THE HOUSE OF REPRESENTATIVES STANDING COMMITTEE ON ENVIRONMENT, RECREATION AND THE ARTS

INQUIRY INTO THE REGULATORY ARRANGEMENTS FOR TRADING IN GREENHOUSE GAS EMISSIONS

Submission
by the
Department of Industry, Science and Tourism

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Executive Summary

This submission by the Department of Industry, Science and Tourism is in response to an invitation from the House of Representatives Standing Committee on Environment, Recreation and the Arts in respect of the Committee's inquiry into the regulatory arrangements for trading in greenhouse gas emissions.

The Kyoto Protocol provides for consideration of international emissions trading but does not require any party to the United Nations Framework Convention on Climate Change to participate in the proposed international emissions trading scheme or to introduce a domestic scheme.

Should the Kyoto Protocol be ratified and enter into force for Australia, we would be required to limit our greenhouse gas emissions to 8 per cent above 1990 levels on average in the period 2008 to 2012.

The package of greenhouse measures announced by the Australian Prime Minister on 20 November 1997 included voluntary "no regrets" actions, subsidies for innovation and commercialisation, improved information, but also the development of standards and regulation of economic activity that will impose costs on the economy.

The Prime Minister described the package as "a realistic, cost effective reduction in key sectors where emissions are high or growing strongly" while allowing "us to improve the performance of our highly competitive energy dependent sectors" and providing the "potential to create wealth and jobs". The Prime Minister said the package will reduce Australia's net emissions growth from 28% to 18% above 1990 levels. The difference between this projected outcome and Australia's 8% target may be met from reductions in emissions from land use change and forestry and from the flexibility provisions in the Kyoto Protocol. Even so, the emissions reduction task will be a challenging one for Australia.

Australia may wish to introduce a domestic emissions trading scheme if experience shows the current package of measures is not sufficient to enable Australia to meet a legally binding emissions target, or if an emissions trading scheme can be demonstrated to be a lower cost way of meeting the target.

Imposing a greenhouse gas emissions target requiring emission reductions from 'business as usual' or 'no regrets' levels will impose costs on the Australian economy. These costs will vary in size and relative impact on different sectors of the economy depending on the approach adopted. This submission explores the relative costs and benefits of alternative approaches. These are summarised in the table immediately following this Executive Summary.

Scope and Coverage

An emissions trading scheme should be comprehensive, covering all greenhouse gases and all sectors, to ensure the lowest possible cost of emission abatement is available. Excluding any group of emitters from the scheme would impose an inequitable emissions abatement burden on other sectors, distort resource allocation and encourage diversion of investment, unless these excluded sectors are subject to equivalent emissions abatement measures.

There are practical difficulties and costs in accurately estimating, monitoring and ensuring compliance with an emission trading scheme, particularly in areas such as agriculture and land use change where there are a large number of small scale emitters and where methods for measuring emissions are inexact. However, as the second largest source of emissions (30% in 1995), there are significant national benefits from the inclusion of the agriculture and land use change sectors in any emissions trading scheme. Further work is necessary to enable these sectors to be effectively included.

The most cost-effective approach may be to commence the domestic emissions trading scheme by including carbon dioxide emissions from large energy related sources which represented 42 per cent of Australia's total emissions in 1995[1]. Any increase in energy costs will be passed through to consumers.

Because domestic energy consumption and transport contain many small scale emitters, it may be more effective to include these sectors by requiring providers of energy (eg: petrol and gas suppliers) to be accountable for the emissions of these products by consumers.

Non-participants in the formal scheme could earn emissions credits for voluntary, measurable and verifiable emissions reductions which go beyond business as usual. For example, farmers and the forestry sector could benefit from opt-in arrangements by deriving income from carbon sequestration and other abatement actions.

Relationship with Other Emissions Abatement Measures

For an emissions trading scheme to operate alongside existing measures it must avoid duplication and inconsistency.

It would be necessary to ensure that any emissions trading scheme does not create disincentives for participation in voluntary industry programs like the Greenhouse Challenge Program, or penalise participants in the scheme by imposing an additional cost on them but not on non-participants.

For example, if grandfathering was used as a basis for permit allocation, the selection of say 1998 as the base year for deciding initial permit allocation would disadvantage Greenhouse Challengers who have already taken action to reduce their emissions voluntarily.

[1] Excludes: (i) emissions from transport, small combustion, fugitive emissions and 'other' emissions from energy combustion, and (ii) non-carbon dioxide emissions from energy, transportation industries and industry.

Another example is that an emissions trading scheme would need to be consistent with any arrangements that allowed trading of permits under the measure announced by the Prime Minister requiring a 2% increase in the amount of energy from renewable energy sources.

The use of a mix of measures and the method of permit allocation requires a better understanding of the relative costs of abatement across greenhouse gases and sectors than is presently available. It would also require research into the impacts on industry, consumers and the economy of alternate approaches.

Permit Allocation

The method of initial allocation and the duration of the permit offered are central to the success of any emissions trading scheme and involve economic, social, environmental and legal issues.

The two major means for the initial allocation of permits are auctioning and grandfathering.

Auctioning should produce the most efficient initial allocation of permits and may well produce an allocation from which there is no need for trading at all. Those who have a high cost of emission abatement would purchase more permits, and those who can more easily reduce emissions would purchase fewer permits. It would be fair to new market entrants and investors. However, it may be regarded as inequitable and as imposing an unacceptably high adjustment cost on existing emissions intensive industries such as the energy production and energy intensive industries. These industries might seek compensation on just terms for the loss of any property rights.

Grandfathering is a free allocation of permits to participants according to some criteria. Possible criteria could include the level of current emissions, past emissions, projected emissions, or on the basis of output of product, and so on. Ensuring equity would be particularly important if grandfathering were to be undertaken. An ideal system would not deliver windfall profits to some sectors of the economy at the expense of others. In practice this cannot be avoided, so there will be winners and losers.

Over time, the cost and distribution of permits under an emissions trading scheme should be the same regardless of the initial method of allocation.

The shorter the duration of the permit, the more certain regulators would be of achieving target emissions. Permits which cover longer periods of time could give participants greater ability to plan to meet their targets. A sound approach would be to create and allow trade in permits of different durations. Banking and borrowing of permits and derivatives trading would also increase flexibility.

Governments could reduce the number of permits available to the market by either not reissuing permits that have lapsed, or by purchasing permits at the prevailing market price.

Market Operation

The Government, through the design of the market and its institutional framework, should provide for a competitive and contestable market where trading takes place in an open and transparent manner in order for participants to have confidence in the market.

The market should set the price and volume of permits traded.

Emission permits could be traded on either an informal market or a formal exchange which will most likely depend on the number of participants in the scheme. An informal market could evolve under a limited scheme involving only large energy emitters, where all the participants are known and trade could occur through brokers. A formal exchange would develop under a more comprehensive scheme and would operate similarly to commodities markets or the Australian Stock Exchange.

In addition to the underlying permit, derivative products such as futures, forwards contracts and options may be created and traded in by participants to manage the risks associated with an emissions trading scheme. This should help emitters and potential investors to hedge against future changes to an emissions target, or to their own level of emissions.

Regulatory Considerations

The Government's role in promoting an efficient and effective regulatory framework for an emissions trading scheme would be to:

- determine the overall emissions target;
- define the scope and coverage of the market including gases, sources, sinks and participants, and the type of activities for which credits may be earned;
- design and support the market institutions that will minimise transaction and administration costs; and
- create a transparent regulatory framework.

The regulation of emissions trading is to ensure compliance with the laws of the scheme through effective measuring, monitoring and verification of emissions and permits, while encouraging trading and instituting appropriate penalties for non-compliance.

The cornerstone of the regulatory framework will be the establishment of a designated central authority, with its functions and powers clearly set out in legislation. Its role would be to administer the trading scheme and create the conditions necessary for a competitive and contestable market. This is similar in concept to the role played by the Australian Securities Commission in share trading.

Impacts of an Emission Trading Scheme

According to economic theory, tradeable emission permits offer the benefit of achieving a specific emissions target at least cost by enabling reductions to be made at the lowest marginal cost of abatement across participants in an emissions trading scheme.

Placing a cap on emissions would impose costs, require changes in behaviour and lead to a reallocation of resources in the economy. Costs will occur to the extent that there is a divergence from 'business as usual' or 'no regrets' actions. These costs will impact most on the energy and emissions intensive industries but will flow through the whole economy, including to consumers.

The value of any permits under an emissions trading scheme will depend on the elasticity of demand for emissions intensive goods, particularly energy, and on whether the overall emissions target or cap is higher than "business as usual" emissions.

The transport sector consumes almost entirely petroleum products, electricity conversion uses mostly coal and to a lesser extent gas, while manufacturing uses a variety of sources directly, and indirectly through electricity consumed. Possibilities for interfuel substitution or energy conservation, and the costs of so doing, are important in determining the impact of greenhouse abatement and emissions trading.

Our understanding of the distribution of emission abatement costs is currently limited almost entirely to the energy sector, and even then is deficient in a number of ways. It is important to gain a better understanding of the cost and benefits of emission abatement costs in non-energy sectors before any emission trading scheme is introduced.

An emissions trading scheme should provide an incentive to accelerate the adoption of innovative emission abatement practices and technologies by emitters across a range of sectors, where it is more cost effective than purchasing emissions permits.

The measures in the Prime Minister's 20 November package covering higher efficiency standards for cars, buildings, appliances, power stations and the 2 per cent target for the uptake of renewable energy will drive innovation in these sectors. The measures to accelerate the uptake and commercialisation of renewable energy technology aim to further develop Australia's domestic capabilities.

The government will need to consider how best to utilise any revenues resulting from auctioning or allocating permits, administering the market, any taxes levied, fines collected for non-compliance and so on. How revenue is used can be an important factor in determining the net economic benefit of meeting an environmental target under general equilibrium modelling scenarios.

Uncertainty over the long term approach to greenhouse gas abatement is already impacting on investments, particularly those with a life beyond 2008-2012. Should Australia decide to introduce an emissions trading scheme, it should allow a sufficient time for adjustment by participants and for the establishment of an effective trading regime.

Links to International Schemes

The Kyoto Protocol contains provisions for emissions trading between Annex 1 countries, joint implementation between Annex 1 countries and the establishment of a Clean Development Mechanism that would allow Annex 1 countries to earn credits for certified emissions reductions by investing in projects in non-Annex 1 countries.

The rules and mechanisms of how an international emissions trading scheme might operate have yet to be developed, and this could take considerable time. UN FCCC parties might wish any international emissions trading scheme to retain a high degree of flexibility over the choice of domestic initiatives because the domestic regulatory structures and the costs of particular control options vary greatly among countries. It may constitute the minimum framework necessary for limited international trading of emissions.

An international scheme that allows trading between companies, rather than just countries, would require the implementation of compatible domestic emissions trading schemes in all participating countries.

Monitoring emissions, enforcing compliance and deciding on scope and coverage at international level will be difficult and expensive. The initial allocation and then trading of emissions permits has the potential to produce significant transfers of wealth between countries.

Post World War Two experience with a succession International Commodity Agreements that sought to control production, trade and consumption of certain commodities indicates that negotiation of an effective and lasting international emissions trading scheme will be highly problematic.

In theory, the advantage to Australia from participating in an international emission trading scheme is that Australian industry may have access to even lower cost abatement opportunities than they would at the domestic level. An international scheme could also improve trading by adding to market liquidity and depth. Australian permit holders could derive income from the sale of permits to overseas buyers.

Australia could decide to wait until the rules of an international scheme are concluded before designing a domestic emissions trading scheme. Alternatively, having an operational domestic emissions trading scheme could make the negotiation of a compatible international scheme easier, if it was expected that a credible international scheme might eventually enter into force.

An international emissions trading scheme would have implications for the competitiveness of certain Australian industries and on investment attraction. The impact would largely depend on which countries and sectors are included in the scheme and how initial emission permits are allocated. Ideally, an international emissions trading scheme should be comprehensive.

Arguments for initially limiting an international emissions trading scheme to emissions from energy related sources in Annex 1 countries may arise as emissions from this sector are relatively easy to monitor. An international scheme on this basis could disadvantage Australia relative to other developed and developing countries.

On average for Annex 1 countries in 1990, 87 per cent of emissions were from the energy sector, compared to 58 per cent for Australia[2]. Australia would have a lower proportion of its emissions eligible to participate in such a trading scheme.

Applying emissions targets (and a trading scheme) to just Annex 1 countries, with no constraint on the emissions of others would enable non-Annex 1 countries to free ride. This could result in large shifts in comparative advantage. Competitors located in non-Annex 1 countries would not be subject to the additional cost borne by Australian companies selling into the same markets. It would also provide an incentive for investment to flow from Australia to these countries (carbon leakage) with little or no practical benefit to the environment in terms of emissions abatement.

In the absence of an international emissions trading scheme but with national emissions targets in place for Annex 1 countries only, industries located in Annex 1 countries with a high marginal cost of abatement would have an incentive to relocate to Annex 1 countries with a lower cost of abatement, or to non-Annex 1 countries and avoid entirely the costs of emissions abatement.

If however national emissions targets were in place for all countries together with a comprehensive international emissions trading scheme, industries could purchase emissions permits from the lowest cost source rather than relocating.

[2] Comparable international data on emissions for Annex 1 countries does not include the Land Use Change and Forestry Sector.

Table of Key Implications

IMPLICATIONS OF AN EMISSIONS TRADING SCHEME

Key Aspects of an Emissions Trading Scheme	Some Advantages/Benefits	Some Disadvantages/Costs
Limit the scope and coverage by sector, source or gas	• Could be limited to those sources, sinks and gases capable of accurate measurement, thus promoting credibility of the scheme. • Administrative ease would limit the cost of monitoring, verification and compliance. • Transaction costs may also be lower because of increased confidence in the permits market.	• Difficulty of ensuring equitable treatment of participants and non-participants. • Increases the possibility that the market is not competitive or contestable. • May be more difficult or costly to meet any given target
A comprehensive scheme	• Could produce the least cost emissions limitation response by the country. • Could ensure equity between all sectors, sources and sinks. • Would ensure the market is competitive and contestable.	• Credibility of the scheme may suffer because of the difficulty of validating the activities of all point sources and ensuring compliance by all. • The costs of administration are likely to be high, perhaps offsetting any benefits a trading scheme may yield.
Grandfathering permits	• Should not impose initial costs on existing emitters.	• Difficulty of ensuring equity (ie. that some sectors will receive windfall gains). • Existing emitters receive permits “free” while new entrants must buy permits. • Emitters which have previously taken no steps to reduce emissions could realise a larger windfall gain than those than those which had taken action (depending on base year selected).

Key Aspects of an Emissions Trading Scheme	Some Advantages/Benefits	Some Disadvantages/Costs
Auctioning permits	• The distribution of permits would reflect the costs of emissions abatement across sectors. • A significant increase in government revenue, which could be used to facilitate industry adjustment to lower emissions intensity through investment incentives, or support for research, development and commercialisation.	• Industry adjustment pressures could be intense as emitters have to pay for the right to emit. • International competitiveness could be significantly eroded overnight, particularly for the energy sector and energy intensive industries. • May effect existing property rights
Early introduction of a trading scheme	• May be the least cost response to emissions limitation. • May facilitate integration with any international trading scheme which emerges later.	• An emissions cap unilaterally imposed may impact adversely on Australia's business competitiveness and investment in emissions intensive industries. • Need to determine how a scheme would interact with existing domestic measures. It may impose unnecessary costs on business. It may also be inconsistent with, or duplicate, existing measures. Government may also unnecessarily incur administration costs. • May be inconsistent with any international trading scheme subsequently agreed upon. • May impose unnecessarily high costs on Australia if an international scheme provides Australian industry with access to lower cost permits.

Key Aspects of an Emissions Trading Scheme	Some Advantages/Benefits	Some Disadvantages/Costs
"Delayed" introduction of a trading scheme	• May avoid imposing unnecessary costs on business and government because the measures currently in place are sufficient to meet the country's emission limitation objective. • May avoid adverse impacts on business competitiveness and investment attractiveness. • Could be made consistent with any international trading scheme.	• May preclude adoption of an emission abatement strategy which is least cost for business.
A "light handed" regulatory approach by government ("heavy handed" regulation where the government is closely involved in the market would have the opposite advantages and disadvantages)	• Facilitates efficient operation of the market, producing an efficient outcome. An efficient outcome would enhance the scheme's credibility in the eyes of participants.	• Participants incur the costs of measuring, monitoring and possibly verifying emissions. • Giving participants responsibility for measuring and reporting on emissions may adversely affect credibility.
Use of informal rather than formal market arrangements	• Where there are a small number of traders, the costs of putting in place formal market mechanisms is not justified.	• If the number of traders and the volume of trade is large, a formal market mechanism would facilitate an efficient market outcome by more efficiently providing adequate information to market participants.

Section 1. Approaches to Reducing Greenhouse Gas Emissions

1.1 Introduction

This submission is being made in response to an invitation from the House of Representatives Standing Committee on Environment, Recreation and the Arts in respect of the Committee's inquiry into the regulatory arrangements for trading in greenhouse gas emissions. While there is no formal market for trading in greenhouse gas emissions, the inquiry is being conducted against the background of the Kyoto Protocol agreement to reduce emissions and the recognition that as a result trading in emissions may commence, domestically or internationally, at some time in the future.

If the Kyoto Protocol to the United Nations Framework Convention on Climate Change agreed in December 1997 is ratified, Australia will be required to limit its greenhouse gas emissions to 8 per cent above 1990 levels on average in the period 2008-2012. Australia already has a variety of measures in place to reduce greenhouse gas emissions below the levels they otherwise would have reached (or the 'business as usual' level). These measures include a wide ranging package announced by the Prime Minister on 20 November 1997. The Prime Minister said the package will reduce Australia's net emissions growth from 28% to 18% above 1990 levels. The difference between this projected outcome and Australia's 8% target may be met from reductions in emissions from land use change and forestry and from the flexibility provisions in the Kyoto Protocol. Even so, the emissions reduction task will be a challenging one for Australia.

Alternate mechanisms to reduce emissions such as an emission trading scheme can be explored as further emissions abatement may become necessary in the future, or tradeable permits may allow current emission reduction targets to be met at a lower cost. Emissions permit trading can therefore be examined as either an addition to the current suite of measures or as a replacement for some or all of them.

If further emission abatement measures are required, there is a large number of options from which to choose. These options generally fall within two main groups of policy instruments - 'command and control' measures, such as regulations and other direct controls, and market based measures, such as taxes, subsidies and tradeable emission permits. The purpose in this paper is to concentrate on the issue of possible emissions trading, as that is the focus of the inquiry towards which this submission is directed. However, the interaction between a tradeable permit scheme and other instruments is important and will be addressed.

The remainder of this section of the paper provides a brief background on alternative approaches to reducing greenhouse gas emissions, and outlines the theoretical benefits of some form of emissions trading scheme. Other sections discuss in some detail the practical implications of introducing such a scheme, including the role of government and possible effects on Australian industry. In Section 2, the problems of defining and establishing any market for greenhouse gas emissions are outlined. Section 3 outlines possible models and mechanisms for establishing and maintaining a market. The possible role of government in regulating trade in greenhouse gas emissions is discussed in Section 4. Section 5 discusses some of the economic implications of establishing a market, including possible effects on Australian industry. How a domestic tradeable permits scheme may fit with a future international scheme is discussed in Section 6.

1.2 Instruments to Meet a Greenhouse Emissions Target

Imposing a greenhouse gas emissions target involving emission reductions from 'business as usual' or 'no regrets' levels will produce some costs for the economy. These costs occur because of the imposition of the target and will occur whichever measures are chosen to meet the target.

These costs could include higher prices of the goods which produce the emissions, such as energy and energy-intensive products. There will also be restructuring costs as the economy moves toward the use of less greenhouse intensive fuels. Indirect costs will flow from both of these. Such costs on the economy have been the subject of considerable debate and various estimates have been produced of their size.

There are also costs in monitoring emissions and ensuring that targets are met. These include administrative costs and compliance costs for those involved in reducing emissions and for government. The extent of these costs may vary depending on the mechanism chosen to reduce emissions. However, the costs exist because of the imposition of the target, rather than the method chosen to achieve that target.

An international agreement which produces lower greenhouse gas emissions could also deliver benefits for Australia. These benefits are primarily the avoidance of negative impacts upon the environment that may result from climate change. Some of these impacts, such as crop damage from higher and more variable temperatures or loss of visitors to ski resorts due to declining snow cover, could be translated into economic costs while others, such as changes to ecosystems and biodiversity, would have values which are difficult to quantify. There may also be benefits to some sectors of the economy, such as natural gas production and renewable energy industries, as these industries may be favoured by the change to less greenhouse intensive fuels.

Greenhouse gas emissions can be reduced by measures to improve energy efficiency that also confer economic benefits (so called 'no regrets' measures). The most effective way to realise these benefits is to overcome impediments to the efficient functioning of energy and other markets.

The paper explores the issues surrounding how an emissions trading scheme, together with other abatement measures, might enable Australia to meet an emissions reduction target in a way that will minimise costs and produce an economically efficient outcome.

Command and Control Measures

Command and control includes measures such as quotas on the level of emissions allowed by individual emitters and requirements to install particular technology or undertake particular fuel efficiency measures. The advantage of such measures is that they can achieve a more certain outcome in some cases. There are circumstances where, faced with highly price inelastic demand for goods that are thought to cause negative externalities, command and control may be necessary to restrict consumption without seriously distorting social outcomes. Also, command and control measures may be more appropriate in widely dispersed markets, such as energy efficiency standards for housing.

However, command and control measures generally allow little flexibility in responding to the task of emission reduction. For example, placing a quota on the level of emissions allowed by each firm takes no account for the fact that firm A may have a much lower cost of emission abatement than firm B. It may have been cheaper for firm B to pay firm A to

meet both their emission reduction targets than for both to reduce emissions by the same amount under a command based system. Similarly, a requirement to install a particular technology to improve fuel efficiency may ignore cheaper options which were available and could have achieved the same net emissions result - options such as switching to another fuel or even planting a forest to soak up the emissions being created.

Market Based Measures

Market based measures allow greater flexibility in responding to the task of emissions reduction, and so generally should produce a more efficient outcome.

Environmental or carbon taxes are one form of market based measure. These taxes can be imposed on the rate of emissions, thus providing a direct price incentive to reduce emissions. Taxes would encourage firms to reduce emissions according to their marginal costs of emission abatement. Thus, those firms which can more easily reduce emissions will do so, while those firms where the costs of emissions abatement is higher than the tax, would pay the tax. Such a tax would not necessarily result in achieving a specified level of emissions.

Tradeable emission permits offer the same benefit of encouraging firms to reduce emissions according to their own marginal costs of abatement. Firms which find it difficult to reduce emissions will purchase more permits, while those which can reduce emissions relatively easily will purchase fewer permits, or sell their existing permits on the market. Both emission taxes and permits will allow firms to determine how they will reduce emissions, rather than having a particular technology or method imposed upon them.

An important difference between taxes and permits is the price of the tax or the permit. Under an emissions trading scheme, a fixed quota of emission permits (equivalent to a fixed amount of emissions) can be set, and the price of these permits will be determined by the market. Under an emissions tax, the rate or price of the tax is set by the government with the resultant level of emissions being determined by the market. Several iterations in setting the level of the tax may be required to produce a rate which will deliver a target level of emissions. On-going fine tuning of the tax rate would also be required.

In theory, environmental taxes and tradeable emissions permits should be a more cost effective means of lowering emissions than command and control measures. Tradeable emission permits usually offer the benefit of a more certain outcome in terms of the total level of emissions than do taxes. A number of economic modelling studies have suggested that internationally, emissions trading has the potential to substantially reduce the costs of meeting emissions reduction targets.

Tradeable permits may not be able to ensure a target level of greenhouse gas emissions for the whole country is met, as some emitters are likely to be outside any practicable emission trading scheme. This issue will be discussed further in Section 2, but the policy implication is that, despite the theoretical advantages, emissions trading alone may not be sufficient or necessarily the most efficient way to reach a given greenhouse target in practice. Further, the costs involved with monitoring emissions, allocating permits and ensuring compliance may outweigh the benefits produced.

Section 2. Scope and Coverage of the Market

There is a large number of practical considerations that have to be addressed before any market in greenhouse gas emissions is established. In this section, some of the major considerations in establishing a market are outlined. The necessary mechanisms to allow the market to operate after establishment are covered in Section 3.

2.1 Profile of Greenhouse Gas Emissions

An understanding of the current profile of greenhouse gas emissions is important in developing mechanisms for emissions reduction.

Emissions by Gas

The major direct greenhouse gases are carbon dioxide (CO2), methane (CH4), nitrous oxide (N2O) and perflourocarbons (PFCs). Information on emissions of these gases is collected by the National Greenhouse Gas Inventory Committee (NGGIC).

The global warming potential of these greenhouse gases varies. Emissions of gases can be expressed as a carbon dioxide equivalent, where the global warming potential ratios are 1 for carbon dioxide, 21 for methane, 310 for nitrous oxide, 6500 for perflouromethane (CF4) and 9200 for perflouroethane (C2F6). The proportion of total emissions by gas in carbon dioxide equivalent for 1995 is shown in Table 1.

Table 1: Emissions by Gas, 1995 (CO2 equivalent)

Gas	Proportion of emissions
Carbon dioxide (CO2)	71.6 %
Methane (CH4)	22.7 %
Nitrous oxide (N2O)	5.4 %
Perflourocarbons (PFCs)	0.3 %

Source: NGGIC 1995

Carbon dioxide is the dominant form of emissions, although methane at 22.7 per cent of total CO2 equivalent emissions is also considerable. Emissions of methane dominate the agriculture, waste and fugitive emissions sectors, and are much more significant for Australia than for most other Annex I countries.

Emissions by Activity

A large proportion of Australia's greenhouse gas emissions come from energy related sources, particularly the production of electricity. While energy related sources constitute 65.2 per cent of emissions for Australia, some non-energy related sources are also quite significant, particularly agriculture with 17.9 per cent of emissions, and land use change and forestry with 11.7 per cent of emissions. In general, non-energy related emissions are more significant for Australia than they are for most other Annex I countries.

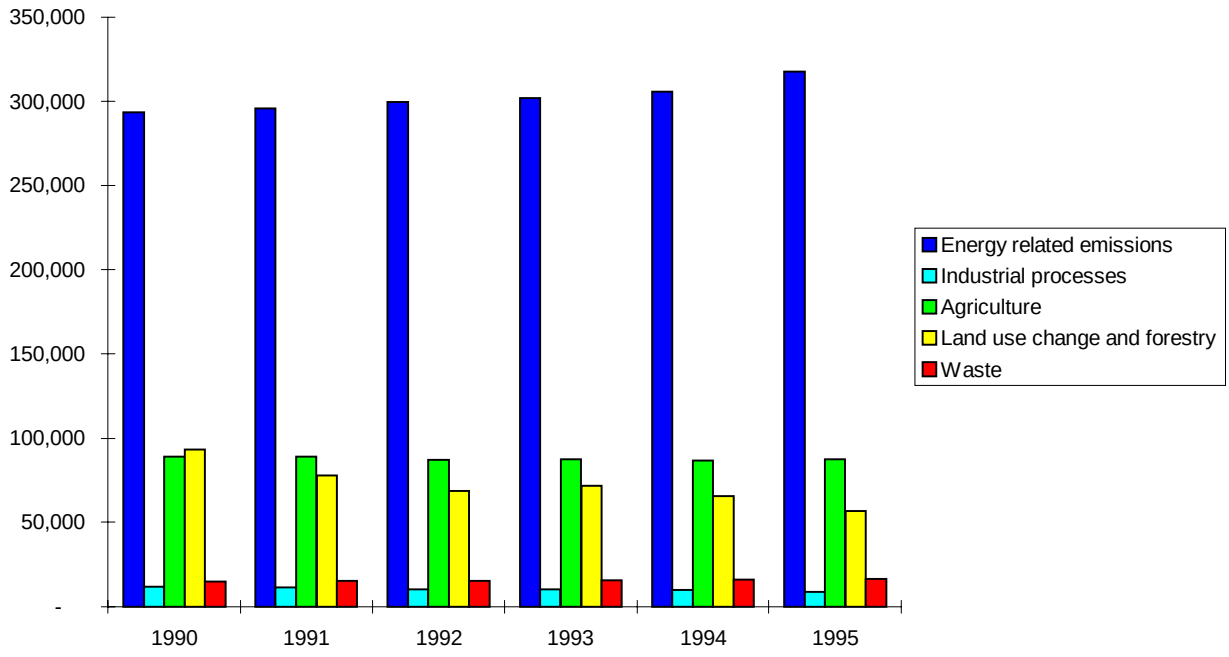
Table 2 shows the contribution of types of activity to total emissions for 1995, while Chart 1 shows changes since 1990 in the profile of emissions by activity.

Table 2: Emissions by Activity, 1995 (CO2 equivalent)

Emissions by activity type	Per cent of total CO2 equivalent emissions
Energy related sources	
Energy and transformation industries	32.3
Electricity and heat production	*29.1*
Petroleum refining	*1.4*
Solid fuel transformation	*1.8*
Industry	9.8
Transport	14.1
Road transport	*12.4*
Small combustion	2.8
Other	0.4
Biomass burned for energy	0.4
Fugitive emissions (leakage)	5.3
Coal mining	*3.4*
Oil and natural gas systems	*1.8*
Subtotal	**65.2**
Non energy related sources	
Industrial processes	1.8
Agriculture	17.9
Land use change and forestry	11.7
Waste	3.4
Subtotal	**34.8**
Total	**100**

Source: NGGIC 1995

Chart 1: Emissions by Activity, 1990 to 1995 (CO2 equivalent)



Land use change and forestry is a more significant source of emissions for Australia than most other Annex I countries, but from 1990 to 1995 it has been a declining source of emissions, while energy related emissions (the majority source) has continued to rise steadily.

Emissions by Fuel

Emissions of carbon dioxide are predominantly from the energy conversion sector. The level of emissions will vary depending on the source of energy, with renewable energy producing no emissions and brown coal producing the highest level of emissions. ABARE provide estimates of energy consumption by fuel and these estimates, combined with the rate of emission per fuel, form the basis of the NGGIC calculation of emissions for the energy conversion sector.

Table 3: Energy Consumption by Fuel, 1995-96

Fuel	Proportion of energy consumption
Black coal	28.3 %
Brown coal	11.6 %
Petroleum products	36.8 %
Natural gas	17.6 %
Renewables	5.7 %
Total	100 %

Source: ABARE 1997a

2.2 Scope and Coverage of a Tradeable Emissions Permit Scheme

Ideally, an emissions trading market should be as broad as possible, covering all forms of greenhouse gases, to ensure the lowest possible cost of emission abatement. However, there are a number of factors which could make a broadly based scheme difficult to implement. These factors include the costs involved with estimating, monitoring and ensuring compliance for some forms of emissions.

Costs and Uncertainties

The accuracy of data will be important in the success of a tradeable emissions permit scheme. While reasonable assessments can be made of the amount of greenhouse gases in the atmosphere, it is more difficult to assign these emissions to a particular country, let alone an individual emitter.

An internationally accepted methodology is in place under the Intergovernmental Panel on Climate Change (IPCC) to estimate greenhouse gas emissions from Australia. This same methodology can also be extended to individual or point source emitters, albeit involving higher monitoring costs. However there are uncertainties involved with these estimates of point source emissions. The uncertainties arise from deficiencies in measurement techniques and from the natural variability of the items being measured, and they will vary between sectors and firms. At the moment there is no internationally accepted methodology to measure the accuracy of estimates of point source emissions.

If there is a high level of uncertainty over the level of emissions from individual participants then permits may be granted (or not granted) on the basis of data which does not reflect the true activity. This may lead to participants and regulators losing confidence in the system. Currently, the most accurately monitored source of emissions is carbon dioxide from energy conversion. The uncertainty attached to this source of data is less than 10 per cent.
In comparison, the level of uncertainty attached to emissions data on agriculture or forestry is over 25 per cent, while uncertainty is over 50 per cent for land use change. More data and improved methods will help to reduce uncertainties, but will not eliminate them.

The uncertainties involved with measurement, and the higher costs associated with individual or point source measurement of emissions, may well mean that an emissions permits scheme is not practical or not economic for some time to come. An assessment would have to be made of the benefits of the scheme (in terms of more efficiently meeting an emissions target) against the costs of measurement and monitoring.

The costs of monitoring the scheme are likely to also depend on the scale of emission. There will be higher costs involved in monitoring sectors where there are a large number of entities which each emit a small amount of greenhouse gases, than sectors where emissions are concentrated into a smaller number of entities. These costs have to be traded off against the greater scope for economic efficiency gains where a larger number of entities are involved in a scheme. Elements of the energy conversion sector (such as electricity production and industry) have a larger quantity of emission per individual entity, than does the agriculture or transport sectors for example, where emissions by individual entities are on a much smaller scale.

Note that while there are administrative savings in having a fewer number of participants, there will need to be an adequate number of participants to facilitate an active and competitive market. If one or a small number of firms dominate the market they may be able to bid up the price of permits to levels which make the market inaccessible for smaller players or new entrants. Using such market power to create barriers to entry could result in windfall gains to those dominating the market. This may be more likely to occur if there is only a relatively small number of participants in the market to begin with. In this event, the market would need to be regulated to ensure that fair trading practices do occur so that participants can buy and sell permits with confidence. It may be possible to limit the scheme to large emitters only, but promote market competitiveness and contestability by allowing non-participants (eg. the community) to trade in permits or for no-participant emitters to participate on a voluntary basis.

A Scheme Limited to Energy Conversion

Given the problems associated with accurately monitoring emissions from a number of sources, an option may be to commence the scheme including only carbon dioxide emissions from large energy related sources, particularly as they are the dominant form of emissions. The scheme could include emissions which result from the energy transformation industries (such as electricity production and petroleum refining), and from energy conversion in industrial activity (such as iron and steel, aluminium and cement production). This would amount to 42 per cent of total emissions in 1995. Other energy related sources, such as transport and fugitive emissions, and non-energy related sources, such as agriculture and land use change, could be incorporated in the scheme at a later date, and will be discussed in turn later in this section.

Participants in the initial scheme could be readily identified. The NGGIC reports provide data on emissions factors for 40 individual power stations across Australia. These power stations could be a logical first point for an emissions trading scheme.

Data on a larger number of establishments is collected in the ABARE energy survey. This survey is concentrated in the mining, manufacturing and electricity and gas production sectors and covers about 5300 separate establishments, controlled by about 3000 organisations. It is aimed at all establishments with an annual energy consumption of one terajoule (280 000 kWh) or more. A threshold level for emissions permits could be set at the same level so that smaller scale emitters would not be included in the scheme. If the costs of involving smaller players are prohibitive, the cut off point could even be higher, such that a subset of those involved in the ABARE survey would be involved in tradeable permits.

An alternative approach might be to draw initial participants in an emissions trading scheme from those organisations involved with the Greenhouse Challenge program. This program develops cooperative agreements between government and industry to reduce greenhouse gas emissions. Organisations which emit approximately 45 per cent of Australia's emissions had already joined the program by the end of 1997. Plans are for 500 companies to be involved by the year 2000 and 1000 companies by 2005 (Commonwealth of Australia 1997).

The Greenhouse Challenge is a voluntary program with only limited coverage in some sectors. To link an emissions trading scheme with such a program, careful design would be needed to ensure that it did not create disincentives for participation in the program. Consideration could also be given to providing incentives to organisations that are in the program to participate in an emissions trading scheme.

However limiting the scheme to the energy conversion industries means that potentially lower cost forms of emission abatement are being excluded from the scheme. Such a scheme could also produce a substitution towards sources of emissions and types of economic activity not covered by the scheme. Unless action was also taken to limit emissions in other sources and industries in some way there would be incentives created to increase activity in areas other than energy conversion and use.

Measurement of Emissions

A limited scheme targeting the energy conversion sector would allow permits to be based on fossil fuels consumed (inputs) and their related emission factors, rather than the actual level of emissions (output). For example, coal combustion produces higher rates of carbon dioxide emissions per unit of energy than does oil or natural gas, so coal would have a higher emission factor. Measuring emissions on the basis of inputs is potentially cheaper in terms of monitoring costs than measuring outputs of emissions directly.

Against the possible cost saving of an input based measurement, there may be a loss in the accuracy of the data. Also, a scheme based on inputs (volume of the fuel consumed), rather than outputs (the emissions), may also remove the incentive of installing new technology which would reduce the amount of emissions for a given quantity of fossil fuels. However, this could be solved by allowing different firms to have different emission factors depending on the technology used, and if they implemented new technology the firm could apply to the regulator to have their emission load revised.

Incorporating Other Sources of Emissions

The emissions trading scheme restricted to energy related sources outlined above could be thought of as introductory, with separate markets developed for greenhouse gas emission from other sectors, such as transport, agriculture and land use change, and these incorporated into the main scheme when the costs of monitoring these sectors allow a net benefit to be derived.

The sectors outside the limited emissions trading scheme outlined above are generally characterised as having less certain data on emissions and a greater number of emitters on a small scale, thus producing higher monitoring and administrative costs to involve them in the scheme.

Compliance and monitoring costs may be lowered by having a scheme which rewards emitters in these sectors for reducing emissions, rather than having an allocation of permits and penalising the emitters if they don't meet a target. A voluntary scheme which offers benefits for reducing emissions would reduce the administrative costs of involving a wide group of emitters and it would remove the problem of allocating permits to individuals within these sectors (a problem which could be considerable given the large number of players).

The benefit offered to those who volunteer for the scheme could be credits in the limited emissions trading scheme. These credits could be sold on the permit market, thus proving a link between the main energy conversion scheme and the schemes operating for the other sectors. Having compatibility between the schemes is essential to encourage emission reduction to take place in the sectors with the lowest cost of abatement.

The US Sulphur Dioxide Program[3] provides an example of a successful opt-in scheme, where non-compulsory participants can enter the program voluntarily, be granted permits and allowed to sell excess permits on the market.

Another option to account for the higher level of uncertainty in measuring emissions from areas such as agriculture and land use change is to discount credits or permits allocated by the level of uncertainty. For example, if emissions from land use change are subject to a level of uncertainty of 50 per cent, then any credits allocated could also be discounted by 50 per cent. However, this assumes the actual level of emissions is at the top end of the estimate. It may therefore be appropriate to use IPCC methodologies to produce and then use estimates. Moreover, a discount may make it uneconomic to reduce net emissions from these sectors.

A scheme which rewards participants for voluntarily opting in to emission reduction could create a moral hazard problem. As credits are provided for reducing emissions, this may encourage individuals to produce a higher base of emissions to begin with, or alternately not undertake other activities which would have reduced the emissions but are outside the scheme. For example, a scheme which rewards landfill operators for capturing and burning methane (thus converting it to less potent carbon dioxide) would do nothing to discourage the growth of landfills. Such considerations would have to be taken into account in the design of a voluntary opt-in scheme.

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[3] The United States 1990 Clean Air Act contains provisions for sulphur dioxide allowance trading. Participants are initially only large coal-fired electric utilities, but will be expanded to include all utilities in the year 2000. The government annually allocates allowances to utilities, which are an authorisation to emit an amount of sulphur dioxide. The scheme is underpinned by legislation, effective regulatory institutions and well developed monitoring systems.

The following sections discuss sources of emissions outside the limited scheme outlined above and how these sectors might be included in a tradeable permits scheme, or otherwise encouraged to reduce emissions.

Transport

Table 2 showed that petroleum refining accounted for 1.4 per cent of total emissions in 1995. It is likely this source of emissions could be included in the limited scheme outlined above. However, a much larger source of emissions is produced in the activity of transport, particularly road transport. The transport sector accounts for 14.1 per cent of total emissions. As emissions are produced by almost every vehicle on the road it would not be practical to assign permits to every emitter (every vehicle owner).

Rather than assigning permits to each emitter, it would be possible to assign permits further up the processing chain, either at the point where excise is levied, or at the petrol refining stage, where there are a manageable number of participants. Permits would be assigned on the basis of inputs (production or sales of petrol), rather than outputs (the emissions produced by the vehicle owner). Such a scheme would increase petrol prices to final consumers. While the end users would not be encouraged to reduce emissions directly, they would be encouraged to reduce consumption of the fuels which produce emissions. A similar result could also be produced by increasing the excise on fuel. However, this is likely to distort markets as diesel fuel for off-road purposes is exempt from excise. Tradeable permits would provide a link to the wider permits market. Both tradeable permits or taxes may have limited success in actually reducing emissions given that emissions from transport depend critically on the fuel efficiency of motor vehicles.

Another method of reducing emissions is to target the fuel efficiency of new cars. This approach has already been adopted by the Commonwealth. The environmental strategy for the automotive industry announced by the Commonwealth in November 1997 includes a commitment to negotiate with the automotive industry a 15 per cent fuel efficiency improvement by the year 2010 over business as usual. Any reductions in greenhouse gas emissions from fuel efficiency improvements will take some time to pervade the motor vehicle fleet as only 10 per cent or less of the fleet is replaced each year.

The current environmental strategy for the automotive industry recognises it is difficult for one measure to effectively address emissions. In addition to the commitment to negotiate fuel efficiency improvements with the industry, the strategy includes mandatory fuel efficiency labelling; bringing forward the phase out of leaded petrol; and progressive tightening of noxious emissions standards.

Methane Emissions (Agriculture, Waste, Fugitive Emissions)

Emissions of methane are produced mainly from the non-energy related sources of agriculture and waste, but there is also a significant element from leakage from coal mining and oil and natural gas systems (energy related). Methane has a global warming potential of 21 times that of carbon dioxide. At 23 per cent of total emissions on a carbon dioxide equivalent scale, it is quite a significant source of emissions. If methane is collected and burned, thereby converted to carbon dioxide, the impact of emissions would be reduced.

The feasibility of collecting and burning methane would vary between sources and locations, but it may be feasible for some landfill emissions and for fugitive emissions from

coal mining and oil and natural gas systems. There are a relatively small number of players producing the

bulk of emissions from these sectors which would lower administrative costs. However, the uncertainty associated with current data estimates from waste and fugitive emissions is significantly higher than for the energy conversion sector, which would add to monitoring and compliance costs. If the benefit from involving these sectors is greater than the costs, or if the costs of measuring and monitoring such emissions falls in the future, then permits could be issued to the significant players in these sectors to incorporate them into the tradeable permits scheme. Alternately, they could be encouraged to participate on a voluntary opt-in basis and receive credits for emission reduction activities, which could then be sold on the tradeable permits market.

Agriculture is by far the most significant form of methane emissions. As Australia is a large exporter of agricultural produce, the agriculture sector is a more significant form of emissions than for most other Annex I countries. Compared to the energy conversion sector, emissions are produced by a large number of small emitters (although there would be some agricultural properties which would be quite significant emitters in their own right). Given the large number of producers and the difficulties in accurately monitoring emissions from the agricultural sector, a system of tradeable permits for each emitter is probably not feasible. It is important that ways are found to enable to agriculture sector to bear its fair share of Australia's emissions abatement burden.

Methane emissions from animals can be targeted through improvements in technology. The CSIRO has developed additives and vaccines which assist in reducing methane emissions. An anti-methanogen feed additive has been patented which suppresses methane emissions by up to 100 per cent but produces only marginal production gains and has to be fed daily. A methanogen vaccine has also been patented which is producing an 18 per cent reduction in emissions with some significant production gains (Commonwealth of Australia 1997). Given the costs and perhaps limited production gains, this technology may not be utilised without some incentive. An incentive could be provided by rewarding agricultural producers with credits if they take action to reduce emissions, such as through vaccinating their stock. These credits could then be sold on the tradeable permits market, thus providing a link to the wider scheme. Such a scheme could also have very large monitoring costs, so other mechanisms, such as directly subsidising the cost of the vaccine, may be more cost effective in achieving the emission reduction target.

Land Use Change and Forestry

Emissions from the land use change and forestry sector are more significant for Australia than for most Annex I countries. In Australia they accounted for 11.7 per cent of emissions in 1995. As this sector is a significant source of emissions, and has the potential to be a significant sink, land use change and forestry should be incorporated in the emissions reduction task. However, this sector would also involve more smaller emitters and high monitoring costs. Data on emissions from land use change and forestry activities is subject to a higher level of uncertainty than other emissions. The reliability of this data may improve over time as new measures, such as the national carbon accounting system for land based sources and sinks are developed. Under the Greenhouse Challenge program, opportunities are being investigated for firms to invest in carbon sequestration activities to offset their emissions, with work being undertaken to measure and account for these activities.

As with some other sectors, land use change and forestry activities may be best involved through a voluntary scheme where credits are granted for emission reduction, or

sequestration activities, which reduce greenhouse gases in the atmosphere. Credits could then be used to offset other emissions, or traded in the wider tradeable permits market.

Participants could come from those who are taking part in sequestration under the Greenhouse Challenge Program to offset emissions, or from any sector where it is cost effective to create a sink, receive credits and then sell them on the market.

The issue of rewarding sequestration activities introduces many problems in terms of measurement which would have to be monitored over a long time period. With activities such as timber plantations there is the question of when credits should be earned. Trees grow at different rates and the impact of harvesting on greenhouse gas levels depends on the end use of the timber. A scheme which allocated credits as a plantation grew and required use of credits when it was harvested might track the effect on greenhouse gas levels quite closely but would be very complex to administer.

An additional complexity arises from how to treat emissions from the timber and the land after it has been harvested. Depending on the state of the land, the level of emissions will differ. The emissions will also differ depending on whether the timber is used for construction, for pulp and paper or for some other purpose. There are also issues such as the impact of a bushfire on credits earned. Again the impact will depend on factors such as the type of tree, with most eucalypts regenerating after low intensity fires while pine trees are generally killed by fire.

The considerable complexities surrounding the treatment of sinks will need to be resolved before a credits scheme can be effectively and efficiently implemented.

Renewable Energy

About 6 per cent of energy consumption is from non-emitting renewable energy (ABARE 1997a). As part of the suite of measures announced on 20 November 1997, the Commonwealth government will work with States and Territories to increase the use of renewable energy by setting a mandatory target for electricity retailers to source an additional two per cent of their electricity from renewable energy sources by 2010. While the target appears small at 2 per cent of energy generation, industry sources believe that it might be quite difficult to achieve for many generators. The target would require investment in renewable energy of at least 2000 MW; accounting for approximately 20 per cent of all new investment in energy supply through to 2010. DIST estimates that, conservatively, meeting this target could require an additional $2 billion in investment.

As the costs of meeting the renewable energy target could be quite high in some locations, savings could be generated by allowing trade in these renewable energy quotas. This would encourage those with the lowest cost in producing renewable energy to purchase the quotas, and thus there would be a lower cost in energy production for the same level of renewable energy use. Again, it is conceivable that these quotas could be traded with emissions permits in the wider market at an appropriate rate. This is one way by which tradeable permits could complement existing greenhouse gas reduction measures. Other measures in the 20 November package include financial assistance and venture capital for increasing the uptake and commercialisation of renewable energy technology. Links between a tradeable permits scheme and current measures are discussed further in Section 4.

2.3 DeterminatiExecutive Summaryon of an Emissions Target

An overall target for emissions could be derived from Australia's agreed target at Kyoto (if ratified) and any subsequent international agreements.

An emissions target should take into account projections of emissions in the future, as well as knowledge of current sources. For example, projections are for a slowing in the rate of growth of energy consumption, to growth of 2.1 per cent a year to 2009-10, partly due to continuing improvements in technology. Consumption of natural gas is expected to grow strongly, largely at the expense of black coal, with this switch reducing the greenhouse intensity of energy supply (ABARE 1997a).

Reform of the energy sector may also have an influence on the future level of emissions. Reform could have a positive influence by facilitating fuel switching and greater use of renewable energy and encouraging greater efficiency in generation. It could also produce reductions in the price of energy which could induce greater energy consumption and consequent emissions.

Australia's Kyoto emissions target is only for the period 2008-2012. There is no requirement for any targets to be imposed before that date.

However, if Australian regulators wanted an emissions trading scheme operational before 2008-2012 they would have to determine overall targets in the intervening period. The rate of emissions reduction could be spread evenly over a number of time periods, it could be more stringent at first and ease over subsequent periods, or it could be gradual at first and more stringent subsequently. The relative costs and benefits from each scenario would have to be assessed.

Assigning an Overall Emissions Target to a Limited Scheme

While one of the arguments for a tradeable permits scheme is to achieve certainty in the level of emissions produced, in the case of greenhouse gas emissions with a number of sources and sinks, in practice it will be very difficult to have a comprehensive scheme. There are likely to be some, if not a large proportion, of emissions occurring outside the tradeable permits scheme. Therefore, it will be very difficult to know in advance the level of emissions which will be produced by Australia in total.

One option with a limited scheme is to assign the entire emissions reduction task to those sectors within the scheme, with other sectors outside the scheme not being accountable for reducing emissions. This approach would place an inequitable burden on the energy production and energy intensive industry sectors. The effects of such a burden are discussed in Section 5. Such a scheme would also be inefficient as there may be lower cost options available to reduce emissions in other sectors. Finally, it would not provide certainty about the total amount of emissions being produced because, in the absence of incentives such as credits or other reduction measures, other sectors may actually increase their emissions so that the overall target is not met.

Another option for a limited scheme is to assign some proportion of the emissions reduction task to the participants in the scheme. It could be proportional to the current emissions profile. For example, if participants in the scheme accounted for 40 per cent of current emissions, their target could incorporate 40 per cent of the reduction task. Other sectors outside the scheme could be targeted to reduce their shares of emissions in other ways such as through research, technology, taxes, or subsidies. In this case, while the amount of emissions produced from the energy sector is known, the overall level of emissions produced will not be known in advance as the methods used to encourage emissions reduction in other sectors will lack the precision of tradeable permits.

Compatibility of a Voluntary Opt-In Scheme with an Overall Emissions Target

The voluntary opt-in scheme would reward participants with credits for reducing emissions, and these credits could be traded. The method of allocating these credits can have implications for the overall emissions reduction task.

One option is for the government to keep a certain number of credits in reserve for each sector and distribute them whenever any voluntary participant meets certain criteria. The amount of credits in reserve could be equivalent to the current proportion of emissions from each sector or it could be estimated by the government as the amount of credits it is likely to be asked for by voluntary participants. The amount of credits in reserve could also be unlimited which would effectively mean the supply of permits is not fixed.

If credits are worth exactly the same as permits under an emissions trading scheme (for example a permit is worth one tonne of CO2 equivalent emission and a credit is granted for reducing emissions by one tonne of CO2 equivalent), then a scheme where there is a variable supply of credits may not actually succeed in reducing emissions further than allowed for under the permits in the limited scheme. The credits sold on the market would allow more emissions in the energy conversion sector which would exactly offset the reduced emissions from the credit. To ensure overall emission reductions are occurring, a solution could be that the amount of emissions reduction necessary to receive a credit could be more than the value of emissions on the equivalent permit. This may reduce the incentive to exploit lower cost emission abatement opportunities.

Another option is to distribute all permits and hold the total supply of these permits fixed. If someone then meets the criteria to be allocated credits, the government would intervene in the market to buy permits to give to these participants. This option would provide greater certainty in advance of the amount of emissions which will be produced within the scheme, but would have implications for government revenue.

Whichever option is chosen the overall emissions level will not be known in advance, as the number of voluntary participants will not be known and the emissions produced by the non participants is also unknown. Under each scenario, in the limited and the voluntary opt-in schemes, the government has to make some estimate in advance of the total number of permits and credits it should issue to achieve the goal of meeting the emissions reduction target for the country as a whole. The government may get better at making these estimates the longer the operation of the scheme, which may provide reason to introduce a tradeable permits scheme before the target date of 2008-2012, if the Kyoto agreement is ratified.

2.4 Type of Permit

Consideration will have to be given to the type of emissions permit offered, the duration of the permit and when to introduce the scheme.

Permits should be denominated in CO2 equivalent emissions. In theory one could ascribe any (high or low) denomination to a permit. However, as discussed previously, there could be a threshold set at a certain level, so that the costs of involving smaller emitters in the scheme would be avoided.

The duration of the permit may depend upon the overall target chosen, and whether this will be a year by year target or a once off target for the period 2008-2012. The shorter the time period of the permit, the more certain regulators are of achieving target emissions on a year by year basis. However, permits which cover longer periods of time could give participants greater ability to plan to meet their targets. Short term permits which are issued well in advance could also provide participants with the certainty they require to develop emission reduction strategies, provided they are confident there will not be short term changes to targets which are disruptive to their long term plans. The ability to incorporate into the scheme banking and borrowing of permits may depend upon the duration of the permit and whether emissions targets have to be met every year or can be averaged over a number of years.

In determining when the scheme will commence, consideration should be given to any impact the announcement of the scheme may have on emissions activity. Depending on how permits are allocated, a time lag between announcement of the scheme and allocation of permits may produce an incentive to increase emissions in order to secure more permits. Careful consideration of the timing should easily overcome any problems in this regard.

2.5 Allocation of permits

As well as an overall national target for greenhouse gas emissions, a tradeable emissions permit scheme will require the allocation of individual permits within that target. Permits would have to be allocated for all emissions from sectors participating in the scheme, not just incremental emissions beyond a certain base level such as the level in 1990 as it would not be possible to distinguish between what is a base level emission and what is an incremental emission.

In addition to an initial allocation of permits, there would be re-allocations for each future time period. Permits could be auctioned off to the highest bidder or allocated to existing emitters free of charge (grandfathering) on the basis of some criteria, or some combination of the two.

Auctioning

Auctioning should produce a more efficient initial allocation of permits. Those who have a higher cost of emission reduction would purchase more permits, and those who can more easily reduce emissions would purchase fewer permits. Auctioning would reveal the true preferences of agents and may well produce an allocation from which there is no trading at all, as it is the most efficient allocation.

However, auctioning would impose costs on emitters where there has previously been no cost. This may place high adjustment costs on firms and industries and may give rise to demands for compensation on just terms for the loss of any property rights..

Grandfathering

Grandfathering is an allocation of permits to participants according to some criteria. Possible criteria could include the level of current emissions, past emissions, projected emissions, or on the basis of output of product and so on.

Ensuring equity will be an important factor in the distribution of permits. Ideally, the scheme should not deliver windfall profits to some sectors of the economy at the expense of others. However, to some extent this cannot be avoided, unless there is an efficient allocation to begin with (an allocation which would be expected to be produced by auctioning). Participants will have differing costs of emissions abatement, so will benefit to differing extents from their ability to reduce emissions or otherwise purchase permits on the market.

1990 is viewed as a benchmark year and emissions from this year could form the basis for an allocation of permits. However, there have been significant changes in the economy since that time, with some firms going out of business, others undertaking technological improvement and so on. An allocation based on a profile of the economy from eight or more years ago is likely to create significant windfall gains and losses. Further, there is no accurate and comprehensive data on emissions by enterprise on which to base such an allocation.

If permits are allocated on the basis of current or past emissions or production (with no account taken of future requirements) this may advantage incumbent firms at the expense of new and expanding firms. This would be a disincentive to investment. This is because new and expanding firms would have to purchase additional permits, placing them at a cost disadvantage (new source bias). New source bias may be alleviated if the permit is for a fixed period of time and re-allocated each time period on the basis of current production. However, this may not encourage a reduction of emissions as the higher emitters may be rewarded with more permits in the next time period.

An allocation of permits according to current levels of emissions may penalise those who have already made an effort to reduce their emissions. This concern would encourage the allocation to be made on the basis of output of product or some other variable. However, those that have reduced emissions in the past may have done so on a ‘no regrets’ basis, so would not have incurred a cost and therefore are not being penalised through a lower allocation.

In the US sulphur dioxide scheme, most permits were allocated by a grandfathering method free of charge. However, a small proportion of permits are auctioned annually, primarily to facilitate a price and stimulate trade in the market. The sulphur dioxide scheme initially allocated permits primarily on historical fuel consumption and a specific emission rate. Although only 263 coal-fixed electric utilities were initially designated as participants in the scheme, allocations were differentiated according to 29 different allocation rules.

Some of the rules of allocation could include projected future growth rates and projected costs of emissions abatement. To the extent that these can be projected, the initial allocation of permits may produce an efficient outcome and reduce the need for future trades.

Criteria could be used to allocate permits according to a differentiated approach, with some sectors gaining more permits and others less. Australia has been a leading proponent internationally for differentiated targets on the basis of countries having different costs and capacities to meet targets. If the same approach was adopted domestically then permits would be allocated according to each participants' marginal cost of emission abatement. This would produce an efficient outcome, just as if the permits had been auctioned. However, an allocation according to costs of emission abatement would be very difficult as this information may not be known outside a particular company and the costs can also change over time.

If permits are allocated free of charge according to some other criteria, then after trading the same efficient outcome will be produced. Having an emissions trading scheme actually produces market driven differentiation, on the basis of producers' marginal costs of abatement. The main equity consideration is that different initial allocations could produce windfall gains and losses for different participants. Further study would be required on these potential windfall gains and losses in advance of introducing an emissions trading scheme.

Other Considerations

Other factors to take into account in the allocation of permits include changes in firm ownership or operation since the allocation period and how to deal with new emitters. For example, if permits are allocated on historical emission rates and there has since been a change in ownership of the firm, a problem arises over who should get the permits. The permits could go with the economic entity; that is, the new owners of the entity would get the permits. If there is then some subsequent change in ownership or break up of the company, it then becomes a commercial decision as to who or which entity gets the permits. Alternatively, the permits could be viewed as an asset in their own right. In any event, the regulatory authority would not allow emissions to occur without permits.

The government could withhold a 'strategic reserve' of permits which it could use to allocate to new emitters. This might be appropriate for equity reason, if the initial permit allocation is on the basis of grandfathering.

Section 3. Operation of the Market

The purpose of this section is to discuss how an efficient and effective market for an emissions trading scheme might operate, including the mechanisms that may facilitate trading.

An emissions trading scheme will impose transaction costs on participants and administration costs on governments. The critical issue in this section is how the market and its institutional framework can be designed to operate in a manner that will minimise these costs for industry and governments, thereby minimising any adverse impact on competitiveness and investment.

There will be distinct roles for both the government and the domestic institutions that facilitate emissions trading. In general, it should be the market's role to set the price and volume of trading, not government. Government's role should be to create the regulatory framework (refer to Section 4) and the market institutions that minimise transaction and administration costs and encourage trading, while ensuring the overall emissions target is met.

The mechanisms for trade under an emissions trading scheme should not need to distinguish between trade in permits and credits as long as they are valid, verifiable and readily convertible.

The Central Authority

Government, through a central authority will need to administer any emissions trading scheme. The objectives of the central authority should be to:

- maintain and facilitate the market (Section 3.1);
- maintain the confidence of participants (Section 3.2);
- enforce compliance with any laws of the scheme (Section 3.3), and
- minimise transaction costs and regulatory controls (Section 3.4).

It is through careful design of the market and its institutional framework that the government and the central authority can achieve these objectives. It may be advantageous for existing institutions and infrastructure to be used to administer elements of the scheme where appropriate.

3.1 Establishing and Facilitating the Market

There are two basic models a central authority may use to establish a market for trade in emission permits: an informal market or a formal exchange. The appropriate model will most likely depend on the number of participants in the scheme.

Two specific examples of markets with similarities and applicability to proposed emissions trading schemes are used throughout Sections 3 and 4 to highlight the market mechanisms and regulatory framework that might be used: the United States sulphur dioxide (SO_2) allowance trading market and markets for securities in Australia, principally the Australian Stock Exchange (ASX) and the Sydney Futures Exchange (SFE).

An Informal Market

An informal market would be appropriate in an emissions trading scheme where there are a relatively small number of participants who are accustomed to dealing with each other. This may be the case with a limited scheme involving the large emitters in the energy conversion sector.

A limited number of brokers could help match willing buyers and sellers of permits, and trades could be registered with the central authority. Brokers would provide information about prospective suppliers and demanders of permits and the price of emission permits. Information services, such as electronic bulletin boards quoting prices and quantities of emissions units sold, may arise to facilitate trading under such circumstances.

The advantage of an informal market is that the transaction and administration costs of an emissions trading scheme could be substantially less than under a formal exchange.

There will however be a point where the number of participants under an emissions trading scheme becomes too large for brokers to supply efficient information about prospective suppliers and demanders of permits and the price of emission permits. Beyond this point, it will be more efficient and cost effective for a formal exchange to be established.

A Formal Exchange

A formal exchange should be used where there is a need to match large numbers of willing buyers and sellers under standard contracts for transactions. Formal exchanges not only facilitate trading and provide information on prices, but improve market liquidity. Commodities exchanges and securities exchanges such as the ASX and SFE are examples of existing formal exchanges which could potentially facilitate emissions trading.

Under a formal exchange, there are two main types of market-place where trade in emissions units could occur:

- Open-outcry exchanges: here bids for purchase and offers of sale for a commodity are made vocally so that all traders have equal access to the trade and the information about price and quantity of the bid. Exchanges that trade physical commodities, options and futures (including the SFE) are typical of such exchanges.
- Electronic market-place: such markets may involve trade facilitated by computer assisted order routing, clearance and/or settlement. The ASX is an example of such a market.

The trading scheme should be kept simple, with as little bureaucratic interference as possible, to minimise transaction costs and allow the market place to set the price and volume of trades.

While a tradeable emission unit has similarities with commodities traded on open-outcry markets, an electronic market-place would assist to minimise transaction costs and provide a more effective interface with an international exchange where trades occur across borders and time zones. By international comparisons, the ASX and SFE operate internationally sophisticated and competitive markets, however Australia does not operate an internationally competitive commodities securities market. The ASX and SFE could provide an effective interface to international markets. Therefore, this section focuses on the applicability of the ASX to trade in emissions units.

It will be the role of the exchange itself, not the central authority, to operate the market for emissions trading. The core functions of a formal exchange would be to facilitate trading, act as a clearing house and register, regulate the market and conduct investigations.

Trading is facilitated through brokers on formal exchanges, but they are assisted by institutions set up by exchanges. For example the ASX facilitates trading electronically using SEATS (Stock Exchange Automated Trading System). This is the computer system for trading shares and other securities listed on ASX. It provides stockbrokers with immediate access to the national market regardless of their location. With a SEATS terminal, brokers can enter buy and sell orders on behalf of investors and observe the market. Trades can be executed and confirmed almost immediately. All shares listed on the ASX are bought and sold using SEATS.

Traditional exchanges perform a clearing house role, with responsibility for registration, clearing and processing all trades executed. A similar institution or arrangement will be necessary under a tradeable permits scheme. An important function will be to record balances of emission permits held by participants for compliance purposes, ie. the exchange could act as a register. So long as participants notify the exchange of any change to their holding of emission permits, there is no reason for the central authority nor the exchange to be concerned how trades actually occur.

CHESS (Clearing House Electronic Subregister System) is the computerised transfer and settlement system of the ASX. It speeds up the buying and selling of shares by eliminating some of the paperwork. Instead of receiving share certificates from the company when purchasing shares, the shares are held on the CHESS electronic registry and investors receive a CHESS holding statement.

In the design of a domestic emissions trading scheme, the central authority may wish to consider the use of features such as SEATS and CHESS which would significantly reduce transaction and administration costs.

Allocation of Permits

A market mechanism may be necessary to allocate permits. Allocation could be performed by the central authority, but if permits are to be auctioned it may be more efficient for this function to be performed by an exchange or another agency. Auctions of allowances under the US SO_2 scheme are conducted by the Chicago Board of Trade.

Brokers

Traditionally trading on exchanges is facilitated through brokers. Brokers perform a vital role because they:

- help participants to trade on an exchange;
- assume risk by buying, selling and holding permits;
- could help, under any future international emissions trading scheme, participants to make bilateral trades;
- can add value by understanding the regulatory process and by maintaining information about prospective suppliers and demanders of permits;
- reduce transaction costs below what they otherwise would be by helping parties minimise transaction costs.

It will be necessary to decide who should be allowed to facilitate trade under an emissions trading scheme to ensure credibility and accountability for regulatory purposes. For

example, only brokers as Members of either the ASX or SFE, and their authorised representatives, are authorised to trade on the ASX or SFE.

Other Market Mechanisms

A host of other market mechanisms might arise under an emissions trading scheme including information services such as newsletters, electronic bulletin boards, etc., quoting prices and quantities of emission units sold; standard documentation to facilitate easier trading; accreditation bodies; and liability provisions or government guarantees of permits to protect participants who trade in good faith on the basis that emission permits are valid.

Facilitating Changes to the Emissions Trading Scheme

As part of its role in maintaining and facilitating a market for emissions trading, the responsibilities or powers of the central authority would need to be extensive and may include:

- changing the emission cap over time in accordance with changes in government policy;
- periodic issue of permits;
- setting the framework that enables features such as banking, borrowing, provisions for natural disasters and use of a strategic reserve; and
- issuing credits to participants in a voluntary opt-in scheme.

In facilitating changes to an emissions trading scheme, the central authority or exchange must signal to the market any intended adjustment or action with potential to impact upon the market well in advance. Such adjustments or actions should be carried out infrequently to minimise uncertainty. It may be necessary that the institutional arrangements to enable such actions be built into the design of the trading scheme.

3.2 Ensuring Market Competitiveness and Contestability

It will be the role of the central authority and the formal exchange to create the conditions necessary for a competitive and contestable market. This can be achieved through careful design of the market and its institutional framework to ensure there is sufficient market depth and liquidity and that a small number of participants do not dominate the permit market. Therefore, to maximise the efficiency of the market, there should ideally be no restrictions on trade , for example, pre-sale verification requirements or limits on the number of permits which can be bought or sold by individual emitters.

Insufficient market depth and liquidity may more likely be characteristic of a limited domestic emissions trading scheme. The general conditions necessary to ensure sufficient market depth and liquidity are:

- a sufficient number of participants and permits; and
- a sufficient volume of trading.

The Number of Participants and Permits

The probability of trading is directly related to the numbers of participants and their permit holdings. This will be determined by the scope and coverage of the scheme, and any provision for emitters from excluded sectors to opt-in, as well as the method of allocating permits.

Market Power

Market power arises where a few large buyers/sellers/participants dominate the permit market through the size of their emission permit holdings. The simplest strategy to reduce market power is to create a large number of diverse participants in the initial allocation of permits. Other strategies might include issuing permits with limited lives or for the central authority to keep a strategic reserve of permits to reduce the ability of large participants to prevent new entrants from purchasing emissions units or to drive up prices by hoarding.

Holding a 'Strategic Reserve'

The central authority could hold a 'strategic reserve' which would increase market confidence by reassuring participants, including new participants, that they would be able to purchase permits in the future. This would facilitate more and earlier trading as participants would not need to hold onto permits due to the uncertainty that emission permits would not be available in the future. It may also reduce the threat of undue use of market power if permits from the reserve were allocated or auctioned at regular intervals.

The 'strategic reserve' could be formed in a number of ways, including by participants allocating a proportion of their emission permits, by the central authority holding a reserve from the initial allocation or by governments purchasing permits/credits in the market. Regulations relating to the circumstances under which the reserve would be used may need to be instituted.

By withholding the full permit allocation from the market, traded permits would cost more than they otherwise would.

The Volume of Trading

Through design of the market the central authority will have control over the number of participants and permits, but it cannot guarantee that trading will take place at any given level. Rather, it can only create conditions conducive to ensuring that a sufficient volume of trading occurs.

There are many reasons why there may not be a sufficient volume of trading. The primary reason would most likely be high transaction costs and regulatory controls. There might also be a lack of confidence and inexperience with trading on a new exchange. This might be addressed by encouraging the use of existing institutions to administer the scheme (such as the ASX, existing brokers) and inclusion of participants accustomed to trading with each other.

If permits are auctioned such that each firm acquires its equilibrium amount of permits, then there may be no need to engage in trade initially. However if auctioning achieves an efficient outcome, lack of a sufficient volume of trading should not be a problem.

Uncertainty as to whether participants will have sufficient permits to match their emissions will be another reason why there may not be a sufficient volume of trading. Participants will not have absolute certainty of their total emission levels until the end of the permit period. There is the likelihood they will hold onto their permits until they have greater certainty that they will have sufficient permits to cover their emissions. This could be partially addressed by conducting reconciliations of permits against emissions during the permit period, although this introduces new complexities to the scheme. The conditions referred to above for a competitive and contestable market may also reduce this uncertainty significantly.

Finally, there might be a lack of strong monitoring and compliance mechanisms. Failure to enforce strict monitoring and compliance mechanisms will create a lack of confidence in the scheme and undermine the economic value of the emissions permit. This will encourage non-compliance and create little incentive to trade.

There could be requirements for the sellers to show that the units are valid *before* they could be sold through the exchange (ie. that the unit is associated with a reduction in emissions or some sequestration activity by the participant). However, verification of every emissions unit that is traded would be expensive, time consuming, and would hinder the development of a fully liquid market. It may therefore be necessary for liability provisions to be formulated, or government guarantees provided, to protect participants who trade in good faith on the basis that emission permits are valid.

Banking and Borrowing

'Banking' allows emission units unused in a previous year to remain valid to offset emissions in future years or to be sold to others. Banking is advantageous from a market competitiveness perspective because it adds to the liquidity of the market by creating a larger pool of emission permits than could be traded and it improves market confidence as participants have greater certainty that emission permits will be available in the future.

'Borrowing' allows future allocations of emission permits to be used to offset emissions in excess of the emission limit in the current period. Borrowing has the disadvantage that it might reduce liquidity if all participants were to borrow from their future emissions allocations rather than trade. 'Bankruptcy' can also occur under borrowing if participants borrow permits and either use or sell large numbers of them but cannot cover these through future greenhouse gas mitigation or purchases. These disadvantages could be limited by restricting borrowings to a percentage of permits held and/or attaching a discount to the value of the borrowed emission rights.

Banking and borrowing may not be consistent with meeting an overall emissions target in a particular year, but would be less of a problem for emission targets expressed in terms of a number of years.

3.3 Ensuring Compliance with the Scheme

Once the scheme is operating the central authority would have three main tasks to ensure compliance:

- keeping track of permits;
- keeping track of emissions; and
- responding to violations of the scheme in a manner that ensures it is always in the interests of participants to comply.

There will be costs and difficulties in measurement, monitoring and verification across different sources of greenhouse gases as well as large numbers of participants. The costs of measuring, monitoring and verifying both emissions and permits can be an impediment to trade. However the absence of monitoring encourages participants not to comply. Clearly there will be some optimum level of monitoring and verification by government that encourages trade while discouraging excessive non-compliance.

The primary mechanisms for ensuring compliance are legal mechanisms. Ensuring compliance is essentially a regulatory issue and is discussed in detail in Section 4. However there are some market mechanisms that may be used to achieve compliance and support the regulatory framework. These mechanisms are the systems to monitor permits and the systems to measure, monitor and verify emissions.

Monitoring Permits

For compliance purposes, it will be necessary for some agency to verify balances of emission permits held by participants. A formal exchange could perform this role by acting as a register, alternatively either the central authority or a government agency in an informal exchange could perform the role of a register.

To record balances of emission units held by participants, a register would need to record:

- the number of units issued to participants;
- permits deducted for compliance purposes (for example permits deducted from future allocations due to non-compliance in a previous settlement period);
- transfers of permits between participants; and
- the number of credits from voluntary participants bought and/or sold.

The use of banking, borrowing, strategic reserves and credits would introduce additional complexities into monitoring balances of emission permits. Such features of an emissions trading scheme will make it even more important for there to be accurate information on balances of emission permits but would add to the administrative burden in monitoring emission permits.

Measuring and Monitoring Emissions

Participants will need to monitor emissions to ensure that by the end of the permit period they are holding sufficient permits to be in compliance with the scheme. The responsibility and cost of measuring and monitoring emissions from each emission source could be borne by the emitter based on the 'emitter pays' principle.

Participants should be expected to maintain records of their emissions for compliance purposes. All participants would be required to submit an inventory of their greenhouse gas emissions to the central authority at the time of any reconciliation or at the end of a permit period. To minimise transaction and administration costs, it would be advantageous for there to be common reporting requirements and formats for reporting emissions.

Verifying Emissions

There are essentially two alternatives for verifying emissions. Firstly, verification may be undertaken by the central authority or on its behalf, for example by agencies of national or state governments. Alternatively, the central authority may require participants to have their reportable emission levels verified by independent auditors (at the expense of the participants), who are certified or accredited by the central authority according to agreed standards.

Where verification is undertaken by the central authority, it will reduce the costs to participants significantly, but add to government's costs. The opposite would be true where verification is undertaken by the participants. It could be argued that verification should be undertaken by the party for whom the net cost is lowest, but if this is the participants, the likely effect this would have on discouraging trade must be taken into account.

3.4 Transaction and Administration Costs

The critical issue for the operation of the market is how the market and its institutional framework can be designed, according to the circumstances of the emissions trading scheme proposed, in a manner that will minimise transaction and administration costs and encourage trading, whilst ensuring compliance with national and/or international commitments. The discussion so far has raised some of the means by which this objective might be achieved.

Under a formal exchange, one means by which administration and transaction costs can be minimised is the means by which trades occur. It is possible that the emissions trading scheme be designed such that permits could be traded electronically utilising mechanisms such as those used by the ASX, namely SEATS and CHESS (refer to Section 3.1).

However transaction and administration costs might be expected to be significant for trade in emissions credits under a voluntary opt-in scheme. The costs under such a scheme would include all costs necessary to ensure a valid and verifiable amount of emission reduction or sequestration. These costs would include the measurement, monitoring and verification of these activities and the costs for ensuring compliance.

Transaction Costs

Transaction costs will be a critical element in the success or failure of the trading scheme.

Transaction costs are those costs incurred in buying and selling permits and in establishing and monitoring the market. The sources of transaction costs can be broadly classified as:

- search and information (these include the cost of finding partners to trade with);
- bargaining and decision (these include fees for brokerage, legal and insurance services); and
- monitoring and compliance.

Transactions costs should be lower in markets with relatively large numbers of potential trading partners, or where formal trading exchanges have been established, as it should be easier for sources to identify potential trading partners.

It would be difficult to estimate the costs of bargaining and decision making in advance under an emissions trading scheme (for example brokerage fees). However a competitive and contestable market should ensure these are minimised. Innovations may arise to keep these costs low. Transaction costs might also be lower in a scheme allowing trading among companies that are accustomed to dealing with each other.

The use of approaches or mechanisms described so far in Section 3 might significantly reduce transaction costs.

Administration Costs

The design of a greenhouse gas emissions trading scheme can greatly affect administrative costs. Administration costs are all the costs necessary to operate and administer such a scheme and are essentially the costs of maintaining a central authority, including the costs of verifying emissions and enforcing compliance, and any other legal costs.

It could reasonably be expected that the most significant costs would be those of verifying emissions and ensuring compliance.

The use of features such as banking, borrowing and strategic reserves will impose an additional administrative burden to systems used to monitor emission permits, but could be minimised through the use of standardised emission permits.

Cost Recovery

One issue for government to consider is cost recovery for its administration costs. There are essentially two costs to consider: verification costs and compliance costs.

Cost recovery of verification costs would not be an issue where the central authority required participants to have their reportable emission levels verified by independent auditors. However government may need to consider cost recovery where the central authority or another agency on its behalf has responsibility for verification of emissions.

There is an argument for government to bear compliance costs as there are social benefits conferred through emission reductions.

3.5 Derivative Products: Risk Management Mechanisms

Derivative products are mechanisms or techniques used to effectively manage risk and uncertainty. Formal markets for trade in derivative products such as futures and options could operate similarly (though not totally) to that of the spot market, ie. the market for the underlying permit. Derivative markets assist in providing additional depth and liquidity to the underlying permit market.

Markets for derivatives will develop only if there are a sufficient number of hedgers and speculators in the market for the underlying permit. The need for markets for trading in derivatives will be determined by the market. The Government has a role in regulating such markets.

Traders in emission permits will face a number of risks. Some examples include:

- the risk that participants will be unable to purchase/sell permits at a future date;
- the risk of a significant rise/fall in the price of permits for participants who may wish to purchase/sell permits at a future date; and
- the risk that a participant will invest in technology for greenhouse gas emissions abatement and that the price of a permit will be less than the price for an equivalent amount of emission abatement at which the technology could be sold at a future date when the technology is realised, that is the risk of price movements impacting upon investment/technology decisions.

The principal advantage of markets for derivatives is that they can be used to create offsetting risks to better manage or eliminate exposures to future movements in the spot markets. This has a number of implications, including:

- a forward and/or futures market would provide a way of efficiently reducing the risk in the costs of greenhouse gas emissions abatement, thereby stimulating investment in the research, development and use of least cost mechanisms for emission control; and
- encouraging greater trading in the spot market.

The three most likely derivative products to be used (although other market instruments might be developed) are discussed below.

Futures Contracts

A future is a contract between a buyer (seller) and an established exchange or its clearing house in which the buyer (seller) agrees to take (make) delivery of something at a specified price at the end of a designated period of time.

The futures market would develop once the parties to the agreement know the basis on which quotas will be allocated over time and that the units traded are standardised. The futures market offers greater liquidity than the forward market if contracts can be settled by monetary transactions, rather than delivery of the permit itself. This would mean more transactions in the futures market leading to greater information flows, reducing uncertainty, risk and transaction costs.

Forwards Contracts

A forward is a contract between two participants to exchange emissions units at a set price on a future date. They differ from futures contracts in that they are not actively traded nor standardised and they carry the risk of creditworthiness of the party to the other side of the transaction.

Options Contracts

An option is a contract in which the writer of the option grants the buyer of the option the right, but not the obligation, to purchase from (‘call’) or sell (‘put’) to the writer something at a specified price within a specified period of time (or at a specified date). The writer grants this right to the buyer in exchange for a sum of money (the option price or premium).

Section 4. Regulatory Framework

This section discusses the necessity for a regulatory framework under an emissions trading scheme. It illustrates that this is an extremely complex matter that will make implementation of an efficient and effective emissions trading scheme highly difficult.

Governments and participants will have different needs from a regulatory framework. Government needs to be able to enforce compliance to ensure the emissions target will be met, and compliance can only be achieved through legislation.

Participants, principally industry, will need a regulatory framework that ensures:
- certainty for their commercial transactions;
- consistency and equity in the application of the scheme and its regulations across all participants;
- transparency in the regulatory processes;
- a competitive and contestable market where least cost emission abatement options can be implemented; and
- minimised transaction and administration costs.

Broadly stated, the regulatory framework is needed to ensure an efficient and effective market with least cost obligations imposed on participants, while meeting the overall emissions target.

The role of the government will be to create a regulatory framework that will support:
- the overall emission target established (Section 4.1),
- the definition of the market (Section 4.2), and
- the facilitation of trade (Section 4.3), and
- ensuring compliance with the laws of the scheme (Section 4.4).

The government would need to create legislation and/or amend existing legislation to allow for emissions trading, and to establish its regulatory framework.

4.1 The Overall Emission Target

The scope of an emissions trading scheme may be less than fully comprehensive, and the emissions target for the scheme may in the future be set at less than Australia's overall Kyoto emission target.

Government must decide a target for the emissions trading scheme. A target that is not established in legislation will have advantages from policy perspectives and flexibility of the scheme, but will create uncertainty for participants if they do not believe it will be effectively enforced. This may reduce the economic value of permits thereby discouraging trading. Moreover, it would not allow participants to effectively plan for investment in emissions abatement.

The emissions target could be established in legislation and subsequently amended. For example, under the United States SO_2 allowance trading scheme the emission limit is firmly established in legislation. It is vital that government through the central authority signal to the market any change to the emission target well in advance as this action has potential to impact upon the market.

4.2 Defining the Market

The government must legally define the market before creating an institutional framework to facilitate and maintain trading.

Scope and Coverage

It will be critical in the regulatory framework that the greenhouse gases, sources, sinks and participants involved are defined precisely to ensure strict compliance can be achieved.

It may also be necessary to define the activities for which credits may be earned for a number of reasons. For example, due to the difficulty in measuring, monitoring and verifying some sources and sinks, some activities may need to be excluded, otherwise there is potential to damage the credibility of the whole scheme.

The Permit

Defining the emissions permit will be important. It must be accurately defined otherwise it will make regulation of trade in permits difficult.

Under the United States SO_2 allowance trading scheme, the allowance is an 'authorisation to emit' rather than a 'property right'. This is an important distinction in the definition because it gives the government the authority to take away utilities' allowances if required under United States law. However, the emission limit is firmly established in legislation and would be difficult to change, so it is unlikely the US government would take away allowances.

Defining the emissions permit as an 'authorisation to emit' can give rise to difficulties. Equity considerations might need to be addressed as any currently emitting firm or industry under the scheme would have to pay for the right to emit, while those outside of the scheme would not. Further, government may need to define in its regulatory framework the criteria or circumstances for removing participants' permits.

The definition will also be important for ownership reasons. Where permits are allocated on the basis of historical emission levels and the firm is sold subsequent to an allocation, a problem arises as to which firm retains the permits. If the permits are a property right, then they may remain the property of the original firm, however where they are authorisations to permit, they might remain attached to the emission source.

Ownership issues will also need to be addressed for emission credits earned under joint implementation projects.

Allocation of Permits

Allocations can occur through grandfathering or auctioning or some combination. Depending upon the complexity of either method, a regulatory framework may not need to be established (eg. for simple auctions on an open-outcry market). However regulation may have potential advantages, including avoiding disputes and providing greater certainty for participants as to their allocation to assist business planning.

4.3 Facilitating Trade

The legal and regulatory framework for trade in securities will have parallels to the framework needed for an emissions trading scheme due to similarities between the schemes.

Ideally, trade in permits should become part of the ordinary conduct of business for participants. Those regulations and laws such as common law, Corporations Law and the Trade Practices Act that deal with the ordinary conduct of business should apply to trade in emissions permits. However there are specific regulations relating to trade in securities, for example, rules dealing with insider trading, and there may be a similar need for specific laws and regulations dealing with emissions trading.

The Central Authority

The cornerstone of the institutional framework needed to facilitate emissions trading will be the central authority. A designated central authority would be needed to administer the scheme as a whole with its functions and powers clearly set out in legislation. For example, the Australian Securities Commission (ASC) is the sole administrative authority for securities regulation. The *Australian Securities Commission Act 1989* defines its functions and powers and it has responsibility for all regulation of the securities industry as set out in the Corporations Law.

From a regulatory perspective the objectives of the central authority are those set out in Section 3. The central authority will have ultimate responsibility for these objectives, however it may delegate its functions and powers to other agencies to administer elements of the scheme or contract out some functions as appropriate.

Regulating the Operation of Markets

Traditionally markets are owned, operated and regulated by their participants, however governments also regulate markets to protect the interests of investors and other participants.

In Australia the ability to operate an exchange for trading in securities requires the approval of the ASC. The ASX operates under powers delegated by the ASC, while the SFE operates under powers delegated by the Corporations Law. Securities markets are regulated by the ASC through the Corporations Law and the ASC can apply to the courts to enforce the Business or Listing Rules of either exchange.

Regardless of whether an informal or formal exchange or market is established, the central authority will still need to maintain an oversight function to protect the interests of government, traders, brokers and other participants. To do so, the central authority will need the necessary authority to carry out its powers and functions as described in Section 3, such as the allocation of permits, use of a strategic reserve, changes to the emission cap, and so on.

Regulating the Activities of Participants

Regulation of the market is essentially about regulating the activities of participants.

There are essentially two categories of participants: traders and brokers. In traditional securities markets, both have rights and obligations backed by legislation. It may be necessary to similarly legislate or alter existing legislation under an emissions trading scheme to create such rights and obligations.

The ASX and SFE are self-regulating organisations. Members of the ASX or SFE (that is brokers) must comply with the Business Rules of these exchanges and companies listed on the ASX must comply with the Listing Rules of the ASX. These Business and Listing Rules can be enforced under the Corporations Law.

There will be a similar need to regulate the activities of participants in an emissions trading scheme. Dealings between traders and brokers will be subject to existing laws and regulations dealing with conduct of business generally, such as common law and the Trade Practices Act. In addition, just as there are laws specifically regulating the securities industry, there may need to be laws specifically regulating trade in emissions permits. One advantage of specific regulations is that criminal liability can be imposed rather than civil liability under these existing laws.

The formal exchange may also conduct investigations to ensure no participant acts to influence the price of permits or that any rules or regulations of the market may have been contravened under an emissions trading scheme. For example, the ASX conducts electronic surveillance of the market to ensure the fairness and efficiency of the market is not impaired by activities such as inadequate disclosure, breach of trading rules, insider trading and market manipulation.

Brokers

It will be necessary to regulate the conduct of brokers, for example their dealings with clients' money, making recommendations about permits, prohibited activities, and the like. Brokers are traditionally regulated by being subject to the rules of the exchange on which they participate and by being licensed.

Only brokers as Members of either the ASX or SFE and their authorised representatives are permitted to trade on the ASX or SFE. Members must comply with the Business Rules of these exchanges, which govern the behaviour of their members. The ASX can enforce the Business Rules against its members or the ASC can enforce the Business Rules under the Corporations Law. The ASC also requires brokers of the ASX or SFE to be licensed.

The central authority would need to create rules to regulate the conduct of brokers and must decide whether to licence brokers under an emissions trading scheme. It might be argued that brokers under an emissions trading scheme should not be licensed because they deal not with the public, but with large greenhouse gas emitters (typically large companies). Alternatively, brokers may be licensed for an formal exchange but not for an informal market.

Traders

It will also be necessary to regulate the activities of traders, particularly prohibiting conduct such as manipulating the market and making false or misleading statements in relation to permits.

Facilitating Changes to the Emissions Trading Scheme

The central authority may need to facilitate changes to the emissions trading scheme, for example changes to the emission cap over time and periodic issue of permits. It may be necessary that the regulatory arrangements to facilitate such actions be built into the design of the trading scheme.

A smaller emissions reduction target could be introduced in the future by regulation, or by the Government purchasing and then withdrawing emissions permits from the market.

4.4 Ensuring Compliance with Laws of the Scheme

One of the principal roles of government in an emissions trading scheme will be to ensure compliance with the laws of the scheme through its regulatory framework. The elements necessary to ensure compliance within the regulatory framework are discussed below.

It should be noted that inclusion of voluntary participants will introduce a host of additional complexities making the task of ensuring compliance more difficult.

Monitoring Permits

Government needs to monitor participants' balances of permits (including credits) under its regulatory framework, and could do so by requiring all trades to be registered with the central authority, a formal exchange or another agency.

Measuring and Monitoring Emissions

The overall objective is to ensure a credible and fair trading scheme with verifiable greenhouse gas emission reductions. At present, there are significant difficulties in measuring greenhouse gas sources and sinks from individual emitters. Even when measurement can be carried out with sufficient accuracy and certainty, there will be a number of issues to address (which will apply equally to compulsory and voluntary participants) from a regulatory perspective:

- who should measure and monitor emissions?
- there may need to be standards for measuring emissions that are consistent across participants, including guidelines on how to take into account the uncertainty of some sources and sinks. This should be the responsibility of the central authority.
- mechanisms to measure emissions may need to be accredited by the central authority or agency charged with verification of emissions.
- liability provisions may be needed for the protection of sinks against fire, drought, and so on.
- the reporting requirements/formats for reporting emissions should be clearly defined.
- there may need to be criteria for accrediting mechanisms for measuring emissions and for accrediting agencies, firms or individuals to monitor emissions.

Verifying Emissions

Government must decide upon the degree of verification it requires. There are essentially two degrees of verification: complete or partial. If verification is performed by independent auditors, then the central agency may wish to ensure total compliance of all participants. However where the cost of verification is borne by the central agency, it may be beyond the resources of the government to ensure complete verification, and therefore a degree of risk management would be needed to determine the extent of partial compliance.

The central agency could have the power to conduct random audits of emitters, under a partial verification approach, to verify their emissions, with penalties for non-compliance being a significant deterrent to risk taking by participants. The purpose of random audits of emissions from participants would be to ensure:

- monitoring systems are working well;
- their emissions do not exceed their holdings of permits at the end of the permit period; and
- the likelihood of being subject to a random audit is sufficient to deter risk taking by participants.

The responsibility for verifying emissions ultimately rests with the central authority. This may require the central authority to have powers under its regulatory framework to:

- require participants to disclose details of their emissions and any other information necessary to verify its emissions;
- delegate its responsibilities for verifying emissions to a Commonwealth government agency, State government or agency, or accredited private agencies; and
- conduct audits as appropriate and necessary.

Audit and review procedures for verifying emissions must be accurately defined under the regulatory framework, so as to provide certainty and direction to participants to ensure they have met all conditions necessary to ensure compliance.

Emission Credits

The inclusion of voluntary participants to an emissions trading scheme adds significantly to the complexity of the regulatory framework. Under such arrangements, if a voluntary participant can demonstrate a verifiable amount of greenhouse gas sequestration, or a verifiable reduction in greenhouse gas emissions compared to their expected 'business as usual' emission levels measured from some baseline, they would be eligible to be allocated emission credits by the central authority.

From a regulatory perspective, there would be numerous issues to address in allowing trade in emission credits, for example:

- the accuracy in measuring amounts of greenhouse gases sequestered by various sinks and uncertainties associated with these amounts;
- the inherent difficulties and uncertainties in establishing a baseline for credits earned from emission reductions, and how this might be verified, as well as establishing forecast 'business as usual' emission levels;
- the potential for exposing the scheme to manipulation and fraud by inclusion of voluntary participants.
- the timing of allocation of credits; and
- verification of these amounts of greenhouse gas sequestration or reductions (and with what degree of accuracy) when the activities occur in another country.

Ensuring Compliance

Enforcement will be needed where emissions exceed the number of permits held. The main institutions for enforcement are legal mechanisms. It is critical that procedures to ensure compliance, the circumstances of non-compliance and the relevant penalties be clearly defined for legal purposes in the regulatory framework.

The central authority will have responsibility for ensuring compliance. The central authority should ensure emitters are in compliance with their emission limits and impose penalties for non-compliance. It could reconcile permits held against records of emissions and if emissions were less than an equivalent number of permits held, the excess permits could be sold or carried forward ('banked') into the following period. However, if emissions exceed the number of permits held, then some form of enforcement is needed.

Timing

From both market and regulatory perspectives, the timing of the reconciliation of permits against emissions is a critical issue. The timing of reconciliations should be defined in the regulatory framework to provide certainty to participants.

Reconciliations only need to be performed once, at the end of the permit period. This would reduce administrative costs, but may encourage trading to be concentrated around this date, thereby reducing market competitiveness. Reconciliations could also be performed at intervals throughout the permit period, though this would increase administration costs.

The advantage of more frequent reconciliations is that they may encourage greater levels of trading and reduce the risk of too many participants having large deficits of permits at the end of period reconciliation. However this risk could also be addressed by a rule relating to the size of the deficit a participant is allowed during the permit period.

Penalties

The central authority will have responsibility for ensuring compliance with the laws of the scheme. This will be needed primarily where emissions exceed the number of permits held, but may also be needed for any matter of non-compliance (such as market manipulation). Some options for enforcement include:

- imposing fines or penalties (possibly criminal);
- reducing future emission permits allocations; or
- preventing non-compliers from participating in international trading.

There would be little incentive for a participant to purchase emission units if the cost of non-compliance were less than the cost of the units, or if the likelihood of penalties being imposed were low. In the US sulphur dioxide scheme, if emissions produced are greater than the number of permits held, the entity must pay a fine and surrender permits for the following year equivalent to the excess of emissions. The fine is usually equivalent to about 20 to 30 times the market price of permits.

Penalties could either be imposed immediately or the central authority could grant the participant a period of leave to purchase permits on the market. A period of leave may be more appropriate where reconciliations occur during the permit period and a participant is found to have fewer permits than emissions. An immediate penalty may be more appropriate if participants are found to hold fewer permits than emissions at the end of the permit period.

Consideration will also be have to be given to how to enforce compliance by voluntary participants, such as for attempted misrepresentation of emission reductions.

Dispute Resolution

There may be a need for a dispute resolution mechanism to deal with disputes on a case-by-case basis. A dispute resolution mechanism makes accurate definition of all elements of the regulatory framework crucial.

The government may wish to choose existing institutions such as courts or a new institution/mechanism. Government must also decide upon the rules by which any dispute resolution mechanism would operate. These rules should be consistent with the whole regulatory framework and be capable of being applied efficiently and cost-effectively.

4.5 Current Abatement Measures and the Use of Other Instruments

The broad principles to consider in the use of instruments to reduce greenhouse gas emissions, including an emissions trading scheme, are that they should be comprehensive, equitable, able to deliver its objectives, provide certainty for current and future business operations and investment, implemented with least cost and ensure the competitiveness of Australian industry.

Australia's agreed greenhouse gas emissions target at Kyoto of an increase of 8 per cent above 1990 levels on average in the period 2008-12 is a challenging target. Australia has already put in place a range of measures aimed at limiting greenhouse gas emissions. On 20 November 1997 the Prime Minister announced a package of measures the Commonwealth would implement in consultation with the states and territories. To reduce emissions significantly from business as usual, the measures announced in the Prime Minister's statement will need to be effectively implemented, requiring the commitment of all government, industry, and other stakeholders.

Relationship with Current Abatement Measures

Given the package of measures announced by the Prime Minister in November 1997, a threshold issue in considering the introduction of an emissions trading scheme is whether it would replace measures which are already in place or supplement those measures.

A trading scheme could be considered to take the place of existing measures if it could be clearly demonstrated that the impact on business competitiveness of a fully verifiable and enforceable scheme would be less than using the existing measures.

An emissions trading scheme might also be introduced if the existing measures proved in time to be insufficient to meet Australia's emissions target and if the scheme is demonstrated to be the measure which impacts least on business competitiveness and Australia's ability to attract investment.

If a trading scheme is to operate alongside or supplement existing measures, then it must avoid duplication and inconsistency. The Submission earlier provided some thoughts on the links between the environmental strategy for the automotive industry and an emissions trading scheme. Careful consideration would also need to be given to the trading scheme's links with programs such as the Greenhouse Challenge Program; codes and standards for buildings, domestic appliances and industrial equipment; efficiency standards for power generation; the 2 per cent target for the uptake of renewables in power supplies and reducing methane emissions from livestock. Steps would be required to ensure that the trading scheme does not create disincentives for participation in these programs or penalise participants by imposing an additional impost on them but not on non-participants. The Greenhouse Challenge program might also be the basis of the type of voluntary opt-in arrangements mentioned in previous sections.

Use of Several Instruments

The principal reason for the use of a mix of instruments in addition to emissions trading, is due to the practical difficulties discussed in previous sections of implementing a comprehensive emissions trading scheme.

If an emissions trading scheme is not comprehensive it becomes essential to consider what mix of instruments might be considered. Ideally this would take full account of the relevant costs of abatement across sectors, sources and sinks and would be consistent with the fundamental principle of achieving emission reductions at least cost and in the most equitable manner.

Taking into account any existing abatement measures, government must address three key questions when considering the use of additional instruments with a domestic emissions trading scheme:

- *Which greenhouse gases and sectors would be external to any emissions trading scheme?*

- *Which instruments would most effectively and efficiently ensure the costs of greenhouse gas abatement are shared equitably between participants and non-participants?*

- *What are the theoretical and practical advantages and disadvantages of mixing these policy instruments?*

The use of a mix of instruments requires a better understanding of the relative costs of abatement across greenhouse gases and sectors than is presently available, as well as considerable research into the impacts on industry, consumers and the economy generally, for each proposed measure.

Section 5. Economic Impacts of Emissions Trading

Placing a target on emissions will require changes in behaviour, will impose costs and lead to a reallocation of resources in the economy. These costs will occur to the extent that there is a divergence from 'business as usual' or 'no regrets' policies. These costs will impact on the industries where the emissions reductions are occurring, and will also have indirect effects throughout the economy (upon consumers and other industries).

The scope and coverage of the emissions trading scheme may also have implications for regional economic activity in Australia. Limiting coverage to energy related sources may have a significant impact on these regions in Australia which focus on coal mining, electricity generation, oil and gas production and minerals and metals processing. This will in part depend on whether there is the opportunity to gain credits for sink enhancement or abatement activities in other sectors.

If tradeable emissions permits are used to achieve an emissions target then permits bought or distributed under the scheme are likely to be valuable. Exactly how valuable will depend on the elasticity of demand for greenhouse intensive goods, particularly energy. The initial allocation of permits could have significant wealth effects encouraging stakeholders to take an intense interest in securing rights to permits. It is necessary to undertake further analytical and modelling work in advance of any scheme, to determine the potential impacts on firms, industries, the economy, regions and the level of emissions.

5.1 Economic Impacts on Industry

With an effective emissions trading scheme, the greatest reductions in emissions should occur in those sectors where the cost of emissions reduction is the lowest. Currently, however, our understanding of the distribution of emission abatement costs is limited almost entirely to the energy sector, and even then is deficient in a number of ways.

Sectors such as manufacturing, electricity generation and transport might be expected to suffer the largest direct impact from rises in energy prices associated with an emissions trading scheme. However, the impact will also vary depending on the type of fuels consumed across sectors, and which fuels are encouraged or discouraged through the establishment of an emissions target. The transport sector consumes almost entirely petroleum products, electricity conversion uses mostly coal products and to a lesser extent gas, while manufacturing uses a variety of sources directly and indirectly (through electricity). Possibilities for interfuel substitution or energy conservation, and the costs of so doing, are important in determining the effects of greenhouse reductions by industry.

Table 4 shows the level of energy consumption by sector in 1995-96. Sectors vary considerably in their direct consumption of energy and this information could be important in assessing economy wide effects.

Table 4: Energy Consumption by Industry, 1995-96

Industry	Proportion of energy consumption
Agriculture	1.5 %
Mining	5.1 %
Manufacturing	25.6 %
Electricity generation	26.9 %
Construction	1.0 %
Transport	26.2 %
Commercial and services	4.2 %
Residential	8.0 %
Other	1.5 %

Source: ABARE, Energy 1997

The results of a simulation undertaken by McDougall and Dixon (1996), using a general equilibrium model to analyse taxes placed on fossil fuels, are illustrative. Tradeable emissions permits can be thought of as equivalent to a tax if the price of the tax equals the price of the permit. The tax adversely affects those industries which supply energy and, as these supply industries pass on energy taxes in full to their customers, those sectors which are intensive users of energy are also adversely affected. Modelling results differed depending on assumptions over how the revenue was recycled, but generally the worst affected areas were electricity, gas and water; metal products; mining; chemicals and petroleum products; and construction. Low energy users such as the services sector performed relatively well under these scenarios. ABARE modelling has also shown that international emission reduction targets will impact most heavily on those industries which supply energy or are intensive users of energy.

The McDougall and Dixon study, and other modelling studies which have been performed on this issue, impose higher costs only on the energy sector as a means of simulating a carbon tax or emission permits. However, as discussed throughout the paper, emissions from energy related sources only constitute about two thirds of total emissions. Emission abatement costs in non-energy sectors are not well understood. A thorough study of economic impact would also consider higher costs on the agriculture and land use change and forestry sectors.

If credits are granted for carbon sequestration activities, the impact on forestry activities is likely to be an incentive to plant more trees, or different types of trees. Currently there are incentives to clear land or to plant fast growing trees for harvest. If credits are provided which reflect the value of trees in absorbing greenhouse gases then the incentives in the forestry sector and land use are likely to change. Analysing the economic impacts flowing from a comprehensive scheme which includes these sectors should also be the subject of future analytical and modelling studies.

Studies of economic impact usually assume that existing technologies remain or innovation occurs at historical rates of uptake. However, imposing costs through an emissions reduction target could be a driver to designing and implementing new technologies. Industry development opportunities may well open up in the renewable energy and environmental management industries and for new technologies that offer significant abatement opportunities such as fuel cells.

The higher the price of emission permits, the more incentive firms are likely to have to invest in innovation to reduce emissions. However, if left to the private sector alone, the level of this investment is likely to be less than optimal. Indeed, rather than innovate Australian firms may buy technologies developed overseas. Government support for innovation may therefore be appropriate, but any consideration of this would have to take account of existing support measures such as the support for commercialisation of renewable energy technologies announced in the Prime Minister's 20 November 1997 package of measures.

Whether the costs of meeting a target will impact upon the international competitiveness of Australian firms will to some extent depend also upon the environmental targets of other countries, how they choose to meet them and whether some countries are not required to participate in global emissions abatement activities. This is discussed further in Section 6.

5.2 Comprehensive or Limited Approach

Any suite of measures that is limited in its coverage (concentrating on some sources of emissions but not others) will place an inequitable burden on those sectors which are covered.

If for example, the agricultural sector was excluded from a tradeable permits scheme, and its emissions were not addressed in other ways, this would create an extra burden for those sectors which are in the scheme, such as the energy sector.

Excluding Agriculture

Excluding agriculture would benefit the agricultural sector relative to the rest of the economy to the extent of the value of the subsidy or exemption received. Excluding any sectors from an emissions trading scheme will in theory make it less effective and more costly because it will reduce the range of least cost abatement options across the economy.

As discussed in Section 2, if emissions reduction in some sectors is being addressed through other instruments because the measuring and monitoring costs would be too great, the overall number of permits provided to the sectors within an emissions trading scheme can be adjusted, so that they do not have to incur a disproportionate share of the emission reduction costs.

Excluding Export Industries

Arguments may also be put forward that the export sector should not be part of an emissions trading scheme, or indeed, not part of the emissions reduction task because of its impact on international competitiveness. Such action would be equivalent to providing an export subsidy. Import competing industries involved in the emissions trading scheme would be rendered less competitive relative to imports which generally enter Australia at tariff rates of around 3%.

Any exclusions from a tradeable permits scheme mean that the potential to benefit is reduced, as access to lower cost emissions abatement in the excluded sectors is not available.

Innovation

Any domestic emissions trading scheme that is not fully comprehensive will impact on business competitiveness and the uptake of innovation. The competitiveness of any sector not covered by an emissions trading scheme restricted to energy related sources (for example service industries, small scale emitters and certain manufacturers) will improve relative to those sectors within such a scheme. Further, industry development opportunities may well open up for the renewable energy and environmental management industries, for sellers of innovation and for those involved in sequestration activities such as plantation forestry.

5.3 Incidence of Costs

In designing a method to allocate permits, consideration should be given to where the actual incidence of the costs of emission abatement will fall, which may or may not be on the permit holder. The incidence can be analysed by examining how the price of electricity might change under a limited emission permit scheme.

An emissions permit in a sense places a quota on the amount of electricity which a participant can produce. To exceed their quota and produce more electricity, an electricity producer has to either purchase more permits or adopt less emissions intensive technology. The price of electricity to consumers would rise reflecting the higher costs associated with purchasing permits or adopting cleaner technology, or reflecting the relative scarcity of electricity given the quota which has been imposed.

5.4 Use of Revenue

Depending largely upon how permits are allocated, there may be significant monetary flows under a emissions trading scheme. The question arises of what to do with any revenues which are transferred to government from the scheme (such as revenue transfer resulting from auctioning permits, administering the market, any taxes involved, fines for non-compliance and so on). How revenue is used can be an important factor in determining the net economic benefit of meeting an environmental target under general equilibrium modelling scenarios. Modelling undertaken by McDougall and Dixon (1996) shows that if revenue from an energy tax is used to reduce or eliminate payroll tax there is a net benefit to the economy, whereas if the revenue had been used to reduce the government budget deficit then there is a net loss. Hamilton and Quiggin (1997) state that in general, modelling studies produce the best results when revenue is used to cut taxes on investment and payrolls, the next best is to cut corporate taxes, and the worst options are to cut income taxes and make lump sum transfers.

Some possible options for the use of revenue are:

- administration of the permit scheme. The administrative costs may be considerable and should be examined in evaluating the net benefit of the scheme. It would seem appropriate that at least some of the revenue collected pay for the costs of operating the scheme.

- transfers to offset the impact on consumer incomes of a permit scheme. This may be appropriate if revenue is collected from the auction of permits as such revenue would be akin to a tax. As the incidence of the tax is likely to fall on the wider community of energy users rather than just the emitter, the revenue gained should also be used to

benefit the wider community. Note that such a transfer may feed back into demand for greenhouse intensive goods, such as energy, and necessitate larger price rises to produce a desired reduction in greenhouse emissions. Whether this occurs depends on the relative strengths of the income and substitution effects relating to a rise in the price of energy.

- subsidisation of greenhouse friendly research and development and technology diffusion. This would appear appropriate, particularly if the revenue arises from penalties imposed for a breach of the permit, as the revenue has only been received because of unplanned damage to the environment.

There are of course plenty of other uses for additional general revenue which are not directly related to greenhouse gas issues, such as tax reform, increased welfare payments, and so on.

Section 6. Links to International Schemes

The Kyoto Protocol contains flexibility provisions for emissions trading between Annex 1 countries as well as joint implementation between Annex 1 countries and the establishment of a Clean Development Mechanism (CDM) that would allow Annex 1 countries to earn credits for certified emissions reductions by investing in projects in non-Annex 1 countries.

The rules and mechanisms of how an international emissions trading scheme might operate have yet to be developed. The previous sections have highlighted the significant complexities and difficulties involved in designing a credible domestic emissions trading scheme that is equitable and cost-effective, while ensuring the operation of an efficient and effective market that can achieve an overall emissions target. There are even greater difficulties in designing a credible, efficient and effective international trading scheme.

Gaining international agreement to trade greenhouse gases, which are produced by every country from a variety of sources and sinks, and are still subject to uncertainties in measuring and monitoring, is likely to be extremely difficult. A succession of International Commodity Agreements since World War 2 have failed after seeking to control production, trade or consumption of certain commodities.

Greenhouse gas emissions share some of the characteristics which have led to the downfall of these international commodity agreements; namely, a large number of potential participants, high costs involved with effective monitoring, difficulty in enforcing compliance and the potential gains from non-compliance by an individual country.

Even if governments agree to participate in an international emissions trading scheme, they might wish to retain a high degree of flexibility over their choice of domestic initiatives because domestic regulatory structures, political feasibility of different measures, and the costs of particular control options vary greatly among countries. An international scheme that allows trading between companies, rather than just countries, would require the implementation of compatible domestic emissions trading schemes in all participating countries.

Countries could allocate individual emission limits to domestic industries or private enterprises, making it possible for them to participate in the international trading scheme. Governments might retain responsibility for verifying emissions and permits and enforcing compliance by these domestic industries or private enterprises. This would still require the use of many of the same market mechanisms, as well as the institutional and regulatory framework of a domestic scheme.

There are theoretical advantages to a domestic emissions trading scheme interfacing with an international scheme. It may lower the cost of emissions abatement for Australian industry by allowing access to low cost emissions abatement options in other countries. An international scheme would also improve market competitiveness by adding to market liquidity and depth.

6.1 Scope and Coverage

Pressure may arise to limit an international emissions trading scheme, initially at least, to the most easily monitored forms of emissions. Annex I countries in general have a much higher contribution of emissions from energy related sources (87 per cent in 1990) than does Australia (58 per cent in 1990)[4]. With such a high contribution from energy related sources internationally and the greater difficulty in measuring emissions from other sources, it is likely that some countries would seek to have an international scheme limited to energy related emissions.

Such a limited scheme would disadvantage Australia relative to other countries. It would only allow Australia to benefit from this trade for 58 per cent of its emissions, while other Annex I countries would have that benefit for 87 per cent of their emissions. Australia would have less scope to gain from trade.

If sectors like land use change, agriculture and transport were included in a domestic scheme, they may not be able to be part of the international scheme. For example, while permits to emit carbon dioxide from energy conversion could be traded internationally, the permits relating to methane, transport, land use change and so on could only be validly traded with carbon dioxide permits within Australia.

6.2 The Participants

There are three alternative models for trading under an international emissions trading scheme:

- trading is restricted to national governments;
- international trading is allowed at either a company or individual level. National governments would be able to allocate permits domestically from within the internationally agreed target or permit level;
- national governments are allowed to trade alongside private participants.

The following discussion addresses some of the advantages and disadvantages of each of these models. Each model assumes a domestic emissions trading scheme would operate alongside the international scheme. In addition, each model may need to consider the participation of non-Annex 1 countries or private enterprises as the Kyoto Protocol has provision for such elements.

A National Government only Trading Scheme

Allowing only governments to trade would result in fewer participants, significantly reducing transaction and administration costs. In addition, governments could trade in the context of their overall national interest.

However, some governments due to the size of their greenhouse gas emissions, may dominate the market and exert undue market power. This may have significant implications for investment and the competitiveness of certain Australian industries.

[4] Comparable international data on emissions for Annex 1 countries does not include the Land Use Change and Forestry Sector.

Allowing governments to trade may highlight their multiple and perhaps conflicting roles including:

- negotiating agreements on emission limits;
- monitoring and reporting national inventories of emissions; and
- actively trading emission units would require governments to obtain information on commercial opportunities for and costs of greenhouse gas mitigation in their country and other countries.

Participants in such a scheme would need to be satisfied that all participating countries had the systems in place to monitor, verify and enforce compliance.

An Enterprise only Trading Scheme

The principal advantage of restricting trade under an international emissions trading scheme to companies and individuals is that the risk of any individual company exerting market power is significantly lower. A larger number of participants would increase market depth and liquidity and make the market more competitive and contestable.

Even so, some of the large multinational corporations, particularly in the energy and resources sectors, may have access to better information on international marginal abatement costs and therefore have the capacity to exert undue market power.

There are additional advantages, including removing the conflicting roles government may have if they were to participate. Moreover, the scheme would fit well with a domestic emissions trading scheme based on enterprises and compliance is more easily enforced against domestic enterprises by national governments than against national governments by an international agency.

The most significant disadvantage of such a scheme is likely to be its complexity, particularly the large transaction and administration costs that might be expected.

A National Government/ Enterprises Trading Scheme

Many of the advantages and disadvantages discussed under the previous schemes may occur in an international emissions trading scheme where governments trade alongside private enterprises. Allowing governments to trade alongside private enterprises does not eliminate the conflicting roles they may have. Moreover it may introduce additional conflicts for government such as verifying emissions and trades of domestic private enterprises and enforcing compliance nationally.

Non-Annex 1 Countries and Enterprises

The Kyoto Protocol also contains provisions for the establishment of a Clean Development Mechanism (CDM). The CDM offers a means of allowing non-Annex 1 countries or private enterprises in these countries to participant in emission limitation activities, derive emission credits and obtain technology from Annex 1 countries. Non-Annex 1 countries could sell these credits to Annex 1 countries with emission limitation targets.

The principal advantage of allowing non-participating countries to trade is that the larger the number of countries with different costs of greenhouse gas abatement participating in the trading scheme, the greater the potential to access lower cost emission abatement activities.

However, extending the scheme to allow non-participating countries to trade may make monitoring, verification and enforcement more difficult, thereby undermining the value of emissions permits and credibility of the scheme and/or adding significantly to transaction and administration costs.

6.3 Allocation of Permits

Under an international emissions trading scheme permits would need to be allocated to countries. As stated in Section 2, permits can either be auctioned off to the highest bidder or can be allocated to existing emitters free of charge (grandfathering) on the basis of some criteria.

International auctioning is unlikely because it removes the sovereign right of countries and/or their domestic industries to emit greenhouse gases. It is unlikely governments would readily surrender such a right.

The negotiated outcome process adopted under the Kyoto Protocol agreement for the period 2008 - 2012 is a version of Grandfathering. There is no agreed formula for setting national emissions targets for periods beyond 2008 - 2012.

6.4 Credibility of the Scheme

The success of any international emissions trading scheme will ultimately depend on its credibility. An international emissions trading scheme can only be credible if each participant achieves its overall emission target in a manner that can be verified or is penalised for non-compliance, and the standards of verification or penalties for non-compliance are consistent across all participants.

If the scheme lacks credibility, through ineffective verification and compliance mechanisms, this will undermine confidence in the scheme. This will encourage non-compliance and reduce the incentive to trade if there is a risk that some permits may not be accepted.

Parties to the UNFCCC could, under a trading scheme limited to Governments, simply rely on each party to implement national arrangements to meet its Kyoto Protocol obligations including its emissions target, and national reporting requirements. However, given the potentially large wealth transfers likely and the incentive for under reporting of emissions, most parties are likely to require enhanced arrangements for monitoring, compliance and enforcement.

Some of the issues that will need to be considered by the international community to ensure the credibility of an international greenhouse gas emissions trading scheme are:

- standards for measuring greenhouse gas emissions that are consistent across all participants should be agreed. Mechanisms for measuring emissions may also need to be accredited by an international agency;

- who will verify emissions? A number of groups could verify emissions: an international agency, national governments or accredited agencies. An international agency may need to accredit the agencies in each country responsible for verifying emissions or, governments may have to agree to mutual recognition arrangements;

- who will ensure compliance? Responsibility for ensuring compliance could be performed by either an international agency or national governments;

- a fair and equitable dispute resolution mechanism recognised by all participants.

6.5 Implications for Competitiveness

An international emissions trading scheme could have implications for the competitiveness of Australian firms. This would in large part depend on which countries are included in the scheme and how emissions permits are initially allocated among participants. As with a domestic scheme, the initial allocation of permits has the potential to produce significant transfers of wealth between countries.

In the absence of an international emissions trading scheme but with national emissions targets in place for Annex 1 countries, industries located in Annex 1 countries with a high marginal cost of abatement would have an incentive to relocate to Annex 1 countries with a lower cost of abatement, or to non-Annex 1 countries (carbon leakage).

If however a comprehensive international emissions trading scheme is in place, it may be more cost effective for the industry in the Annex 1 country to purchase emissions permits from Australia or any other country participating in the scheme rather than relocate its investment. If non-Annex 1 countries are outside of the scheme and did not impose effective national emissions targets, industry would still have an incentive to relocate its investment to these countries to avoid entirely the costs associated with emissions abatement.

Any adverse impact on Australia's competitiveness in the above scenarios results from the imposition of emissions targets rather than the means of achieving them.

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