate was originally made.

gas emissions. The measures, once having reached maturity are estimated to reduce emissions by less than 0.2% of the business-as-usual levels.

Modest though they are, these estimated reductions exaggerate the effect of the regulations because they exclude energy efficiency improvements that are taking place without any regulation.

In addition, the studies on which the regulations were based were predicated on a rate of take up of the more energy efficient appliances where the real energy cost was assumed to increase by 1% per annum up to 2015. Following electricity reforms, costs to contestable customers have fallen in nominal terms by close to 20% and, as contestability has been extended to most customers, further real declines to households can be expected. This would reduce the share of energy to total costs from those used in the GWA 1996 study of 43% for refrigerators, 47% for freezers and 25-62% for electric storage water heaters. (Based on an 8% discount factor).

MEPS is also likely to mean reducing the availability of cheaper products or of some specialised products which fill particular niches or requirements. The proposals were estimated to increase the price of refrigerator-freezers by 1.4% and water heaters by 5-10%. The total cost to manufacturers of the adoption of MEPS is \$9.5 million per annum. These costs will be recouped from consumers.

Higher prices of themselves are likely to have a market effect. With higher prices consumers will defer the purchase of new goods. This reduces somewhat the effect of the regulations in bringing about the targeted reductions in energy use and CO2 emissions.

The effect on competition is also likely to be significant. The GWA 1994 study estimated that MEPS would have ruled out the sales of 50% of refrigerators and freezers if introduced in its original form in 1992. Considerable negotiation was engaged in to establish a level of MEPS that the local producers could acquiesce in for water heaters and even then the measure was designed to exclude the smaller units.

Housing energy saving

Governments are examining energy saving measures that will require additional costs for new buildings, including houses. Victoria's Government will require that all new houses incorporate additional \$2000 costs to use less electricity and water.

Under the *Plumbing (Water and Energy Savings) Regulations 2004*, people buying new houses must install low pressure water valves. In addition, they have a choice of installing a 2000 litre rainwater tank or a solar heating system.

The proposed water storage tank for each new house would mean an outlay of \$1895. This would save only \$11 per year and won't contribute in a drought. Even the government's chosen consultants couldn't endorse it.

The new home buyers' alternative regulatory choice, solar heating, involves an up-front outlay of \$2000. This is for an unreliable energy supply that, once its capital

costs are factored in, is many times more expensive than conventionally generated electricity.

The government's consultants claim that the proposed measures will bring economic benefits. They argue more jobs will be created as labour intensive solar heating and water tank manufacturing replaces capital intensive power stations and dams. If solving unemployment was that easy, we could replace our aluminium and steel industries and broad acre agriculture with basket weaving and organic farming!

They also claim the regulations would improve the income of those incurring the costs. This maintains the paternalism that has long dominated public policy in this area – apparently the new home buyers do not have the wisdom to take self-beneficial decisions for themselves.

Specific Subsidies for “Greenhouse Friendly” Energy Producers and Users

Aside from the taxes implicit in the programs addressed above, a great many Commonwealth and State measures provide financial support to fuels that offer lower carbon: energy intensities or require energy users to incur costs that encourage reduced emissions.

Measures listed in the 2004/5 Commonwealth Budget are as follows:

Table 5 Department of Environment and Heritage Climate Change Expenditures

	2004-05	2005-06
	\$m	\$m
EXPENSE		
Action on energy efficiency	5.5	6.7
Challenge Plus - Industry Partnerships	6.7	6.9
Climate Change Science Programme	6.6	6.8
Continued administration of the Mandatory Renewable Energy Target	2.6	2.7
Emissions measurement and analysis	5.3	8.1
Local greenhouse action	2.5	3.2
Greenhouse action to enhance sustainability in regional Australia	3.7	4.9
Influencing international climate change policy	2.5	4.8
Low emissions technology and abatement	3.2	5.7
National Climate Change Adaptation Programme	2.3	3.6
Strategic national response	4.4	7.2
Total expenditure	45.5	60.6
Reprioritisation of existing funding	-42.1	-57.5
Net additional expenditure	3.4	3.2
RELATED REVENUE MEASURES(a)		
Continued administration of the Mandatory Renewable Energy Target	0.5	0.6

Source: Commonwealth Budget

Since then there has been the PM's Statement of June 2004 in *Securing Australia's Energy Future*. According to this,

“The Australian Government will implement a suite of measures to lower the cost of significantly reducing greenhouse emissions in the future by:

- increasing the availability and reducing the costs of low greenhouse emissions technologies by:
 - establishing a \$500 million fund to demonstrate low-emission (fossil fuel and renewable) technologies which could significantly reduce greenhouse gas emissions if deployed at commercial scale
 - providing an additional \$100 million to target strategic research, development and commercialisation of smaller-scale renewable energy technologies
- establishing a \$75 million Solar Cities programme to provide a working demonstration of how technology, energy efficiency and efficient markets can combine to provide a sustainable energy future
- facilitating commercially attractive emission reductions, with a focus on large energy users, through measures including mandatory energy efficiency opportunity assessments, an enhanced Greenhouse Challenge programme with membership required for large energy projects and users, and development of more demand side management opportunities in electricity and gas markets
- maintaining support for the take-up of low-emission energy sources, including by
 - continuing the Mandatory Renewable Energy Target (MRET) until 2020 with improved transparency and administration
 - providing \$230 million to continue support for greenhouse technology projects under programmes such as the Remote Renewable Power Generation and Greenhouse Gas Abatement programmes.
 - providing \$34 million to remove specific barriers to the deployment of renewable energy, including better wind forecasting, improved electricity storage options and better grid connection rules.”

The additional program expenditure listed under Energy Efficiency and Climate Change and Energy include:

Table 6 Commonwealth Program Expenditures Announced June 2004

	2004-05	2005-06	2006-07	2007-08
Mandatory energy efficiency opportunity assessments	2.2	3.7	3.9	3.7
Climate Change Strategy—Action on energy efficiency	5.5	6.7	7.2	7.2
Low Emissions Technology Demonstration Fund	1.5	1.8	51.8	51.6
Solar Cities	2.1	5.9	21.2	24.6

In addition there is government funding for low emission technologies, the vehicles for which are listed as

- University Funding
- R&D Tax Concession
- Australian Research Council Grants
- R&D Start/Commercial Ready
- The Cooperative Research Centre for Greenhouse Gas Technologies, which has an average annual funding of \$3.1 million

- Other Cooperative Research Centres
- CSIRO
- Elements of GeoScience Australia

Additional program expenditures by State Governments include

- NSW Department of Energy, Utilities and Sustainability (DEUS) Renewable Investment Program estimated at about \$5 million per annum
- Victorian SEAV \$21.8 million, plus the Community Action Fund (\$0.8 million) and the Centre for Energy Technologies (\$4.7 million).

It is difficult to estimate the effectiveness or efficiency of these measures in terms of CO₂ mitigation.

Concluding Comments

The threshold question is whether governments should take action to reduce carbon dioxide and other emissions that are thought to be promoting global warming. The Australian Government, though not having ratified Kyoto, has announced that it will seek to meet the targets, at least for the 2008-12 reference period.

Government regulatory and direct expenditure on greenhouse gas abatement is considerable but difficult to estimate. The greenhouse programs are a potpourri of taxing and spending that has grown up in an ad hoc manner such that no official agency has been able or willing to undertake a comprehensive audit of the different expenditures. The programs involve the following summaries of spending:

Table 7 Summary of Greenhouse Taxes and Expenditures

	Costs M
Commonwealth, NSW and Queensland Abatement Requirements on Retailers	\$669 (2010)
Royalties	\$844
Commonwealth Government Disbursements	\$124 (2006/7)
State Government Disbursements	\$32

In addition there are the regulatory measures that cannot be readily evaluated including stipulations on the energy efficiency of buildings and appliances, and regulatory measures that require consumers to finance poles and wires for wind based generators.

Clearly, there is considerable waste and inconsistencies in the various measures that governments have introduced which they claim to be targeted at concerns about possible global warming. The plethora of measures amount to a micro-management of the mitigation of carbon dioxide and other greenhouse gas emissions. This is never likely to be a successful policy approach. The agencies and jurisdictional rivalries within government will always prevent such an approach from providing the most efficient policy tools.

The most efficient approach is likely to involve a simple carbon (and other greenhouse gas) pricing mechanism that offers the right incentives for those best placed to determine and act on the most cost-effective means of defraying the emissions.

While many would view carbon taxes or the creation of tradable carbon rights as an optimal solution in economic terms, substantial practical difficulties have prevented their adoption to date. These include questions as to the appropriate rate of such taxes, or means of vesting the tradable rights. Many of these questions derive from uncertainties as to the likely future effects of global warming, as well as the political difficulties that inevitably arise from taxation proposals that would have substantially differing effects on different sectors of the economy. Moreover, the commitment to existing regulatory measures with long time frames makes it difficult for their early termination and replacement by a price based mechanism.

Even so, given the policy commitment to an emission reduction strategy, a severe rationalisation of Australia's many programs would seem to recommend itself. A precursor to this would be to develop some auditable hierarchy of return in terms of dollar cost per unit of abatement that each of the present measures entails.