

# **GREENHOUSE TRADING**

**An operational specification for the  
phased introduction of a nation-wide  
greenhouse emissions-trading  
framework for Australia.**

**A REPORT OF  
AN EMISSIONS TRADING WORKING GROUP  
CONVENED BY THE NSW DEPARTMENT OF ENERGY**

**October 1998**

## FOREWORD

Australia's National Greenhouse Strategy foreshadows development of emissions trading. The case for emissions trading is well developed but as yet, no one has developed an operational specification for a trading scheme. To consider these details and issues arising, I established an Emissions Trading Working Group within the NSW Department of Energy. Their report provides the detail necessary to take the debate the next stage.

I have had the opportunity to consider this report and would now like to offer it for consideration of other government agencies, industry and environmental organisations for discussion purposes. The report demonstrates the opportunities emanating from the timely introduction of emissions trading. I commend the phased approach put forward as an option for serious consideration. Universal, one-step introduction of greenhouse gas emissions trading throughout Australia is a daunting task. Division of the task into four stages is a pragmatic way forward. I am also pleased to see that the Working Group proposes additional flexibility mechanisms (such as well secured carbon sequestration) be linked to trading with grid-connected power stations as the first step.

The report raises and examines a number of issues for high level consideration by government. In particular, there is a need to decide:

- who should administer an emissions trading scheme;
- which gases should be included in the first phase;
- whether windfall gains should benefit only existing emitters;
- the most appropriate allocation system;
- the best legislative arrangements; and
- a commencement date.

It should be noted that this report does not represent the views of the NSW Government, and is offered as a "without prejudice" contribution to the debate on emissions trading. The option described in the report is one amongst many possible design variations.

I commend the efforts of the Working Group and the contribution their report provides to the examination of these key issues in this developing policy area.



Hon Bob Debus  
Minister for Energy

## PREFACE

Conceptually, emissions trading appears to offer a cost-effective way of meeting the greenhouse mitigation targets set in the Kyoto Protocol. Moreover, there is considerable expectation that Australia's response to the Kyoto Protocol will include a national emissions trading scheme linked to a framework enabling international trading of *emission permits*. Australia has very little experience in the design and implementation of emissions trading systems.

In recognition of the need for operational detail as a starting point for national level discussion about emissions trading, the NSW Department of Energy established a Working Group to develop a template for an operational emissions trading system. This report contains the result – specification of a nation-wide emissions trading system capable of adaptation as national and international understanding of the challenges embodied in the Kyoto Protocol evolve. This specification is presented as a basis for further discussion. It has been developed to assist policy makers in evaluating options and exploring the challenges associated with implementing such a system.

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## EXECUTIVE SUMMARY OF DRAFT SPECIFICATION

In recognition of the need for rapid progress in the development of a nation-wide emissions trading system, the NSW Department of Energy established a working group to draft specifications for such a scheme. The specification is consistent with the Kyoto Protocol.

### *Principles*

Experience in the design of emissions-trading systems in the United States and other tradeable property-right systems used in natural resource management within Australia, suggest that the system should:

- have an adaptive framework so that new knowledge, new sectors and changes to the Kyoto Protocol can be accommodated;
- clearly specify rights (shares), entitlements (permits) and obligations for industry so that it can invest with confidence;
- have low transaction costs to minimise impediments to efficient adjustment;
- minimise legal and commercial risks for all participants; and
- maintain equity among all sources of greenhouse gas emissions.

### *What can be traded?*

For any emissions trading system to be viable, it is necessary to satisfy four criteria. There must be:

- sufficient emissions and sufficient sources for a market to be developed;
- a reliable, low cost means to monitor emissions coupled with a detailed history of recent emissions;
- an agreed cap on emissions; and
- an administratively feasible implementation pathway.

Although the Kyoto Protocol covers six greenhouse gases, carbon dioxide (CO<sub>2</sub>), methane (CH<sub>4</sub>) and nitrous oxide (N<sub>2</sub>O) account for 99.7% of Australian emissions. In the early stages, it is proposed that emissions trading not include the 0.3% of emissions covered by perfluorocarbons (PFCs), hydrofluorocarbons (HFCs) and sulfur hexafluoride (SF<sub>6</sub>).

### *Information on emissions, sources and sinks*

For Australia, information on CO<sub>2</sub> is best developed and most reliably quantified for sources involving the combustion of fossil fuels - coal, petroleum and natural gas. CH<sub>4</sub> and N<sub>2</sub>O emission data are of variable quality. Similarly, sink data are of variable quality. Methods for estimation of the quantity of carbon sequestered through afforestation and deforestation are still being developed. It is feasible, however, to include CH<sub>4</sub> and N<sub>2</sub>O in an emissions trading system.

### *A phased implementation schedule*

Given the large array of greenhouse gas emission sources and lack of data about them, simultaneous implementation of emissions trading for all sources and the three main gases would be administratively impossible.

Consequently, a phased approach is recommended. Phasing creates opportunity for learning and early demonstration of leadership among all nations listed in Annex 1 to the Kyoto Protocol. There are significant first mover advantages to the nation which shows the world how to set up a greenhouse gas emissions trading scheme.

Based on national inventories, a cap on emissions is necessary. Consistent with the Protocol, this cap would be known as the *assigned amount*. In each phase, the *assigned amount* for national emissions would be partitioned into two parts:

- a *tradeable amount*; and
- a *non-tradeable emissions buffer*.

Four phases are proposed, one of two years, followed by two of three years, and one of 5 years. This phased implementation schedule is designed with two key considerations in mind:

- The first *commitment period* under the Kyoto Protocol commences in 2008 and, hence, the third phase of the proposed national emissions trading should end on 31 December 2007 so that the fourth phase meshes exactly with international requirements that begin on 1 January 2008.
- Negotiation of details for the second *commitment period* from 2013 to 2017 through another internationally agreed protocol are scheduled for 2005. Completion of a second phase in 2004 would place Australia in a sound position to participate in these negotiations.

Phase I would apply to grid-connected power stations and should include verified sinks in States and Territories where there are tight controls on vegetation clearance and sequestration agreements are registered on a land title.

Phase II would be expanded to include most of the transport sector.

Phase III would incorporate most sources with *non-tradeable emissions buffers* left in place for those parts of each sector where the cost of inclusion in the system outweigh the benefits. International trading would be possible with nations who have made similar advances.

Phase IV envisages full international participation in international trading arrangements.

*Why start with grid-connected power stations?*

In the first phase, there is a need to focus on establishing a market and keeping the administrative task manageable. Grid-connected power stations account for around half of Australia's national carbon dioxide emissions and are substantially controlled by State and Territory governments. Excluding hydro-electric generators, Electricity Supply Association of Australia (ESAA) data identifies 75 grid-connected power stations with a rated capacity in excess of 30 MW<sup>1</sup>. Collectively, they

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<sup>1</sup> This includes power stations connected to transmission and distribution networks.

account for around 80% of the total capacity for the electricity sector (*Electricity Australia 1998*).

As some power stations have already begun to offset emissions via carbon sequestration agreements with the forestry sector, we suggest that some carbon sequestration be incorporated in the first phase.

## **MAIN FEATURES OF THE PROPOSED SYSTEM**

When developing the draft system specification, the Working Group focused on detail and tried at all times to come up with a precise recommendation. The main strategic elements are as follows:

- emissions trading for the gases that account for 99.7% of greenhouse gas emissions - CO<sub>2</sub>, CH<sub>4</sub> and N<sub>2</sub>O;
- differentiation of Australia's *assigned amount* into a *non-tradeable emissions buffer* and a *tradeable amount*;
- phased introduction of emissions trading starting with all grid-connected power stations (this includes power stations connected to transmission and distribution networks)<sup>2</sup>;
- progressive increase of the number of sources, sinks and sectors in the trading system;
- a system designed so that compliance monitoring can occur at different locations for each gas and enforcement mechanisms can change as more sources and sinks are added;
- planning periods synchronised with Kyoto Protocol reporting and review requirements;
- allocation of emission shares that entitle the holder to periodically receive *emissions permits* in proportion to the number of shares held;
- *emission permits* that can be carried forward in perpetuity until acquitted;
- parallel legislation adopted in each State, Territory and the Commonwealth;
- regulations attached to that legislation and revised periodically to remain consistent with the Emission Management Plan for each phase;
- issuance of *emission permits* in proportion to the volume of carbon sequestered less an amount set aside to cover fire, disease and other natural losses; and
- restrictions on international trading in shares until the consequences of permanently assigning part of Australia's *assigned amount* to another country are understood and permit trading is well established.

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<sup>2</sup> A specification may be required to place grid-connected power stations below a set rating capacity in the *non-tradeable emissions buffer* where the cost of their inclusion in the system outweighs the benefits.

At a more detailed level:

- the *tradeable amount* will be partitioned into *tradeable amounts* for CO<sub>2</sub>, CH<sub>4</sub> and N<sub>2</sub>O;
- emission shares defined as an emission entitlement to a proportion of the amount assigned to Australia in the Kyoto Protocol, operationalised via the periodic issue of emission permits in proportion to that entitlement;
- to preserve options and keep arrangements consistent with emerging international norms, shares issued for each phase with a renewal guarantee binding future governments and providing investment security;
- *emissions permits* issued annually in proportion to number of shares held;
- *emission accounts* resembling a cheque account - emissions and permit sales will be debited as they occur, permit allocations and acquisitions will be credited as they occur, and transfer of permits by writing a “cheque”;
- all *emission accounts* in CO<sub>2</sub> *equivalents* with actual emissions converted into CO<sub>2</sub> *equivalents* using internationally agreed global warming equivalents;
- except for a short “*grace period*” and “*grace amount*,” no borrowing against future emission entitlements will be allowed;
- a proportion of each shareholding will be periodically returned to the community;
- the penalty for emissions in excess of the number of permits held approximately equal to three times the market value of a permit.

### **Phase I implementation**

In phase I, each grid-connected power station would receive shares in proportion to their recent emissions history. To allow for variations in demand and down time, the number of shares issued would be in proportion to the sum of the three highest annual emission amounts occurring during the last five years

Committed investments, power stations with no emissions history, new stations and stations with new generating capacity operational before midnight on 31 December 1999 would be allocated a *deemed emission history*. That history would be based on industry averages less an adjustment for the lower emissions expected of new technology.

In Phase I, separate share holdings will be defined for each gas so that measurement and definitional issues associated with commencement of trading for each gas can be solved independently. In either Phase III or Phase IV it is expected that all shares will be merged into an aggregated formal share of Australia’s *assigned amount*.

To provide maximum investment security, CO<sub>2</sub> shares, CH<sub>4</sub> shares and N<sub>2</sub>O shares would be defined in terms of the proportion of Australia’s *assigned amount* for the first *commitment period*. There would be no opportunity for non-participating sectors and sources to argue for a subsequent

redistribution of *emission shares*. That is, if Phase I participants are allocated shares equivalent to 30% of Australia's *assigned amount* for the first *commitment period*, they would be guaranteed that any future reductions in the amounts assigned to Australia would be made on a pro rata basis across all shareholders and the *non-tradeable emissions buffer*. Increases in the *amount assigned* to Australia would be retained by Government on behalf of the community.

It is proposed that shares be issued in November 1999 and the first phase commence on 1 January 2000.

In Phase I, trade in shares would be limited to grid-connected power stations. In Phase II, consideration would be given to the merits of extending share trading to allow acquisition by any Australian citizen and all emitting firms required to account for emissions, that is in the first phase investors would be able to trade in permits but not shares. In subsequent phases, it is expected that these restrictions would be relaxed as global markets emerge and international marketing protocols develop. As a general principle, the guiding rule is the recommendation that share trading should be introduced after permit trading markets are well developed.

### **Administrative arrangements**

Administrative arrangements for implementation of the proposed emission trading scheme require high level consideration.

It is suggested that the Council of Australian Governments and a Taskforce reporting to it, be responsible for implementation and periodic review of the scheme. The periodic Emission Management Plan would remain an ongoing role of the Taskforce or equivalent body. Operational elements of the scheme could be undertaken by existing institutions.

## GLOSSARY

<b>Assigned Amount</b>	The quantity of greenhouse gas emissions Australia is allowed to emit in a phase or <i>commitment period</i> .
<b>Certified Sequestration Credit</b>	A stock of carbon defined in <i>CO<sub>2</sub> equivalents</i> and certified as being sequestered within an accounting period and protected by a sequestration agreement legally obliging the landholder to maintain that stock in perpetuity. If fire or disease reduces the volume sequestered the landholder is obliged to restore the stock as quickly as possible. Sequestration agreements may be cancelled by surrendering permits equivalent to the stock of carbon associated with the agreement.
<b>Clean Development Mechanism (CDM)</b>	Certified emission reduction credits earned through projects in countries which are not listed in Annex 1 of the Kyoto Protocol. Emission permits would be issued in proportion to the certified reduction achieved.
<b>CO<sub>2</sub> Equivalent (CO<sub>2</sub>-e)</b>	Tonnes of CO <sub>2</sub> with the same global warming potential as a given mass of CH <sub>4</sub> , N <sub>2</sub> O or other greenhouse gas.
<b>Commitment Period</b>	The period during which total emissions from all sources must be less than or equal to the <i>assigned amount</i> .
<b>Deemed Emission History</b>	An emissions history given to a power station expected to begin operation before 1 January 1999.
<b>Emission Permit</b>	An entitlement to emit one tonne of CO <sub>2</sub> or equivalent. The permit can be banked for as long as the Kyoto Protocol remains in force.
<b>Emissions Account</b>	An account used to register the number of unused <i>emission permits</i> held by each emitting firm, record permit allocations and record recent transactions.
<b>Emissions Permit Cheque</b>	A piece of paper requesting the transfer of <i>emission permits</i> from one <i>emissions account</i> to another.

<b>Emission Share</b>	<p>A guaranteed right to receive a proportion of all the <i>emission permits</i> allocated in a phase or <i>commitment period</i>.</p> <p>Shareholders are guaranteed that any reduction in Australia's <i>assigned amount</i> will be made via a pro-rata reduction in allocations across all shareholders and the <i>non-tradeable emissions buffer</i>.</p>
<b>Free Rider</b>	A person or firm or sector who benefits from the actions of others without making an equitable contribution to the cost of that action.
<b>Grace Amount</b>	The maximum gap allowed between emissions and <i>emission permits</i> held.
<b>Grace Period</b>	The period that an emitting firm has to rectify any deficit in its <i>emissions account</i> .
<b>Non-Tradeable Emissions Buffer</b>	The proportion of Australia's <i>assigned amount</i> that is not available for trade.
<b>Prior Right</b>	A provision indicating that all emissions from a sector or sub-sector are to be included in the <i>non-tradeable buffer</i> .
<b>Tradeable Amount (TA)</b>	The proportion of Australia's <i>assigned amount</i> available for emissions trade.

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# SPECIFICATION OF A FRAMEWORK FOR A NATION-WIDE GREENHOUSE GAS EMISSIONS TRADING SCHEME

## The Kyoto Protocol

Negotiated in December 1999, the Kyoto Protocol aims to reduce emissions of six greenhouse gas species. The Protocol becomes a legally binding document once it is ratified by 55 countries or sufficient countries to account for 55 per cent of the total carbon dioxide emissions of the Annex 1 (developed) countries. The Kyoto Protocol assigns each country an entitlement to emit not more than a fixed quantity of greenhouse gases during a five-year *commitment period* commencing in 2008. This entitlement is known as an *assigned amount*.

Under the Protocol, Australia's total emissions in the first *commitment period* from 2008-2012 must be less than 108% of 1990 emissions plus any credits generated through *Clean Development Mechanism (CDM)* projects undertaken between 2000 and 2012. The methodology used to measure greenhouse gas emissions in the 1990 baseline year must be the same as that used to quantify each nation's *assigned amount* in the first *commitment period*.

Six species of gas are involved: carbon dioxide (CO<sub>2</sub>), methane (CH<sub>4</sub>), nitrous oxide (N<sub>2</sub>O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulfur hexafluoride (SF<sub>6</sub>). For accounting purposes, these gases are measured as *CO<sub>2</sub> equivalents* (CO<sub>2</sub>-e) which takes into account their relative global warming potential.

**Table 1. Estimates of global warming potentials for selected greenhouse gases**

Greenhouse gases	Global warming potential (for 100 year term horizon)
Carbon dioxide (CO <sub>2</sub> )	1
Methane (CH <sub>4</sub> )	21
Nitrous oxides (N <sub>2</sub> O)	310
Perfluorocarbons (PFCs)	6 500-9 200(a)
Hydrofluorocarbons (HFCs)	140-11 700
Sulfur hexafluoride (SF <sub>6</sub> )	23 900

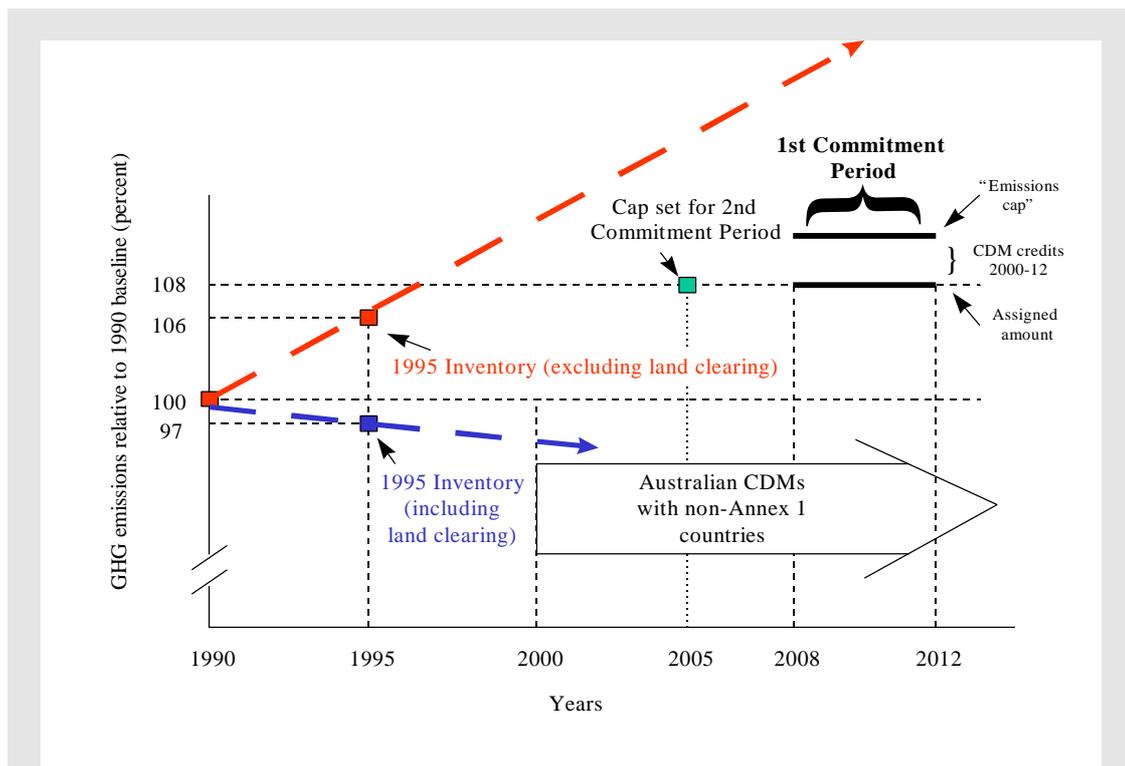
(a) CF<sub>4</sub> (GWP=6500) and C<sub>2</sub>F<sub>6</sub> (GWP=9200) (NGGIC, 1997a)

Source: IPPC 1996.

Countries can bank emissions credits. That is, they can carry unused amounts forward into the next *commitment period* (or sell any certified emissions reductions internationally) but they can not borrow from a future *commitment period*. Under Article 3 and Article 17 of the Protocol it is

envisaged that some countries will use emissions trading as a means to help keep aggregate emissions within their *assigned amount*. International trading of any part of an *assigned amount* is permitted under the Protocol.

Figure 1 below provides an overview of suggested national planning periods synchronised with Kyoto reporting and review requirements. The figure also highlights the influence that factors such as land clearing and CDMs may have on the degree of adjustment necessary for Australia to be able to comply with the Kyoto Protocol. It should be noted that the inventory projections, particularly where incorporating the impact of land clearing, are speculative only.



**Figure 1** The Kyoto timeline for Australia with a linear extrapolation of recent emissions based on the two data points available from the 1995 national inventory

Source: NGGIC 1997a, Young and Berger 1998

### What is emissions trading?

Essentially, any emissions trading system involves a "cap" on the amount of gases that can put into the atmosphere. Emission rights are allocated to emitting firms and *emission permits* issued. Permit holders are free either to use their permits or sell them to other emitting firms. But each source must have sufficient permits to cover its emissions in each reporting period. When it is expected that the cap might either be increased or decreased, emission rights are often defined as proportional shares of that cap. In Kyoto Protocol language the "cap" is known as an *assigned amount*. Pragmatically, not all of this *assigned amount* could be included in a trading scheme. In practice, there will be a need to set aside a *non-tradeable emission buffer* so that emissions from all sources including those excluded from the trading system remain less than Australia's *assigned amount*.

In this report we define the tradeable emission cap as the *tradeable amount*. An equitable process for periodic revision of the *tradeable amount* is developed later in the report.

## Why have emissions trading?

The case for inclusion of emissions trading in a national strategy to reduce greenhouse gas emissions is well developed (ABARE 1998) and, as a result of experience in the United States, proven as one of the most cost-effective means to reduce atmospheric pollution (Harding 1998; Saile 1998). In brief:

- Early introduction of a national emissions trading scheme would allow Australia an opportunity to play a major role in defining how international trading is developed and to gain necessary experience prior to the development of an international emissions trading scheme;
- A national scheme would be competitively neutral and could be designed not to distort investment and operation of energy utilities between States and Territories;
- A national scheme could be designed to ensure that export competitiveness of Australian companies is not disadvantaged by allowing companies *emissions permits* equivalent to the emissions embodied in their exports; and
- Low cost abatement options such as forestry-based sequestration could be developed on a consistent basis across Australia.

## Emission rights

As the allocation of emission rights can influence or change existing property rights, emission entitlements need to be expressed in a form which clearly defines legal rights and conditions.

In a well designed regime, trading minimises the industry-wide costs of emission reduction. Emitting firms who can reduce emissions, sell permits to those who can't. The total cost of emission reduction is shared but those who can't adjust at low cost, pay others, via the purchase of permits, to make the change. The environmental outcome is the same but the cost to industry is much less because market processes are used to discover the most efficient way to reduce pollution.

While there are infinite forms of emissions trading regimes, most are based on variants of two types of allocation methods:

- those where *emission permits* are auctioned and the government keeps the resulting revenue; and
- those where permits are allocated in proportion to a pre-determined formula.

Auctions tend to be more difficult to implement as the revenue gained from the auction process is usually retained by government. The use of auctions is often seen as a more equitable allocation approach. Allocation by auction does not disadvantage new entrants to an industry but it taxes

existing firms. The sudden requirement to buy emission entitlements, just to continue in business, increases production costs. In practice, the option is seen as a tax introduced under the guise of a trading system.

When permits are allocated the option to reduce or increase the cap can be preserved by granting each emission source a share of each gas's tradeable emission cap for each planning period commensurate with their historical record. Effectively, a dual-right system is created involving both:

- *emission shares*; and
- *emission permits*.

Separation of property rights into two elements dramatically lowers transaction costs and opens up many administrative and allocation options. By allocating shares of the *tradeable amount* for each gas rather than an entitlement to a fixed quantity of gas, periodic changes can be made without the need for compensation. There is need for a guarantee however, that any changes will be made on a pro-rata basis. Choice of this mechanism guarantees that Australia can cope with any changes (in particular, reductions) in the amount assigned to it in future *commitment periods*.

An accounting system is used to reconcile actual emissions against permits held. High penalties are imposed on any emitting firm whose emissions exceed the number of permits they hold. The cost of these penalties and the likelihood that it will be applied, are such that emitting firms have an incentive to buy "surplus" permits from other emitting firms.

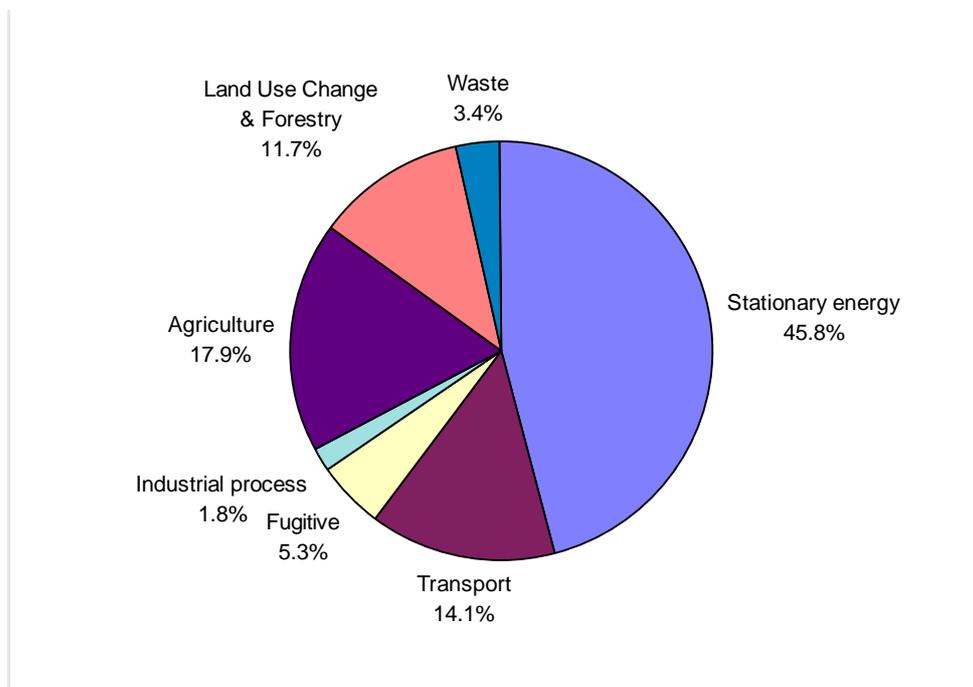
Emissions trading, however, is not a panacea. As recognised in the Prime Minister's Statement on Greenhouse (Prime Minister 1997), emissions reduction is also achievable through regulation, incentive based programs, education and information. In areas where the costs of emission trading will be greater than the benefits, these other measures should be used on their own. Where emission trading benefits are greater than costs, the option of mixing this opportunity with other measures needs to be explored.

## **This report**

This report aims to raise key issues and assist policy makers in designing and evaluating trading scheme options. The focus is on operational settings and arrangements for a national scheme designed for incorporation in whatever international system emerges from the Kyoto Protocol process.

The forthcoming Framework Convention on Climate Change meeting to be held at Buenos Aires in November 1998 will initiate discussions on developing agreed definitions and operational design for an international greenhouse gas emissions trading regime. In recognition of the need for rapid progress, the NSW Department of Energy established a working group to determine draft specifications for a pilot nation-wide emissions trading system capable of extension to a full national scheme. The framework is consistent with the Kyoto Protocol.

The introduction of an emission trading scheme could become bogged down or derailed by the many political choices required to be made and agreed upon. It is important, at this stage, that the significant cost mitigation benefits of emissions trading are not overlooked. Early adopters of emission trading are also likely to gain “first mover” advantages by influencing international scheme design and gaining hands-on operational knowledge of a developing international market. Pursuit of that advantage is one of the key motivations underpinning preparation of this report.



**Figure 2 Contribution to Total CO<sub>2</sub>-e Emissions by Sector 1995 (Including Forest and Grasslands Conservation)**  
*Source: National Greenhouse Gas Inventory 1995.*

The Department of Energy is examining emissions trading options in the knowledge that stationary energy sources are responsible for 46% of Australia's greenhouse gas emissions (as shown in Figure 2 above). The electricity sector, as Australia's single most significant greenhouse gas emitter and dominant source of stationary energy emissions, stands to benefit most from participation in emissions trading and the savings in mitigation cost it could provide. Within the electricity sector, efficient fossil fuel power stations would benefit from requiring less permits, thus lowering operating costs. Early involvement in design, in advance of other nations, will significantly increase the probability that final international arrangements will dovetail perfectly with this sector's requirements.

Introduction of emissions trading would also benefit the renewable energy sector. Emissions trading effectively reduces the gap between the costs of fossil fuel and renewable energy generation by incorporating the environmental costs of power generation in production costs. As the gap is reduced, opportunities for development of renewable energy expand. As this sector does not emit greenhouse gases, the opportunities available to it remain unconstrained. Where there are no emissions, there is no need for permits.

For NSW, the development of emissions trading would also assist the State to meet its greenhouse mitigation requirements. Under the *Electricity Supply Act 1995*, NSW electricity retailers are required to develop action plans for energy efficiency and demand management strategies, and strategies for purchasing energy from sustainable sources. Electricity distributor licensees are required to conduct demand management investigations, prior to expanding or increasing the capacity of their distribution system. Ultimately, a fully functioning national emissions trading scheme would make current greenhouse mitigation provisions under the *Electricity Supply Act 1995* superfluous and would meet the environmental outcomes envisaged in the Act in a more cost effective manner.

### **Steps in design**

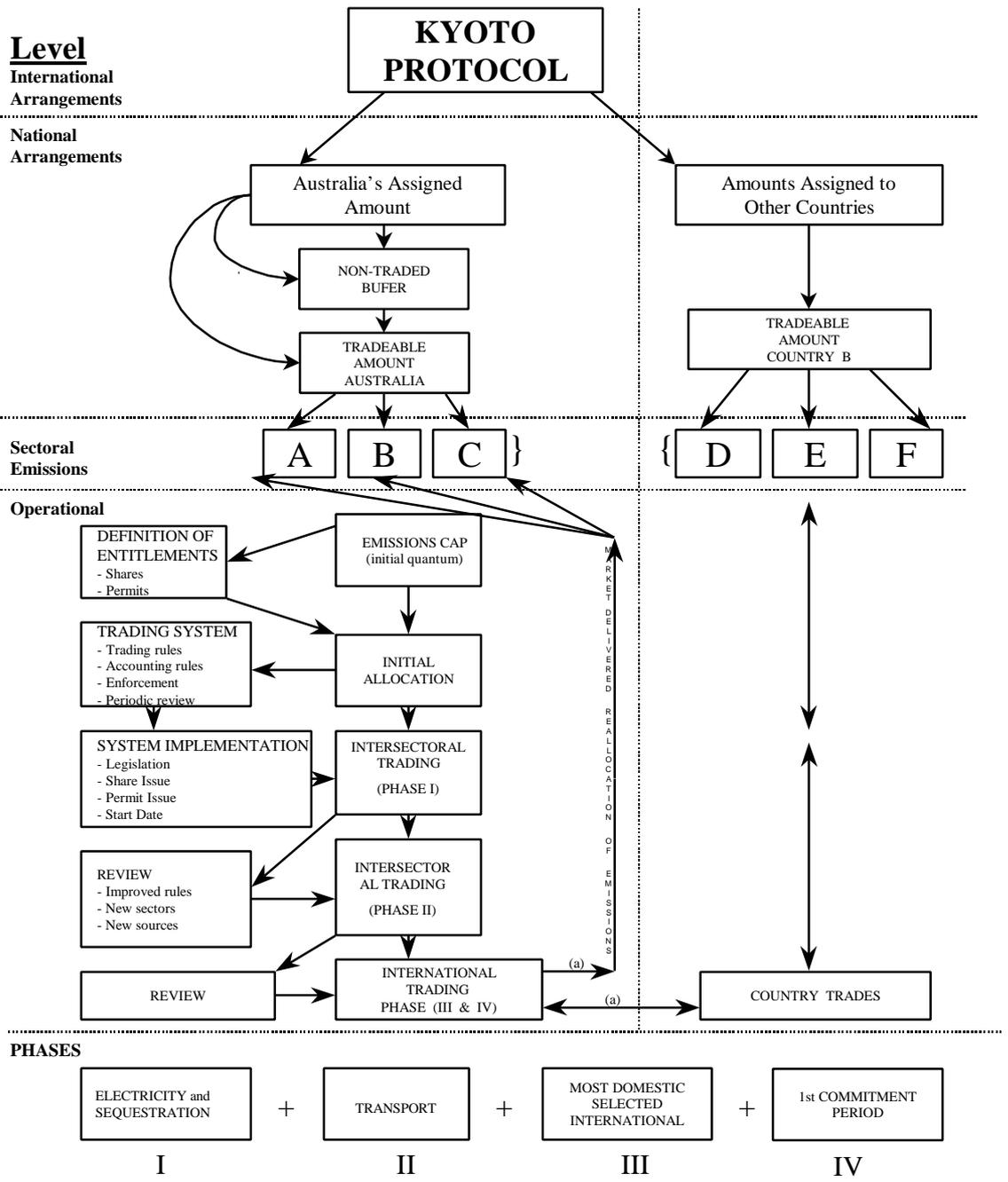
The overall steps involved in developing a framework for a nation-wide greenhouse gas emissions trading scheme are illustrated in Figure 3.

### **What should be traded?**

For any emission trading system to be viable, it is necessary to satisfy four criteria. There must be:

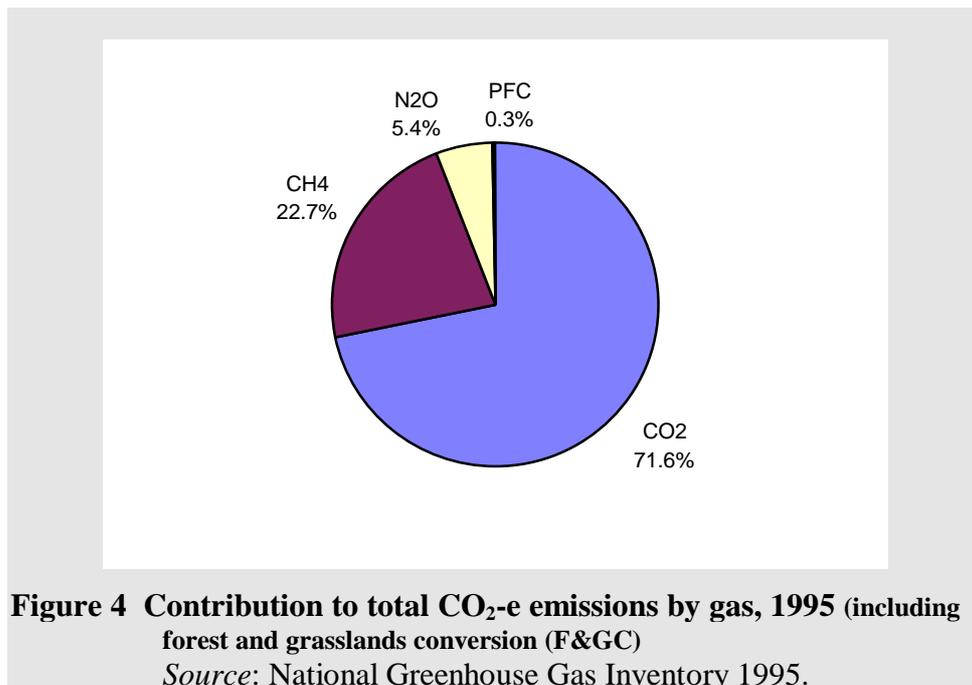
- sufficient tradeable permits or quantities and sufficient emitting firms for a market to be developed;
- a reliable, low cost means to monitor emissions coupled with a detailed history of recent emissions;
- a cap on emissions agreed by all trading entities; and
- an administratively feasible implementation pathway.

As shown in Figure 4, carbon dioxide (CO<sub>2</sub>), methane (CH<sub>4</sub>) and nitrous oxide (N<sub>2</sub>O) account for 99.7% of Australia's greenhouse gas emissions. Pragmatically, this means that any domestic trading system will most likely only involve these three gases.



(a) Totals reconcile (i.e. have same overall sum, direction and impact on Australian and Country B tradeable amount emissions).

**Figure 3 Steps in developing a nation-wide greenhouse gas emissions trading framework.**



There are insufficient emissions to facilitate the low cost, measurable and accurate inclusion of PFCs, HFCs and SF<sub>6</sub> in an emissions trading system. Where data are lacking or participants too few, *non-tradeable emissions buffers* can be used to allow part of the *assigned amount* to be kept out of the trading system. Thus, the:

$$\text{Tradeable Amount} = \text{Assigned Amount} - \text{Non-Tradeable Emissions Buffer}$$

Under the Kyoto Protocol, all participating nations are obliged to keep total emissions within their *assigned amounts* (plus *CDMs* and the net effect of approved international trades). The amount allocated to the *non-tradeable emissions buffer* must be sufficient to cover all eventualities. In effect, activities within the *non-tradeable emissions buffer* are given a “*prior right*”. In property law, a *prior right* is given to those people whose rights are superior to those within the allocation system. Subject to regulation, the *tradeable amount* is reduced always by the quantity they emit. People within the trading regime are not compensated for the impact of this arrangement on the opportunities available to them.

**Where are there sufficient data to start with confidence?**

For Australia, information on CO<sub>2</sub> is best developed and most reliably quantified for sources involving the combustion of fossil fuels - coal, petroleum and natural gas. There is, however, a number of significant issues associated with estimation of emissions (and sinks) deriving from afforestation, reforestation and deforestation. Information on CH<sub>4</sub> and N<sub>2</sub>O emissions is of variable quality.

To simplify the introduction of a trading regime, and if CH<sub>4</sub> and N<sub>2</sub>O data are insufficient, we could begin with CO<sub>2</sub> only. CO<sub>2</sub> makes up 72% Australia’s total greenhouse gas emissions.

For major sources, like grid-connected power stations, the materials input and emission inventories are reasonably robust. Moreover, a relatively small number of sources are involved. Excluding hydro-electric generation, Australia has 75 power stations with a generating capacity greater than 30 MW (*Electricity Australia 1998*). We suggest that one pragmatic way to introduce emissions trading in Australia is to begin with the electricity sector's grid-connected power stations (this includes power stations connected to transmission and distribution networks) irrespective of size. As mentioned earlier, a specification may be required to place grid-connected power stations below a set rating capacity in the *non-tradeable emissions buffer*. This would occur where the cost of inclusion in the system outweighs the benefits.

## A phased approach

The rationale for this stepwise approach to implementation is that much of the detail surrounding the Kyoto Protocol has still to be defined. The 75 grid-connected power stations in Australia with a generating capacity greater than 30 MW (excluding hydro-electric generators) account for around 80% of the total capacity of the electricity sector. The electricity sector contributes around 53% of national emissions of CO<sub>2</sub> (NGGI 1995)<sup>3</sup>. Moreover, as most power stations are government assets, the commercial risks associated with early introduction are less than those associated with full national implementation of emissions trading in one step. Several power stations have already begun to negotiate sequestration arrangements with the forest industry. Consequently, the Working Group is of the opinion that the electricity sector is an appropriate starting point for introduction of a national emissions trading system.

The phased approach and time sequence selected enables an initial two year trial with grid-connected power stations, followed by expansion to embrace all stationary energy and transport sources - accounting for 60% of Australia's total greenhouse gas emissions (NGGI 1995).

A decision on the degree to which other sources, like emissions associated with fertiliser use and livestock, are included in an emissions trading scheme, would be deferred. Well before 2005, a decision would be taken either to incorporate sources like these in the emissions trading system or retain them in the *non-tradeable buffer* where regulatory and other incentive mechanisms may be used to reduce emissions.

The phased approach we recommend creates an opportunity for early learning and international demonstration of Australia's leadership and commitment to equitable emissions reduction. Three introductory phases are proposed, one of two years, followed by two of three years. This is designed with two key considerations in mind:

- Negotiation of details for the second *commitment period* from 2013 to 2017 are scheduled for 2005. Completion of a second phase in 2004 would place Australia in a sound position at these negotiations.

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<sup>3</sup> This represents around 30% of Australian emissions of all six species of greenhouse gas (NGGI 1995).

- The first *commitment period* commences in 2008 and hence, the third phase leading to a fully operational and universal national scheme should end on 31 December, 2007.

Later in the report, we propose mechanisms that protect participants in the early phases from competitive disadvantages that may arise from *free rider* opportunities.

In order to be comprehensive, and as some power stations have already begun to make arrangements to offset emissions via carbon sequestration in the forestry sector, we propose that Phase I should include verified sinks in States and Territories, where there are tight controls on vegetation clearance. Phase II would expand to include most of the transport sector. Phase III would incorporate most sources. *Non-tradeable buffers* will be left in place for those parts of each sector where the cost of inclusion outweigh the benefits. In parallel with this process, *buffer* sources could be subject to increasingly stringent regulation. Phase I would start on 1 January, 2000.

In summary, Australia could gain significant advantages by proceeding quickly to an emissions trading system. Grid-connected power stations, which are largely still controlled by State and Territory governments, are well placed to be part of the first phase. Given Australia's demonstrated interest in land use change and forestry, there should be some opportunity for inclusion of sinks. More work is needed on:

- setting the optimal level to set the *tradeable amount* for each gas in each phase; and
- the rate at which other sources are included in the trading regime.

**Table 2 Possible framework for the phased introduction of emissions trading in Australia**

Phase	Years	Period	Sectors involved	Suggested <i>assigned amount</i> for each phase (Expressed as a percentage of 1990 emissions)
I	2000-01	2 yrs	Grid-connected power stations and certified sinks in States with clearing controls	104%
II	2002-04	3 yrs	Add transport sector	105%
III	2005-07	3 yrs	All major sources with buffers for the rest	106%
IV	2008-12	5 yrs	Links to the international sector	108%

### What cap (*assigned amount*) for early phases?

Strategically, Australia needs to ensure that national emissions, in the first *commitment period* from 2008 to 2012, are less than 108% of 1990 emissions. We assume that this means that the optimal adjustment path for the nation will be one that progressively increases to the 108% limit.

It is unwise and economically expensive to overshoot and then take the measures necessary to claw back to under the limit at the last minute. A related issue is the extent of international trading that can be expected to occur. If the burden of Kyoto Protocol compliance in Australia is less than in other participating countries, then a large number of permits will leave Australia and the nation could experience a significant economic shock. In this case, it may be wiser to set the *assigned amount* for each phase so that a surplus of permits is available for sale in 2008.

Conversely, if our domestic *tradeable amount* is tight, trade of permits into Australia could result in expansion of economic activity. While much more research on this issue is needed, for the purposes of this report we assume, if the adjustment pathway set out in Table 2 is followed then the effects of

international exposure will be optimal.<sup>4</sup> In the first phase, the *tradeable amount* we propose for grid-connected power stations would require this sector to keep emissions for the first two years at current (1998) levels. This would require them to reduce projected national emissions across this sector by around 2% per annum (NIEIR).

## DESIGN PRINCIPLES

Experience in the design of emissions trading systems and other tradeable property-right systems used in natural resource management, such as those used for water and fishery management, suggest that the system should:

- have an adaptive framework so that new knowledge, new sectors and changes to the Kyoto Protocol can be accommodated;
- clearly specify rights, entitlements and obligations for industry so that it can invest with confidence;
- have low transaction costs so as to minimise impediments to efficient adjustment;
- minimise legal and commercial risks for all participants; and
- maintain equity among all sources of greenhouse gas.

## SYSTEM FRAMEWORK

The design of any tradeable property-right system requires many choices to be made. The approach we follow in this report is summarised in Figure 3. Decisions are being made at international, national, sectoral and operational levels. Our goal is an operational specification of a workable system to give Australia a strategic advantage in a complex arena. The approach recommended is one that is adaptive, with an emphasis on improvement as national and international experiences emerge.

### A single system or a separate system for each gas from fossil fuel?

As identified earlier, there are only sufficient sources and emission information for trading in three gases: CO<sub>2</sub>, CH<sub>4</sub> and N<sub>2</sub>O. At least in the early stages, it is recommended that emissions trading begin with these three gases and that a *non-tradeable emissions buffer* be set aside from Australia's *assigned amount* to allow for changes in emissions associated with the three minor gas species.

### Shares

Unless permits are allocated by auction, it is necessary to establish an equitable allocation mechanism. The most transparent way to do this is to allocate shares. Shares could be allocated either as:

- a share of the *tradeable amount* set for a period; or

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<sup>4</sup> Options to delay or advance participation in international trading will need to be reviewed periodically.

- a share of a *tradeable amount* defined for each gas.

We recommend initially, that share allocation procedures be defined for each gas and then sources be issued *emission shares* in each gas's *tradeable amount*. Initially, there should be CO<sub>2</sub> shares, CH<sub>4</sub> shares and N<sub>2</sub>O shares. At a later stage, once allocation processes are completed, these could be converted into shares in the CO<sub>2</sub>-e amount assigned to Australia.

In the early stages of implementation, the allocation of CO<sub>2</sub>, CH<sub>4</sub> and N<sub>2</sub>O shares preserves options. It means that risks associated with changing scientific knowledge and inventories are quarantined to each gas. There will be an institutional incentive to deal with all gases. Measurement and definitional issues associated with each gas can be dealt with separately. Problems with one gas will not impede progress with another. Basing the trading structure on three primary building blocks rather than one, makes it easier for Australia to ensure that it can conform with whatever international arrangements emerge.

Pragmatically, in Phase I this means that each power station will need to be allocated CO<sub>2</sub>, CH<sub>4</sub> and N<sub>2</sub>O shares. It also means that Australia will need legislation that caps emissions from these sources and for these gases from 1 January, 2000. If nation-wide data on N<sub>2</sub>O and/or CH<sub>4</sub> emissions are incomplete or unreliable, the scheme could begin with CO<sub>2</sub> alone. CH<sub>4</sub> and N<sub>2</sub>O trading could be introduced in a later Phase.

## Permits

While it is recommended that, in the early stages, a separate system be set up for each gas, there is no need for separate *emission permits* to be issued for each gas. It is recommended that - using internationally agreed carbon gas equivalent conversion ratios - all permits be issued in *CO<sub>2</sub> equivalents*.

Inventory and accounting requirements associated with each greenhouse gas species can be expected to vary significantly. Moreover, across the nation, data for CH<sub>4</sub> and N<sub>2</sub>O are of varying quality and coverage. CO<sub>2</sub> emissions data, for example, are much more easily accessible and accurately measured than those for methane. CO<sub>2</sub> emissions are relatively easily estimated. Comprehensive data on sales of fossil fuels are available from government records generated by the royalty system associated with coal mining, oil refining and gas production. CH<sub>4</sub> emissions associated with power generation are potentially available from coal mines. Emissions data for N<sub>2</sub>O are potentially available from environment protection agencies; but in the past, such records have not always been adequately maintained.

## Legislative arrangements

The Kyoto Protocol's first *commitment period* will run for five years from 2008 to 2012. The recommended implementation framework is designed to take the nation through three preparatory phases. The first phase will run for two years. Two three-year phases will follow.

Operationally, legislation establishing the framework will need an adaptive review mechanism that copes with change but provides security.

Regulations under that legislation will need to set the *tradeable amount* for each gas, define trading rules, define monitoring processes and set penalties for non-compliance. Legislation could provide for a periodic emissions management planning process. Emissions Management Plans would contain the detail.

The focus of legislation would be on the system. Regulations would focus on phase-specific arrangements. Collectively, the legislation and associated regulations would:

- guarantee all share holders a right to receive an offer to convert Phase I shares into Phase II shares in a manner that maintains their equity in the trading system;
- set the *tradeable amount* for each period and for each gas;
- define the annual number of permits to be issued per share;
- specify accounting, monitoring and enforcement procedures;
- specify restrictions on share and/or permit trading;
- specify exchange rates between gases and, if appropriate, specify exchange rates for permits issued by other countries;
- define the mechanism to be used to bring new sectors and emission sources into the trading regime; and
- define penalties for non-compliance.

There is a need to provide a framework allowing redefinition of administrative arrangements, the number of permits periodically allocated to each share, specification of entitlements, etc as the Kyoto Protocol evolves. To ensure that rights remain clearly specified, shares may also have to be redefined as more sectors, sources and sinks are included.

## Share period

For investment confidence, it will be important that legislation require that the offer of shares for the next phase should be made no more than two thirds of the way through the current phase. Early specification of the arrangements for the next phase is consistent with the Kyoto Protocol which defines 2005 as the year to make arrangements for the second *commitment period, which begins in 2012. Early finalisation of the Emission Management Plan for each phase means that industry can adjust to new arrangements efficiently and invest with confidence.* In the event that plans for the next phase cannot be agreed, legislation should provide regulations for the current phase to apply to the next one without modification. This would be forced by requiring automatic re-issue of Phase I shares as Phase II shares subject, without modification, to all the conditions defined for Phase I shares. Similarly, the arrangements and rules for trading in *emission permits* and accounting for emissions would remain unchanged.

## Permits

*Emission permits* would entitle the holder of that permit to emit the quantity of gas defined in the permit on the condition that when they emit that quantity they surrender the permit. *Emission permits* would last in perpetuity until acquitted. That is, unused permits could be transferred forward from phase to phase without conflict. Consistent with the Kyoto Protocol, no borrowing against future permit allocations would be permitted.

## REGISTRATION AND TRADING

In the course of establishing an emissions tracking system, it will be necessary to establish a share register and a set of accounts.

### Share register

The share register established would be similar in nature to those used for company shares. It would be centralised and organised so that electronic transactions are possible. The minimum trading unit would be one share. Initially, one share would entitle a person to receive an annual allocation of approximately one tonne of CO<sub>2</sub> or its equivalent in global warming units. Periodic variations to the allocation ratio would be anticipated.

As shares will be valuable assets, there may be advantages in making them mortgageable. The simplest way to facilitate mortgage-like transactions is to provide an option making it possible for a shareholder to agree that sale of some shares be subject to permission of a registered interest. One part could be held in an unencumbered state while dealings in the other half would be subject to the consent of the legal entity named on the register. Unencumbered shares could be sold on the Australian Stock Exchange or by private negotiation. Brokers could also assist with the steps involved in clearing shares that are mortgaged and then transferring them to another party.

### Emissions accounts and permits

As indicated earlier, separate share and permit registration systems would be established. Consistent with the plan for each phase, *emission permits* would be issued in proportion to the number of shares held adjusted for the global warming equivalent for each gas. Once issued, there would be no restriction on permit trading.

The permit registration and tracking system would resemble those banks use to track money.

Box 1 provides an example of the type of accounting system proposed. The account is owned by XYZ Trading Pty Ltd which has 1030 CO<sub>2</sub> shares. In phase I, 1.1 permits per share are issued each year. Permits are bought and sold from ABC Power. Permits are also acquired from Bush Carbon - a limited liability company formed by a Landcare Group to sell the annual sequestration value of 5,000 hectares of revegetation they have established.

**Box 1**

**Illustration of a domestic emissions accounting system that could be used to keep transactions costs low.**

**GREENHOUSE GAS EMISSIONS PERMIT ACCOUNT**

Firm name: **XYZ Pty Ltd**

Date	Transaction	Debit	Credit	Balance
1/1/01	Balance bought forward			1,000
1/1/01	Emission permit allocation, 1030 CO <sub>2</sub> shares @ 1.1 tonnes per share		1,133	2,133
15/1/01	CO <sub>2</sub> emissions for month of December 2000	300		1,833
19/1/01	Permits acquired from ABC Pty Ltd		250	2,083
19/1/01	Permits acquired from Bush Carbon Pty Ltd		200	2,283
20/1/01	Permits sold to ABC Pty Ltd	100		2,183

Unlike shares, no attempt would be made to record ownership on each permit. Transaction costs would be kept to a minimum by allowing cheque book-like permit trading. The accounting software for this style of system has already been developed for SO<sub>x</sub> and NO<sub>x</sub> emission trading schemes in the United States, based on that existing in banking. A similar system is also being used by BP in its internal emission trading scheme trial.

## **International linkages**

The entire framework developed in this report is designed so that, at any stage, it will be possible to ensure consistency with the decisions made as the Kyoto Protocol is implemented. Those familiar with the Protocol will note that the Protocol foreshadows the introduction of *emission permits* that will become internationally tradeable. However, the Kyoto Protocol is silent on the matter of how to allocate these permits. Rights to periodically or otherwise receive emission permits and international trade of them is a national issue left for each participating nation's government to decide. Having considered this issue, this report recommends a dual property-right structure facilitating trade in permits and/or shares.

In the early stages, permits would be issued as Australian permits with the opportunity for these permits to be sold internationally. Potentially, permits imported to Australia from Japan, for example, may be converted on a one for one basis. However, if nations take different approaches and different risks in trading system design, it may be appropriate to reserve the option to discount permits acquired from another country. This arrangement would mean that the liability to keep total emissions in any country would remain a national responsibility without qualification. Australia may, for example, accept a permit from Japan or the United States only when that country agrees to reduce its *assigned amount* by the amount defined by the permit.<sup>5</sup> The approach mimics the rules used for foreign currency exchange. Non-compliance in one country does not automatically mean non-compliance in another.

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<sup>5</sup> Such an arrangement would not be necessary if all nations agree to use permits that are tradeable throughout the world and identify a means of international enforcement.

## Sequestration

The Kyoto Protocol recognises sinks generated through afforestation and reforestation. Australia is actively seeking to incorporate sequestration measures into its greenhouse program and many power generation companies are keen to participate in such initiatives. In accordance with the Kyoto Protocol, it is suggested that sequestration in the first phase of the emission trading be limited to well-secured carbon. Permits would be issued in proportion to the volume of CO<sub>2</sub> sequestered less an amount put aside to cover the risk of loss from fire etc, shared among all registered sources. In Phase I, recognition would be limited to:

- carbon sequestered by changes in land-use practice made after December 1997 when the Kyoto Protocol was negotiated (until the definition of "additionality" under Article 6b of the Protocol becomes clear);
- the actual quantity of carbon sequestered in each year of the phase;
- afforestation or reforestation protected under a covenant guaranteeing that the sink will be maintained in perpetuity unless an equivalent carbon off-set is provided; and
- land-use change in States and Territories where formal land clearing controls are in place and where the entire State is demonstrating no net loss in the area covered by perennial vegetation.<sup>6</sup>

The owner of any afforestation or reforestation independently, certified as meeting the above criteria, would be issued permits equivalent to the volume of CO<sub>2</sub> sequestered less an allowance for fire, disease and other uncontrollable risks. Certification would be undertaken by accredited agencies. The central register would establish an *emissions account* for each participating landholder and then credit the account with an appropriate number of permits.<sup>7</sup>

The above guidelines would be reviewed as part of the planning process associated with the transition to the next phase.

## Emission equivalents and permits

There is a choice between converting all greenhouse gas emissions to CO<sub>2</sub> *equivalents* or issuing permits for each gas species. Transaction costs will be lower if all permits are identical. Consequently, it is recommended that all permits be in CO<sub>2</sub> *equivalents*.

Emission exchange rates for CH<sub>4</sub> and N<sub>2</sub>O would be defined in the regulations defining administrative arrangements for each phase. Table 1 lists the current rates used to convert CH<sub>4</sub> and N<sub>2</sub>O emissions into CO<sub>2</sub>

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<sup>6</sup> This stringent requirement is suggested to ensure that false expectations are not raised among sectors or states where the rate of emission growth is still significant.

<sup>7</sup> This is consistent with a recent report to the Australian Greenhouse Office on Bush for Greenhouse. See Young, M.D. and Berger, N.J. (1998) Bush for Greenhouse: Market, legal and policy issues. Final Report to the Australian Greenhouse Office. CSIRO Land and Water, July 1998.

*equivalents*. In the absence of an alternative, estimates of global warming potentials for greenhouse gases provided by the International Panel on Climate Change (IPCC) would be applied. This means that all emissions would be recorded in *CO<sub>2</sub> equivalents*. Unlike shares, only one account would be kept for each emission source.

### **Registration and transaction costs**

Permit account keeping would be electronic. To encourage trading, at least in Phase I, there would be no charge for the cost of registering trades.

A small account fee would be set so that people are aware of the costs of setting up and keeping a permit account. Periodic statements, like the one in Box 2, would be sent to each account holder.

As with shares, the Australian Stock Exchange, individual brokers and participating parties would all be free to hold, deal with or exchange permits. They would be free to set broking fees in the normal manner.

### **Market Restrictions**

In the early stages, a mature market will not operate either for *emission shares* or for *emission permits*. This means that a company or nation could try to use the proposed system as a "backdoor" way to gain control of the industry. It is possible, for example, that a foreign company could seek to take control of a large proportion of Australia's grid-connected power stations by buying *emissions shares* and then using monopsony powers to the detriment of the Australian economy and the efficiency gains sought through emissions trading. To quarantine risks associated with such activity some restriction on share or permit ownership may be necessary in the early phases.

### **Restrictions on share trading**

At the most general level, the case for restrictions on share ownership is greater than that for permits. Share allocation is a once-off process. Under some scenarios, it could involve transfer of a significant proportion of the *amount assigned* to Australia under the Kyoto Protocol to another country.

The dual share/permit system proposed facilitates establishment of an open international market for permits while preventing permanent sale of Australia's long term entitlement under the Kyoto Protocol until the market for these permits is well established.

**Table 3 Proposed restrictions on share trading**

Phase	Year	Allocation period	Participants
I	2000/01	2 year trial	Power stations and new power stations starting in that period plus selected landholders.
II	2002/04	3 years	Australian citizens and other Australian emitters now in system.
III	2005/07	3 years	Include other nations to the extent of joint implementation arrangements in permit trading. No international trade in emission shares.
IV	2008/12	5 years	Review implications of full international trade in shares. Free trade in permits expected but not guaranteed at this stage.

Given Australia's interest in maintaining control of its domestic economy, there is a strong case for restriction of trading in shares until an international market for permits is well developed. A draft set of share trading restrictions is summarised in Table 3. In Phase I, share ownership would be limited to system participants, namely power stations and those involved in certified carbon-sequestration. In Phase II, speculative investment in shares may be allowed among Australian citizens and companies registered in Australia. In Phase III, trade could extend to include nations involved in joint implementation arrangements with Australia. In the administrative review, leading up to Phase IV, there will be a need to assess the implications of allowing full international trade in shares of Australia's *assigned amount*.

Eventually, share dealings may only be subject to the Foreign Investment Review Board processes. At this stage, however, it is recommended that Australia avoid offering to permanently sell part of its *assigned amount* to other nations until others agree to similar arrangements and the international market for *emission permits* is well developed.

### Restrictions on Permit Trading

In the early phases and, if share transfer restrictions are in place, there is no significant case for any restriction on permit transfers. As more permits are issued each year, there is no long term supply issue. Moreover, restrictions on permit trading would significantly raise transaction costs. Indeed, the

Working Group could identify no significant reason to restrict permit trading.

## ALLOCATION

To implement the proposed system it is necessary to allocate shares and/or permits. Essentially, there are three broad options:

*Option 1* - Sale of all permits by auction or tender with retention of all “shares” in government ownership;

*Option 2* - Allocation of shares to existing sources in proportion to say the sum of the three highest annual emission amounts occurring during the last five years, or kilowatt hours produced; or

*Option 3* - Combinations of 1 and 2.

While Option 1 is likely to be an efficient means of distributing entitlements, emitters are not likely to solely support a system which does not accept the “property right” of existing operators and requires purchase of their initial entitlement allocation. There is also an issue as to who retains the revenue thus raised and for what purpose this money should be used. Under Option 2, it can be argued that, if shares are issued at zero or low cost to existing emission sources, then they gain a competitive advantage and new emitting firms face an additional barrier to entry. These equity problems dissipate in subsequent periods as adjustment occurs.

In practice, Option 1 - retention of shares in public ownership coupled with periodic auction of permits - would be interpreted as a tax on industry. In the short term, the Working Group judges this option to be unworkable. Industry would not embrace emissions trading with enthusiasm. Success in implementation is heavily reliant on positive engagement with industry. Options to return some of the windfall gains from this process to the community are developed later.

International experience in introducing tradeable emission and tradeable natural resource right systems suggests that it is politically difficult to introduce a system that does not closely mimic existing practice and subsequently takes participants through an equitable and efficient adjustment process.<sup>8</sup> At present, greenhouse gas emissions are unencumbered and industry is being encouraged to progress emission reduction through voluntary measures under the Greenhouse Challenge Program, some regulation and State based programs such as the NSW Green Power Accreditation Program run by the Sustainable Energy Development Authority (SEDA).

### **An operational allocation system**

Equity and simplicity require that the share allocation procedure be consistent nationwide. A greater sense of equity will also exist if the principles underpinning the share allocation process are consistent among

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<sup>8</sup> See Young (1992, 1996), Young and McCay (1997) and Young and Evans (1997).

phases. That is, the principles used to allocate shares in Phase I should be the same as Phase II, even though the industries and sources receiving new shares will be different.

In Phase I when the focus is on grid-connected power stations, there is a need to issue shares to existing emission sources and committed investments. Examples of a committed investment include - a power station under construction or a power station that is having a major refurbishment.

For grid-connected power stations, reasonably reliable CO<sub>2</sub> and CH<sub>4</sub> emission data are available from 1995. Stations fall into three categories:

- those with constant emissions;
- those with rising emissions; and
- those with falling emissions.

Generally, emission allocation processes require high level government consideration. Unless care is taken, introduction of tradeable right systems can involve lengthy legal challenges. Pragmatically, the most effective allocation methods use mathematical formulae consistent with legislative guidelines. Appeals are then limited to arguments over measurement and/or recording errors.

Having analysed the available data, the most acceptable and least cost process appears to involve allocation of *emission shares* in proportion to:

- past emissions;
- a special allocation rule for committed investments

That part of the allocation based on emission history can be in proportion to:

- 1999 emissions only; or
- the sum of all emissions in the last five years; or
- the sum of emissions from the three years in the last five where emissions were largest.

Drawing on experience in other areas of natural resource management, such as the fishing industry, the fairest option is allocation of shares in proportion to the sum of emissions from the three years in the last five where emissions were greatest. The main attraction of this formula is that it avoids the need to give special consideration to atypical years.<sup>9</sup>

With regard to committed investments, power stations with no emissions history, new stations and stations with new generating capacity operational before midnight on 31 December 1999, would be allocated *deemed emission histories* for CO<sub>2</sub>, CH<sub>4</sub> and N<sub>2</sub>O. For CO<sub>2</sub> and N<sub>2</sub>O, the emission history for each committed investment would be deemed to be equivalent to mean industry capacity for a generator of equivalent size less a discount. A small discount seems appropriate as the new generators should be among the most efficient in Australia given the source of energy used. There

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<sup>9</sup> See Young (1996).

would, however, be no emission history discount for CH<sub>4</sub> emissions, as these occur when coal is mined, not as power is generated.<sup>10</sup>

### Windfall gains and security

Phased introduction means that early share holders face allocation risks. Their main concern will be that others, because they join later, will have an incentive to increase emissions and hence, try to gain a greater share of the tradeable portion of Australia's *assigned amount*. In recognition of this valid concern, it is suggested that shares should be defined, from the outset, as a fixed share of the emission entitlement assigned to Australia at Kyoto in 1997. Effectively, this would mean that other sectors could not increase emissions for advantage and Phase I participants would not be affected by *free rider* problems.

Legislation would provide that any future reductions in Australia's *assigned amount* would be allocated on a pro-rata basis across all shareholders and the *non-tradeable emissions buffer*. Any increase, however, should be reserved to the Crown on behalf of the people of Australia. These are windfall gains and we see no reason why the benefits of such an opportunity should be granted to shareholders who were allocated shares by the Government at no cost.

A related issue, is the possibility of windfall gains associated with a reduction in emissions from non-traded sources like land-use change. Emissions from tree clearing, for example, could drop substantially in ways that cannot be credited to individual landholders. If this occurs, then these gains are available for distribution. Under one option, the benefits from this increase could flow to existing shareholders. Alternatively, any windfall gains of this form could be treated as a new assignment and additional shares sold to the highest bidder or held by government as an investment. If retained as an investment, then the government would be able to periodically sell *emission permits* on the open market. It is recommended that the latter approach be taken. Legislation should define the government as the initial owner of any gains not generated by shareholders.

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<sup>10</sup> It is stressed that the data used to make this recommendation have not been verified and may contain errors. More analysis is needed before a final decision is made. More analysis is needed on the implications of discounting deemed emissions for committed investments and, also, on the cut-off date after which committed investments will need to acquire shares and/or permits via normal market processes.

## MARKET DEEPENING

In Phase I, once emission entitlements are allocated, there may be little incentive for existing power stations to trade either shares or permits.

In fact, international experience suggests that share and permit holders are reluctant to trade until a mature market emerges.<sup>11</sup> In the early stages and while the number of shareholders is small, there is opportunity for emitting firms to use emissions trading as a means to establish a dominant position in the market for electricity production. There is, however, a powerful mechanism available to remove the opportunity for this to occur. The mechanism - known as a zero revenue auction or zero revenue tender - forces all shareholders to trade on a regular basis.

Zero-revenue auctions work by forcing each participant to sell a proportion of their shares every year. A reserve price can be set, but shares or permits must be offered for sale. In the United States, a system like this is used to deepen the market for sulfur emission rights. For such a system to be introduced in Australia, it would be necessary to allow shareholders to set a reserve price so that, if the shares are “bought back”, they would not be subject to capital gains tax.<sup>12</sup>

A recommended variant of this same system introduces a return to the community. Used in forestry licensing systems in Canada, the revenue collected from the auction/tender process described above, is retained by the government as a “return to the community”. This variant deepens the market in the same manner as a zero-revenue auction, but gradually transfers the windfall gains associated with the introduction of a tradeable emission right system to the community.

Having considered the merits of these mechanisms, it is recommended that a community return be incorporated into the emissions trading framework specified in this report. Choice of the proportion to be retained as a return to the community is clearly a matter for high level consideration by governments. Nevertheless, it is suggested that markets be deepened by forcing all share holders to place 5% of their share holding on the market each year. The “return to the community” could be implemented on the last Friday in November of each year. During Phase I, however, all the revenue received could be returned to shareholders. During this phase, the emphasis would be on market development and learning about the system, not revenue collection. In Phase II, it is suggested that the revenue collected at each auction be retained as a return to the community.

### Who allocates entitlements?

Consideration of allocation issues raises the question of whether or not shares should be first issued to emission sources:

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<sup>11</sup> See Young and Evans (1997).

<sup>12</sup> Under some auction systems, shares are not identified and, hence, a firm buying back its own shares may be liable to pay capital gains tax. Legislation can be written to define the situation that when a shareholder buys back a number of shares equivalent to those surrendered it is deemed that no sale has occurred.

- by the Commonwealth; or, alternatively,
- by States and Territories.

A choice between these alternatives must be made at highest level. Two considerations should be key parameters in the decision:

- equitable disbursement of the revenue arising from the proposed “return to the community” mechanism; and
- need for national consistency.

Allocation by the Commonwealth provides national consistency while leaving the revenue issue open. States and Territories have a legitimate interest in the allocation and community returns process. State/Territory environment protection agencies are likely to be involved in compliance monitoring. As sequestration agreements will need to be registered on the title, allowable offsets (such as forestry sequestration) are most effectively handled through the agencies responsible for maintenance of land titles in each State and Territory. A possible compromise is a national allocation system with a mechanism guaranteeing States/Territories a proportion of the revenue arising from the return to the community mechanism and any new share issues. This proportion would be in line with the volume of emissions in each State and Territory when shares are first allocated. However, as with allocations to industry this option would reward States and Territories with poorer track records in greenhouse gas mitigation.

Providing there is a national framework to allocation in place there is no reason States and Territories could not directly undertake allocation within their jurisdictions. Noting that the initial distribution of Australia's *assigned amount* between the States will require complex negotiation at highest Government levels. Subsequent allocation of State/Territory segments would need to be predicated on a national approach being agreed to ensure State/Territory allocation mechanisms remain consistent with one another. This would provide share and permit transferability at parity within Australia and allow the widest scope for cost-effective economic adjustment within the trading scheme.

Direct involvement in the allocation process is likely to be the minimum position of States and Territories. This approach would be likely to secure the earliest introduction of a national emissions trading scheme. State/Territory issuance of shares would also ensure that they remain committed to ensuring that the system runs as efficiently as possible.

## **Legislation and administrative considerations**

No tradeable emission-right system can be introduced without supporting legislation. It is possible for the Commonwealth to prepare the necessary legislation and administer the scheme through a central authority. Alternatively, one State could offer to act as lead legislator. Other States, Territories and the Commonwealth could then enact complementary legislation. The latter approach is recommended. In practice, inclusion of emission credits from sequestration requires access to State and Territory legislation so that sequestration agreements can be registered on land title.

The initial design, implementation and review of a national scheme will require a high level decision making body which engages State, Territory and Commonwealth Governments. The Council of Australian Governments (COAG) and a Taskforce reporting to it has proven to be a successful mechanism for dealing with inter-jurisdictional issues of this nature. The periodic development of an Emission Management Plan (a key scheme driver) would necessitate an ongoing role for the Taskforce or an equivalent independent body developed from it. The Emission Management Plan specifies the detail of scheme parameters such as guaranteeing the right of share renewal, setting the *tradeable amount* for each period and for each gas, defining the annual number of permits to be issued per share, specifying restrictions on share and/or permit trading and defining the mechanism to be used to bring new sectors and emission sources into the trading regime.

Ongoing operational elements of the scheme could be undertaken by existing institutions to avoid duplication and reduce scheme costs. As mentioned earlier State and Territory environmental protection agencies are likely to be involved in monitoring emissions and possible scheme enforcement. The Australian Stock Exchange could provide a market place for scheme transactions and together with other companies and individuals provide brokerage services.

The main issue for Government is to decide upon the most appropriate process to develop the system and the steps necessary for it to gain approval for shares to be allocated in time for implementation on 1 January, 2000.

## **Enforcement**

The permit value is the opportunity cost of abatement. To ensure compliance, emissions in excess of permit levels would be penalised at a level that far exceeds the likely market price of emissions permits. The penalty (expressed in \$s per tonne) would be set at three times the permit value so there is a clear incentive to comply. Share forfeiture in proportion to the offence could also be used as an implementation mechanism.

## **CONCLUSION**

This report is timely as it demonstrates the possibilities of greenhouse gas emissions trading in Australia. The option outlined is based on pragmatic design principles. An adaptive scheme framework which clearly specifies legal rights and obligations and minimises transaction costs is proposed.

The phased introduction of emissions trading allows significant rapid progress. The phased approach also overcomes the time consuming - possibly overwhelming - task of introducing the scheme in one step. In the first phases, emissions trading will place little pressure on industry to adjust. The focus, in the spirit of a trial, will be to learn and gain experience.

The dual-share/permit system proposed in this report preserves options to reduce and increase the emissions cap, significantly lowers transactions costs and opens up administrative and allocation options.

Most importantly, the report raises a number of issues for high level consideration by government. In particular, there is a need to decide:

- who should administer an emissions trading scheme
  - it is suggested that COAG and a Taskforce reporting to it should develop and implement the initial scheme design with ongoing operational elements undertaken by existing institutions;
- which gases should be included in the first phase
  - CO<sub>2</sub> alone or CO<sub>2</sub> + CH<sub>4</sub> + N<sub>2</sub>O?
- whether windfall gains should benefit only emissions shareholders, or, alternatively, the entire community
  - a community return is suggested;
- the most appropriate allocation system
  - a dual share-permit system is suggested;
- the best legislative arrangements
  - parallel legislation is suggested; and
- the date to start emissions trading
  - 1 January, 2000 is suggested.

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