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Submission to the ICESD on the National Greenhouse Strategy

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Forming the Productivity Commission

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CONTENTS

ABBREVIATIONS v

SUMMARY vii

1 INTRODUCTION 1

1.1 Why is the Commission making a submission? 2

1.2 Approach taken in this submission 2

2 SNAPSHOT OF DOMEST IC GREENHOUSE RESPONSE 5

2.1 The 1992 National Greenhouse Response Strategy 6

2.2 Greenhouse 21C 6

3 WHAT CAN BE ACHIEV ED USING ‘NO REGRETS’ MEASURES 9

3.1 Role of cooperative agreements 9

3.2 Impact of ‘no regrets’ energy efficiency gains 10

3.3 The expansionary impact of energy efficiency gains 11

4 ROLE OF ECONOMIC I NSTRUMENTS 15

4.1 The choice of economic instrument 16

4.2 Key considerations in establishing a tradable permit scheme 22

4.3 Towards an operational tradable permit scheme 25

5 AREAS FOR FURTHER STUDY 29

REFERENCES 33

List of figures

2.1 Impact of *NGRS* and *Greenhouse 21C* on Australia’s GHG emissions 5

List of tables

2.1 Policy measures and estimated greenhouse gas emission savings from *Greenhouse 21C* 7

5.1 Contribution of specific gases and activities to Australia’s greenhouse gas emissions, 1994 29

List of boxes

3.1 The ‘rebound effect’ 12

4.1 Criteria for choice of policy instruments 16

4.2 Cost-effectiveness of economic instruments 18

4.3 Some overseas and Australian examples of tradable permit schemes 21

4.4 A phased approach to an operational tradable permits regime 26

ABBREVIATIONS

ABARE	Australian Bureau of Agricultural and Resource Economics
BAU	Business-as-usual
BIE	Bureau of Industry Economics
CoA	Commonwealth of Australia
FCCC	Framework Convention on Climate Change
GHG	Greenhouse gases
GWP	Global warming potential
IC	Industry Commission
ICESD	Intergovernmental Committee on Ecologically Sustainable Development
IPCC	Intergovernmental Panel on Climate Change
Mt	Megatonnes
NGRS	National Greenhouse Response Strategy
NGS	National Greenhouse Strategy
PC	Productivity Commission
UNCTAD	United Nations Conference on Trade and Development

SUMMARY

This submission is in response to a Discussion Paper, *Future directions for Australia's national greenhouse strategy*, released by the Intergovernmental Committee on Ecologically Sustainable Development (ICESD) in March 1997. The ICESD called for comments on the principles and proposed greenhouse response measures contained in the Discussion Paper and on the strategic issues underpinning Australia's response to climate change.

The submission comments on the efficacy of 'no regrets' policies as a greenhouse response option and highlights the significance of economic instruments as a long term policy tool to reduce greenhouse gas emissions.

Current status

Given current uncertainty over the economic and ecological implications of the enhanced greenhouse effect, industrialised countries including Australia have adopted an initial goal of returning their greenhouse gas emissions to 1990 levels by the year 2000.

In the absence of measures aimed at greenhouse gas abatement, Australia's business-as-usual emissions are expected to increase by 82 million tonnes (Mt), or 14 per cent, of carbon dioxide (CO_2) equivalents between 1990 and 2000.

The greenhouse response policies and measures currently being adopted in Australia are premised on the principle of 'no regrets'. 'No regrets' policy options have been defined as measures that have net benefits (or at least no net cost) in addition to addressing the enhanced greenhouse effect. A more intuitive interpretation of 'no regrets' measures could be that they are actions which would still be considered worthwhile even in the absence of concerns about the potential adverse impact of global warming.

The policies most commonly proposed as 'no regrets' options include measures aimed at improving efficiency in energy production, distribution and use with particular attention to the residential, industrial and commercial sectors.

Australia's current greenhouse policy response is embodied in two major strategies: the *National Greenhouse Response Strategy* (NGRS) and *Greenhouse 21C*. Measures contained in these strategies emphasise 'no regrets' abatement action.

The adoption of the NGRS was expected to reduce emissions growth to 38 Mt by the year 2000. The additional measures contained in *Greenhouse 21C* were expected to further reduce year 2000 emissions by approximately 21 Mt of CO_2 equivalent. The 'cooperative agreement' component of *Greenhouse 21C* was estimated to account for 15 Mt of CO_2 equivalent, or about 70 per cent, of the emission savings from *Greenhouse 21C*. The measures contained jointly in *Greenhouse 21C* and NGRS, were estimated to bring Australia's emissions to within 3 per cent of 1990 levels by 2000.

Efficacy of 'no regrets' policies

Despite the prominence given to 'no regrets' policies in addressing greenhouse concerns, the long term greenhouse benefits of such policy measures are less clear. The projected emission reductions may not arise because 'no regrets' opportunities may not be widespread within firms. An analysis of the scope of 'no regrets' opportunities among firms suggests that emissions due to measures contained in the NGRS could only deliver 18 Mt of the expected emission reductions.

Even if such opportunities did exist, any energy efficiency gains may dissipate over time. Because 'no regrets' energy and emission savings tend to be associated with reductions in operating costs and increased profits, firms have an incentive then to increase their production levels, and consequently, the level of emissions.

As economic activity expands in response to efficiency improvements, second-round increases in energy consumption, known as the 'rebound effect' can be expected to occur in some areas of the economy. Recent economy-wide analysis shows that 'rebound effects' can be expected to reduce the emission savings by almost 50 per cent in the short term, and by about 75 per cent within a decade of implementation of the 'no regrets' policy measures. This economy-wide analysis showed that emission reductions in Australian industry due to 'no regrets' energy efficiency gains are likely to be around 6 to 10 Mt at the turn of the century. This is in contrast to the emission savings of around 15 Mt expected by the year 2000 from the 'cooperative agreement' component of the *Greenhouse 21C* package.

Hence it is likely that the current greenhouse response measures and actions based on 'no regrets' policies will be insufficient for Australia to meet the existing international targets implied in the UN Framework Convention on Climate Change, or any strengthened commitments.

While the empirical evidence points out the challenge ahead for achieving a reduction in greenhouse gas emissions espoused in the current national greenhouse response strategy on a ‘no regrets’ basis, it also highlights the longer term challenges associated with mounting an effective greenhouse response.

Significance of economic instruments

There are several groups of instruments which are available to policy-makers to address the greenhouse concerns. An important criterion for choosing among them is the cost-effectiveness with which emission abatement obligations are met. This is an important consideration since Australia relies heavily on the use of fossil fuels in the generation of energy and has a large energy-intensive export industry. A cost-effective policy instrument is desirable because it minimises the loss of welfare to society, and because it enhances the likelihood that Australia will comply in achieving its international greenhouse gas abatement obligations.

The available policy instruments include command-and-control measures and market-based incentives. Command-and-control measures consist of direct measures requiring polluters to either adopt specified technologies or to reach permissible emission levels. Market-based measures include environmental taxes, subsidies and tradable emissions permits. These measures consist of incentives whose effect is to encourage polluters to meet emission abatement obligations at least cost.

Carbon taxes have been suggested as a possible market-based instrument. A carbon tax consists of a levy on a polluting fuel that varies with a fuel’s carbon content. Carbon taxes work by encouraging energy producers to substitute towards other less polluting fuels, or to improve the energy efficiency of the fuel.

Tradable emissions permits are another market-based instrument. They are quotas on the level of greenhouse gases emissions, and are privately-owned and transferable. Polluters wishing to emit greenhouse gases must either possess the required number of permits or undertake the necessary pollution abatement. The number of permits on issue reflects the desired level of greenhouse gas emissions for a given period. Both national and global tradable permit regimes have been suggested for the control of greenhouse gases.

There are some practical reasons for considering a tradable permits scheme over carbon taxes. Tradable permits are potentially more cost-effective than carbon taxes because the emission abatement effort for Australia can be extended to include participants other than the energy producing and consuming sectors. Tradable permits can allow non-polluters to participate in the abatement effort. Carbon taxes need to be revised over time in response to changes in technology, incomes and public attitudes and preferences, and any error in estimating tax rates can have significant economic and environmental ramifications. Finally, given the international pressure in meeting greenhouse gas emission reductions, the transparency of compliance associated with a tradable emissions permits scheme is a desirable attribute. Like command-and-control measures, tradable emissions permits require a regulating authority to monitor and enforce compliance to emission allowances. It also requires the regulating authority to initially distribute permits to potential participants in a permit market.

Establishing a tradable permits scheme

For a tradable emissions permit scheme to deliver the desired emission abatement at least cost, a number of issues need to be carefully addressed.

Tradable emissions permits must have a sufficiently long duration to allow polluters a long time horizon to plan their emission reduction investments.

The permits must also be defined in such a manner that polluters have ample time to meeting their emission reductions. Permits must not be narrowly defined for carbon dioxide, but also include as many global warming gases. This assists in the cost-effectiveness of the scheme.

A greater number of potential participants should be allowed to trade, even if they are not active polluters. Experience has shown that in cases where markets have been narrowly defined, few transactions have taken place and the tradable permits did not reach their potential. Non-polluters may contribute to the scheme’s cost-effectiveness by earning permits through sequestering carbon dioxide with biomass, or by being allowed to purchase permits. Polluters may earn emission credits from undertaking abatement action in other countries.

The initial allocation of permits to potential participants, whether by grandfathering or by auction, can result in significant wealth transfers. Effort must be made to understand how best to initially allocate permits in a manner which does not compromise the scheme’s wider applicability.

The preferred market mechanism is that which minimises transaction costs. This is most likely to involve a single trade centre, where spot, swaps, futures, call and put option exchanges, and banking and borrowing can take place. There must be an appropriate legal and regulatory infrastructure to allow for such a market.

Monitoring, auditing and enforcement must not be compromised when establishing a tradable permit scheme. However, it is not necessary that the regulating authority need to clear every transaction that takes place. Given the sensitivity of the success of tradable permit schemes to transaction costs, over-regulation can reduce a scheme's cost-effectiveness.

Areas for further study

The most important issue is to better understand the marginal costs of greenhouse gas abatement for each emitting sector in the economy. Understanding these costs will allow the designer of an emissions permit scheme to better address the various design parameters to ensure cost-effectiveness, and equity considerations of the scheme.

Another area for further study is to understand the merit of cooperating in a wider global tradable permits scheme. There has been considerable debate over the appropriateness of strengthening the current UN Framework Convention on Climate Change commitments into a global tradable emissions permits scheme. While a global tradable emissions permit scheme may be theoretically appealing, there may be significant environmental, economic and trade implications. Understanding the implication of cooperating in a wider global tradable emissions scheme will no doubt have numerous implications for the implementation of a domestic tradable permit scheme.

The Commission is currently undertaking research on some of the issues raised above.

1 INTRODUCTION

The Intergovernmental Committee on Ecologically Sustainable Development (ICESD), which comprises representatives of Commonwealth, State and Territory governments and the Australian Local Government Association, is currently in the process of preparing a new National Greenhouse Strategy. As a part of this process, in March 1997, the ICESD released a Discussion Paper, *Future directions for Australia's national greenhouse strategy*, explaining the goals and principles that are likely to underpin the new National Greenhouse Strategy. The Discussion Paper also presents a series of sectoral modules each containing specific proposals for further action as part of Australia's response to climate change. The ICESD indicated that it was keen to receive comments on the principles and proposed measures contained in the Discussion Paper and on the strategic issues underpinning Australia's response to climate change.

According to the ICESD's Discussion Paper, one of the guiding principles for the new National Greenhouse Strategy would involve the development and implementation of measures that can be characterised as 'no regrets' actions (ICESD 1997, p. 7). 'No regrets' policies have been defined as policies that have '... net benefits (or at least no net cost) in addition to addressing the enhanced greenhouse effect' (CoA 1992, p. 12). A more intuitive interpretation of 'no regrets' measures could be that they are actions which would still be considered worthwhile even in the absence of concerns about the potential adverse impact of global warming. At a national level, various infrastructure, tax and regulatory reforms have been suggested as contributing to potential 'no regrets' outcomes (CoA 1992, BCA 1995) although, the long term greenhouse benefits of such measures are less clear (IC 1991a, BIE 1996).

In explaining the options for further actions to achieve emission reductions, the Discussion Paper has highlighted the importance of a number of policy tools, including economic instruments. The use of economic instruments has been promoted widely both nationally and internationally as having the potential to achieve environmental goals at a reduced cost (ICESD 1997, p. 12).

This submission has two major aims: first, to comment on the ability of 'no regrets' policies to be an effective greenhouse response strategy and second, to discuss the importance of the use of economic instruments as a long term strategy to reduce greenhouse gas emissions.

1.1 Why is the Commission making a submission?

As the key independent advisory and research body on industry policy to Australian governments, the Commission has a vital interest in improving the productivity performance of the Australian industry in particular, and the overall welfare of Australians. Productivity performance (and hence economic performance) and environmental protection are interdependent. There are several dimensions to the interdependency. Measures to protect the environment (for example, through pollution control) raise some costs and may have an adverse impact on productivity in the short term. Failure to protect the environment, on the other hand, may raise other costs in the long term. Policy instruments addressing environmental problems that succeed at minimising costs will have the least adverse effect on productivity. These considerations suggest that protecting the environment can make good economic sense. Furthermore, greater emphasis on productivity, in terms of delivering environmental objectives more efficiently and using resources more efficiently, can be good for both the economy and the environment (IC 1990).

Balancing economic and environmental objectives presents a number of challenges for policy formulation. A feature of a number of Commission inquiries has been the need to respond to the community’s joint concerns about environmental issues and continued economic prosperity.

1.2 Approach taken in this submission

This submission is premised on the view that greater use of economic instruments to reduce greenhouse gas emissions into the atmosphere is perhaps the best long term strategy for ensuring consistency between economic and greenhouse objectives. In its greenhouse gas inquiry, the Commission highlighted the advantages of using economic instruments such as tradable permits as a more efficient means of meeting greenhouse gas targets than straight regulatory approaches (IC 1991a).

Community attitudes and preferences ultimately shape choice about environmental protection. It is vital that these choices be well informed – about both the environmental and economic consequences. This requires information, and complete information is rarely available. The potential for climate change as a result of greenhouse gas emissions is a prime example of an issue that requires decision making in the midst of considerable uncertainty. However, because the potential consequences could be large, deferring decisions until comprehensive information is available is not a sensible option (PC 1996).

Decision making processes about environmental issues in Australia are highly political. Powerful interest groups, which strongly advocate their own points of view, put considerable pressures on governments to take decisions that do not necessarily serve the long-term community interest. Publicly available information and scrutiny help to inform and educate the community generally and that in turn helps governments to take policy decisions that are in the best interests of the public (IC 1991b).

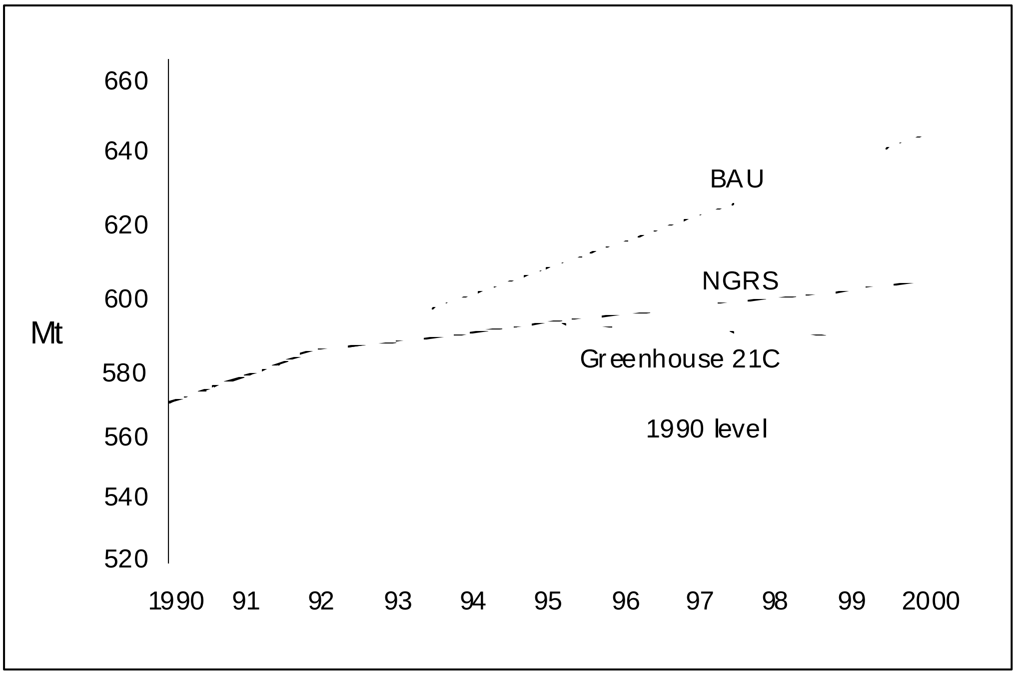
Before discussing the issues related to why key components of ‘no regrets’ policies may not be adequate for Australia to meet its international greenhouse gas reduction obligations and why economic instruments are preferable, section 2 provides some scene setting information on Australia’s current domestic greenhouse response strategy.

2 SNAPSHOT OF DOMESTIC GREENHOUSE RESPONSE

As signatories to *Annex I* of the United Nations Framework Convention on Climate Change (FCCC), Australia and other industrialised countries have agreed to implement measures aimed at reducing emissions of greenhouse gases into the atmosphere. Given current uncertainty over the economic and ecological implications of the enhanced greenhouse effect, industrialised countries have adopted an initial goal of returning their emissions to 1990 levels by the year 2000.

Recent climate change negotiations have concluded that challenges facing *Annex I* Parties in meeting the aim of returning their greenhouse gas emissions to 1990 levels by 2000, and efforts being made to address these challenges will be relevant for future negotiations on commitments for the post-2000 period. This reflects the need to address national circumstances in the setting of post-2000 commitments.

Figure 2.1 Impact of *NGRS* and *Greenhouse 21C* on Australia's GHG emissions



Source: Based on CoA (1994) and (1995).

In the absence of policies and measures directly aimed at greenhouse gas (GHG) abatement, Australia's business-as-usual (BAU) emissions were expected to increase by 82 million tonnes (Mt), or 14 per cent of total carbon dioxide (CO_2) equivalent emissions, between 1990 and 2000 (figure 2.1) (CoA 1994).

Australia's greenhouse policy response is embodied in two major strategies: the *National Greenhouse Response Strategy* (NGRS) and *Greenhouse 21C*. Measures contained in these strategies emphasise 'no regrets' GHG abatement action.

2.1 The 1992 National Greenhouse Response Strategy

The NGRS was endorsed by the Council of Australian Governments in December 1992 (CoA 1992). The NGRS is underpinned by a set of general principles on which sectoral objectives are based. The first phase of the NGRS focuses on 'no regrets' abatement action aimed at improving efficiency in energy production, distribution, and use with particular attention to the residential, industrial and commercial sectors. Specific measures include introducing energy performance standards for household appliances, developing a national 'Household Energy Rating Scheme' and implementing energy labelling and energy standards for non-residential buildings and industrial equipment.

The greenhouse response measures contained in the NGRS were estimated to reduce emissions growth to 38 Mt, or 7 per cent above BAU levels by 2000 (figure 2.1) (CoA 1994). However, the potential reduction in emissions from the first phase measures contained in the NGRS was only around 18 Mt of that required to meet the 1990 stabilisation target by 2000 (Bush et al. 1993 and Thorpe et al. 1994).

2.2 Greenhouse 21C

Against the backdrop of widespread community debate on appropriate policies to further reduce Australia's GHG emissions, the Commonwealth Government announced in March 1995 additional greenhouse response measures in its *Greenhouse 21C* package (table 2.1) (CoA 1995). An integral component of Greenhouse 21C is the 'partnerships' approach to promoting best environmental practice by government, industry and the broader community. The centrepiece of this 'partnerships' approach is a program of cooperative agreements between industry and government to reduce GHG emissions.

According to *Greenhouse 21C*, cooperative agreements are expected to yield GHG emission reductions in the order of 15 Mt of CO_2 equivalent by the year 2000. This represents about 70 per cent of the emission savings expected to flow from the *Greenhouse 21C* package. Other *Greenhouse 21C* measures, including the expansion of the 'One Billion Trees Program' and gas market reforms, are estimated to further reduce emissions by around 6 Mt. These measures, in addition to initiatives under the NGRS, were estimated to bring Australia's emissions to within 3 per cent of 1990 levels by 2000 (table 2.1).

Table 2.1 Policy measures and estimated greenhouse gas emission savings from *Greenhouse 21C*

	Estimated emission savings by 2000 (Mt CO2 equivalent)
Partnership 21C	
(Initiatives based on partnerships between governments and all sectors of the community)	
Cooperative agreements	15.0
Energy 21C	
(Initiatives aimed at improving energy efficiency and the greater use of new energy sources)	
Gas market reform	2.0
Car fuel efficiency labelling and advertising	0.45
Urban 21C	
(Initiatives aimed at reducing emissions from urban activity)	
Transport impact statement	0.1
Capturing methane from sewerage and industrial processes	0.4
Biosphere 21C	
(Initiatives aimed at reducing emissions from agriculture and better land management)	
One Billion Trees	2.0
Labour market programs for expanded tree planting	1.0
Reducing methane emissions from livestock waste	0.2
Global 21C	
(Initiatives aimed at enhancing Australia's participation in a global greenhouse response)	na
Total	**21.15**

na Estimates of savings from Global 21C initiatives are not included in Greenhouse 21C and, in any case, would not necessarily accrue to Australia only.
Source: CoA (1995).

In assessing Australia's performance in relation to the existing international greenhouse target, the ICESD (1997, p. 4) has indicated that current actions will be insufficient for Australia to meet the target implied in the FCCC, or any strengthened commitments.

3 WHAT CAN BE ACHIEV ED USING ‘NO REGRETS’ MEASURES

The current greenhouse response strategy is mainly based on ‘no regrets’ actions. The ICESD (1997) has indicated that the measures in the new National Greenhouse Strategy will also be premised on the principle of ‘no regrets’.

This section looks briefly at one of the key components of the ‘no regrets’ policy action of the current greenhouse response strategy, namely the cooperative agreements between industry and government to reduce greenhouse gas emissions, and discusses the potential effectiveness of these agreements in achieving ‘no regrets’ greenhouse outcomes.

3.1 Role of cooperative agreements

The policies most commonly proposed as ‘no regrets’ options include measures aimed at improving energy efficiency. In this regard, the Commonwealth government’s *Greenhouse 21C* package and in particular, the ‘cooperative agreement’ component of it, is expected to play a critical role (see table 2.1). Cooperative agreements are the culmination of intensive discussion between government and industry on the feasibility of a cooperative greenhouse response.

In describing the development of the cooperative agreements initiative, *Greenhouse 21C* notes that ‘... industry has identified a willingness and ability to achieve significant greenhouse reductions on a cooperative basis without the need for further regulatory or fiscal measures’. Further, it identifies the objective of these agreements as seeking ‘... to ensure these industries and firms seek continuous improvements in energy efficiency and maximum practicable greenhouse performance ...’ leading to ‘... reduced greenhouse emissions and cost savings for industry ...’ (CoA 1995, p. 7).

The idea that ‘no regrets’ opportunities are available within firms, and can be targeted by government, is contentious. The performance, management and culture of firms vary widely, and they must operate in an environment of continuous change and uncertainty. Under these circumstances business performance will be spread across a continuum, with some firms having no scope for ‘no regrets’ savings, some other firms having considerable scope, and many firms with opportunities somewhere in between. If it is possible for firms to improve their performance by streamlining existing production activities, there may be opportunities for firms to improve their competitiveness while cutting their greenhouse gas emissions (BIE 1996).

This issue was raised in a recent paper by the policy working group of the Intergovernmental Panel on Climate Change (IPCC). In their summary report the IPCC (1996) estimated that energy efficiency gains of around 10 to 30 per cent could be achieved over the next two to three decades in a cost-effective manner. But the actual magnitude of these gains and the appropriate role of government would depend on what and how wide-spread the factors are that prevent firms from undertaking cost-effective emission reductions in the ordinary course of business.

3.2 Impact of ‘no regrets’ energy efficiency gains

Based on energy audit data from over 700 Australian firms, the BIE (1996) has recently examined the potential ‘no regrets’ energy efficiency gains available to various industries and their contribution to greenhouse gas emission abatements.

According to BIE (1996) analysis, while evidence points to large energy efficiency gains being available within some firms, in general, opportunities for reducing energy consumption consistent with cutting unit costs are modest. Data on electrical energy efficiency opportunities in the mining and manufacturing industries point to ‘no regrets’ measures that would reduce overall electricity consumption by about 4 per cent. This also implies a saving of about 2.6 Mt of greenhouse gas emissions on current levels. If sectoral energy efficiency gains of a similar magnitude can be achieved across all fuels used within the industrial sector, and assuming modest efficiency gains in the energy intensive electricity supply and commercial transport sectors, the BIE (1996) estimates that annual emission savings equivalent to between 5.7 Mt and 9.8 Mt of CO_2 could be achieved on 1994–95 emission levels.

Based on year 2000 projections of fuel mix, energy consumption and business-as-usual technological improvements in the electricity supply industry, the estimated pattern of sectoral energy efficiency gains by the BIE (1996) suggests that savings in energy-related greenhouse gas emissions of between 6.0 and 10.6 Mt are available at the turn of the century through the implementation of relatively straight-forward ‘no regrets’ measures in the business sector.

Although the BIE (1996) analysis of the potential impact of ‘no regrets’ energy efficiency gains in Australian industry can only be considered as a guide to what may be available in reality, it points to a potentially large gap between the greenhouse gas emission savings that can be achieved by Australian business through implementation of relatively straightforward and commercially attractive measures and the 15 Mt targeted for business when the cooperative agreements program was first announced.

3.3 The expansionary impact of energy efficiency gains

By definition, ‘no regrets’ energy efficiency measures – particularly those that are commercially attractive and likely to be adopted on a voluntary basis – can reduce costs in the economy. In turn, it is commonly assumed that energy efficiency improvements lead to less energy use which results in lower greenhouse gas emission levels. However, ‘no regrets’ energy efficiency improvements may not always deliver long term savings in energy consumption and greenhouse gas emissions. Because ‘no regrets’ energy efficiency improvements generate net economic benefits (or at least no net cost), they can have expansionary impacts on the economy (see box 3.1). The potential for improvements in energy efficiency to lead to partially (or wholly) offsetting increase in output and energy consumption over time is generally described as the ‘rebound effect’ (Schwarz and Taylor 1995). To the extent that energy efficiency improvements contribute to a more efficient economy, growth and increased incomes can be expected.

The initial reduction in energy use (and corresponding greenhouse gas emissions) from improvements in energy efficiency within, for example a firm, may induce a partially or wholly offsetting rise in energy consumption (and greenhouse gas emissions) over the longer term because of output growth that would not otherwise have occurred. In an economy-wide framework, the changes in energy consumption, profits and output that occur within the more energy efficient firm will have flow-on effects to its competitors, suppliers and customers.

Box 3.1 The ‘rebound effect’

The extent to which the ‘rebound effect’ is likely to undermine energy savings associated with efficiency improvements is a matter of some debate. Brookes (1990) and Grubb (1990) noted that, in the (unusual) case where energy supply or price is a constraint on economic activity (for example, during the oil price shocks of the 1970s), energy efficiency improvements will tend not to reduce total energy use. However, Brookes (1990, 1992) argued that if energy supply is not a constraint on economic activity, energy efficiency improvements will lead to increased energy consumption.

Brookes (1990) also noted that increased labour and capital productivity have historically led to new uses for energy, thereby offsetting any energy efficiency improvements and leading to an increase in total energy use.

However Grubb (1990, 1992) argued that historical economic observations are generally not relevant to future economic growth, as evidenced by recent changes in the pattern of economic development towards less energy intensive goods, rising real energy prices and saturation in some end-uses of energy (for example, the residential sector). Grubb made a distinction between ‘natural’ and specific policy-driven energy efficiency improvements, and also noted that historical observations of improved energy efficiency and rising energy demand did not imply causality.

Increased energy consumption was likely to be associated with factors such as the push for new markets and automation, which allowed energy and capital to be more readily substituted for labour. Consequently, energy efficiency improvements that occur ‘naturally’ tend to focus on activities where output levels are highly responsive to energy cost reductions, thereby resulting in high ‘rebounds’ in energy consumption. But Grubb (1990) argued that if energy efficiency is a deliberate goal, rather than a means to other economic objectives, there will be a net energy saving. In the ‘no regrets’ context this could be construed as targeting energy savings that leave the cost structures of the firms unaffected, rather than cost savings and hence provide the opportunity to expand activity levels.

The Brookes–Grubb debate focuses on the impact of technical progress and specific policy-driven measures on energy efficiency and total energy consumption. However, there are other factors determining energy use and greenhouse gas emissions in the economy. These have the potential to at least partially offset any energy and greenhouse gas emissions savings achieved through higher energy efficiency. BIE (1995) identified the various demand and supply side factors underlying energy consumption and greenhouse gas emissions in the Australian economy. In addition to energy efficiency, demand side factors include income per person, population growth and carbon intensity (that is, the carbon content of energy consumed). Supply side factors include Australia’s abundant supply of fossil fuels, which has provided a significant cost advantage in the production, use and export of energy and emissions intensive goods.

Economy-wide analysis of the energy and greenhouse gas emission rebound effects arising from energy efficiency improvements in Australian industry is sparse. Recent BIE (1996) analysis using the ORANI–E general equilibrium model of the Australian economy indicates that the estimated ‘no regrets’ energy efficiency improvements in Australian industry will benefit national output and income, and will assist in reducing CO_2 emissions. Improvements in energy efficiency reduce production costs, thereby lowering the price of goods and services and increasing income (profits and wages). In turn, output is expected to rise as a result of increased demand within the economy. This has significant implications for the achievement of greenhouse emission reduction targets. ‘No regrets’ energy efficiency measures, estimated to generate about 7.5 Mt of greenhouse gas emission savings in the year 2000 (based on the energy audit data analysis by the BIE (1996)), are likely to deliver only between 1.8 Mt and 4 Mt of emission savings when economy wide effects are taken into account. This represents a reduction in initial greenhouse emission savings by about 50 per cent in the short-term, and by around 75 per cent within a decade of implementing the ‘no regrets’ policy measures. If a year 2000 greenhouse reduction target of 15 Mt is to be achieved, firms must aim at first-round savings that significantly exceed this amount (BIE 1996). The BIE (1996) analysis highlights the importance of taking ‘rebound effects’ into account in developing plans for greenhouse gas abatement that rely on ‘no regrets’ measures alone.

Of course, there are likely to be ‘no regrets’ greenhouse initiatives that have not been captured by the BIE (1996) study which can bolster net emission savings. Such initiatives might include major energy generation projects involving waste energy sources such as coal seam methane or other elaborate re-engineering opportunities within industry. However, the broad message from the BIE (1996) analysis is that when improving energy efficiency is profitable, over time increased production and consumption will lead to an erosion of the initial energy and emission savings.

While the empirical evidence provided above points out the challenge ahead for achieving a reduction in greenhouse gas emissions espoused in the current National Greenhouse Response Strategy on a ‘no regrets’ basis, it also highlights the longer term challenges associated with mounting an effective greenhouse response. While there is scope for more efficient (and profitable) utilisation of current energy technologies, the greenhouse savings that are generated are likely to be gradually eroded through rising energy consumption associated with economic growth. This points to the need for additional means of satisfying economic needs at a lower environmental cost. How best to achieve these objectives is the focus of the next section.

4 ROLE OF ECONOMIC IN STRUMENTS

Cost-effectiveness in international greenhouse gas abatement is a basic principle of the UN Framework Convention on Climate Change. This principle is particularly important in the Australian context. Australia relies heavily on the use of fossil fuels in the generation of energy and has a large energy-intensive export industry. A cost-effective policy instrument is desirable because it minimises the loss of welfare to society, and because it enhances the likelihood that industries, governments and communities will comply in achieving the desired greenhouse gas abatement target.

Two groups of policy instruments that can be used towards meeting Australia's greenhouse gas emission commitments include *command-and-control* measures (which involve regulating or directly controlling emissions by either specifying the permissible emission levels that each source must meet, or the necessary production process or equipment to be used), and *market–based incentives* (which impact on the cost of production and/or output prices) (IPCC 1996, p. 403). Market-based incentives include environmental taxes (which can be imposed either on the polluting feed-stock or on the rate of emissions), subsidies (which are conferred to encourage the development or adoption of cleaner production processes or technologies), and tradable emission permits (IC 1991a).

The choice of which instrument to adopt can be made against a number of criteria (see box 4.1). The advantage of command-and-control instruments is that they are dependable because such measures often compel polluters to meet their obligation requirements. Their disadvantage is that they are not cost-effective and rarely equitable. Regulations that require every polluter to meet minimum level of emission abatement or technological standard provide the polluter with little flexibility, incentive or opportunity to develop alternative more cost-effective methods of meeting emission abatement obligations. Command-and-control methods rarely accommodate for the differing abilities of polluters to meet emission reduction goals.

Market-based incentives, such as environmental taxes, subsidies and tradable emission permits for greenhouse gases are generally more cost-effective than command-and-control measures because the burden of reducing emissions is shared across those polluters who are able to reduce emissions at the least cost (see box 4.2). Market-based measures also provide polluters with an incentive to develop new methods of meeting their obligations over time. For this reason alone they are generally regarded as preferable to command-and-control measures.

> **Box 4.1 Criteria for choice of policy instruments**
>
> Decisions about which policy instruments to adopt to reduce greenhouse gas emissions can be made against a number of criteria. These include:
>
> **Dependability.** This concerns the degree to which the instrument meets the target standard, both in the short and long run.
>
> **Efficiency.** An efficient instrument is one that achieves its aim at the lowest possible resource cost.
>
> **Information requirements.** Instruments differ in the amount of information available to a regulatory agency that is required for their effective use.
>
> **Ease of monitoring and enforcement.** Monitoring is needed to judge compliance, and in some cases to assess payments. Enforcement problems arise if non-compliance is detected. Monitoring and enforcement is not costless and requires appropriate information.
>
> **Flexibility.** The instrument should be capable of achieving its goal in changing economic circumstances. Some instruments may need frequent modification as circumstances change.
>
> **Equity.** The costs generated by the instrument should be distributed equitably.
>
> **Continuing incentive.** An instrument might be preferred if it is not only dependable but provides an incentive to reduce emissions further.

Because various market-based measures employ different incentives, their dependability is greatly influenced by the ability of the regulator to accurately assess how polluters will respond to those incentives and the administrative framework necessary to operate such schemes. The choice between the various market-based instruments also depends on a variety of other considerations (see IC 1991a for a detailed discussion).

4.1 The choice of economic instrument

The case for environmental taxes and subsidies

There are a number of environmental taxes. This paper examines carbon taxes and end-of-pipe emission taxes. Carbon taxes are an example of a price-based economic incentive. In its most commonly understood form, a carbon tax consists of a levy on polluting fuels (such as coal, oil and gas), which varies with the carbon content of the fuel. A carbon tax may be imposed either at the production of the fuel or at its consumption. Because carbon taxes are a price-based instrument, they are intended to encourage producers to substitute towards other less polluting alternatives, or to improve the energy efficiency of the fuel. Polluters face the decision of how much effort to undertake in abating their emissions. Polluters who find it relatively costly to switch fuels may choose to continue the use of the same feed-stock, while those who are readily able to switch energy-sources will reduce their carbon consumption. Another advantage of a carbon tax is that it requires relatively less complex administrative arrangements, since it can be easily implemented through existing taxation systems (BIE 1992, IC 1991a, IPCC 1996).

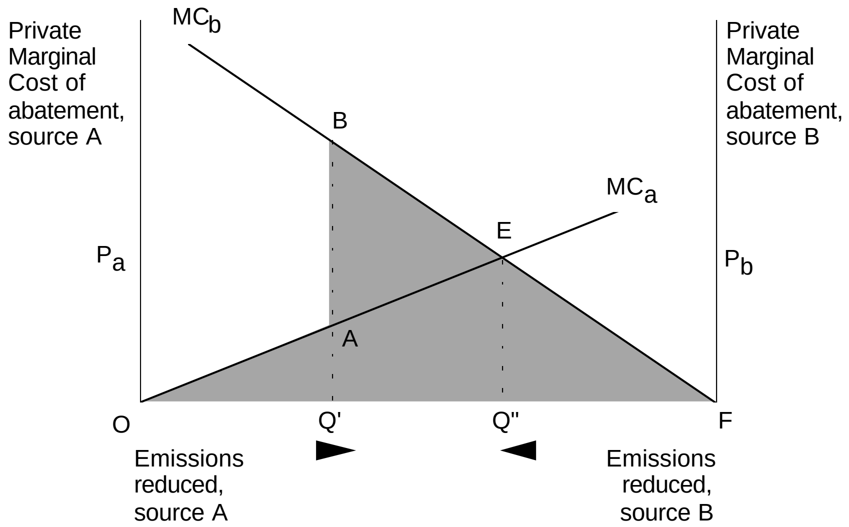
There are however, several disadvantages to using a carbon tax. First, because a levy is imposed on the carbon content of fuels, a polluter will not have an incentive to reduce greenhouse gas emissions by adopting technologies such as carbon dioxide ‘scrubbers’ in smoke stacks or to sequester carbon dioxide emissions, because these measures will not help reduce the polluter’s taxation burden (IPCC 1996, pp. 407, 416). Thus while carbon taxes are more cost-effective than command-and-control measures, they are not the most cost-effective instrument.

Second, carbon taxes may not be equitable. The economic burden of a carbon tax will be mostly absorbed by the energy producing or consuming industries, even though these sectors only account for one-half of Australia’s greenhouse gas emissions (IPCC 1996, p. 419; DEST 1996; See also table 5.1). Activities such as land clearing and agriculture which also have significant emission consequences will in effect be subsidised by not contributing to the greenhouse gas emission effort. This taxation burden is in addition to the often large excise taxes levied on fossil fuels (UNCTAD 1994, p. 14). For this reason, several studies have examined the impact of carbon taxes on particular sectors in the Australian economy and found that the economic impact was concentrated in the coal and oil producing industries, the electricity-generating industry and in exporters of energy-intensive products (IC 1991a, CIE 1994, Thorpe et al. 1994).

One alternative to the carbon tax is an end-of-pipe emissions tax. Under this scheme, a tax is payable after measurements of actual greenhouse gas emissions have been taken. The advantage of this method is that it broadens the scope of greenhouse gas abatement to other sectors not otherwise covered by a carbon tax. It is more dependable than a carbon tax since the incentive to reduce greenhouse gas emissions is directly linked to actual emissions (IPCC 1996, p. 416, BIE 1992, p. 17). This implies that the scheme is more cost-effective than a carbon tax because a polluter enjoys greater flexibility in meeting emission commitments. The scheme’s disadvantage is that it requires careful monitoring of greenhouse gas emissions, which would be administratively more difficult than under a carbon tax imposed on a polluting fuel.

Box 4.2 Cost-effectiveness of economic instruments

Consider a hypothetical example in which coal-fired electricity plants A and B are the main sources of greenhouse gas emissions. The lines MCa and MCb represent plant A's and B's *marginal costs of abatement* respectively. These represent the extra cost incurred from increasing the plant's compliance to abate greenhouse gas emissions. In the absence of any requirements to abate, plants A and B would operate at O and F respectively.



Consider an example in which plants A and B were obliged to reduce their emissions by an equal proportion, and that this proportion required them to reduce emissions by OQ' (plant A) and FQ' (plant B). This is an example of command-and-control regulation. The joint reduction in emissions is OF. In the absence of fixed costs, the areas under each curve represent the total cost of abatement. The cost to firm A from the reduction will be the amount shown by the area OAQ'. The cost to firm B will be the amount shown by the area FBQ'. The cost to the two firms is the sum of the two areas, OABF.

Consider an alternative example, in which the government issued tradable permits such that the distance OF represented the amount of emissions that would need to be reduced. In the permit control system, the total costs to society amount to the area OEF. The amount ABE is the cost-saving from adopting a tradable permit scheme rather than using a command-and-control approach. Under tradable permits, the low cost plant (A) reduces emissions by amount OQ" (Q'Q" more than it did under command-and-control), and high cost plant (B) reduces emissions by amount FQ". Plant A has lower marginal compliance costs than plant B, so it is sensible that it bears a greater part of the emission reduction burden than would have been the case had both firms been required to abate by equal proportions.

Environmental taxes and tradable permits are conceptually equivalent and yield the same cost-effective results. In the above example, a reduction in emissions by amount OF implies that the price for permits is equal to P_a (=P_b). Under a regime of environmental taxes, a universal tax rate set at P_a for each unit of emission will force plants A and B to reduce their emissions by OQ" and FQ" respectively, which is equivalent to jointly reducing emissions by amount OF.

A second alternative is to introduce a subsidy per unit of emissions reduction (Cropper and Oates 1992, p. 681). A subsidy could establish the same incentive for abatement activity as a tax of the same magnitude per unit of greenhouse gas emission. However, environmental subsidies and taxes have different implications for the profitability of polluters — subsidies increase profits while taxes decrease them. They therefore have quite different long-run implications for the structure of industry. The use of subsidies could attract investment in industries and entry of new polluters. This may partially or wholly offset the initial reduction of emissions. Subsidies can also potentially impact on government outlays. For these reasons, subsidies have rarely been regarded as a viable strategy to abate emissions (Cropper and Oates 1992, p. 681).

The case for tradable permits

Tradable permits are private and transferable property rights. Possession of an emission permit allows an individual to emit up to a prescribed amount of greenhouse gas emissions. Essentially, they act as pollution quotas. They are an example of a quantity-based economic incentive.

The number of permits that are issued by the government to individual polluters reflects the desired level of greenhouse gases (measured in terms of their CO_2 global warming potential equivalents) that can be emitted by the economy over a given period. Because only a limited number of permits are on issue, and usually well within the current level of greenhouse gas emissions, the permits attract a value. To meet the necessary emission compliance, polluters must either purchase existing permits from other polluters, or reduce their emissions.

Polluters that are able to reduce their greenhouse gas emissions at a relatively low cost will tend to do so (by adopting new emission abatement technologies, changing feedstock or investing in new and cleaner production technologies), and sell any excess emission permits. Polluters that have relatively high greenhouse gas emission abatement costs will instead purchase tradable permits in order to meet their emission requirements.

Like environmental taxes and subsidies, tradable greenhouse gas permits allow a community to attain its greenhouse gas abatement target at a lower cost than command-and-control measures (box 4.2). Environmental taxes seek to directly place a cost on the pollutant and thereby indirectly reduce the output of emissions, and tradable permits act to directly limit the output of emissions and thereby indirectly influence the cost of pollution (BIE 1992).

Which economic instrument?

The choice of economic instrument will depend upon the nature of the environmental problem. In the case of greenhouse gas emissions, there are some practical reasons for considering a tradable permits scheme over carbon taxes. First, while carbon taxes are administratively simpler than tradable permits, particularly given that tradable permits require the establishment of trading rules and regulations, carbon taxes are levied only on a portion of total greenhouse gas emission sources. As mentioned above, it is inequitable and inefficient to require a few sectors to undertake the majority of greenhouse gas abatement (IPCC 1996, p. 407). Tradable permits can allow non-polluters to participate in the abatement effort.

Second, abatement elasticities, defined as the responsiveness of reductions in emissions to increases in taxes, can rarely be estimated accurately, given that technology, incomes and preferences change over time (BIE 1992, p. 15). If environmental damage from greenhouse gas emissions is more sensitive to changes in the emissions than are abatement costs to emissions, then an error in setting the environmental tax rate could lead to a net cost to society. In the face of uncertainty about firms' abatement costs and sensitivity of environmental damage, tradable permits are a more dependable instrument than environmental taxes (Thorpe et al. 1994 p. 5, Cropper and Oates 1992, p. 682).

Third, given the international pressure in meeting greenhouse gas emission reductions, the transparency of compliance associated with a tradable emission permit scheme is a desirable attribute.

However, as explained in section 4.2, which outlines the main steps in establishing a tradable permits scheme, the scheme may have some disadvantages. One is that, while the initial allocation of greenhouse gas permits does not affect the scheme's ability to achieve given environmental standards at the least possible cost, the method of allocating the initial stock of permits will have significant welfare impact upon the participants. A participant who receives more permits than they actually require can sell them, while others will be required to purchase permits. The welfare consequence of a permit regime depends in large part on whether the initial stock and any new permit issue is 'grandfathered' or auctioned.

Grandfathering entails allocating emission permits to polluters on the basis of their past emission levels and patterns. It has proved to be the most common method of allocating tradable permits for a number of schemes (see box 4.3). Because it implies that emission permits initially enter the market free of charge to the existing industry participants, subsequent trade in permits can result in windfall gains and losses for participants because permit allocation is not linked to abatement costs or opportunities. Such welfare consequences can place significant pressure on the viability of a tradable permit scheme, particularly at the international level where initial allocations need to be reached by consensus between countries. However, experience has shown that distributional issues can be overcome for national tradable permit schemes (box 4.3).

Box 4.3 Some overseas and Australian examples of tradable permit schemes

The first comprehensive application of tradable permits was the US Federal Environmental Protection Agency's (EPA) Emissions Trading Program (ETP). The ETP evolved over a number of years from 1975 as a result of the failure of the Clean Air Act amendments of 1970 to achieve emission reduction for a variety of air pollutants. The high costs imposed upon polluters by the 1970 amendments discouraged compliance and in some instances encouraged legal action against the US Federal EPA (BIE 1992, p. 50). In a bid to improve compliance, the Federal EPA introduced a number of market-based mechanisms that later paved the way for the Clean Air Act amendments of 1990.

The US Clean Air Act amendments of 1990 allowed the US Federal EPA to operate the well-known sulphur dioxide tradable permit scheme. Sulphur dioxide is emitted by coal-fired electricity plants and deposited as acid rain. Permits were initially issued free of charge to utilities that were emitting between 1985 and 1987 and were still operating. In the first phase of the scheme, sulphur dioxide emissions were reduced by 5 million tons, and a further 5 million tons are scheduled to be reduced by the year 2000. A permanent cap of 8.9 million tons of sulphur dioxide emissions will apply thereafter. The scheme was confined to power authorities.

The US lead trading program, which operated between 1982 and 1987, allowed petroleum refineries to add lead in petrol. Over the scheme's life the total level of permissible lead available for petrol was tightened. Refiners were entitled to trade lead rights of an amount equal to the difference between the actual quantity used and permitted quantity of lead. Reductions in lead levels were achieved by gradual tightening of permissible levels. It is regarded by Hahn and Hester (1989) as the most successful tradable permit regime to date, generating substantial cost savings and active trades in permits. The EPA estimated that the banking component of the scheme alone generated savings to $US226 million.

As part of Australia's commitment to the Montreal Protocol on Ozone Depleting Substances, Australia is currently operating a tradable permits scheme through the *Ozone Protection Act 1989*. Initially thirteen licences (with a life of 10 years) were issued to firms that used chlorofluorocarbons (CFCs) in the manufacture or import of their goods. Quotas limiting the use of CFCs were then grandfathered to licensees. The Minister responsible for the scheme has the discretion to reduce the number of quotas every year to comply with protocol. Quotas can be traded between licensees. The market for quotas was active in the first year, and only a few transactions took place thereafter. Tradable permit schemes for ozone depleting substances are also used in New Zealand, the United States and Singapore.

Source: Hahn and Hester (1989), BIE (1992), IC (1991a) and Mullins and Baron (1996).

4.2 Key considerations in establishing a tradable permit scheme

In examining the experiences of existing tradable permit schemes and the problem of global climate change, the following provides an overview of some of the key issues that will arise when establishing a tradable permit scheme, whether domestically or globally based, to reduce greenhouse gas emissions.

Defining the product and the market

The first step in implementing a tradable permit scheme is to define the nature of the tradable permit. Two features are: the life-span of the permit; and the permissible rate of emissions over a given period. Permits often have a pre-determined life-span and when that period expires, all permits become void and new permits are issued. The purpose of limiting the life-span of permits is to give the regulating authority control over the overall number of permits on issue. Thus, permits that have a life-expectancy of one year would allow the authority to adjust the level of permits annually. One disadvantage of using very short-lived permits is that they do not provide a climate conducive for long-term investment planning. There is a case for longer-lived permits where the regulating authority can buy back existing permits and not reissue them.

Permits must also be defined in terms of the rate of emissions over a given period, and in terms of the greenhouse gases they cover. The rate of emissions allowed in a permit depends in part on the degree of flexibility that the regulating authority wishes to provide the market participants, and the frequency with which the authority wants to revise the stock of permits. For example, a rate of 10,000 tonnes of emissions over ten years provides greater flexibility to the participant than does 1,000 tonnes over one year, even though the average annual rate of emissions is the same. However, the regulating authority has greater scope for controlling the rate of emissions in the second case.

The full range of global warming gases should be covered, as in principle, the scheme's cost-effectiveness improves with the extent of potential trade. Thus permits must be defined in terms of some global warming potential. A suitable numeraire may be CO_2 equivalent.

In defining the market, the widest number of participants (market players) should be allowed to trade. Experience from the United States has shown that in cases where markets have been narrowly defined, few transactions have taken place, and the commensurate gains have been less than their potential (ABARE and DFAT 1995, 126; BIE 1992). This implies that as many polluters as possible should be included in a tradable permit scheme, and not limited in scope as would be in the case of a carbon tax. Thus where possible, methane emissions from landfills, carbon release from vegetation clearing and motor vehicle emissions should be addressed, whether directly or indirectly. Experience from the United States shows that it is possible to account for such polluters in a tradable permit system (BIE 1992, pp. 26–7).

Initial allocation of permits

The next step in implementing a tradable permit scheme is to allocate the initial stock of permits. As mentioned earlier, the creation and distribution of emission permits can transfer wealth between the market's participants. This step will no doubt involve considerable negotiation between the regulator and the prospective participants over the nature of the distribution, whether grandfathering or auctioning. It will prove to be the most difficult stage in implementing a tradable permit scheme. For a global tradable emissions permit scheme, consensus will need to be reached amongst participating countries on the exact distribution of permits. Given the likely effects of transfers of wealth between countries due to the initial allocation of permits and the subsequent trading, its implementation will be quite complex (McKibbin and Wilcoxen 1997).

Market mechanism

The ability of tradable permit systems to deliver cost-effective emission abatement is sensitive to transaction costs (BIE 1992, p. 33). The most appropriate market mechanism for tradable permits is that which minimises transaction costs. The market mechanism most likely to minimise transaction costs would probably involve a single trade centre, where a full range of products could be traded. Such a market could potentially engage in spot, swaps, futures and even call and put option exchanges (Mullins and Baron

1996, p. 13). To allow for such a market, there must be an appropriate legal and regulatory infrastructure typical of such markets.

One option often raised with tradable permits is the role of *banking* and *borrowing*. There may be scope to provide even greater flexibility in meeting emission commitments by allowing the participants to 'bank' surplus permits in return for a higher emission allowance in a later period, and others to 'borrow' permits during a deficit in exchange for a lower emission allowance at a later period (BIE 1992).

An important feature of tradable permits is the issue of market power. Given that possession of tradable permits will become a necessary component for the functioning of some industries, some firms may see an opportunity to obtain market-power in either the permit and final product markets. Market-power issues have implications for efficiency in the product market and cost-effectiveness of pollution abatement (Hahn 1984, Misiolek and Elder 1989, Malueg 1990 and BIE 1992). Mullins and Baron (1996) described how in the case of the US sulphur dioxide scheme, the US EPA retained a small fraction of the total stock of permits as a 'reserve' for later auctioning. Alternatively, there may be an active role for a regulatory body to play in order to prevent the abuse of market power.

Finally, there may be scope for individuals, communities or firms to 'earn' or purchase permits, even if they are not directly engaged in emitting greenhouse gases. One example includes the generation of permits via the sequestering of CO_2 through biomass. Another is for community interest groups to 'purchase' permits. A third example is for domestic based firms to 'earn' emission permits from undertaking abatement action in other countries. In all these cases the effect would be to create an increasingly active and effective market for permits.

Compliance

While tradable permits allow for cost-effective abatement costs, as with other policy instruments there is still a need for rigorous monitoring, auditing and enforcement (BIE 1992, p. 29). Such monitoring and enforcement serve two aims: to ensure that the market mechanism is being respected (for example, that illegal trade is not being undertaken), and that participants are complying with their emission commitments.

There is clearly a role for an independent regulator with the authority to maintain continuous monitoring of participants' emissions, to audit when necessary, and if appropriate enforce any penalties. For example, in the US sulphur dioxide scheme if sulphur dioxide emissions exceed the number of allowances, statutory penalties are imposed (every excess ton of sulphur dioxide emitted incurs a fee of US$2000 compared to the estimated marginal cost of reduction between US$300 and US$800 per ton) plus an automatic deduction of one allowance from the following year per excess ton (Mullins and Baron 1996).

Even though monitoring is an important aspect of any emission abatement scheme, it is not necessary that the regulating authority need to clear every transaction that takes place. Indeed such vetting processes have been blamed for the failure of some tradable permit schemes in the past and it is not a feature of the current US sulphur dioxide scheme (BIE 1992, p. 56; Mullins and Baron 1996). Given the sensitivity of the success of tradable permit schemes to transaction costs, over-regulation can reduce a scheme's cost-effectiveness (BIE 1992, pp. 46–7; ABARE and DFAT 1995, p. 136).

A great challenge for any regulatory authority is to monitor and enforce the many polluters such as methane emissions from farms or carbon release from forestry and carbon monoxide emissions from motor vehicles. However, experience has shown that these issues might be addressed either by proxy methods, such as distributing permits to city councils on the basis of available parking spaces, to motor vehicle manufacturers on the basis of fuel efficiency or to petroleum refiners (BIE 1992, p. 27).

Finally, a regulatory agency, by serving in its role as a monitoring mechanism, could also take responsibility for maintaining Australia's reporting responsibilities to the United Nations FCCC. This monitoring mechanism could also take responsibility for reviewing permit holder's emission accounts. An additional role would be to provide information on prospective participants wishing to enter the permit market.

4.3 Towards an operational tradable permit scheme

The greenhouse problem is a global one. Greenhouse gas emissions have the same impact on the greenhouse effect no matter where they are produced. Hence no one country acting alone can solve the greenhouse problem. Cooperation among countries is essential. Without cooperation there will be an incentive for some countries to free ride and reap the benefits of emissions reduction without sharing the costs.

The main issues that will attract attention during the continuing international negotiations on climate change include the extent of greenhouse gas reductions needed to be achieved by *Annex I* parties, and the type of cost-effective policy measures to be adopted to achieve the agreed target levels. These issues need to be resolved before a global tradable permit scheme allowing trade by individuals across countries could be considered as a feasible and appropriate policy option.

Tietenberg and Victor (1994) and ABARE and DFAT (1995) have identified three phases towards an operational tradable emission permit regime (see box 4.4). This would involve a more gradual and a step-wise approach toward a global tradable permit scheme rather than its immediate widespread adoption. It is in this context that the feasibility of a domestic tradable permit scheme needs to be explored. Although there is a considerable amount of analysis and discussion about the applicability of tradable emission permits at an international level to reduce greenhouse gas emissions, there is very little policy research and analysis undertaken to examine the scope for using a domestic tradable emission permit scheme within Australia to address the greenhouse problem.

Box 4.4 A phased approach to an operational tradable permits regime

Phase I

Annex I countries continue to pursue stabilisation goals, while experimenting with joint implementation projects in Rest of World regions to allow Annex I countries to undertake some part of the emission abatement commitment implied by their stabilisation goals in lower cost countries.

Phase II

Begin a tradable permit scheme among Annex I countries. Formalise the process of using jointly implemented projects to allow Annex I countries to undertake an agreed part of their emission reduction commitments in lower cost countries. For each emission abatement project in the Rest of World regions, a certified number of tradable permits would be created, equivalent to the amount of emission abatement achieved. Such permits would be treated as equivalent to the quotas issued in Annex I countries and could be traded freely.

Phase III

Seek to expand the fully fledged tradable permit scheme beyond Annex I countries. To induce Rest of World regions to participate in the full scheme, consideration could be given to an initial allocation of permits that would provide at least as good an initial outcome (in terms of welfare) as alternative schemes (such as joint implementation). A global tradable permit scheme would result when complete country participation was achieved

Source: ABARE and DFAT (1995), Tietenberg and Victor (1994).

There are several factors that have the potential to constrain the emergence of a multilateral tradable permits system. McKibbin and Wilcoxen (1997) have identified some of these factors. First, current proposals towards establishing a multilateral tradable permit scheme focus on stabilising emissions at 1990 levels. Most studies suggest that the cost of stabilising emissions could be substantially higher than the damage caused to the environment. Second, the grandfathering of permits to countries would encourage wealth transfers between countries of such magnitude that the ratification of the proposals by the participants could be problematic. Third, the presence of large volumes of permits in transaction could distort the normal process of trade and long-term development. Finally, no individual government would have an incentive to police a multilateral agreement because monitoring and imposing penalties on violators impose costs on domestic residents in exchange for benefits that will largely accrue to foreigners. An elaborate and costly multilateral mechanism for monitoring and enforcement would be required (McKibbin and Wilcoxen 1997). Clearly these concerns warrant further investigation of the possible role of a global tradable emissions permit scheme.

The above concerns do not detract from the reasons for further exploring the feasibility of an Australian permit scheme. First, given that the current and proposed ‘no regrets’ greenhouse response measures in Australia are unlikely to meet the greenhouse gas stabilisation targets being agreed upon under the UN FCCC, an economic instrument which is cost effective must be employed.

Second, a carbon tax aimed at reducing Australia’s greenhouse gas emissions is unlikely to be equitable. Australia relies heavily on fossil fuels in the generation of energy and has large energy-intensive exports, and a narrowly imposed carbon tax will have significant economic effects for those sectors. An instrument that shares the burden more widely is desirable.

Third, the presence of individual participants with varying marginal costs of reducing greenhouse gas emissions is crucial to the implementation of a tradable permit scheme so that trade in permits could take place. In Australia, the presence of greenhouse gas emitting industries with varying abatement cost structures provides an opportunity to at least explore the possibility of using a tradable permit scheme.

Finally, having in place a domestically operating emission trading scheme in Australia would make the interface with a global scheme practically easier in the event that, following the international climate change negotiations, a global permit scheme was accepted and ratified as the appropriate international policy measure. A domestic tradable emissions permit scheme would also provide a basis with which to further domestic greenhouse gas abatement commitments by reducing emissions overseas through bilateral or plurilateral joint effort, if a global permit scheme were not to emerge.

Given that very little policy research and analysis has been undertaken with respect to the scope for using a domestic tradable emission permits scheme within Australia, further research is required to provide insights into formulating such a scheme. The final section of this submission attempts to highlight several key areas for further research as a basis for implementing a domestic tradable permit scheme.

5 AREAS FOR FURTHER STUDY

The discussion so far has concentrated on the inability of 'no regrets' policies to allow Australia to meet its obligations under the FCCC, and the potential use of tradable permits in meeting those obligations cost-effectively. The discussion has also covered some of the key issues likely to be encountered when implementing a tradable emissions permit regime. Before any attempt is made at establishing such a regime, or any other approach such as a combination of environmental tax–tradable permit scheme, there remain a number of areas that warrant further study. This section highlights some of the main areas for further study.

The most important issue is to understand better the marginal costs of greenhouse gas abatement for each emitting sector in the economy. As mentioned in section 4, the diverse sources of greenhouse gas emissions in Australia will help ensure an active trading environment for emission permits (table 5.1).

Table 5.1 Contribution of specific gases and activities to Australia's greenhouse gas emissions, 1994

Activity	CO_2 (Carbon dioxide) (%)	CH_4 (Methane) (%)	N_2O (Nitrous oxide) (%)	PFCs (Perfluoro-carbons) (%)	Contribution of activit y to total emissions (Mt)
Industrial processes	1.3	0.0	0.1	0.4	9.9
Waste	0.0	3.3	0.0	0.0	18.8
Agriculture	0.0	13.4	3.7	0.0	98.5
Land use change	21.6	1.4	0.2	0.0	133.9
Energy	48.3	5.7	0.6	0.0	314.5
Per cent contribution of gas to total emissions	71.2	23.7	4.7	0.4	575.7

Source: DEST (1996)

While it is not necessary for the regulator to know the underlying marginal abatement costs of participating polluters to design a tradable permit scheme, knowledge of marginal abatement costs will nonetheless be helpful. Understanding these costs will allow the designer of an emissions permit scheme to better assess the likely equity issues of the scheme, and thus ensure its viability. This is particularly important, because as noted in section 4, the initial distribution of permits can have significant wealth effects potentially.

Estimating the marginal abatement costs will necessarily involve more accurately assessing the rates of emissions from different sectors of the economy and the number of potential participants in an emissions permits scheme.

Accurate data on emissions, sources of emissions and marginal abatement costs will greatly assist in:

- defining the market mechanism, including the permits, the coverage of emissions and participants, and whether borrowing and banking be included;
- addressing potentially difficult areas such as controlling emissions from motor vehicles, forestry and land clearing;
- exploring the scope for allowing polluters to use biomass to offset their emissions, and whether non-polluters could ‘earn’ emission credits from planting biomass; and
- considering whether other economic incentives, such as environmental taxes, can be used in conjunction with tradable permits.

Other issues that need to be examined include the:

- design of the rules and regulations for the fair trading of permits, allocation of regulatory responsibility, and establishment of a mechanism for monitoring and enforcement;
- estimation of the likely impacts on the Australian economy of active trade in permits; and
- scope for facilitating international joint implementation of abatement tasks.

Another area for further study is to understand the merit of cooperating in a wider global tradable permits scheme. There has been considerable debate over the appropriateness of strengthening the current FCCC commitments into a global tradable emission permits scheme (UNCTAD 1994, ABARE and DFAT 1995, Mullins and Baron 1996). While a global tradable emissions permit scheme may theoretically be the most cost-effective mechanism, the proposed scheme has significant economic implications. McKibbin and Wilcoxen (1997) have argued that if implemented and enforced, a global tradable permit scheme is likely to result in wealth transfers between countries (particularly between developed and developing countries) that could cause dramatic changes in exchange rates, trade balances and international capital flows, where the economic costs are likely to be greater than the benefits from controlling greenhouse gas abatement. Understanding the environmental, economic and trade effects of cooperating in a wider global tradable emissions scheme will no doubt have numerous implications for the implementation of a domestic tradable permit scheme. The Commission is currently undertaking research on some of the issues raised above.

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